



7705 SERVICE AGGREGATION ROUTER | RELEASE 21.4.R1

Basic System Configuration Guide

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1 Preface

1.1 About This Guide

This guide describes system concepts and provides configuration explanations and examples to configure the 7705 SAR boot option file (BOF) and perform system and file management functions.

This guide is organized into functional chapters and provides concepts and descriptions of the implementation flow, as well as Command Line Interface (CLI) syntax and command usage.



Note: This manual generically covers Release 21.x content and may contain some content that will be released in later maintenance loads. Please refer to the 7705 SAR 21.x.Rx Software Release Notes, part number 3HE17436000xTQZZA, for information on features supported in each load of the Release 21.x software.



Note: As of Release 21.4, software support for the following hardware has been deprecated:

- 7705 SAR-M 6-port DSL Combination module (3HE05914AA)
- 7705 SAR-M 8-port xDSL module (3HE05577AA)
- 7705 SAR-M GPON module (3HE05126AA)
- 7705 SAR-Wx xDSL variants (3HE07618AA, 3HE07619AA)

These components are no longer recognized in the release.

1.1.1 Audience

This guide is intended for network administrators who are responsible for configuring the 7705 SAR routers. It is assumed that the network administrators have an understanding of networking principles and configurations. Concepts described in this guide include the following:

- CLI concepts
- file system concepts
- boot option, configuration, image loading, and initialization procedures

- basic system management functions such as the system name, router location, coordinates, and CLLI code, as well as time zones, Network Time Protocol (NTP), Simple Network Time Protocol (SNTP), and synchronization properties

1.1.2 Technical Support

If you purchased a service agreement for your 7705 SAR router and related products from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance. If you purchased a Nokia service agreement, follow this link to contact a Nokia support representative and to access product manuals and documentation updates:

[Product Support Portal](#)

2 7705 SAR System Configuration Process

[Table 1](#) lists the tasks that are required to navigate the Command Line Interface (CLI), configure basic router and system parameters, perform operational functions with directory and file management, and configure boot option parameters.

Each chapter in this book is presented in an overall logical configuration flow. Each section describes a software area and provides CLI syntax and command usage to configure parameters for a functional area.

Table 1 Configuration Process

Area	Task/Description	Chapter
CLI Usage	Navigate the CLI and perform basic configuration tasks	CLI Usage
Operational functions	Perform general operational functions for directory and file management	File System Management
Boot options	Configure boot option files (BOF)	Boot Options
System configuration	Configure system functions, including host name, address, domain name, and time parameters	System Management
Reference	List of IEEE, IETF, and other proprietary entities	Standards and Protocol Support

3 CLI Usage

This chapter provides information about using the Command Line Interface (CLI).

Topics in this chapter include:

- [CLI Structure](#)
- [Navigating in the CLI](#)
- [Getting Help in the CLI](#)
- [The CLI Command Prompt](#)
- [Displaying Configuration Contexts](#)
- [EXEC Files](#)
- [CLI Script Control](#)
- [Entering CLI Commands](#)
- [CLI Configuration Rollback](#)
- [Transactional Configuration](#)
- [Basic Command Reference](#)

3.1 CLI Structure

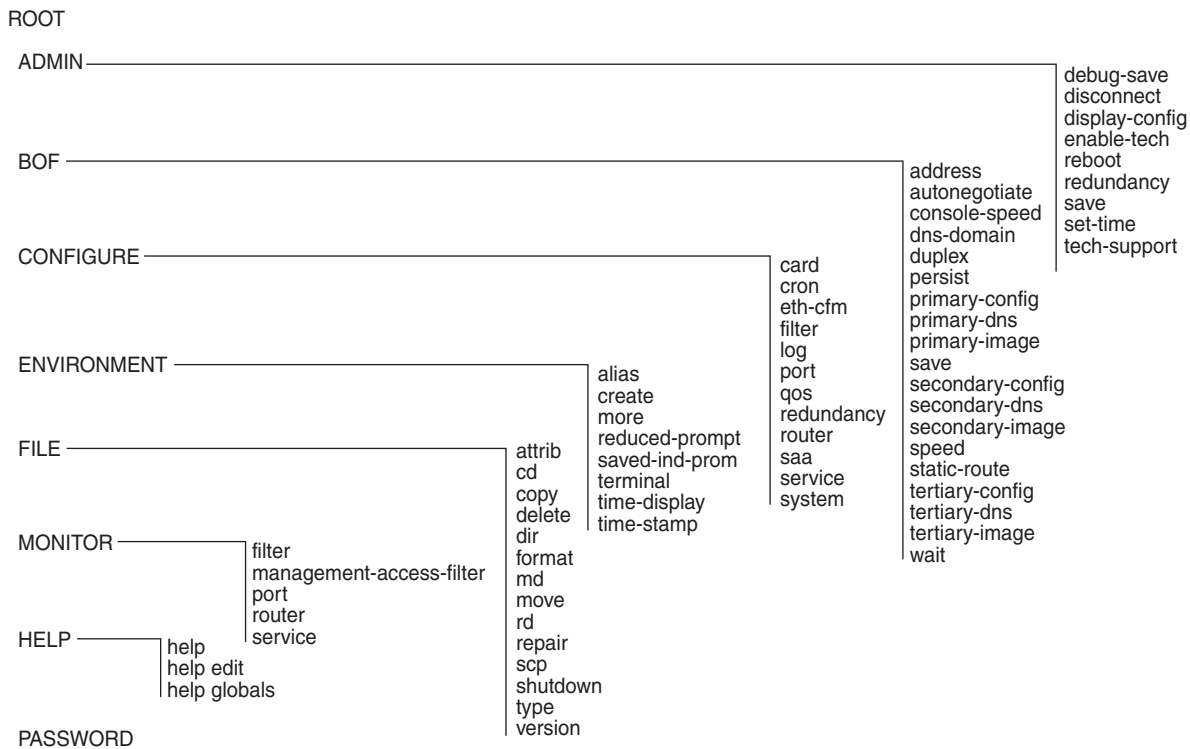
The 7705 SAR CLI is a command-driven interface accessible through the console, or through Telnet, secure shell (SSH), or SSH file transfer protocol (SFTP). The CLI can be used for configuration and management of 7705 SAR routers.

The 7705 SAR CLI command tree is a hierarchical inverted tree. The highest level is the ROOT level. Below this level are other tree levels with the major command groups; for example, **configure** commands and **show** commands are levels below ROOT.

The CLI is organized so that related commands with the same scope are at the same level or in the same context. Sublevels or subcontexts have related commands with a more refined scope.

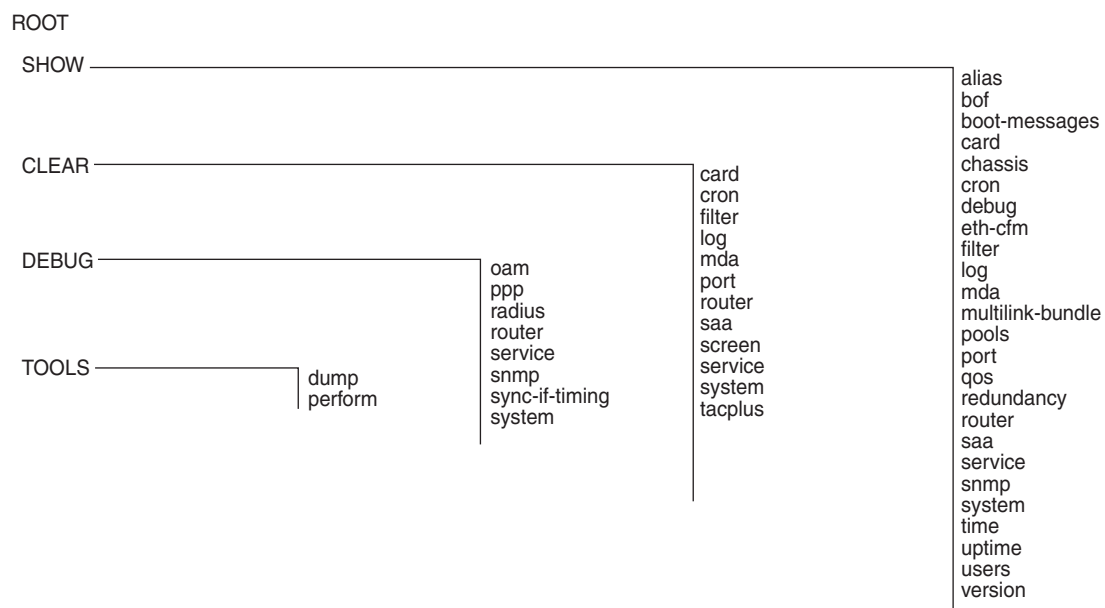
Figure 1 and Figure 2 display the major contexts for router configuration. The figures are sample representations of high-level commands; not all commands are included.

Figure 1 Root Commands



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Figure 2 Operational Root Commands



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3.2 Navigating in the CLI

The following sections describe additional navigational and syntax information:

- [CLI Contexts](#)
- [Basic CLI Commands](#)
- [CLI Environment Commands](#)
- [CLI Monitor Commands](#)

3.2.1 CLI Contexts

Use the CLI to access, configure, and manage 7705 SAR routers. CLI commands are entered at the command line prompt. Access to specific CLI commands is controlled by the permissions set by your system administrator. Entering a CLI command makes navigation possible from one command context (or level) to another. When you initially enter a CLI session, you are in the ROOT context. Navigate to another level by entering the name of successively lower contexts. For example, enter either the **configure** or **show** commands at the ROOT context to navigate to the **config** or **show** context, respectively. For example, at the command prompt, enter **config**. The active CSM slot displays in the command prompt at the beginning of the CLI context.

```
A:ALU-12# config
A:ALU-12>config#
```

In a given CLI context, you can enter commands at that context level by simply entering the text. It is also possible to include a command in a lower context as long as the command is formatted in the proper command and parameter syntax.

The following example shows two methods of navigating to a service SDP ingress level:

Method 1: Enter all commands on a single line.

```
A:ALU-12# configure service cpipe 6 spoke-sdp 2:6 ingress
*A:ALU-12>config>service>cpipe>spoke-sdp>ingress#
```

Method 2: Enter each command on a separate line.

```
A:ALU-12>config# service
A:ALU-12>config>service# cpipe 6
*A:ALU-12>config>service>cpipe# spoke-sdp 2:6
*A:ALU-12>config>service>cpipe>spoke-sdp# ingress
*A:ALU-12>config>service>cpipe>spoke-sdp>ingress#
```

The CLI returns an error message if the syntax is incorrect.

```
*A:ALU-12>config# router
Error: Bad command.
```

3.2.2 Basic CLI Commands

The console control commands are the commands that are used for navigating within the CLI and displaying information about the console session.

Most of these commands are implemented as global commands. They can be entered at any level in the CLI hierarchy, with the exception of the **password** command, which must be entered at the ROOT level. The console control commands are listed in [Table 2](#).

Table 2 Console Control Commands

Command	Description
<Ctrl-c>	Aborts the pending command
<Ctrl-z>	Terminates the pending command line and returns to the ROOT context
back	Navigates the user to the parent context
clear	Clears statistics for a specified entity or clears and resets the entity
echo	Echoes the text that is typed in. Primary use is to display messages to the screen within an exec file.
exec	Executes the contents of a text file as if they were CLI commands entered at the console
exit	Returns the user to the previous higher context
exit all	Returns the user to the ROOT context
help	Displays help in the CLI
?	Displays all available options
history	Displays a list of the most recently entered commands
info	Displays the running configuration for a configuration context
logout	Terminates the CLI session
mrinfo	Displays multicast information from the target multicast router. See the 7705 SAR OAM and Diagnostics Guide for details.

Table 2 Console Control Commands (Continued)

Command	Description
mstat	Traces a multicast path from a source to a receiver and displays multicast packet rate and loss information. See the 7705 SAR OAM and Diagnostics Guide for details.
mtrace	Traces a multicast path from a source to a receiver and displays hop-by-hop information. See the 7705 SAR OAM and Diagnostics Guide for details.
oam	Provides OAM test suite options. See the 7705 SAR OAM and Diagnostics Guide for details.
password	Changes the user CLI login password. The password can only be changed at the ROOT level.
ping	Verifies the reachability of a remote host
pwc	Displays the present or previous working context of the CLI session
sleep	Causes the console session to pause operation (sleep) for 1 second or for the specified number of seconds. Primary use is to introduce a pause within the execution of an exec file.
ssh	Opens a secure shell connection to a host
telnet	Telnet to a host
traceroute	Determines the route to a destination address
tree	Displays a list of all commands at the current level and all sublevels
write	Sends a console message to a specific user or to all users with active console sessions

The list of all system global commands is displayed by entering **help globals** in the CLI. For example:

```
*A:ALU-12>config>service# help globals
  back          - Go back a level in the command tree
  echo          - Echo the text that is typed in
  enable-admin  - Enable the user to become a system administrator
  exec          - Execute a file - use -echo to show the commands and
                  prompts on the screen
  exit          - Exit to intermediate mode - use option all to exit to root
                  prompt
  help          - Display help
  history       - Show command history
  info          - Display configuration for the present node
  logout        - Log off this system
  mrinfo        - Request multicast router information
  mstat         - Trace multicast path from a source to a receiver and
                  display multicast packet rate and loss information
```

```

mtrace          - Trace multicast path from a source to a receiver
oam             + OAM Test Suite
ping           - Verify the reachability of a remote host
pwc            - Show the present working context
sleep          - Sleep for specified number of seconds
ssh            - SSH to a host
telnet         - Telnet to a host
traceroute     - Determine the route to a destination address
tree           - Display command tree structure from the context of execution
write         - Write text to another user

```

*A:ALU-12>config>service#

Table 3 lists command syntax symbols. Where the syntax differs between the CLI and the Command Reference sections of the 7705 SAR guides is noted in the table.

Table 3 Command Syntax Symbols

Symbol	Description	Example
	A vertical bar represents an OR, indicating that only one of the parameters in the brackets or braces can be selected	tcp-ack {true false}
[]	Brackets indicate optional parameters	router [router-name]
< >	Angle brackets indicate that the user must enter a value for the parameter inside the brackets (Note: angle brackets are not used in the 7705 SAR guides but are used on the CLI; italics are used in these guides to indicate the same rule)	interface <interface-name>
{ }	Braces indicate that one of the parameters must be selected	default-action {drop forward}
[{ }]	Braces within square brackets indicate that the parameters are optional, but if one is selected, the information in the braces is required; for example, if you select the peer parameter, you must enter the keyword peer (<i>ip-address</i> is optional)	discovery [{peer [ip-address]} {interface [ip-int-name]}]
Bold	In the 7705 SAR guides (not on the CLI), bold indicates commands and keywords that the user must enter exactly as shown	scope {inclusive template}
<i>Italic</i>	In the 7705 SAR guides (not on the CLI), italics indicate parameters that the user must enter a value for	dscp <i>dscp-name</i>
n/a	In the Command Reference section, n/a in the Default field of a command indicates that a default value is not applicable for the command	—

3.2.3 CLI Environment Commands

The CLI **environment** commands are found in the **root>environment** context of the CLI tree. These commands control session preferences for a single CLI session. The CLI environment commands are listed in [Table 4](#).

Table 4 CLI Environment Commands

Command	Description
alias	Enables the substitution of a command line by an alias
create	Enables or disables the use of a create parameter check
more	Enables the CLI output to be displayed one screen at a time, awaiting user input to continue
reduced-prompt	Configures the maximum number of higher-level CLI context nodes to display by name in the CLI prompt for the current CLI session
saved-ind-prompt	Saves the indicator in the prompt
suggest-internal-objects	Enables the suggestion of internally created objects while auto-completing
terminal	Configures the terminal screen length for the current CLI session
time-display	Specifies whether time should be displayed in local time or UTC
time-stamp	Specifies whether a timestamp should be displayed before the prompt

3.2.4 CLI Monitor Commands

The CLI **monitor** commands are found in the **root>monitor** context of the CLI tree. Monitor commands display specified statistical information related to the monitor subject (such as filter, port, router, and service) at a configurable interval until a count is reached.

The **monitor** command output displays a snapshot of the current statistics. The output display refreshes with subsequent statistical information at each configured interval and is displayed as a delta to the previous display.

The <Ctrl-c> keystroke interrupts a monitoring process. Monitor command configurations cannot be saved. You must enter the command for each monitoring session. If the maximum limits are configured, you can monitor the statistical information for a maximum of 60×999 s (approximately 1000 minutes, or 16.6 hours).

The CLI monitor commands are listed in [Table 5](#).

Table 5 CLI Monitor Commands

Command	Description
filter	Enables IP and MAC filter monitoring at a configurable interval until that count is reached
management-access-filter	Monitors commands for management access filters
port	Enables port traffic monitoring. The specified ports' statistical information displays at the configured interval until the configured count is reached.
router	Enables virtual router instance monitoring at a configurable interval until that count is reached
service	Monitors commands for a particular service

3.3 Getting Help in the CLI

The **help** system commands and the **?** key display different types of help in the CLI. [Table 6](#) lists the help commands.

Table 6 Online Help Commands

Command	Description
?	Lists all commands in the current context
string ?	Lists all commands available in the current context that start with <i>string</i>
command ?	Displays the command's syntax and associated keywords
command keyword ?	Lists the associated arguments for <i>keyword</i> in <i>command</i>
string<Tab> string<Space>	Completes a partial command name (auto-completion) or lists available commands that match <i>string</i>

The **tree** and **tree detail** system commands are help commands that are useful when searching for a command in a lower-level context.

The **tree flat** command displays the command hierarchy on single lines; for example:

```
card
card card-type
card mda
card mda access
card mda access ingress
card mda access ingress fabric-policy
card mda access ingress security-queue-policy
card mda ais-propagation
card mda clock-mode
```

[Figure 3](#) shows a partial list of the output of the **tree** and **tree detail** commands entered at the **config** level.

Figure 3 CLI Display for CLI Tree Help

```

*A:ALU-12>config# tree
configure
+---card
| +---card-type
| | +---mda
| | | +---clock-mode
| | | +---mda-type
| | | +---network
| | | | +---ingress
| | | | | +---queue-policy
| | | +---shutdown
| | +---shutdown
+---cron
| +---action
| | +---expire-time
| | +---lifetime
| | +---max-completed
| | +---results
| | +---script
| | +---shutdown
| +---schedule
| | +---action
| | +---count
| | +---day-of-month
| | +---description
| | +---end-time
| | +---hour
| | +---interval
| | +---minute
| | +---month
| | +---shutdown
| | +---type
| | +---weekday
| +---script
| | +---description
| | +---location
| | +---shutdown
+---filter
| +---ip-filter
| | +---default-action
| | +---description
| | +---entry
| | | +---action
| | | | +---description
| | | | +---match
| | | | | +---dst-ip
| | | | | | +---dst-port
| | | | | | | +---icmp-code
| | | | | | | +---icmp-type
| | | | | | | | +---src-ip
| | | | | | | | +---src-port
| | +---renum
| | +---scope

```

```

*A:ALU-12>config# tree detail
configure
+---card <slot-number>
| no card <slot-number>
| +---card-type <card-type>
| | no card-type
| +---mda <mda-slot>
| | no mda <mda-slot>
| | +---clock-mode adaptive
| | +---mda-type <mda-type>
| | | no mda-type
| | +---network
| | | +---ingress
| | | | +---no queue-policy
| | | | | queue-policy <name>
| | +---no shutdown
| | | shutdown
| +---no shutdown
| | shutdown
+---cron
| +---action <action-name> [owner <action-owner>]
| | no action <action-name> [owner <action-owner>]
| | +---expire-time {<seconds>|forever}
| | +---lifetime {<seconds>|forever}
| | +---max-completed <unsigned>
| | +---no results
| | | results <file-url>
| | +---no script
| | | script <script-name> [owner <script-owner>]
| | +---no shutdown
| | | shutdown
| +---no schedule <schedule-name> [owner <schedule-owner>]
| | schedule <schedule-name> [owner <schedule-owner>]
| | +---action <action-name> [owner <action-owner>]
| | | no action
| | +---count <number>
| | | no count
| | +---day-of-month {<day-number> [..<day-number>]}all}
| | | no day-of-month
| | +---description <description-string>
| | | no description
| | +---end-time [<date>|<day-name>] <time>
| | | no end-time
| | +---hour {<hour-number> [..<hour-number>]}all}
| | | no hour
| | +---interval <seconds>
| | | no interval
| | +---minute {<minute-number> [..<minute-number>]}all}
| | | no minute

```

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3.4 The CLI Command Prompt

By default, the CLI command prompt indicates the device being accessed and the current CLI context. For example, the prompt **A:ALU-1>config>router#** indicates that the active CSM is CSM A, the user is on the device with hostname **ALU-1**, and the current context is **configure router**. In the prompt, the separator used between contexts is the “>” symbol.

At the end of the prompt, there is either a pound sign (**#**) or a dollar sign (**\$**). A **#** at the end of the prompt indicates that the context is an existing context. A **\$** at the end of the prompt indicates that the context has been newly created. New contexts are newly created for logical entities when the user first navigates into the context.

Since there can be a large number of sublevels in the CLI, the system command **reduced-prompt no-of-nodes-in-prompt** allows the user to control the number of levels displayed in the prompt.

All special characters (**#**, **\$**, and so on) must be enclosed within double quotes; otherwise, the character is seen as a comment character and all characters on the command line following the **#** are ignored. For example:

```
*A:ALU-1>config>router>mpls# authentication-key "router#1"
```

This example shows a security configuration over a network link. Because the string “router#1” is enclosed within double quotes, it is recognized as a password for the link.

When changes are made to the configuration file, a “*” appears in the prompt string (***A:ALU-1**), indicating that the changes have not been saved. When an admin **save** command is executed, the “*” disappears. This behavior is controlled by the **saved-ind-prompt** command in the **environment** context.

3.5 Displaying Configuration Contexts

The **info** and **info detail** commands display the configuration for the current level. The **info** command displays non-default configurations. The **info detail** command displays the entire configuration for the current level, including defaults. The following example shows the output that displays using the **info** command and the output that displays using the **info detail** command.

```
*A:ALU-1>config>router# interface system
*A:ALU-1>config>router>if# info
-----
                address 10.221.221.72/8
-----
*A:ALU-1>config>router>if#

*A:ALU-1>config>router>if# info detail
-----
                address 10.221.221.72/8
                no description
                no arp-timeout
                icmp
                    mask-reply
                    unreachable 100 10
                    ttl-expired 100 10
                exit
                no ntp-broadcast
                no shutdown
                no bfd
-----
*A:ALU-1>config>router>if#
```

3.6 EXEC Files

The **exec** command allows you to execute a text file of CLI commands as if it were typed at a console device.

The **exec** command and the associated exec files can be used to conveniently execute a number of commands that are always executed together in the same order. For example, an **exec** command can be used to define a set of commonly used standard command aliases.

The **echo** command can be used within an **exec** command file to display messages on screen while the file executes.

3.7 CLI Script Control

The 7705 SAR provides centralized script management for CLI scripts that are used by CRON and the Event Handling System (EHS). Scripts contain a set of CLI commands that are executed at a scheduled time or when an event is triggered. A set of script policies and script objects can be configured to control such things as:

- where scripts are located (local compact flash or remote FTP server)
- where the output of the results is stored
- how long historical script result records are kept
- how long a script may run

Script parameters are configured under the **config>system>script-control** context.

A script is assigned a script name and optional owner. The owner is an arbitrary string; it is not associated with an actual CLI user. Multiple owners can be associated with a script name, and each script name/owner combination is unique.

A script is also associated with a script text filename and its location. The text file contains the CLI commands to be executed.

When a script has been defined, a script policy is configured under the **config>system>script-control** context and associated with the script. A script policy is assigned a policy name and optional owner. The owner is an arbitrary string; it is not associated with an actual CLI user. Multiple owners can be associated with a script policy name, and each script policy name/owner combination is unique.

The script policies are referenced by the CRON scheduler and the EHS event handler. All configured script policies can be used by both CRON and EHS.

The script text files can be stored on the local compact flash or on a remote FTP/TFTP server. In CSM-redundant 7705 SAR-8 Shelf V2 or 7705 SAR-18 systems, the script text files must be saved in the compact flash of both CSMs so that CRON or EHS configurations are not lost if a CSM switchover occurs. However, a CSM switchover does cause all queued scripts to be dropped. For remote servers, communication must be reliable; otherwise, there may be undesired pauses during script execution.

Only one script can execute at a time. An SNMP table (smRunTable in the DISMAN-SCRIPT-MIB) is used as both an input queue of scripts waiting to be executed and for storage of records for completed scripts. If the input queue is full, the script request is discarded.

For information on CRON, see [CRON](#) in this guide. For information on the Event Handling System, refer to the 7705 SAR System Management Guide, “Event Handling System”.

3.8 Entering CLI Commands

The following sections describe additional information on entering CLI commands:

- [Command Completion](#)
- [Unordered Parameters](#)
- [Editing Keystrokes](#)
- [Absolute Paths](#)
- [History](#)
- [Entering Numerical Ranges or Lists](#)
- [Pipe/Match](#)
- [Pipe/Count](#)
- [Redirection](#)

3.8.1 Command Completion

The CLI supports both command abbreviation and command completion. If the keystrokes entered are enough to match a valid command, the CLI displays the remainder of the command syntax when the <Tab> key or spacebar is pressed. When typing a command, the <Tab> key or spacebar invokes auto-completion. If the keystrokes entered are sufficient to identify a specific command, auto-completion completes the command. If the letters are not sufficient to identify a specific command, pressing the <Tab> key or spacebar displays commands matching the letters entered.

The command completion functionality works for both keywords and for optional parameters that have already been configured. When using command completion for optional parameters, the <Tab> key must be used.

For example, entering "i <Tab> returns the following user-configured interface names:

```
*A:ALU-12>config>router# interface "i
"igmp_interface"      "igmp_interface2"  "isis_interface"
```

System commands are available in all CLI context levels.

3.8.2 Unordered Parameters

In a given context, the CLI accepts command parameters in any order as long as the command is formatted in the proper command keyword and parameter syntax. Command completion will still work as long as enough recognizable characters of the command are entered.

3.8.3 Editing Keystrokes

When entering a command, special keystrokes allow for editing of the command. [Table 7](#) lists the command editing keystrokes.

Table 7 Command Editing Keystrokes

Editing Action	Keystrokes
Delete current character	<Ctrl-d>
Delete text up to cursor	<Ctrl-u>
Delete text after cursor	<Ctrl-k>
Move to beginning of line	<Ctrl-a>
Move to end of line	<Ctrl-e>
Get prior command from history	<Ctrl-p>
Get next command from history	<Ctrl-n>
Move cursor left	<Ctrl-b>
Move cursor right	<Ctrl-f>
Move back one word	<Esc>
Move forward one word	<Esc><f>
Convert rest of word to uppercase	<Esc><c>
Convert rest of word to lowercase	<Esc><l>
Delete remainder of word	<Esc><d>
Delete word up to cursor	<Ctrl-w>
Transpose current and previous character	<Ctrl-t>
Enter command and return to root prompt	<Ctrl-z>

Table 7 Command Editing Keystrokes (Continued)

Editing Action	Keystrokes
Refresh input line	<Ctrl-I>

3.8.4 Absolute Paths

CLI commands can be executed in any context by specifying the full path from the CLI root. To execute an out-of-context command, enter a forward slash "/" or backward slash "\" at the beginning of the command line. The commands are interpreted as absolute paths. Spaces between the slash and the first command will return an error.

```
*A:ALU-12# configure router
*A:ALU-12>config>router# interface system address 192.0.2.0
*A:ALU-12>config>router# /admin save
A:ALU-12>config>router# \clear router bfd session all
A:ALU-12>config>router#
```

The command may or may not change the current context depending on whether it is a leaf command. This is the same behavior the CLI performs when CLI commands are entered individually, for example:

```
*A:ALU-12# admin
*A:ALU-12>admin# save
```

or

```
*A:ALU-12# admin save
*A:ALU-12#
```

3.8.5 History

The CLI maintains a history of the most recently entered commands. The **history** command displays the most recently entered CLI commands.

```
*A:ALU-1# history
 1 environment terminal length 48
 2 show version
 3 configure port 1/1/1
 4 info
 5 show port 1/1/1
 6 \con port 1/1/1
 7 \configure router mpls
 8 info
```

```

    9 \configure system login-control
    10 info
    11 history
*A:ALU-1# !2
*A:ALU-1# show version
TiMOS-B-0.0.I322 both/hops NOKIA SAR 7705
Copyright (c) 2018 Nokia.All rights reserved.
All use subject to applicable license agreements.
Built on Wed Jan 17 01:05:13 EST 2018 by csabuild in /re8.0/I322/panos/main
*A:ALU-1#

```

3.8.6 Entering Numerical Ranges or Lists

The 7705 SAR CLI allows the use of a single numerical range, a list of values (elements), or a combination of both as an argument in the command line.

A range in a CLI command is limited to positive integers and is denoted with two numbers enclosed in square brackets with two periods (“.”) between the numbers [x.. y] where x and y are positive integers and y-x is less than 1000. For example, to configure a range of VPLS service IDs from 20 to 30 for a customer, enter:

```
config service vpls [20..30] customer 1 create no shutdown
```

A list of values contains discrete integer elements, in any order. For example, to configure a list of VPLS service IDs that are not sequential, enter:

```
config service vpls [3,5,7] customer 1 create no shutdown
```

To configure a list of interface names (interface names must begin with a letter), put the alphabetic part of the name outside of the brackets; for example:

```
config router interface intf[1,4,6] no shutdown
```

This command creates interfaces with names intf1, intf4, and intf6.

Lists can contain ranges as elements, as well as values. For example, to configure multiple ports on MDA 1, enter:

```
config port 1/1[1..6,8,10, 21..32] no shutdown
```

CLI commands can also contain ranges or lists of hexadecimal values; for example, [0x0f..0x13], [0x4,0x8,0xc]. This allows ranges to be used when working with data that is normally expressed in hexadecimal, such as IPv6 addresses or MAC addresses.

A range can also be a reference to a previous range in the same command. This reference takes the form "\$x", where x is an integer between 0 and 5, with 0 referring to the first range in the command, 1 to the second, and so on up to the maximum of six ranges. For example:

```
config service vprn [11..20] router-id 10.20.[0].1
```

gives vprn 11 the router ID 10.20.11.1, vprn 12 the router ID 10.20.12.1, and so on.

<Ctrl-c> can be used to abort the execution of a range command.

Specifying a range in the CLI does have limitations. These limitations are summarized in [Table 8](#).

Table 8 CLI Range Use Limitations

Limitation	Description/Example
Up to six ranges (including references) can be specified in a single command but must not combine to more than 1000 iterations of the command	For example, ports on two adapter cards can be shut down in one command by using two ranges: config port 1/[1..2]/[1..10] shutdown This command shuts down ports 1 to 10 on MDA 1 and MDA 2.
Ranges within quotation marks are interpreted literally	Enclosing a string in quotation marks (" <i>string</i> ") causes the string to be treated literally and as a single parameter. For example, several commands in the 7705 SAR CLI allow the configuration of a descriptive string. If the string is more than one word and includes spaces, it must be enclosed in quotation marks. A range that is enclosed in quotes is also treated literally. For example, config router interface "A[1..10]" no shutdown creates a single router interface with the name "A[1..10]". However, a command such as: config router interface A[1..10] no shutdown creates 10 interfaces with names A1, A2, to A10.
The range cannot cause a change in contexts	Commands should be formed in such a way that there is no context change upon command completion. For example, config port 1/1/[1..10] will attempt to change 10 different contexts. When a range is specified in the CLI, the commands are executed in a loop. On the first loop execution, the command changes contexts, but the new context is no longer valid for the second iteration of the range loop. A "Bad Command" error is reported and the command aborts. Adding shutdown or no shutdown to the command keeps the same context.

Table 8 CLI Range Use Limitations (Continued)

Limitation	Description/Example
Command completion may cease to work when entering a range	After entering a range in a CLI command, command and key completion, which normally occurs by pressing the <Tab> or spacebar, may cease to work. If the command line entered is correct and unambiguous, the command works properly; otherwise, an error is returned.

3.8.7 Pipe/Match

The 7705 SAR supports the pipe/match (...| **match**) feature to search one or more files for a specified character string or pattern.

Match syntax:

match *pattern* **context** {**parents** | **children** | **all**} [**ignore-case**] [**max-count** *lines-count*] [**expression**]

match *pattern* [**ignore-case**] [**invert-match**] [**pre-lines** *pre-lines*] [**post-lines** *lines-count*] [**max-count** *lines-count*] [**expression**]

where:

- pattern*: a string or regular expression (maximum 200 characters)
- context**: displays the context associated with the matching line
- parents**: displays the parent context information
- children**: displays the child context information
- all**: displays both parent and child context information
- ignore-case**: ignores the case in the string (uppercase or lowercase)
- max-count** *lines-count*: displays the matching lines, up to the specified number (1 to 2147483647)
- expression**: the pattern is interpreted as a regular expression
- invert-match**: displays all the lines that do not contain the string specified in *pattern*
- pre-lines** *pre-lines*: displays the lines prior to the matching line, up to the specified number (0 to 100)
- post-lines** *lines-count*: displays the lines after the matching line, up to the specified number (1 to 2147483647)

For example:

```
*A:ALU-12# show service sap-using | match 1/1 pre-lines 10
=====
Service Access Points
=====
PortId                               SvcId      Ing.  Ing.    Egr.  Egr.    Adm  Opr
```

		QoS	Fltr	QoS	Fltr		
1/1/1:333	111	1	none	1	none	Up	Up
1/1/1:444	111	1	none	1	none	Up	Up
1/1/9:10	200	1	none	1	none	Up	Up
1/1/9:11	200	1	none	1	none	Up	Up
1/1/9:12	200	1	none	1	none	Up	Up
1/1/9:13	200	1	none	1	none	Up	Up
1/1/9:14	200	1	none	1	none	Up	Up
1/1/9:15	200	1	none	1	none	Up	Up

```
A:ALU-12# show log log-id 98 | match ignore-case "sdp bind"
>Status of SDP Bind 101:1002 in service 1001 (customer 1)changed to admin=up oper=up
flags="
"Processing of a SDP state change event is finished and status of all affected SDP
Bindings on SDP 101 has been updated."
```

```
A:ALU-12# show log log-id 98 | match max-count 1 "service 1001"
>Status of service 1001 (customer 1)changed to administrative state: up, operational
state: up"
```

```
*A:ALU-12# admin display-config | match post-lines 5 max-count 2 expression "snmp"
```

```
snmp
exit
login-control
    idle-timeout disable
    pre-login-message "csasim2 - " name
exit
snmp
    view "testview" subtree "1"
        mask ff
    exit
    view "testview" subtree "1.3.6.1.2"
        mask ff type excluded
```

```
*A:ALU-12#
```

[Table 9](#) describes regular expression symbols and interpretation (similar to what is used for route policy regexp matching).

Table 9 Pipe/Match Characters

String	Description
.	Matches any single character
[]	Matches a single character with what is contained within the brackets [abc] matches "a", "b", or "c" [a-z] matches any lowercase letter [A-Z] matches any uppercase letter [0-9] matches any number

Table 9 Pipe/Match Characters (Continued)

String	Description
[^]	Matches a single character with what is not contained within the brackets [^abc] matches any character other than “a”, “b”, or “c” [^a-z] matches any single character that is not a lowercase letter
^	Matches the start of the line (or any line, when applied in multiline mode)
\$	Matches the end of the line (or any line, when applied in multiline mode)
()	Defines a “marked subexpression” Every matched instance will be available to the next command as a variable
*	A single character expression followed by “*” matches zero or more copies of the expression
{m,n}	Matches at least <i>m</i> and at most <i>n</i> repetitions of the term
{m}	Matches exactly <i>m</i> repetitions of the term
{m,}	Matches <i>m</i> or more repetitions of the term
?	The preceding item is optional and matched at most once
+	The preceding item is matched one or more times
-	Used between start and end of a range
\	An escape character to indicate that the following character is a match criterion and not a grouping delimiter

Table 10 identifies the special character options.

Table 10 Special Characters

Options	Similar to	Description
[:upper:]	[A-Z]	Uppercase letters
[:lower:]	[a-z]	Lowercase letters
[:alpha:]	[A-Za-z]	Uppercase and lowercase letters
\w	[A-Za-z_]	Word characters
[:alnum:]	[A-Za-z0-9]	Digits, uppercase and lowercase letters
[:digit:]	[0-9]	Digits
\d	[0-9]	Digits
[:xdigit:]	[0-9A-Fa-f]	Hexadecimal digits

Table 10 Special Characters (Continued)

Options	Similar to	Description
[:punct:]	[.,!?:...]	Punctuation
[:blank:]	[\t]	Space and Tab
[:space:]	[\t\n\r\f\v]	Blank characters
\s	[\t\n\r\f\v]	Blank characters

3.8.8 Pipe/Count

The 7705 SAR supports a pipe/count command (...| **count**) that provides a count of the number of lines that would have otherwise been displayed. The pipe/count command is particularly useful when used in conjunction with the pipe/match command in order to count the number of output lines that match a specified pattern.

For example:

```
*A:ALU-12# show service service-using vprn
=====
Services [vprn]
=====
ServiceId  Type      Adm  Opr  CustomerId Service Name
-----
1          VPRN      Down Down 1
44         VPRN      Up   Up   1
100        VPRN      Down Down 1
102        VPRN      Up   Up   1
235        VPRN      Down Down 1
1000       VPRN      Down Down 1000
-----
Matching Services : 6
-----
*A:ALU-12# show service service-using vprn | match Down | count
Count: 4 lines
*A:ALU-12#
```

3.8.9 Redirection

The 7705 SAR supports redirection (“>”) which allows the operator to store the output of a CLI command as a local or remote file. Redirection of output can be used to automatically store results of commands in files (both local and remote).

```
'ping <customer_ip> > cf3:/ping/result.txt'
```

```
'ping <customer_ip> > ftp://ron@ftp.alcatel.com/ping/result.txt'
```

In some cases only part of the output might be applicable. The pipe/match and redirection commands can be combined:

```
ping 10.0.0.1 | match expression "time.\d+" > cf3:/ping/time.txt
```

This records only the RTT portion (including the word "time").

3.9 CLI Configuration Rollback

The CLI configuration rollback feature allows operators to save rollback checkpoint and rescue files that can be used to quickly return the node configuration to a previous state with minimal impacts to services and without restarting the node.

CLI configuration rollback gives operators better control and visibility over router configurations and reduces operational risk while increasing flexibility and providing powerful recovery options.

The location and generic filename of the rollback checkpoint and rescue files must be configured with the **rollback-location** and **rescue-location** commands before a rollback file can be saved. Files can be saved locally on the compact flash or on a remote device. The file URL must contain a path or directory and a generic filename with no extension. File suffixes are automatically appended when the file is saved.

3.9.1 Rollback Checkpoint and Rescue Files

Rollback checkpoint files and rescue files are created with the rollback **save** command. A rollback checkpoint file can be saved at any time or configured to be automatically saved on a recurring schedule using the 7705 SAR CRON feature. For more information refer to [CRON](#).

Rollback checkpoint and rescue files contain all current operationally active configurations, including configuration changes from CLI commands in the config context and SNMP sets. Rollback checkpoint files are intended to be saved whenever there have been a moderate number of changes to the configuration, in order to create a series of intermediate checkpoints that operators can return to. The rollback rescue file is intended to be a permanent stable configuration that can be reverted to if needed.

Rollback checkpoint and rescue files do not contain any BOF configuration information or any configuration or state changes performed under the debug branch of the CLI. Similarly, performing a CLI configuration rollback never impacts the BOF configuration or any command from the debug CLI branch.

When a rollback **save** command is executed, a rollback checkpoint or rescue file is saved in the configured location. The latest rollback checkpoint file is saved with the suffix ***.rb**. The suffixes of all previously saved rollback checkpoint files are automatically incremented by one (***.rb** becomes ***.rb.1**, ***.rb.1** becomes ***.rb.2**, and so on). The rescue file is saved with the suffix ***.rc**.

By default, there can be 10 rollback checkpoint files, the latest with suffix *.rb and nine older files with suffixes *.rb.1 through *.rb.9. If the maximum number of checkpoint files is reached and a new one is saved, the oldest checkpoint file is deleted. The maximum number of rollback checkpoint files that can be saved can be configured with the **local-max-checkpoints** and **remote-max-checkpoints** commands.

There can only be one rollback rescue file. When a new rescue file is saved, the existing file is deleted. The rescue file is not impacted by the number of rollback checkpoint files — there will always be one rescue file available.

Operators can view a list of rollback checkpoint or rescue files with the rollback **view** command. The following information is displayed for the files:

- date and time stamps
- file index and suffix
- the user who created the file
- release number
- comment string

A rollback **compare** command is also available that allows operators to compare different checkpoint files to each other or to the current operating configuration. The command output highlights any differences between the configurations.

Rollback checkpoint and rescue files are not editable, nor are they interchangeable with configuration files, such as those generated with an **admin save** command.

Both **admin save** and **rollback save** should be performed periodically. The **admin save** command backs up the complete configuration file to be used during a router reboot and should be performed after any major service changes or hardware and software upgrades. The **rollback save** command should be performed to create intermediate checkpoints whenever a moderate number of changes have been made to the configuration.

Rollback checkpoint files and rescue files can be deleted with the dedicated **admin>rollback>delete** command. When a checkpoint file is deleted, the suffix ID numbers of all older files are automatically decremented.

If a rollback checkpoint file is manually deleted, using, for example, the **file delete** command, the suffix ID numbers of older checkpoint files are not decremented, nor is the backup checkpoint file deleted from the standby CSM. This creates a gap in the checkpoint file list. New rollback checkpoint files can still be created, but the gap is not filled until enough files have been created to roll the gap off the end of the list.

3.9.1.1 Rollback File Backup

The rollback checkpoint files can be backed up from the active CSM to the standby CSM on the 7705 SAR-8 Shelf V2 or 7705 SAR-18 with the **rollback-sync** command in the **admin** context. Rollback file backups are not supported on fixed platforms as they do not have redundant CSMs.

The 7705 SAR also supports automatic synchronization with the **rollback-sync** command in the **config** context. When automatic rollback synchronization is enabled, a rollback **save** will cause the new checkpoint file to be saved on both the active and standby CSMs if the rollback location is a local location. The suffixes of all older checkpoint files on both active and standby CSMs are incremented by one. Automatic synchronization only causes newly created rollback checkpoint files to be copied to both CSMs. Any rollback checkpoint files that were created before automatic synchronization was enabled are not copied to the standby CSM, but can be manually backed up with the **rollback-sync** command in the **admin** context.

If the **config>rollback-sync** command is enabled, deleting a rollback checkpoint file also deletes the backup file and decrements the suffix ID numbers on the standby CSM.

The dedicated **rollback-sync** commands are the only commands that can be used to back up rollback checkpoint files. Existing redundancy synchronization commands are not compatible with rollback checkpoint files.

3.9.2 Performing a CLI Configuration Reversion

The rollback **revert** command is used to return the CLI configuration, including all configuration commands and SNMP sets, to the saved configuration in a rollback checkpoint or rescue file. CLI configuration reversion can be used to quickly correct problems in the configuration during network operation, or to aid in experimentation by enabling a return to known settings after trying a new configuration.

The CLI configuration reversion is performed without a reboot and with minimal impact on the services being provided by the 7705 SAR. Configuration parameters that have changed since the checkpoint file was created, or items on which changed configurations have dependencies, are first reset to their default values and then restored to their previous values from the rollback checkpoint file. Performing a configuration reversion can be briefly service-impacting in changed areas. There are no service impacts to configuration areas that did not change since the rollback checkpoint file was created.

If a rollback reversion process includes any commands that will remove, rebuild, or reboot an adapter card or fixed platform, the impacted adapter cards and platforms are listed in a warning and the operator is asked whether to proceed or not with a y/n prompt. There is no prompt if the rollback reversion is initiated via SNMP, or if the **now** keyword is used. The following are examples of adapter card and fixed platform commands that may generate a warning:

- config>card>card-type
- config>card>mda
- config>card>mda>mda-type

While the 7705 SAR is processing a rollback **revert** command, CLI and SNMP commands from other users are still accepted and applied to the system. The only commands that are blocked during this process are other rollback commands including **revert**, **save**, and **compare**. Only one rollback command can be processed at a time.

Performing a rollback reversion does not have any effect on existing rollback checkpoint and rescue files; files are not renumbered or deleted. For example, if an operator reverts to rollback checkpoint file 3, the file remains as *.rb.3. If the operator then executes a rollback **save** command, the current configuration is saved as the latest rollback (extension *.rb) and *.rb.3 is incremented to *.rb.4. In this scenario, both the latest rollback checkpoint file and checkpoint file 3 will have the same configuration information.

Currently running or scheduled CRON jobs are handled like all other configurations during a rollback reversion. The CRON configuration will revert to the configuration at the time the checkpoint was created.

The **boot-good-exec** or **boot-bad-exec** commands must be manually executed after a rollback reversion; they are not automatically run.

3.9.2.1 Rollback Restrictions

Some hardware or software changes can prevent operators from performing the rollback, or can affect the operation of the node following the reversion.

If hardware is removed or changed after a rollback checkpoint file is saved, the node may not function as expected after the system reverts to that configuration. There is no effect if new hardware is added into previously empty slots.

A CLI rollback reversion is not supported if the rollback checkpoint file was saved in a previous major software load or if it was saved in a more recent major or minor software load. For example:

- a node running Release 9.0.R1 cannot revert to a checkpoint file saved in Release 8.0.R4
- a node running Release 8.0.R4 cannot revert to a checkpoint file saved in Release 9.0.R1
- a node running Release 8.0.R4 cannot revert to a checkpoint file saved in Release 8.0.R6

CLI rollback reversion is supported if the checkpoint file was saved in a previous minor software release. For example, a node running Release 8.0.R6 can revert to a checkpoint file saved in Release 8.0.R4. It is also supported after an operator performs an **admin reboot**, or changes the primary configuration and then performs an **admin reboot**. The reboot does not remove any previously saved rollback files.

If the system runs out of memory during a CLI rollback reversion, the process aborts and the node remains in an indeterminate configuration state. The CLI screen displays a warning message that the CLI reversion failed.

A CLI rollback reversion may also fail in rare cases if the node requires a long time to complete the configuration changes. If the CLI rollback reversion fails during execution, it should be attempted again. The second attempt typically completes the remaining configuration changes.

A high availability CSM switchover during a rollback reversion will cause the rollback process to abort, and the newly active CSM will have an indeterminate configuration. This may not be immediately obvious if the CLI rollback reversion was nearly complete when it was interrupted. To assist operators, a log event is created and the results of the last rollback reversion can be displayed with the **show system rollback** command. If a high availability switchover occurs during a rollback (or within a few seconds of a rollback completing), the Last Revert Result field will display Interrupted and the operator is advised to repeat the rollback revert operation to the same checkpoint.



Caution: Although the use of the Control-C key combination is not recommended during a rollback revert, it is supported in the CLI and SNMP. Interrupting a rollback **revert** command may leave the router in an indeterminate state between the active and saved configuration.

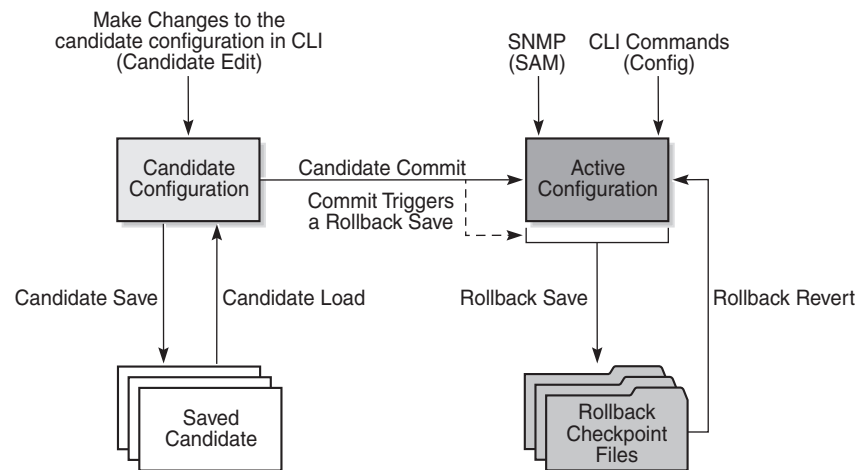
If Control-C is used during a CLI rollback reversion, the 7705 SAR displays a warning message to indicate that the operator must examine the configuration and potentially issue another rollback **revert** command to return to a known, complete configuration.

3.10 Transactional Configuration

Transactional configuration allows a user to make configuration changes inside a candidate configuration without actually causing changes to the active or operational configuration of the router. When the candidate configuration is complete, the user can explicitly commit the changes and cause the new configuration to become active. Transactional configuration gives the user better control and visibility over their router configurations and reduces operational risk while increasing flexibility.

Transactional configuration and [CLI Configuration Rollback](#) combine to provide the operational model depicted in [Figure 4](#).

Figure 4 Router Configuration with Rollback and Transactions



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3.10.1 Basic Operation

In order to edit the candidate configuration, the user must first enter candidate edit mode with the **candidate>edit** command. The user can enter and quit candidate edit mode as many times as they wish before committing the candidate configuration.

In candidate edit mode, the user builds a set of candidate configuration changes using the same CLI tree as the standard (line-by-line, non-transactional) configuration. Tab completion and keyword syntax checking is available.

Just as there is a single operational active configuration that can be modified simultaneously by multiple users, there is also a single global candidate configuration instance. All users make changes in the same global candidate configuration and any command that affects the candidate configuration (such as a **save** or **commit**) applies to the changes made by all users.

Users can enter an exclusive candidate edit mode by blocking other users, or sessions of the same user, from entering candidate edit mode.

When a candidate configuration is committed, the user can request an additional confirmation of the configuration. If the confirmation is not given with the **confirm** command within the specified time frame, the router automatically reverts to a configuration state before the candidate configuration changes were applied. If this automatic reversion occurs, the candidate configuration is not cleared and users can continue to edit it and try the commit later.

If the commit operation is successful and the **confirm** command is issued (if requested during the commit), all the candidate changes take operational effect and the candidate configuration is cleared. If there is an error processing the commit, the router returns to a configuration state before the candidate changes were applied. The candidate configuration is not cleared and users can continue to edit it and try the commit later.

A candidate commit may fail for various reasons, including:

- misordering — the candidate configuration has changes that are not in the correct order; for example, an object is referred to before it is actually created
- invalid options and combinations — although many syntax errors are eliminated during the candidate editing process, the candidate configuration may contain combinations of configurations and options that are not valid and are rejected when the 7705 SAR attempts to have them take operational effect
- resource exhaustion — the application of the candidate configuration may exhaust various system resources, such as queue resources

If a commit fails, the system generates error messages to help the user correct the candidate configuration.

All commands in the candidate configuration must be in the correct order for a commit to be successful. Configuration that depends on other candidate objects must be placed after those objects in the candidate. A set of commands (such as **copy**, **insert**, and **replace**) are available to correct and reorder an existing candidate configuration.

Candidate edit mode is primarily intended for building a candidate configuration using commands from the **configure** branch of the CLI. Although many CLI commands in other branches are supported, access to some CLI commands and branches are blocked, including:

- **exec** command
- **enable-admin** command
- **admin** branch
- **bof** branch
- **debug** branch
- **tools** branch

The candidate configuration can be saved to a file and loaded into a new candidate configuration later. A saved candidate file is similar to, but not exactly the same as, a 7705 SAR configuration file generated with an **admin save** command. The saved candidate file cannot be used as a configuration file and may not execute without failures.

There is no SNMP access to the candidate configuration and no SNMP management of candidates. However, when a candidate configuration is committed, any changes to the active or operational configuration are reported via the standard 7705 SAR SNMP change traps. Basic candidate status information is also available via SNMP.

The active or operational configuration can still be modified with standard CLI or SNMP commands that take immediate effect while a candidate configuration is being created or edited or a candidate commit is being processed. While in candidate edit mode, users can view the current state of the operational configuration with the **info operational** command.

3.10.2 Transactions and Rollback

Transactional configuration relies on the rollback mechanism to operate. By default, the 7705 SAR automatically creates a new rollback checkpoint after a successful candidate commit operation. The rollback checkpoint includes the new configuration changes made by the commit. An optional **no-checkpoint** keyword can be used to prevent the creation of an automatic rollback checkpoint after a successful commit. If the commit fails, no rollback checkpoint is created. If the **confirmed** option is used during the candidate commit, a rollback checkpoint is created and exists whether or not the **confirm** command is issued.

Any configurations that are not supported in a rollback **revert** are also not supported in candidate edit mode. See [CLI Configuration Rollback](#) for more information.

3.10.3 Authorization

Authorization works transparently in candidate edit mode, and no unique or new local profile or TACACS+ permissions rules are required other than allowing access to the candidate branch. For example, if a user has permission to access the **configure filter** context, they automatically have access to the same context when in candidate edit mode.

The candidate **load** and **save** commands load and save only those items that the user is authorized to access.

The candidate **view** command only displays the items that the user is authorized to access.

The candidate editing commands (such as adding or removing lines) only allow the user to modify items that they are authorized to access.

The candidate **commit** and **discard** commands, along with the **admin>rollback>revert** command, impact all items in the candidate configuration and are not affected by authorization.

3.11 Basic Command Reference

3.11.1 Command Hierarchies

- [Basic CLI Commands](#)
- [Environment Commands](#)
- [Monitor Commands](#)
- [Rollback Commands](#)
- [Candidate Commands](#)
- [Show Commands](#)

3.11.1.1 Basic CLI Commands

- **back**
- **clear**
- **echo** [*text-to-echo*] [*extra-text-to-echo*] [*more-text*]
- **exec** [-**echo**] [-**syntax**] {*filename* | <<[*eof-marker-string*]}
- **enable-admin**
- **exit** [all]
- **help**
- **help** edit
- **help** globals
- **help** special-characters
- **history**
- **info** [detail] [operational]
- **logout**
- **mrinfo** [See 7705 SAR OAM and Diagnostics Guide for command description]
- **mstat** [See 7705 SAR OAM and Diagnostics Guide for command description]
- **mtrace** [See 7705 SAR OAM and Diagnostics Guide for command description]
- **oam** [See 7705 SAR OAM and Diagnostics Guide for command description]
- **password**
- **ping** {*ip-address* | *dns-name*} [**rapid** | **detail**] [ttl *time-to-live*] [tos *type-of-service*] [size *bytes*] [*pattern pattern*] [**source** *ip-address*] [interval *seconds*] [{**next-hop** *ip-address*} | {**interface** *interface-name*} | **bypass-routing**] [**count requests**] [**do-not-fragment**] [**router** *router-instance* | **service-name** *service-name*] [timeout *timeout*] [**fc** *fc-name*]
- **pwd** [previous]
- **sleep** [seconds]
- **ssh** *host* [-l *username*] [-v *ssh-version*] [**router** *router-instance* | **service-name** *service-name*] [**re-exchange-min** *minutes*] [**re-exchange-mbyte** *megabytes*]
- **telnet** [*ip-address* | *dns-name*] [*port*] [**router** *router-instance*]
- **telnet** [*ip-address* | *dns-name*] [*port*] [**service-name** *service-name*]
- **traceroute** {*ip-address* | *dns-name*} [ttl *ttl*] [**wait milliseconds**] [**no-dns**] [**source** *ip-address*] [tos *type-of-service*] [**router** *router-instance* | **service-name** *service-name*]
- **tree** [detail] [flat]
- **write** {*user* | **broadcast**} *message-string*

3.11.1.2 Environment Commands

- ```
<root>
```
- **environment**
    - **alias** *alias-name* *alias-command-name*
    - **no alias** *alias-name*
    - [no] **create**
    - [no] **more**
    - **reduced-prompt** [*no-of-nodes-in-prompt*]
    - **no reduced-prompt**
    - [no] **saved-ind-prompt**
    - [no] **suggest-internal-objects**
    - **terminal**
      - **length** *lines*
      - **width** *width*

- **time-display** {local | utc}
- [no] **time-stamp**

### 3.11.1.3 Monitor Commands

#### monitor

- **filter**
  - **ip** *ip-filter-id* **entry** *entry-id* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
  - **ipv6** *ip-filter-id* **entry** *entry-id* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
- **management-access-filter**
  - **ip** **entry** *entry-id* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
  - **ipv6** **entry** *entry-id* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
- **port** *port-id* [*port-id...*(up to 5 max)] [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
- **router** *router-instance*
- **router service-name** *service-name*
  - **ldp**
    - **fec-egress-stats** *ip-prefix/mask* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
    - **session** *ldp-id* [*ldp-id...*(up to 5 max)] [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
    - **statistics** [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
  - **mpls**
    - **group** *grp-ip-address* [**source** *ip-address*] [**interval** *interval*] [**repeat** *repeat*] [**absolute** | **rate**]
    - **lsp-egress-stats** **lsp** *lsp-name* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
    - **lsp-ingress-stats** **lsp** *lsp-name* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**] *ip-address*
  - **pim**
    - **group** *grp-ip-address* [**source** *ip-address*] [**interval** *interval*] [**repeat** *repeat*] [**absolute** | **rate**]
  - **rip**
    - **neighbor** *neighbor* [*neighbor...*(up to 5 max)] [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
  - **vrrp**
    - **instance** **interface** *interface-name* **vr-id** *virtual-router-id* [**ipv6**] [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
- **service**
  - **id** *service-id*
    - **sap** *sap-id* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
    - **sap-aggregation-group** *group-id* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
    - **sdp** {*sdp-id* | **far-end** *ip-address*} [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

### 3.11.1.4 Rollback Commands

- ```

admin
  — rollback
    — compare [to source2]
    — compare source1 to source2
    — delete checkpoint-rescue
    — revert checkpoint-rescue [now]
    — save [comment comment] [rescue]
    — view [checkpoint-rescue]

admin
  — compare source1 to source2

admin
  — redundancy
  — rollback-sync

config
  — system
    — rollback
      — local-max-checkpoints number
      — no local-max-checkpoints
      — remote-max-checkpoints number
      — [no] remote-max-checkpoints
      — [no] rescue-location file-url | rescue filename
      — [no] rollback-location file-url | rollback filename

config
  — redundancy
  — [no] rollback-sync

```

3.11.1.5 Candidate Commands

- ```

candidate
 — edit [exclusive]
 — commit [confirmed timeout] [comment comment]
 — commit no-checkpoint [confirmed timeout]
 — confirm
 — copy [line]
 — delete [line]
 — discard [now]
 — goto line
 — insert [line]
 — load file-url [overwrite | insert | append]
 — quit
 — redo [count]
 — replace [line]
 — save file-url

```



- 
- **undo** [*count*]
  - **view** [*line*]

### 3.11.1.6 Show Commands

- show**
  - **alias**
  - **system**
  - **candidate**

## 3.11.2 Command Descriptions

- [Basic CLI Commands](#)
- [Environment Commands](#)
- [Monitor CLI Commands](#)
- [Candidate Commands](#)
- [Rollback Commands](#)
- [Show Commands](#)

### 3.11.2.1 Basic CLI Commands

#### enable-admin

<b>Syntax</b>	<b>enable-admin</b>
<b>Context</b>	<global>
<b>Description</b>	See the description for the <b>admin-password</b> command. If the <b>admin-password</b> is configured in the <b>config&gt;system&gt;security&gt;password</b> context, then any user can enter a special administrative mode by entering the <b>enable-admin</b> command.

The **enable-admin** command is in the default profile. By default, all users are given access to this command.

Once the **enable-admin** command is entered, the user is prompted for a password. If the password matches, the user is given unrestricted access to all the commands.

The minimum length of the password is determined by the **minimum-length** command. The complexity requirements for the password is determined by the **complexity** command.

The following displays an example of the password command usage.

```
Example: config>system>security#password
 security>password# admin-password test1234 hash
 security>password# aging 365
 security>password# minimum-length 8
 security>password# attempts 5 time 5 lockout 20
 security>password# authentication-order radius tacplus
 local
 security>password# enable-admin
 Password: test1234
 security>password#
```

The following example displays the password configuration:

```
ALU-1>config>system>security# info

...
aging 365
minimum-length 8
attempts 5 time 5 lockout 20
admin-password "rUYUz9XMo6I" hash
...

ALU-1>config>system>security#
```

There are two ways to verify that a user is in the **enable-admin** mode:

- **show users** – administrator can learn which users are in this mode
- enter the **enable-admin** command again at the root prompt and an error message will be returned

```
A:ALU-1# show users
=====
User Type Login time Idle time
 From
=====
admin Console -- 0d 19:42:22
 --
admin Telnet 08APR2008 08:35:23 0d 00:00:00
 10.120.141.147

Number of users : 2
=====
A:ALU-1#
A:ALU-1# enable-admin
MINOR: CLI Already in admin mode.
A:ALU-1#
```

## back

<b>Syntax</b>	<b>back</b>
<b>Context</b>	<global>
<b>Description</b>	This command moves the context back one level of the command hierarchy. For example, if the current level is the <b>config router mpls</b> context, the <b>back</b> command moves the cursor to the <b>config router</b> context level.

## clear

<b>Syntax</b>	<b>clear</b>
<b>Context</b>	<global>
<b>Description</b>	This command clears statistics for a specified entity or clears and resets the entity.
<b>Parameters</b>	<p><b>card</b> — reinitializes an I/O module in a specified slot</p> <p><b>cpm-filter</b> — clears CPM filter</p> <p><b>cron</b> — clears CRON history</p> <p><b>eth-cfm</b> — clears ETH-CFM parameters</p> <p><b>external-alarms</b> — accesses external alarms-related clear commands</p> <p><b>filter</b> — clears IP filter counters</p>

- group-encryption** — accesses group encryption-related clear commands
- ipsec** — accesses IPSec-related clear commands
- lag** — accesses LAG-related clear commands
- log** — closes and reinitializes the log specified by log-id
- mda** — reinitializes the specified MDA in a particular slot
- mw** — reboots managed microwave devices
- port** — clears port statistics
- radius** — clears the RADIUS server state
- router** — accesses clear router commands affecting the router instance in which they are entered
- Values** arp, bfd, bgp, dhcp, dhcp6, forwarding-table, grt-lookup, icmp6, igmp, interface, isis, ldp, mld, mpls, neighbor, ospf, ospf3, pim, rip, router-advertisement, rsvp, vrrp
- saa** — clears the SAA test results
- scada** — clears SCADA statistics
- screen** — clears the console or Telnet screen
- security** — accesses network security-related clear commands
- service** — clears service ID and statistical entities
- system** — clears (re-enables) a previously failed reference
- tacplus** — clears the TACACS+ server state
- test-oam** — accesses OAM-related clear statistics commands
- testhead** — accesses test head-related clear commands
- trace** — clears the trace log
- vrrp** — clears and resets the VRRP interface and statistical entities

## echo

<b>Syntax</b>	<b>echo</b> [ <i>text-to-echo</i> ] [ <i>extra-text-to-echo</i> ] [ <i>more-text</i> ]
<b>Context</b>	<global>
<b>Description</b>	This command echoes arguments on the command line. The primary use of this command is to allow messages to be displayed to the screen in files executed with the <b>exec</b> command.
<b>Parameters</b>	<p><i>text-to-echo</i> — specifies a text string to be echoed, up to 256 characters</p> <p><i>extra-text-to-echo</i> — specifies more text to be echoed, up to 256 characters</p> <p><i>more-text</i> — specifies more text to be echoed, up to 256 characters</p>

---

**exec**

<b>Syntax</b>	<b>exec</b> [-echo] [-syntax] {filename   <<[eof-marker-string]}
<b>Context</b>	<global>
<b>Description</b>	<p>This command executes the contents of a text file as if they were CLI commands entered at the console.</p> <p>Exec commands do not have <b>no</b> versions.</p> <p>Related commands are:</p> <ul style="list-style-type: none"> <li>• <a href="#">boot-good-exec</a> Use this command to configure a URL for a CLI script to exec following a successful configuration boot.</li> <li>• <a href="#">boot-bad-exec</a> Use this command to configure a URL for a CLI script to exec following a failed configuration boot.</li> </ul>
<b>Parameters</b>	<p><b>-echo</b> — echoes the contents of the <b>exec</b> file to the session screen as it executes</p> <p><b>Default</b>    echo disabled</p> <p><b>-syntax</b> — performs a syntax check of the file without executing the commands. Syntax checking looks for invalid commands and keywords as well as unprintable characters in configured parameters. An error message is displayed if any are found.</p> <p><b>Default</b>    execute file commands</p> <p><i>filename</i> — the text file with CLI commands to execute</p> <p><b>&lt;&lt;</b> — Stdin can be used as the source of commands for the exec command. When stdin is used as the exec command input, the command list is terminated with &lt;Ctrl-c&gt;, “EOF&lt;Return&gt;” or “<i>eof_string</i>&lt;Return&gt;”.</p> <p>If an error occurs entering an exec file sourced from stdin, all commands after the command returning the error will be silently ignored. The exec command will indicate the command error line number when the stdin input is terminated with an end-of-file input.</p> <p><i>eof-marker-string</i> — The ASCII printable string used to indicate the end of the exec file when stdin is used as the exec file source. &lt;Ctrl-c&gt; and “EOF” can always be used to terminate an exec file sourced from stdin.</p> <p><b>Default</b>    &lt;Ctrl-c&gt;, EOF</p>

---

## exit

<b>Syntax</b>	<b>exit [all]</b>
<b>Context</b>	<global>
<b>Description</b>	<p>This command returns to the context from which the current level was entered. For example, if you navigated to the current level on a context by context basis, then the <b>exit</b> command only moves the cursor back one level.</p> <pre>ALU-1# configure ALU-1&gt;config# router ALU-1&gt;config&gt;router# mpls ALU-1&gt;config&gt;router&gt;mpls# exit ALU-1&gt;config&gt;router# exit ALU-1&gt;config# exit</pre> <p>If you navigated to the current level by entering a command string, then the <b>exit</b> command returns the cursor to the context in which the command was initially entered.</p> <pre>ALU-1# configure router mpls ALU-1&gt;config&gt;router&gt;mpls# exit ALU-1#</pre> <p>The <b>exit all</b> command moves the cursor all the way back to the root level.</p> <pre>ALU-1# configure ALU-1&gt;config# router ALU-1&gt;config&gt;router# mpls ALU-1&gt;config&gt;router&gt;mpls# exit all ALU-1#</pre>
<b>Parameters</b>	<b>all</b> — exits back to the root CLI context

## help

<b>Syntax</b>	<b>help</b> <b>help edit</b> <b>help globals</b> <b>help special-characters</b>
<b>Context</b>	<global>
<b>Description</b>	<p>This command provides a brief description of the help system. The following information is displayed:</p> <pre>Help may be requested at any point by hitting a question mark '?'. In case of an executable node, the syntax for that node will be displayed with an explanation of all parameters. In case of sub-commands, a brief description is provided. Global Commands:</pre>

Help on global commands can be observed by issuing "help globals" at any time.  
 Editing Commands:  
 Help on editing commands can be observed by issuing "help edit" at any time.

**Parameters** **help** — displays a brief description of the help system

**help edit** — displays help on editing

Available editing keystrokes:

```
Delete current character.....Ctrl-d
Delete text up to cursor.....Ctrl-u
Delete text after cursor.....Ctrl-k
Move to beginning of line.....Ctrl-a
Move to end of line.....Ctrl-e
Get prior command from history.....Ctrl-p
Get next command from history.....Ctrl-n
Move cursor left.....Ctrl-b
Move cursor right.....Ctrl-f
Move back one word.....Esc-b
Move forward one word.....Esc-f
Convert rest of word to uppercase.....Esc-c
Convert rest of word to lowercase.....Esc-l
Delete remainder of word.....Esc-d
Delete word up to cursor.....Ctrl-w
Transpose current and previous character....Ctrl-t
Enter command and return to root prompt.....Ctrl-z
Refresh input line.....Ctrl-l
```

**help globals** — displays help on global commands

Available global commands:

```
back - Go back a level in the command tree
echo - Echo the text that is typed in
enable-admin - Enables the user to become a system administrator
exec - Execute a file - use -echo to show the commands and
 prompts on the screen
exit - Exit to intermediate mode - use option all to exit to
 root prompt
help - Display help
history - Show command history
info - Display configuration for the present node
logout - Log off this system
oam + OAM Test Suite
ping - Verify the reachability of a remote host
pwc - Show the present working context
sleep - Sleep for specified number of seconds
ssh - SSH to a host
telnet - Telnet to a host
traceroute - Determine the route to a destination address
tree - Display command tree structure from the context of
 execution
write - Write text to another user
```

**help special-characters** — displays help on special characters

Use the following CLI commands to display more information about commands and command syntax:



- ? — lists all commands in the current context
- string?** — lists all commands available in the current context that start with the string
- command ?** — displays command syntax and associated keywords
- string<Tab> or string<Space>** — completes a partial command name (auto-completion) or lists available commands that match the string

## history

<b>Syntax</b>	<b>history</b>
<b>Context</b>	<global>
<b>Description</b>	This command lists the last 30 commands entered in this session.

Re-execute a command in the history with the **!*n*** command, where **n** is the line number associated with the command in the history output.

For example:

```
ALU-1# history
 68 info
 69 exit
 70 info
 71 filter
 72 exit all
 73 configure
 74 router
 75 info
 76 interface "test"
 77 exit
 79 info
 80 interface "test"
 81 exit all
 82 configure router
 83 interface
 84 info
 85 interface "test"
 86 info
 87 exit all
 88 configure
 89 card 1
 91 exit
 92 router
 93 exit
 94 history
ALU-1# !88
ALU-1# configure
ALU-1>config#
```

## info

<b>Syntax</b>	<b>info [detail] [operational]</b>
<b>Context</b>	<global>
<b>Description</b>	This command displays the running configuration for the configuration context.

The output of this command is similar to the output of a **show config** command. This command, however, lists the configuration of the context where it is entered and all branches below that context level.

For example:

```
ALU-1>config>router>mpls# info

mpls
 interface "system"
 exit
 interface "to_1/2/1"
 label-map 131
 pop
 no shutdown
 exit
 static-lsp "to121"
 to 10.8.8.8
 push 121 nexthop 10.1.3.1
 no shutdown
 exit
 no shutdown
 exit
 exit

ALU-1>config>router>mpls#
```

By default, the command only enters the configuration parameters that vary from the default values. The **detail** keyword causes all configuration parameters to be displayed.

The **operational** keyword is used to display the operational configuration of the current configuration context when the user is in candidate edit mode. The **operational** keyword is mandatory when using the **info** command while in candidate edit mode.

<b>Parameters</b>	<b>detail</b> — displays all configuration parameters, including parameters at their default values
	<b>operational</b> — displays the operational configuration of the current configuration context

## logout

<b>Syntax</b>	<b>logout</b>
<b>Context</b>	<global>

**Description** This command logs out of the router session.

When the **logout** command is issued from the console, the login prompt is displayed and any log IDs directed to the console are discarded. When the console session resumes (regardless of the user), the log output to the console resumes.

When a Telnet session is terminated from a **logout** command, all log IDs directed to the session are removed. When a user logs back in, the log IDs must be recreated.

## password

**Syntax** **password**

**Context** <ROOT>

**Description** This command changes a user CLI login password.

When a user logs in after the administrator forces a **new-password-at-login**, or the password has expired (**aging**), then this command is automatically invoked.

When invoked, the user is prompted to enter the old password, the new password, and then the new password again to verify the correct input.

If a user fails to create a new password after the administrator forces a **new-password-at-login** or after the password has expired, the user is not allowed access to the CLI.

## ping

**Syntax** **ping** {*ip-address* | *dns-name*} [**rapid** | **detail**] [**ttl** *time-to-live*] [**tos** *type-of-service*] [**size** *bytes*] [**pattern** *pattern*] [**source** *ip-address*] [**interval** *seconds*] [{**next-hop** *ip-address*} | {**interface** *interface-name*} | **bypass-routing**] [**count** *requests*] [**do-not-fragment**] [**router** *router-instance* | **service-name** *service-name*] [**timeout** *timeout*] [**fc** *fc-name*]

**Context** <global>

**Description** This command is the TCP/IP utility to verify IP reachability.

**Parameters** *ip-address* — the IP address of the remote host to ping

### Values

*ipv4-address*: a.b.c.d

*ipv6-address*: x:x:x:x:x:x:x[-*interface*]

x:x:x:x:x:d.d.d.d[-*interface*]

x: [0 to FFFF]H

d: [0 to 255]D

*interface* — 32 chars max, mandatory for link local addresses

**source** *ip-address* — the source IP address to use in the ping requests

**Values**

*ipv4-address*: a.b.c.d  
*ipv6-address*: x:x:x:x:x:x:x (eight 16-bit pieces)  
 x:x:x:x:x:d.d.d.d  
 x: [0 to FFFF]H  
 d: [0 to 255]D

**Default** the IP address of the egress IP interface

**next-hop** *ip-address* — this option disregards the routing table and will send this packet to the specified next hop address. This address must be on an adjacent router that is attached to a subnet that is common between this and the next-hop router.

**Values** a valid IP next hop IP address

**Default** per the routing table

**dns-name** — the DNS name (if DNS name resolution is configured) of the remote host to ping

**Values** 128 characters maximum

**rapid | detail** — the **rapid** parameter specifies to send ping requests rapidly. The results are reported in a single message, not in individual messages for each ping request. By default, five ping requests are sent before the results are reported. To change the number of requests, include the **count** option.

The **detail** parameter includes in the output the interface on which the ping reply was received.

```
ALU-1# ping 192.168.xx.xx4 detail
PING 192.168.xx.xx4: 56 data bytes
64 bytes from 192.168.xx.xx4 via fei0: icmp_seq=0 ttl=64 time=0.000 ms.
64 bytes from 192.168.xx.xx4 via fei0: icmp_seq=1 ttl=64 time=0.000 ms.
64 bytes from 192.168.xx.xx4 via fei0: icmp_seq=2 ttl=64 time=0.000 ms.
64 bytes from 192.168.xx.xx4 via fei0: icmp_seq=3 ttl=64 time=0.000 ms.
64 bytes from 192.168.xx.xx4 via fei0: icmp_seq=4 ttl=64 time=0.000 ms.
---- 192.168.xx.xx4 PING Statistics ----
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max/stddev = 0.000/0.000/0.000/0.000 ms
ALU-1#
```

**time-to-live** — the IP Time To Live (TTL) value to include in the ping request, expressed as a decimal integer

**Values** 0 to 128

**type-of-service** — the type-of-service (ToS) bits in the IP header of the ping packets, expressed as a decimal integer

**Values** 0 to 255

---

*bytes* — the size in bytes of the ping request packets

**Values** 0 to 65507

**Default** 56 bytes (actually 64 bytes because 8 bytes of ICMP header data are added to the packet)

*pattern* — 16-bit pattern string to include in the ping packet, expressed as a decimal integer

**Values** 0 to 65535

*seconds* — the interval in seconds between consecutive ping requests, expressed as a decimal integer

**Values** 1 to 10000

**Default** 1

*interface-name* — specifies the interface name

**bypass-routing** — sends the ping request to a host on a directly attached network bypassing the routing table. The host must be on a directly attached network or an error is returned.

*requests* — the number of ping requests to send to the remote host, expressed as a decimal integer

**Values** 1 to 10000

**Default** 5

**do-not-fragment** — specifies that the request frame should not be fragmented. This option is particularly useful in combination with the size parameter for maximum MTU determination.

*router-instance* — specifies the router name or service ID

**Values** *router-name*: Base, management

*service-id*: 1 to 2147483647

**Default** Base

*service-name* — specifies the service name, 64 characters maximum

*timeout* — specifies the timeout in seconds

**Values** 1 to 10

**Default** 5

*fc-name* — specifies the forwarding class

**Values** be | l2 | af | l1 | h2 | ef | h1 | nc

**Default** nc

## pwc

<b>Syntax</b>	<b>pwc</b> [ <b>previous</b> ]
<b>Context</b>	<global>
<b>Description</b>	This command displays the present or previous working context of the CLI session.

The **pwc** command provides a user who is in the process of dynamically configuring a chassis a way to display the current or previous working context of the CLI session. The **pwc** command displays a list of the CLI nodes that hierarchically define the current context of the CLI instance of the user.

For example:

```
A:ALU>config>router>mpls# pwc

Present Working Context :

<root>
 configure
 router "Base"
 mpls

A:ALU>config>router>mpls#
```

When the **previous** keyword is specified, the previous context is displayed. This is the context entered by the CLI parser upon execution of the **exit** command. The current context of the CLI is not affected by the **pwc** command.

<b>Parameters</b>	<b>previous</b> — displays the previous working context
-------------------	---------------------------------------------------------

## sleep

<b>Syntax</b>	<b>sleep</b> [ <i>seconds</i> ]
<b>Context</b>	<global>
<b>Description</b>	This command causes the console session to pause operation (sleep) for 1 second (default) or for the specified number of seconds.
<b>Parameters</b>	<i>seconds</i> — specifies the number of seconds for the console session to sleep, expressed as a decimal integer
<b>Values</b>	1 to 100
<b>Default</b>	1

---

 ssh

<b>Syntax</b>	<b>ssh</b> <i>host</i> [-I <i>username</i> ] [-v <i>ssh-version</i> ] [ <b>router</b> <i>router-instance</i>   <b>service-name</b> <i>service-name</i> ] [ <b>re-exchange-min</b> <i>minutes</i> ] [ <b>re-exchange-mbyte</b> <i>megabytes</i> ]
<b>Context</b>	<global>
<b>Description</b>	<p>This command opens a Secure Shell (SSH) session with another host.</p> <p>This command initiates a client SSH session with the remote host and is independent from the administrative or operational state of the SSH server. However, to be the target of an SSH or SFTP session, the SSH server must be operational.</p> <p>The command also allows the user to initiate an SSH session with a key re-exchange to occur after a specified number of minutes have passed or a specified number of megabytes have been transmitted. If both parameters are configured, the key re-exchange will occur at whatever limit is reached first. If neither parameter is set, key re-exchange will not occur.</p> <p>Quitting SSH while in the process of authentication is accomplished by either executing a &lt;Ctrl-c&gt; or "~." (tilde and dot), assuming the "~" is the default escape character for the SSH session.</p>
<b>Parameters</b>	<p><i>host</i> — the remote host for an SSH session. The IP address, DNS name (if DNS name resolution is configured), or the user name at the IP address can be specified.</p> <p>For IPv6 addresses, including the “-<i>interface</i>” for the link local address is mandatory; otherwise, “-<i>interface</i>” is omitted. For example, if the <i>user</i> is <i>alu_admin</i> and the IPv6 <i>hostname</i> consists of <i>2001:db8:a0b:12f0::1</i> along with the link local interface “<i>ies1_chicago</i>”, then the full command would be (note the “-” between the <i>ipv6-address</i> and the <i>interface</i>):</p> <pre>ssh -I alu_admin 2001:db8:a0b:12f0::1-ies1_chicago</pre> <p><b>Values</b></p> <p><i>[user@]hostname</i>: 255 characters maximum</p> <p><i>user</i>: user name, 32 characters maximum</p> <p><i>hostname</i>: [<i>dns-name</i>   <i>ipv4-address</i>   <i>ipv6-address</i>]</p> <p><i>dns-name</i>: 128 characters maximum</p> <p><i>ipv4-address</i> a.b.c.d</p>

*ipv6-address* x:x:x:x:x:x[-*interface*]  
 x:x:x:x:x:d.d.d.d[-*interface*]  
 x: [0 to FFFF]H  
 d: [0 to 255]D  
*interface* — 32 chars max, mandatory for link local addresses

*username* — the user name to use when opening the SSH session

*ssh-version* — the version of the SSH session to use

**Values** 1, 2, or 1-2 (for SSHv1 only, SSHv2 only, or SSHv1 and SSHv2)

*router-instance* — the router name or service ID

**Values** *router-name:* Base, management  
*service-id:* 1 to 2147483647

**Default** Base

*service-name* — specifies the service name, 64 characters maximum

*minutes* — specifies the time interval after which the SSH client will initiate the key re-exchange

**Values** 1 to 1440

**Default** 60

*megabytes* — specifies the number of megabytes transmitted during an SSH session after which the SSH client will initiate the key re-exchange

**Values** 1 to 64000

**Default** 1024

## telnet

**Syntax** **telnet** [*ip-address* | *dns-name*] [*port*] [**router** *router-instance*]  
**telnet** [*ip-address* | *dns-name*] [*port*] [**service-name** *service-name*]

**Context** <global>

**Description** This command opens a Telnet session to a remote host.

Telnet servers in 7705 SAR networks limit a Telnet client to three retries to log in. The Telnet server disconnects the Telnet client session after three retries. The number of retry attempts for a Telnet client session is not user-configurable.



<b>Parameters</b>	<i>ip-address</i> — the IP address of the remote host
	<b>Values</b> <i>ipv4-address:</i> a.b.c.d <i>ipv6-address:</i> x:x:x:x:x:x:x[- <i>interface</i> ] x:x:x:x:x:d.d.d.d[- <i>interface</i> ] x: [0 to FFFF]H d: [0 to 255]D <i>interface</i> — 32 chars max, mandatory for link local addresses
	<i>dns-name</i> — the DNS name (if DNS name resolution is configured) of the remote host
	<b>Values</b> 128 characters maximum
	<i>port</i> — the TCP port number to use to Telnet to the remote host, expressed as a decimal integer
	<b>Values</b> 1 to 65535
	<b>Default</b> 23
	<i>router-instance</i> — the router name or service ID
	<b>Values</b> <i>router-name:</i> Base, management <i>service-id:</i> 1 to 2147483647
	<b>Default</b> Base
	<i>service-name</i> — specifies the service name, 64 characters maximum

## traceroute

<b>Syntax</b>	<b>traceroute</b> { <i>ip-address</i>   <i>dns-name</i> } [ <b>tll</b> <i>tll</i> ] [ <b>wait</b> <i>milliseconds</i> ] [ <b>no-dns</b> ] [ <b>source</b> <i>ip-address</i> ] [ <b>tos</b> <i>type-of-service</i> ] [ <b>router</b> <i>router-instance</i>   <b>service-name</b> <i>service-name</i> ]
<b>Context</b>	<global>
<b>Description</b>	The TCP/IP traceroute utility determines the route to a destination address. Aborting a traceroute with the <Ctrl-c> command could require issuing a second <Ctrl-c> command before the prompt is returned.
	<pre>ALU-1# traceroute 192.168.xx.xx4 traceroute to 192.168.xx.xx4, 30 hops max, 40 byte packets  1 192.168.xx.xx4 0.000 ms 0.000 ms 0.000 ms ALU-1#</pre>
<b>Parameters</b>	<i>ip-address</i> — the IP address to trace
	<b>Values</b> <i>ipv4-address:</i> a.b.c.d <i>ipv6-address:</i> x:x:x:x:x:x:x[- <i>interface</i> ]

x:x:x:x:x:d.d.d.d[-*interface*]

x: [0 to FFFF]H

d: [0 to 255]D

*interface* — 32 chars max, mandatory for link local addresses

*dns-name* — the DNS name (if DNS name resolution is configured)

**Values** 128 characters maximum

*ttl* — the maximum Time-To-Live (TTL) value to include in the traceroute request, expressed as a decimal integer

**Values** 1 to 255

*milliseconds* — the time in milliseconds to wait for a response to a probe, expressed as a decimal integer

**Values** 1 to 60000

**Default** 5000

**no-dns** — when the **no-dns** keyword is specified, a DNS lookup for the specified host name will not be performed

**Default** DNS lookups are performed

**source ip-address** — the source IP address to use as the source of the probe packets. If the IP address is not one of the device's interfaces, an error is returned.

**Values**

*ipv4-address:* a.b.c.d

*ipv6-address:* x:x:x:x:x:x:x:x (eight 16-bit pieces)

x:x:x:x:x:d.d.d.d

x: [0 to FFFF]H

d: [0 to 255]D

*type-of-service* — the type-of-service (ToS) bits in the IP header of the probe packets, expressed as a decimal integer

**Values** 0 to 255

*router-instance* — the router name or service ID

**Values** *router-name:* Base, management

*service-id:* 1 to 2147483647

**Default** Base

*service-name* — specifies the service name, 64 characters maximum

---

## tree

<b>Syntax</b>	<b>tree [detail] [flat]</b>
<b>Context</b>	<global>
<b>Description</b>	This command displays the command hierarchy structure from the present working context.
<b>Parameters</b>	<b>detail</b> — includes parameter information for each command displayed in the tree output <b>flat</b> — displays the command hierarchy on single lines

## write

<b>Syntax</b>	<b>write {user   broadcast} message-string</b>
<b>Context</b>	<global>
<b>Description</b>	This command sends a console message to a specific user or to all users with active console sessions.
<b>Parameters</b>	<i>user</i> — the name of a user with an active console session to which to send a console message <b>Values</b> any valid CLI username <b>broadcast</b> — specifies that the <i>message-string</i> is to be sent to all users logged in to the router <i>message-string</i> — the message string to send, up to 250 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

### 3.11.2.2 Environment Commands

#### alias

**Syntax** **alias** *alias-name alias-command-name*  
**no alias** *alias-name*

**Context** environment

**Description** This command enables the substitution of a command line by an alias.

Use the **alias** command to create alternative names for an entity or command string that are easier to understand and remember. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. The special characters “/” and “\” cannot be used as the first character inside an alias string. Only a single command can be present in the command string.

The **alias** command can be entered in any context but must be created in the **root>environment** context.

For example, to create an alias named **soi** to display MPLS interfaces, enter:

**alias soi “show router mpls interface”**

An alias can contain embedded quotes if the quote is preceded with the “\” character (for example, **alias my-alias “| match \“string\”**). This enables aliases to be created as shortcuts for complex commands; for example:

**environment alias my-summary “| match expression \“----[Description|Interface|Admin State|Oper State|Transceiver Type|Optical Compliance|Link Length\” | match invert-match expression \“Ethernet Interface|OTU Interface\” | match invert-match expression \“----\” post-lines 1”**

When applied to the **show port 1/1/1 detail** command, **show port 1/1/1 detail my-summary** will display only the output fields that match the conditions in the match expression as shown in the following examples:

Without alias:

```
*A: Sar18 Dut-B# show port 1/1/1 detail
=====
Ethernet Interface
=====
Description : 10/100/Gig Ethernet SFP
Interface : 1/1/1 Oper Speed : 1 Gbps
Link-level : Ethernet Config Speed : 1 Gbps
Admin State : up Oper Duplex : full
Oper State : up Config Duplex : full
Physical Link : Yes MTU : 1572
Single Fiber Mode : No
IfIndex : 35684352 Hold time up : 0 seconds
```

```

Last State Change : 05/23/2018 18:41:28 Hold time down : 0 seconds
Last Cleared Time : N/A DDM Events : Enabled
Phys State Chng Cnt: 1
Configured Mode : network Encap Type : 802.1q
Dot1Q Ethertype : 0x8100 QinQ Ethertype : 0x8100
Ing. Pool % Rate : 100 Egr. Pool % Rate : 100
Net. Egr. Queue Pol: default
Net. Scheduler Mode: 16-priority
Auto-negotiate : true MDI/MDX : unknown
Config Phy-tx-clock: auto-pref-slave Oper Phy-tx-clock: N/A
NetEgr.Unshaped-Cir: 0 Kbps
Allow Eth-BN : False
Egress Rate : Default Ingress Rate : Default
Egr.Rate Incl.FCS : Disabled
Ingress CBS(bytes) : 130816
Src-pause : Disabled
LACP Tunnel : Disabled
Keep-alive : 10
Retry : 120
Down-when-looped : Disabled
Loop Detected : False
Use Broadcast Addr : False
Loopback : none Swap Mac Addr : Disabled
Loopback Time Left : unspecified
Cfm Loopback : Disabled
PTP Asymmetry : 0 Edge Timestamp : Disable
Timestamp Capable : True
Sync. Status Msg. : Disabled Rx Quality Level : N/A
Tx DUS/DNU : Disabled Tx Quality Level : N/A
SSM Code Type : sdh
CRC Mon SD Thresh : Disabled CRC Mon Window : 10 seconds
CRC Mon SF Thresh : Disabled
EFM OAM : Disabled EFM OAM Link Mon : Disabled
Configured Address : d6:65:01:01:00:01
Hardware Address : d6:65:01:01:00:01
Group Encryption
Inbound Keygroup Id : N/A
Inbound Keygroup Id : N/A
Transceiver Data
Transceiver Status : operational
Transceiver Type : Unknown
Model Number : none
TX Laser Wavelength: 0 nm Diag Capable : no
Connector Code : Unknown Vendor OUI : 00:00:00
Manufacture date : 2000/01/01 Media : Ethernet
Serial Number : none
Part Number : none
Optical Compliance :
Link Length support: Unknown
SFP Sync-E Capable : yes
...

```

**With alias:**

```

*A:Sar18 Dut-B# show port 1/1/1 detail my-summary
Description : 10/100/Gig Ethernet SFP
Interface : 1/1/1 Oper Speed : 1 Gbps
Admin State : up Oper Duplex : full
Oper State : up Config Duplex : full
Transceiver Type : Unknown
Optical Compliance :

```

```
Link Length support: Unknown
```

```

*A: Sar18 Dut-B#
```

- Parameters**
- alias-name* — the alias name. Do not use a valid command string for the alias. If the alias specified is an actual command, this causes the command to be replaced by the alias.
  - alias-command-name* — the command line to be associated

## create

- Syntax** [no] create
- Context** environment
- Description** By default, the **create** command is required to create a new OS entity. The **no** form of the command disables requiring the **create** keyword.
- Default** create

## more

- Syntax** [no] more
- Context** environment
- Description** This command enables per-screen CLI output, meaning that the output is displayed on a screen-by-screen basis. The terminal screen length can be modified with the [terminal](#) command.
- The following prompt appears at the end of each screen of paginated output:
- ```
Press any key to continue (Q to quit)
```
- The **no** form of the command displays the output all at once. If the output length is longer than one screen, the entire output will be displayed, which may scroll the screen.
- Default** more

reduced-prompt

- Syntax** **reduced-prompt** [*no-of-nodes-in-prompt*]
no reduced-prompt
- Context** environment

Description This command configures the maximum number of higher CLI context levels to display in the CLI prompt for the current CLI session. This command is useful when configuring features that are several node levels deep, which can cause the CLI prompt to become too long.

By default, the CLI prompt displays the system name and the complete context in the CLI.

The number of nodes specified indicates the number of higher-level contexts that can be displayed in the prompt.

For example, if **reduced-prompt** is set to 2, the two highest contexts from the present working context are displayed by name with the hidden (reduced) contexts compressed into an ellipsis (“...”).

```
ALU-1>environment# reduced-prompt 2
ALU-1>config>router# interface to-103
ALU-1>...router>if#
```

The setting is not saved in the configuration. It must be reset for each CLI session or stored in an **exec** script file.

The **no** form of the command reverts to the default.

Default no reduced-prompt

Parameters *no-of-nodes-in-prompt* — the maximum number of higher-level nodes displayed by name in the prompt, expressed as a decimal integer

Values 0 to 15

Default 2

saved-ind-prompt

Syntax [**no**] **saved-ind-prompt**

Context environment

Description This command enables a saved indicator in the prompt. When changes are made to the configuration file, a “*” appears in the prompt string indicating that the changes have not been saved. When an admin **save** command is executed, the “*” disappears.

```
*A:ALU-48# admin save
Writing file to ftp://192.0.2.43/./sim48/sim48-config.cfg
Saving configuration .... Completed.
A:ALU-48
```

Default saved-ind-prompt

suggest-internal-objects

| | |
|--------------------|---|
| Syntax | [no] suggest-internal-objects |
| Context | environment |
| Description | This command enables the suggestion of internally created objects while auto-completing in the CLI. |
| Default | no suggest-internal-objects |

terminal

| | |
|--------------------|---|
| Syntax | terminal |
| Context | environment |
| Description | This command enables the context to configure the terminal screen length and width for the current CLI session. The terminal length and width cannot be configured for Telnet or SSH sessions, as the correct display size is automatically negotiated. |

length

| | |
|--------------------|---|
| Syntax | length <i>lines</i> |
| Context | environment>terminal |
| Description | This command sets the terminal screen length (number of lines). |
| Default | 24 — terminal dimensions are set to 24 lines long by 80 characters wide |
| Parameters | <i>lines</i> — the number of lines for the terminal screen length |
| | Values 1 to 512 |

width

| | |
|--------------------|---|
| Syntax | width <i>width</i> |
| Context | environment>terminal |
| Description | This command sets the terminal screen width (number of characters). |
| Default | 80 — terminal dimensions are set to 24 lines long by 80 characters wide |
| Parameters | <i>width</i> — the number of characters for the terminal screen width |
| | Values 1 to 512 |

time-display

| | |
|--------------------|---|
| Syntax | time-display { local utc } |
| Context | environment |
| Description | <p>This command displays timestamps in the CLI session based on local time or Coordinated Universal Time (UTC).</p> <p>The system keeps time internally in UTC and is capable of displaying the time in either UTC or local time based on the time zone configured.</p> <p>This configuration command is only valid for times displayed in the current CLI session. This includes displays of event logs, traps and all other places where a timestamp is displayed.</p> <p>In general, all timestamps are shown in the time selected. This includes log entries destined for console/session, memory, or SNMP logs. Log files on compact flash are maintained and displayed in UTC format.</p> |
| Default | time-display local |

time-stamp

| | |
|--------------------|--|
| Syntax | [no] time-stamp |
| Context | environment |
| Description | <p>This command displays timestamps before the CLI prompt, indicating the last time that the command was completed. The date and time are displayed; the time format is either local or UTC, depending on how it was set with the time-display command.</p> |
| Default | no time-stamp |

3.11.2.3 Monitor CLI Commands

filter

| | |
|--------------------|---|
| Syntax | filter |
| Context | monitor |
| Description | This command enables the context to configure criteria to monitor IP filter statistics. |

ip

| | |
|--------------------|---|
| Syntax | ip <i>ip-filter-id</i> entry <i>entry-id</i> [interval <i>seconds</i>] [repeat <i>repeat</i>] [absolute rate] |
| Context | monitor>filter |
| Description | <p>This command enables IP filter monitoring. The statistical information for the specified IP filter entry is displayed at the configured interval until the configured count is reached.</p> <p>The first screen displays the current statistics related to the specified IP filter. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen output.</p> <p>When the keyword rate is specified, the rate per second for each statistic is displayed instead of the delta.</p> <p>Monitor commands are similar to show commands, but only statistical information is displayed. Monitor commands display the selected statistics according to the configured number of times at the interval specified.</p> |
| Parameters | <p><i>ip-filter-id</i> — displays detailed information for the specified filter ID or filter name and its filter entries</p> <p>Values 1 to 65535 or <i>filter-name</i> (up to 64 characters)</p> <p><i>entry-id</i> — displays information for the specified filter entry ID</p> <p>Values 1 to 65535</p> <p><i>seconds</i> — configures the interval for each display in seconds</p> <p>Values 3 to 60</p> <p>Default 10</p> <p><i>repeat</i> — configures how many times the command is repeated</p> <p>Values 1 to 999</p> <p>Default 10</p> |

absolute — displays raw statistics, without processing. No calculations are performed on the delta or rate statistics.

rate — displays the rate per second for each statistic instead of the delta

Output The following output is an example of statistical information for the specified IP filter entry.

Output Example

```
ALU-1>monitor# filter ip 10 entry 1 interval 3 repeat 3 absolute
=====
Monitor statistics for IP filter 10 entry 1
=====
-----
At time t = 0 sec (Base Statistics)
-----
Ing. Matches : 0
Egr. Matches : 0
-----
At time t = 3 sec (Mode: Absolute)
-----
Ing. Matches : 0
Egr. Matches : 0
-----
At time t = 6 sec (Mode: Absolute)
-----
Ing. Matches : 0
Egr. Matches : 0
-----
At time t = 9 sec (Mode: Absolute)
-----
Ing. Matches : 0
Egr. Matches : 0
=====
ALU-1>monitor#

ALU-1>monitor# filter ip 10 entry 1 interval 3 repeat 3 rate
=====
Monitor statistics for IP filter 10 entry 1
=====
-----
At time t = 0 sec (Base Statistics)
-----
Ing. Matches : 0
Egr. Matches : 0
-----
At time t = 3 sec (Mode: Rate)
-----
Ing. Matches : 0
Egr. Matches : 0
-----
At time t = 6 sec (Mode: Rate)
-----
Ing. Matches : 0
Egr. Matches : 0
-----
At time t = 9 sec (Mode: Rate)
```

```
-----
Ing. Matches : 0
Egr. Matches : 0
```

ipv6

- Syntax** `ipv6 ipv6-filter-id entry entry-id [interval seconds] [repeat repeat] [absolute | rate]`
- Context** monitor>filter
- Description** This command enables IPv6 filter monitoring. The statistical information for the specified IPv6 filter entry is displayed at the configured interval until the configured count is reached.
- The first screen displays the current statistics related to the specified IPv6 filter. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen output.
- When the keyword **rate** is specified, the rate per second for each statistic is displayed instead of the delta.
- Monitor commands are similar to **show** commands, but only statistical information is displayed. Monitor commands display the selected statistics according to the configured number of times at the interval specified.
- Parameters**
- ipv6-filter-id* — displays detailed information for the specified filter ID or filter name and its filter entries
- Values** 1 to 65535 or *filter-name* (up to 64 characters)
- entry-id* — displays information for the specified filter entry ID
- Values** 1 to 65535
- seconds* — configures the interval for each display in seconds
- Values** 3 to 60
- Default** 10
- repeat* — configures how many times the command is repeated
- Values** 1 to 999
- Default** 10
- absolute** — displays raw statistics, without processing. No calculations are performed on the delta or rate statistics.
- rate** — displays the rate per second for each statistic instead of the delta

management-access-filter

| | |
|--------------------|--|
| Syntax | management-access-filter |
| Context | monitor |
| Description | This command enables the context to configure criteria to monitor management access filters. Management access filters control all traffic. They can be used to restrict management of the 7705 SAR by other nodes outside specific (sub)networks or through designated ports. |

ip

| | |
|--------------------|---|
| Syntax | ip entry <i>entry-id</i> [<i>interval seconds</i>] [<i>repeat repeat</i>] [<i>absolute</i> <i>rate</i>] |
| Context | monitor>management-access-filter |
| Description | <p>This command enables IP filter monitoring. The statistical information for the specified IP filter entry is displayed at the configured interval until the configured count is reached.</p> <p>The first screen displays the current statistics related to the specified IP filter. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen output.</p> <p>When the keyword rate is specified, the rate per second for each statistic is displayed instead of the delta.</p> <p>Monitor commands are similar to show commands, but only statistical information is displayed. Monitor commands display the selected statistics according to the configured number of times at the interval specified.</p> |
| Parameters | <p><i>entry-id</i> — displays information for the specified filter entry ID</p> <p>Values 1 to 9999</p> <p><i>seconds</i> — configures the interval for each display in seconds</p> <p>Values 3 to 60</p> <p>Default 10</p> <p><i>repeat</i> — configures how many times the command is repeated</p> <p>Values 1 to 999</p> <p>Default 10</p> <p>absolute — displays raw statistics, without processing. No calculations are performed on the delta or rate statistics.</p> <p>rate — displays the rate per second for each statistic instead of the delta</p> |

ipv6

| | |
|--------------------|---|
| Syntax | ipv6 entry <i>entry-id</i> [<i>interval seconds</i>] [<i>repeat repeat</i>] [absolute rate] |
| Context | monitor>management-access-filter |
| Description | <p>This command enables IPv6 filter monitoring. The statistical information for the specified IPv6 filter entry is displayed at the configured interval until the configured count is reached.</p> <p>The first screen displays the current statistics related to the specified IPv6 filter. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen output.</p> <p>When the keyword rate is specified, the rate per second for each statistic is displayed instead of the delta.</p> <p>Monitor commands are similar to show commands, but only statistical information is displayed. Monitor commands display the selected statistics according to the configured number of times at the interval specified.</p> |
| Parameters | <p><i>entry-id</i> — displays information for the specified filter entry ID</p> <p>Values 1 to 9999</p> <p><i>seconds</i> — configures the interval for each display in seconds</p> <p>Values 3 to 60</p> <p>Default 10</p> <p><i>repeat</i> — configures how many times the command is repeated</p> <p>Values 1 to 999</p> <p>Default 10</p> <p>absolute — displays raw statistics, without processing. No calculations are performed on the delta or rate statistics.</p> <p>rate — displays the rate per second for each statistic instead of the delta</p> |

port

| | |
|--------------------|---|
| Syntax | port <i>port-id</i> [<i>port-id...</i> (up to 5 max)] [<i>interval seconds</i>] [<i>repeat repeat</i>] [absolute rate] |
| Context | monitor |
| Description | <p>This command enables port traffic monitoring. The specified ports' statistical information is displayed at the configured interval until the configured count is reached.</p> <p>The first screen displays the current statistics related to the specified ports. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen output.</p> |

When the keyword **rate** is specified, the rate per second for each statistic is displayed instead of the delta. The percentage of the port being used is also displayed. For Ethernet ports, the usage includes inter-frame gap and preamble.

Monitor commands are similar to **show** commands, but only statistical information is displayed. Monitor commands display the selected statistics according to the configured number of times at the interval specified.

Parameters

port-id — specifies up to 5 port IDs

Values *port-id*: slot/mda/port[.channel]

seconds — configures the interval for each display in seconds

Values 3 to 60

Default 10

repeat — configures how many times the command is repeated

Values 1 to 999

Default 10

absolute — displays raw statistics, without processing. No calculations are performed on the delta or rate statistics.

rate — displays the rate per second for each statistic instead of the delta

Output

The following output is an example of statistical information about the port.

Output Example

```
ALU-12>monitor# port 1/1/4 interval 3 repeat 3 absolute
=====
Monitor statistics for Port 1/1/4
=====
```

| | Input | Output |
|-------------------------------------|-------|--------|
| ----- | | |
| At time t = 0 sec (Base Statistics) | | |
| Octets | 0 | 0 |
| Packets | 39 | 175 |
| Errors | 0 | 0 |
| ----- | | |
| At time t = 3 sec (Mode: Absolute) | | |
| Octets | 0 | 0 |
| Packets | 39 | 175 |
| Errors | 0 | 0 |
| ----- | | |
| At time t = 6 sec (Mode: Absolute) | | |
| Octets | 0 | 0 |
| Packets | 39 | 175 |
| Errors | 0 | 0 |
| ----- | | |
| At time t = 9 sec (Mode: Absolute) | | |

```

-----
Octets                                0                                0
Packets                               39                               175
Errors                                0                                0
=====
ALU-12>monitor#

ALU-12>monitor# port 1/1/4 interval 3 repeat 3 rate
=====
Monitor statistics for Port 1/1/4
=====
                                     Input                                Output
-----
At time t = 0 sec (Base Statistics)
-----
Octets                                0                                0
Packets                               39                               175
Errors                                0                                0
-----
At time t = 3 sec (Mode: Rate)
-----
Octets                                0                                0
Packets                               0                                0
Errors                                0                                0
Bits                                  0                                0
Utilisation (% of port capacity)      0.00                            0.00
-----
At time t = 6 sec (Mode: Rate)
-----
Octets                                0                                0
Packets                               0                                0
Errors                                0                                0
Bits                                  0                                0
Utilisation (% of port capacity)      0.00                            0.00
-----
At time t = 9 sec (Mode: Rate)
-----
Octets                                0                                0
Packets                               0                                0
Errors                                0                                0
Bits                                  0                                0
Utilisation (% of port capacity)      0.00                            0.00
=====
ALU-12>monitor#

```

router

Syntax **router** *router-instance*
router *service-name service-name*

Context monitor

Description This command enables the context to configure criteria to monitor statistical information for MPLS and routing protocols.

Parameters *router-instance* — specifies the router name or service ID

Values *router-name:* Base, management
service-id: 1 to 2147483647

Default Base

service-name — specifies the service name, 64 characters maximum

fec-egress-stats

Syntax **fec-egress-stats** *ip-prefix/mask* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

Context monitor>router>ldp

Description This command displays egress statistics for LDP FEC prefixes at the configured interval until the configured count is reached.

Monitor commands are similar to **show** commands, but only statistical information is displayed. Monitor commands display the selected statistics according to the configured number of times at the interval specified.

Parameters *ip-prefix[/mask]* — the IP prefix and prefix length associated with the prefix FEC

Values

ipv4-prefix: a.b.c.d
ipv4-prefix-length: 32
ipv6-prefix: x:x:x:x:x:x:x (eight 16-bit pieces)
x:x:x:x:x:d.d.d.d
x - [0 to FFFF]H
d - [0 to 255]D
ipv6-prefix-length: 128

seconds — specifies the interval for each display, in seconds

Values 3 to 60

Default 10

repeat — specifies how many times the command is repeated

Values 1 to 999

Default 10

absolute — displays raw statistics, without processing. No calculations are performed on the delta or rate statistics.

rate — displays the rate per second for each statistic instead of the delta

Output The following output is an example of statistics for an LDP FEC instance.

Output Example

```

=====
Monitor egress statistics for LDP FEC prefix 10.10.10.29/32
=====
-----
At time t = 0 sec (Base Statistics)
-----
-----
FEC Prefix/Mask      : 10.10.10.29/32
-----
Collect Stats       : Disabled           Accounting Plcy.   : None
Admin State        : Up
FC BE
InProf Pkts        : 0                 OutProf Pkts      : 0
InProf Octets      : 0                 OutProf Octets    : 0
FC L2
InProf Pkts        : 0                 OutProf Pkts      : 0
InProf Octets      : 0                 OutProf Octets    : 0
FC AF
InProf Pkts        : 0                 OutProf Pkts      : 0
InProf Octets      : 0                 OutProf Octets    : 0
FC L1
InProf Pkts        : 0                 OutProf Pkts      : 0
InProf Octets      : 0                 OutProf Octets    : 0
FC H2
InProf Pkts        : 0                 OutProf Pkts      : 0
InProf Octets      : 0                 OutProf Octets    : 0
FC EF
InProf Pkts        : 0                 OutProf Pkts      : 0
InProf Octets      : 0                 OutProf Octets    : 0
FC H1
InProf Pkts        : 0                 OutProf Pkts      : 0
InProf Octets      : 0                 OutProf Octets    : 0
FC NC
InProf Pkts        : 0                 OutProf Pkts      : 0
InProf Octets      : 0                 OutProf Octets    : 0
-----
At time t = 3 sec (Mode: Absolute)
-----
=====
Monitor egress statistics for LDP FEC prefix 10.10.10.29/32
=====
-----
At time t = 0 sec (Base Statistics)
-----
-----
FEC Prefix/Mask      : 10.10.10.29/32
-----
Collect Stats       : Disabled           Accounting Plcy.   : None
Admin State        : Up
FC BE
InProf Pkts        : 0                 OutProf Pkts      : 0
InProf Octets      : 0                 OutProf Octets    : 0
FC L2
InProf Pkts        : 0                 OutProf Pkts      : 0
InProf Octets      : 0                 OutProf Octets    : 0
FC AF
InProf Pkts        : 0                 OutProf Pkts      : 0
-----

```

```

InProf Octets      : 0                OutProf Octets      : 0
FC L1
InProf Pkts       : 0                OutProf Pkts       : 0
InProf Octets     : 0                OutProf Octets     : 0
FC H2
InProf Pkts       : 0                OutProf Pkts       : 0
InProf Octets     : 0                OutProf Octets     : 0
FC EF
InProf Pkts       : 0                OutProf Pkts       : 0
InProf Octets     : 0                OutProf Octets     : 0
FC H1
InProf Pkts       : 0                OutProf Pkts       : 0
InProf Octets     : 0                OutProf Octets     : 0
FC NC
InProf Pkts       : 0                OutProf Pkts       : 0
InProf Octets     : 0                OutProf Octets     : 0
-----
At time t = 3 sec (Mode: Rate)
-----

```

session

Syntax `session ldp-id [ldp-id...(up to 5 max)] [interval seconds] [repeat repeat] [absolute | rate]`

Context monitor>router>ldp

Description This command displays statistical information for LDP sessions at the configured interval until the configured count is reached.

The first screen displays the current statistics related to the specified LDP sessions. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen output.

When the keyword **rate** is specified, the rate per second for each statistic is displayed instead of the delta.

Monitor commands are similar to **show** commands, but only statistical information is displayed. Monitor commands display the selected statistics according to the configured number of times at the interval specified.

Parameters *ldp-id* — specifies the IP address of the LDP session to display

Values *ip-addr[:label-space]*
ip-addr — a.b.c.d
label-space — [0 to 65535]

seconds — configures the interval for each display in seconds

Values 3 to 60

Default 10

repeat — configures how many times the command is repeated

Values 1 to 999

Default 10

absolute — displays raw statistics, without processing. No calculations are performed on the delta or rate statistics.

rate — displays the rate per second for each statistic instead of the delta

Output The following output is an example of statistical information for the LDP session.

Output Example

```

ALU-103>monitor>router>ldp# session 10.10.10.104 interval 3 repeat 3 absolute
=====
Monitor statistics for LDP Session 10.10.10.104
=====

```

| | Sent | Received |
|-------------------------------------|------|----------|
| ----- | | |
| At time t = 0 sec (Base Statistics) | | |
| ----- | | |
| FECs | 1 | 2 |
| Hello | 5288 | 5289 |
| Keepalive | 8225 | 8225 |
| Init | 1 | 1 |
| Label Mapping | 1 | 4 |
| Label Request | 0 | 0 |
| Label Release | 0 | 0 |
| Label Withdraw | 0 | 0 |
| Label Abort | 0 | 0 |
| Notification | 0 | 0 |
| Address | 1 | 1 |
| Address Withdraw | 0 | 0 |
| ----- | | |
| At time t = 3 sec (Mode: Absolute) | | |
| ----- | | |
| FECs | 1 | 2 |
| Hello | 5288 | 5289 |
| Keepalive | 8226 | 8226 |
| Init | 1 | 1 |
| Label Mapping | 1 | 4 |
| Label Request | 0 | 0 |
| Label Release | 0 | 0 |
| Label Withdraw | 0 | 0 |
| Label Abort | 0 | 0 |
| Notification | 0 | 0 |
| Address | 1 | 1 |
| Address Withdraw | 0 | 0 |
| ----- | | |
| At time t = 6 sec (Mode: Absolute) | | |
| ----- | | |
| FECs | 1 | 2 |
| Hello | 5288 | 5290 |
| Keepalive | 8226 | 8226 |
| Init | 1 | 1 |
| Label Mapping | 1 | 4 |
| Label Request | 0 | 0 |

```

Label Release          0          0
Label Withdraw         0          0
Label Abort            0          0
Notification           0          0
Address                1          1
Address Withdraw       0          0
-----
At time t = 9 sec (Mode: Absolute)
-----
FECs                   1          2
Hello                  5288       5290
Keepalive              8226       8226
Init                   1          1
Label Mapping          1          4
Label Request          0          0
Label Release          0          0
Label Withdraw         0          0
Label Abort            0          0
Notification           0          0
Address                1          1
Address Withdraw       0          0
=====
ALU-12>monitor>router>ldp#

ALU-12>monitor>router>ldp# session 10.10.10.104 interval 3 repeat 3 rate
=====
Monitor statistics for LDP Session 10.10.10.104
=====
                          Sent          Received
-----
At time t = 0 sec (Base Statistics)
-----
FECs                   1          2
Hello                  5289       5290
Keepalive              8227       8227
Init                   1          1
Label Mapping          1          4
Label Request          0          0
Label Release          0          0
Label Withdraw         0          0
Label Abort            0          0
Notification           0          0
Address                1          1
Address Withdraw       0          0
-----
At time t = 3 sec (Mode: Rate)
-----
FECs                   0          0
Hello                  0          0
Keepalive              0          0
Init                   0          0
Label Mapping          0          0
Label Request          0          0
Label Release          0          0
Label Withdraw         0          0
Label Abort            0          0
Notification           0          0
Address                0          0
Address Withdraw       0          0

```

```

-----
At time t = 6 sec (Mode: Rate)
-----
FECs                0                0
Hello               0                0
Keepalive           0                0
Init                0                0
Label Mapping       0                0
Label Request       0                0
Label Release       0                0
Label Withdraw      0                0
Label Abort         0                0
Notification        0                0
Address             0                0
Address Withdraw    0                0
-----
At time t = 9 sec (Mode: Rate)
-----
FECs                0                0
Hello               0                0
Keepalive           0                0
Init                0                0
Label Mapping       0                0
Label Request       0                0
Label Release       0                0
Label Withdraw      0                0
Label Abort         0                0
Notification        0                0
Address             0                0
Address Withdraw    0                0
=====
ALU-12>monitor>router>ldp#

```

statistics

- Syntax** `statistics [interval seconds] [repeat repeat] [absolute | rate]`
- Context** `monitor>router>ldp`
- Description** This command displays statistics for an LDP instance at the configured interval until the configured count is reached.

The first screen displays the current statistics related to the LDP statistics. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen output.

When the keyword **rate** is specified, the rate per second for each statistic is displayed instead of the delta.

Monitor commands are similar to **show** commands, but only statistical information is displayed. Monitor commands display the selected statistics according to the configured number of times at the interval specified.

Parameters *seconds* — configures the interval for each display in seconds

Values 3 to 60

Default 10

repeat — configures how many times the command is repeated

Values 1 to 999

Default 10

absolute — displays raw statistics, without processing. No calculations are performed on the delta or rate statistics.

rate — displays the rate per second for each statistic instead of the delta

Output The following output is an example of statistics for an LDP instance.

Output Example

```
ALU-12>monitor>router>ldp# statistics interval 3 repeat 3 absolute
=====
Monitor statistics for LDP instance
=====
At time t = 0 sec (Base Statistics)
-----
Addr FECs Sent   : 0                Addr FECs Recv   : 0
Serv FECs Sent   : 1                Serv FECs Recv   : 2
...
-----
At time t = 3 sec (Mode: Absolute)
-----
Addr FECs Sent   : 0                Addr FECs Recv   : 0
Serv FECs Sent   : 1                Serv FECs Recv   : 2
...
-----
At time t = 6 sec (Mode: Absolute)
-----
Addr FECs Sent   : 0                Addr FECs Recv   : 0
Serv FECs Sent   : 1                Serv FECs Recv   : 2
...
-----
At time t = 9 sec (Mode: Absolute)
-----
Addr FECs Sent   : 0                Addr FECs Recv   : 0
Serv FECs Sent   : 1                Serv FECs Recv   : 2
...
=====
ALU-12>monitor>router>ldp#
```

```
ALU-12>monitor>router>ldp# statistics interval 3 repeat 3 rate
=====
Monitor statistics for LDP instance
=====
At time t = 0 sec (Base Statistics)
-----
Addr FECs Sent   : 0                Addr FECs Recv   : 0
Serv FECs Sent   : 1                Serv FECs Recv   : 2
```

```

...
-----
At time t = 3 sec (Mode: Rate)
-----
Addr FECs Sent      : 0                Addr FECs Recv      : 0
Serv FECs Sent      : 0                Serv FECs Recv      : 0
...
-----
At time t = 6 sec (Mode: Rate)
-----
Addr FECs Sent      : 0                Addr FECs Recv      : 0
Serv FECs Sent      : 0                Serv FECs Recv      : 0
...
-----
At time t = 9 sec (Mode: Rate)
-----
Addr FECs Sent      : 0                Addr FECs Recv      : 0
Serv FECs Sent      : 0                Serv FECs Recv      : 0
...
=====

```

group

- Syntax** `group grp-ip-address [source ip-address] [interval interval] [repeat repeat] [absolute | rate]`
- Context** monitor>router>pim
- Description** This command monitors statistics for a PIM source group.
- Parameters**
 - grp-ip-address* — specifies the IP address of a multicast group that identifies a set of recipients that are interested in a particular data stream
 - Values** multicast group address (IPv4 or IPv6)
 - ip-address* — specifies the source IP address to use in the ping requests
 - Values** source address (IPv4 or IPv6)
 - Default** 0.0.0.0 to 255.255.255.255
 - interval* — specifies the interval for each display, in seconds
 - Values** 10 | 20 | 30 | 40 | 50 | 60
 - Default** 10
 - repeat* — specifies the number of times the command is repeated
 - Values** 1 to 999
 - Default** 10
 - absolute** — displays raw statistics, without processing. No calculations are performed on the delta or rate statistics.
 - rate** — displays the rate per second for each statistic, instead of the delta

lsp-egress-stats

| | |
|--------------------|--|
| Syntax | lsp-egress-stats lsp <i>lsp-name</i> [interval <i>seconds</i>] [repeat <i>repeat</i>] [absolute rate] |
| Context | monitor>router>mpls |
| Description | This command displays RSVP LSP egress statistics at the configured interval until the configured count is reached. |
| Default | no lsp-egress-stats |
| Parameters | <p><i>lsp-name</i> — the LSP name</p> <p><i>seconds</i> — specifies the interval for each display, in seconds</p> <p><i>repeat</i> — specifies how many times the command is repeated</p> <p>absolute — displays raw statistics, without processing. No calculations are performed on the delta or rate statistics.</p> <p>rate — displays the rate per second for each statistic instead of the delta</p> |
| Output | The following output is an example of LSP egress statistical information. |

Output Example

```

=====
Monitor ingress statistics for MPLS LSP "toNodeA_1"
=====
-----
At time t = 0 sec (Base Statistics)
-----
-----
LSP Name       : toNodeA_1
Sender         : 10.10.10.29
-----
Collect Stats : Disabled          Accting Plcy. : None
Adm State     : Up                PSB Match     : True
FC BE
InProf Pkts   : 0                 OutProf Pkts  : 0
InProf Octets : 0                 OutProf Octets: 0
FC L2
InProf Pkts   : 0                 OutProf Pkts  : 0
InProf Octets : 0                 OutProf Octets: 0
FC AF
InProf Pkts   : 0                 OutProf Pkts  : 0
InProf Octets : 0                 OutProf Octets: 0
FC L1
InProf Pkts   : 0                 OutProf Pkts  : 0
InProf Octets : 0                 OutProf Octets: 0
FC H2
InProf Pkts   : 0                 OutProf Pkts  : 0
InProf Octets : 0                 OutProf Octets: 0
FC EF
InProf Pkts   : 0                 OutProf Pkts  : 0
InProf Octets : 0                 OutProf Octets: 0
FC H1

```

```

InProf Pkts : 0                               OutProf Pkts : 0
InProf Octets : 0                             OutProf Octets: 0
FC NC
InProf Pkts : 0                               OutProf Pkts : 0
InProf Octets : 0                             OutProf Octets: 0
-----
At time t = 3 sec (Mode: Absolute)
-----
LSP Name      : toNodeA_1
Sender        : 10.10.10.29
-----
Collect Stats : Disabled                       Accting Plcy. : None
Adm State     : Up                            PSB Match     : True
FC BE
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC L2
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC AF
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC L1
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC H2
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC EF
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC H1
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC NC
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
-----
At time t = 6 sec (Mode: Absolute)
-----
LSP Name      : toNodeA_1
Sender        : 10.10.10.29
-----
Collect Stats : Disabled                       Accting Plcy. : None
Adm State     : Up                            PSB Match     : True
FC BE
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC L2
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC AF
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC L1
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC H2
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC EF
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC H1
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0
FC NC
InProf Pkts  : 0                               OutProf Pkts  : 0
InProf Octets : 0                             OutProf Octets: 0

```

```

FC H2
InProf Pkts      : 0                OutProf Pkts    : 0
InProf Octets    : 0                OutProf Octets  : 0
FC EF
InProf Pkts      : 0                OutProf Pkts    : 0
InProf Octets    : 0                OutProf Octets  : 0
FC H1
InProf Pkts      : 0                OutProf Pkts    : 0
InProf Octets    : 0                OutProf Octets  : 0
FC NC
InProf Pkts      : 0                OutProf Pkts    : 0
InProf Octets    : 0                OutProf Octets  : 0
-----
At time t = 9 sec (Mode: Absolute)
-----

```

lsp-ingress-stats

- Syntax** `lsp-ingress-stats lsp lsp-name [interval seconds] [repeat repeat] [absolute | rate]
ip-address`
- Context** monitor>router>mpls
- Description** This command displays RSVP LSP ingress statistics at the configured interval until the configured count is reached.
- Default** no lsp-egress-stats
- Parameters**
- lsp-name* — the LSP name
 - seconds* — specifies the interval for each display, in seconds
 - repeat* — specifies how many times the command is repeated
 - absolute** — displays raw statistics, without processing. No calculations are performed on the delta or rate statistics.
 - rate** — displays the rate per second for each statistic instead of the delta
 - ip-address* — the IP address of the remote host
- Values** *ipv4-address* a.b.c.d
- Output** The following output is an example of LSP ingress statistical information.

Output Example

```

B:Sys# monitor router mpls lsp-ingress-stats lsp sample 1.1.1.1 repeat 3
interval 10 absolute
=====
Monitor ingress statistics for MPLS LSP "sample"
-----
At time t = 0 sec (Base Statistics)
-----
LSP Name : sample

```

```

Sender : 1.1.1.1
-----
Collect Stats : Enabled Accting Plcy. : None
Adm State : Up PSB Match : True
FC BE
InProf Pkts : 539 OutProf Pkts : 0
InProf Octets : 548702 OutProf Octets: 0
FC L2
InProf Pkts : 0 OutProf Pkts : 539
InProf Octets : 0 OutProf Octets: 548702
FC AF
InProf Pkts : 0 OutProf Pkts : 0
InProf Octets : 0 OutProf Octets: 0
FC L1
InProf Pkts : 1078 OutProf Pkts : 0
InProf Octets : 1097404 OutProf Octets: 0
FC H2
InProf Pkts : 0 OutProf Pkts : 539
InProf Octets : 0 OutProf Octets: 548702
FC EF
InProf Pkts : 539 OutProf Pkts : 0
InProf Octets : 548702 OutProf Octets: 0
FC H1
InProf Pkts : 539 OutProf Pkts : 0
InProf Octets : 548702 OutProf Octets: 0
FC NC
InProf Pkts : 0 OutProf Pkts : 539
InProf Octets : 0 OutProf Octets: 548702

```

```

-----
At time t = 10 sec (Mode: Absolute)
-----

```

```

LSP Name : sample
Sender : 1.1.1.1
-----
Collect Stats : Enabled Accting Plcy. : None
Adm State : Up PSB Match : True
FC BE
InProf Pkts : 568 OutProf Pkts : 0
InProf Octets : 578224 OutProf Octets: 0
FC L2
InProf Pkts : 0 OutProf Pkts : 568
InProf Octets : 0 OutProf Octets: 578224
FC AF
InProf Pkts : 0 OutProf Pkts : 0
InProf Octets : 0 OutProf Octets: 0
FC L1
InProf Pkts : 1136 OutProf Pkts : 0
InProf Octets : 1156448 OutProf Octets: 0
FC H2
InProf Pkts : 0 OutProf Pkts : 568
InProf Octets : 0 OutProf Octets: 578224
FC EF
InProf Pkts : 568 OutProf Pkts : 0
InProf Octets : 578224 OutProf Octets: 0
FC H1
InProf Pkts : 568 OutProf Pkts : 0
InProf Octets : 578224 OutProf Octets: 0
FC NC
InProf Pkts : 0 OutProf Pkts : 568

```

```
InProf Octets : 0 OutProf Octets: 578224
-----
At time t = 20 sec (Mode: Absolute)
-----
LSP Name : sample
Sender : 1.1.1.1
-----
Collect Stats : Enabled Accting Plcy. : None
Adm State : Up PSB Match : True
FC BE
InProf Pkts : 597 OutProf Pkts : 0
InProf Octets : 607746 OutProf Octets: 0
FC L2
InProf Pkts : 0 OutProf Pkts : 597
InProf Octets : 0 OutProf Octets: 607746
FC AF
InProf Pkts : 0 OutProf Pkts : 0
InProf Octets : 0 OutProf Octets: 0
FC L1
InProf Pkts : 1194 OutProf Pkts : 0
InProf Octets : 1215492 OutProf Octets: 0
FC H2
InProf Pkts : 0 OutProf Pkts : 597
InProf Octets : 0 OutProf Octets: 607746
FC EF
InProf Pkts : 597 OutProf Pkts : 0
InProf Octets : 607746 OutProf Octets: 0
FC H1
InProf Pkts : 597 OutProf Pkts : 0
InProf Octets : 607746 OutProf Octets: 0
FC NC
InProf Pkts : 0 OutProf Pkts : 597
InProf Octets : 0 OutProf Octets: 607746
-----
At time t = 30 sec (Mode: Absolute)
-----
LSP Name : sample
Sender : 1.1.1.1
-----
Collect Stats : Enabled Accting Plcy. : None
Adm State : Up PSB Match : True
FC BE
InProf Pkts : 627 OutProf Pkts : 0
InProf Octets : 638286 OutProf Octets: 0
FC L2
InProf Pkts : 0 OutProf Pkts : 627
InProf Octets : 0 OutProf Octets: 638286
FC AF
InProf Pkts : 0 OutProf Pkts : 0
InProf Octets : 0 OutProf Octets: 0
FC L1
InProf Pkts : 1254 OutProf Pkts : 0
InProf Octets : 1276572 OutProf Octets: 0
FC H2
InProf Pkts : 0 OutProf Pkts : 627
InProf Octets : 0 OutProf Octets: 638286
FC EF
InProf Pkts : 627 OutProf Pkts : 0
InProf Octets : 638286 OutProf Octets: 0
```

```

FC H1
InProf Pkts : 627 OutProf Pkts : 0
InProf Octets : 638286 OutProf Octets: 0
FC NC
InProf Pkts : 0 OutProf Pkts : 627
InProf Octets : 0 OutProf Octets: 638286
=====
B:Sys#

```

neighbor

| | |
|--------------------|--|
| Syntax | neighbor <i>neighbor</i> [<i>neighbor...</i> (up to 5 max)] [interval <i>seconds</i>] [repeat <i>repeat</i>] [absolute rate] |
| Context | monitor>router>rip |
| Description | This command displays statistical RIP neighbor information at the configured interval until the configured count is reached.

The first screen displays the current statistics related to the specified RIP neighbors. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen output. When the keyword rate is specified, the rate per second for each statistic is displayed instead of the delta.

Monitor commands are similar to show commands but only statistical information is displayed. Monitor commands display the selected statistics according to the configured number of times at the interval specified. |
| Parameters | <i>neighbor</i> — the IP address of the neighbor for which to display statistics. Up to 5 neighbors can be specified.

<i>seconds</i> — configures the interval for each display in seconds

<i>repeat</i> — specifies how many times to repeat the command

absolute — displays the raw statistics without processing. No calculations are performed on the delta or rate statistics.

rate — displays the rate-per-second value for each statistic instead of the delta |

instance

| | |
|--------------------|--|
| Syntax | instance interface <i>interface-name</i> vr-id <i>virtual-router-id</i> [ipv6] [interval <i>seconds</i>] [repeat <i>repeat</i>] [absolute rate] |
| Context | monitor>router>vrrp |
| Description | This command displays statistics for a VRRP instance. |
| Parameters | <i>interface-name</i> — the name of the existing IP interface on which VRRP is configured |

virtual-router-id — the virtual router ID for the existing IP interface, expressed as a decimal integer

Values 1 to 255

ipv6 — specifies monitoring the IPv6 instance

seconds — configures the interval for each display in seconds

Values 3 to 60

Default 10

repeat — configures how many times the command is repeated

Values 1 to 999

Default 10

absolute — displays raw statistics, without processing. No calculations are performed on the delta or rate statistics.

rate — specifies the rate per second for each statistic instead of the delta

Default delta

service

Syntax **service**

Context monitor

Description This command enables the context to configure criteria to monitor specific service SAP criteria.

id

Syntax **id** *service-id*

Context monitor>service

Description This command displays statistics for a specific service, specified by the *service-id*, at the configured interval until the configured count is reached.

The first screen displays the current statistics related to the *service-id*. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen output.

When the keyword **rate** is specified, the rate per second for each statistic is displayed instead of the delta.

Monitor commands are similar to **show** commands, but only statistical information is displayed. Monitor commands display the selected statistics according to the configured number of times at the interval specified.

Parameters *service-id* — identifies the service in the service domain
Values 1 to 2147483690 or *service-name*

sap

Syntax **sap** *sap-id* [*interval seconds*] [*repeat repeat*] [*absolute* | *rate*]

Context monitor>service>id

Description This command displays statistics for a SAP associated with this service.

This command displays statistics for a specific SAP, identified by the port ID and encapsulation value, at the configured interval until the configured count is reached.

The first screen displays the current statistics related to the SAP. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen output.

When the keyword **rate** is specified, the rate per second for each statistic is displayed instead of the delta.

Monitor commands are similar to **show** commands, but only statistical information is displayed. Monitor commands display the selected statistics according to the configured number of times at the interval specified.

Parameters *sap-id* — identifies the SAP for the service
 The *sap-id* can be configured in one of the formats described in [Table 11](#). The range of values for the parameters follow the table.

Table 11 SAP ID Configurations

| Type | Syntax | Example |
|---------|---|---|
| port-id | <i>slot/mda/port[.channel]</i> | 1/1/5 |
| bridge | <i>slot/mda/<bridge-id.branch-id></i> | 1/5/16.10 |
| null | <i>[port-id bundle-id lag-id aps-id mw-link-id]</i> | <i>port-id:</i> 1/1/3
<i>bundle-id:</i> bundle-ppp-1/1.1
<i>lag-id:</i> lag-1
<i>aps-id:</i> aps-1
<i>mw-link-id:</i> mw-link-1 |

Table 11 SAP ID Configurations (Continued)

| Type | Syntax | Example |
|-------------|--|--|
| dot1q | [<i>port-id</i> <i>lag-id</i> <i>aps-id</i> <i>mw-link-id</i>]: <i>qtag1</i> | <i>port-id</i> : <i>qtag1</i> : 1/1/3:100
<i>lag-id</i> : <i>lag-1</i> :10
<i>aps-id</i> : <i>aps-1</i>
<i>mw-link-id</i> : <i>mw-link-1</i> |
| qinq | [<i>port-id</i> <i>lag-id</i>]: <i>qtag1.qtag2</i> | <i>port-id</i> : <i>qtag1.qtag2</i> : 1/1/3:100.30
<i>lag-id</i> : <i>lag-1</i> :10.10 |
| atm | [<i>port-id</i> <i>aps-id</i>][: <i>vpi/vci</i> <i>vpi</i> <i>vpi1.vpi2</i>] ¹ | <i>port-id</i> : 1/1/1 or 1/1/1.1 (for T1/E1 channelized ports)
<i>aps-id</i> : <i>aps-1</i>
<i>vpi/vci</i> : 16/26
<i>vpi</i> : 16
<i>vpi1.vpi2</i> : 16.22 |
| lag | <i>lag-id</i> | <i>lag-2</i> |
| frame | [<i>port-id</i> <i>aps-id</i>]: <i>dlci</i> | 1/1/1
<i>aps-id</i> : <i>aps-1</i>
<i>dlci</i> : 16 |
| frame relay | [<i>port-id</i>]: <i>dlci</i> | 1/1/1
<i>dlci</i> : 16 |
| cisco-hdlc | <i>slot/mda/port.channel</i> | 1/1/1.3 |
| cem | <i>slot/mda/port.channel</i> | 1/1/1.3 |
| ima-grp | <i>bundle-id</i> [: <i>vpi/vci</i> <i>vpi</i> <i>vpi1.vpi2</i>] | 1/1/3.1 |
| ipcp | <i>slot/mda/port.channel</i> | 1/2/2.4 |
| hdlc | <i>slot/mda/port.channel</i> | 1/1/3.1 |
| lag-id | <i>lag-id</i> | <i>lag-1</i> |
| mw-link-id | <i>mw-link-id</i> | <i>mw-link-1</i> |
| aps-id | <i>aps-group-id</i> [. <i>channel</i>] | <i>aps-1</i> |
| bundle-id | <i>bundle-[ima ppp]-slot/mda.bundle-num</i> | <i>bundle-ima-1/1.1</i> |
| tunnel-id | <i>tunnel-<id></i> .[<i>private</i> <i>public</i>]: <i><tag></i> | <i>tunnel-1.private:1</i> |

Note:

- For Apipes in virtual trunking mode, vpi/vci, vpi, and vpi1.vpi2 are omitted.

| Values | <i>sap-id:</i> |
|---------------|--|
| null | [<i>port-id</i> <i>bundle-id</i> <i>lag-id</i> <i>aps-id</i> <i>mw-link-id</i>] |
| dot1q | [<i>port-id</i> <i>lag-id</i> <i>aps-id</i> <i>mw-link-id</i>]: <i>qtag1</i> |
| qinq | [<i>port-id</i> <i>lag-id</i>]: <i>qtag1.qtag2</i> |
| atm | [<i>port-id</i> <i>aps-id</i>][:vpi/vci vpi vpi1.vpi2] |
| frame | [<i>port-id</i> <i>aps-id</i>]: <i>dlci</i> |
| cisco-hdlc | <i>slot/mda/port.channel</i> |
| cem | <i>slot/mda/port.channel</i> |
| ipcp | <i>slot/mda/port.channel</i> |
| ima-grp | <i>bundle-id</i> [:vpi/vci vpi vpi1.vpi2] |
| hdlc | <i>slot/mda/port.channel</i> |
| port-id | <i>slot/mda/port</i> [. <i>channel</i>] |
| bridge | <i>slot/mda/bridge-id.branch-id</i>
<i>bridge-id</i> 1 to 16
<i>branch-id</i> 1 to 32 |
| bundle-id | <i>bundle-type-slot/mda.bundle-num</i>
<i>bundle</i> keyword
<i>type</i> ima, ppp
<i>bundle-num</i> 1 to 32 |
| aps-id | <i>aps-group-id</i> [. <i>channel</i>]
<i>aps</i> keyword
<i>group-id</i> 1 to 24 |
| mw-link-id | <i>mw-link-id</i>
<i>id</i> 1 to 24 |
| lag-id | <i>lag-id</i>
<i>lag</i> keyword
<i>id</i> 1 to 32 |
| qtag1 | *, 0 to 4094 |
| qtag2 | *, 0 to 4094 |
| vpi | NNI 0 to 4095
UNI 0 to 255 |
| vci | 1, 2, 5 to 65535 |
| dlci | 16 to 1022 |
| tunnel-id | <i>tunnel-id</i> .[<i>private</i> <i>public</i>]: <i>tag</i>
<i>tunnel</i> keyword
<i>id</i> 1 to 16 (1 is the only valid value)
<i>tag</i> 0 to 4094 |

port-id — specifies the physical port ID in the *slot/mda/port* format

If the card in the slot has an adapter card installed, the *port-id* must be in the *slot_number/MDA_number/port_number* format. For example, 1/2/3 specifies port 3 on MDA 2 in slot 1.

The *port-id* must reference a valid port type. When the *port-id* parameter represents TDM channels, the port ID must include the channel ID. A period “.” separates the physical port from the *channel-id*. The port must be configured as an access port.

bridge-id — specifies an existing bridge that has been configured on an Integrated Services card in the *slot/mda/<bridge-id.branch-id>* format

bridge-id value range: 1 to 16

branch-id — specifies an existing branch that has been configured on an Integrated Services card in the *slot/mda/<bridge-id.branch-id>* format

branch-id value range: 1 to 32

bundle-id — specifies the multilink (PPP or IMA) bundle identifier. The **bundle** keyword must be entered at the beginning of the parameter. The command syntax must be configured as follows:

```

bundle-id:           bundle-type-slot/mda.bundle-num
type:               ima, ppp
bundle-num:        1 to 32

```

For example:

```

*A:ALU-12>config# port bundle-ppp-xz5/1.1
*A:ALU-12>config>port# multilink-bundle

```

qtag1, *qtag2* — specifies the encapsulation value used to identify the SAP on the port or sub-port. For dot1q encapsulation, only *qtag1* is used; for qinq encapsulation, both *qtag1* and *qtag2* are used. If *qtag1* or *qtag2* is not specifically defined, the value 0 is used. The “*” value represents all *qtag* values between 0 and 4094 that are not specifically defined within another SAP context under the same port. In addition, the following *qtag1.qtag2* values are invalid options:

- *.*qtag2*
- *.0
- 0.*qtag2*

Values *qtag1*: *, 0 to 4094

qtag2: *, 0 to 4094

The values depend on the encapsulation type configured for the interface. [Table 12](#) describes the allowed values for the port and encapsulation types.

Table 12 Port and Encapsulation Values

| Port Type | Encap-Type | Allowed Values | Comments |
|-----------|------------|----------------|--|
| Ethernet | Null | — | The SAP is identified by the port. |
| Ethernet | Dot1q | *, 0 to 4094 | The SAP is identified by the 802.1Q tag on the port. A 0 qtag1 value also accepts untagged packets on the dot1q port, and a * qtag1 value accepts any VLAN ID that is not specifically configured on the port. ¹ |
| Ethernet | QinQ | *, 0 to 4094 | The SAP is identified by the two 802.1Q tags on the port. A 0 qtag1 or qtag 2 value also accepts untagged packets on the qinq port, and a * qtag1 or qtag2 value accepts any VLAN ID that is not specifically configured on the port. ¹ |

Note:

1. Traffic matching the * qtag value uses VLAN 4095 internally.

seconds — configures the interval for each display in seconds

Values 11 to 60

Default 11

repeat — configures how many times the command is repeated

Values 1 to 999

Default 10

absolute — displays the absolute rate-per-second value for each statistic

rate — displays the rate per second for each statistic instead of the delta

sap-aggregation-group

Syntax **sap-aggregation-group** *group-id* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

Context monitor>service>id

Description This command displays the statistics for the specified SAP aggregation group that is associated with the service.

Parameters *group-id* — specifies the identifier for the SAP aggregation group

Values 1 to 32 characters

seconds — configures the interval for each display in seconds

Values 11 to 60

Default 11

repeat — configures how many times the command is repeated

Values 1 to 999

Default 10

absolute — displays the absolute rate-per-second value for each statistic

rate — displays the rate per second for each statistic instead of the delta

Output The following output is an example of statistics for a SAP aggregation group.

Output Example

```
*A:SYS28# monitor service id 1570 sap-aggregation-group SAG repeat 2
```

```
=====
Monitor statistics for Service 1570 SAP Aggregation Group SAG
=====
```

```
-----
At time t = 0 sec (Base Statistics)
-----
```

```
-----
Sap Aggregation Group Statistics
-----
```

```
Last Cleared Time      : N/A
```

```
Dropped Egress Cells (unconfigured vpi/vci): 14
```

| | Packets | Octets |
|-----------------------------------|----------|--------|
| Forwarding Engine Stats (Ingress) | | |
| Dropped | : 0 | n/a |
| Off. HiPrio | : 205557 | n/a |
| Off. LowPrio | : n/a | n/a |

| | Packets | Octets |
|--------------------------------------|----------|----------|
| Queueing Stats(Ingress QoS Policy 1) | | |
| Dro. HiPrio | : 0 | n/a |
| Dro. LowPrio | : n/a | n/a |
| For. InProf | : 0 | 0 |
| For. OutProf | : 205557 | 68605598 |

| | Packets | Octets |
|----------------------------------|---------|--------|
| Forwarding Engine Stats (Egress) | | |
| Dropped | : 0 | n/a |

| | Packets | Octets |
|-------------------------------------|----------|----------|
| Queueing Stats(Egress QoS Policy 1) | | |
| Dro. InProf | : 0 | n/a |
| Dro. OutProf | : n/a | n/a |
| For. InProf | : 202446 | 63083956 |
| For. OutProf | : n/a | n/a |

```
-----
Sap Aggregation Group per Queue Stats
-----
```

| | Packets | Octets |
|----------------------------|----------|--------|
| Ingress Queue 1 (Priority) | | |
| Off. HiPrio | : 205557 | n/a |
| Off. LoPrio | : n/a | n/a |
| Dro. HiPrio | : 0 | n/a |
| Dro. LoPrio | : n/a | n/a |

```

For. InProf          : 0                0
For. OutProf         : 205557           68605598

Egress Queue 1
For. InProf          : 202446           63083956
For. OutProf         : n/a              n/a
Dro. InProf          : 0                n/a
Dro. OutProf         : n/a              n/a
    
```

```

-----
At time t = 11 sec (Mode: Delta)
-----
    
```

Sap Aggregation Group Statistics

```

-----
Last Cleared Time    : N/A
    
```

Dropped Egress Cells (unconfigured vpi/vci): 14

| | Packets | Octets |
|-----------------------------------|---------|--------|
| Forwarding Engine Stats (Ingress) | | |
| Dropped | : 0 | n/a |
| Off. HiPrio | : 233 | n/a |
| Off. LowPrio | : n/a | n/a |

| | | |
|--------------------------------------|-------|-------|
| Queueing Stats(Ingress QoS Policy 1) | | |
| Dro. HiPrio | : 0 | n/a |
| Dro. LowPrio | : n/a | n/a |
| For. InProf | : 0 | 0 |
| For. OutProf | : 233 | 77822 |

| | | |
|----------------------------------|-----|-----|
| Forwarding Engine Stats (Egress) | | |
| Dropped | : 0 | n/a |

| | | |
|-------------------------------------|-------|-------|
| Queueing Stats(Egress QoS Policy 1) | | |
| Dro. InProf | : 0 | n/a |
| Dro. OutProf | : n/a | n/a |
| For. InProf | : 232 | 72384 |
| For. OutProf | : n/a | n/a |

Sap Aggregation Group per Queue Stats

| | Packets | Octets |
|----------------------------|---------|--------|
| Ingress Queue 1 (Priority) | | |
| Off. HiPrio | : 233 | n/a |
| Off. LoPrio | : n/a | n/a |
| Dro. HiPrio | : 0 | n/a |
| Dro. LoPrio | : n/a | n/a |
| For. InProf | : 0 | 0 |
| For. OutProf | : 233 | 77822 |

| | | |
|----------------|-------|-------|
| Egress Queue 1 | | |
| For. InProf | : 232 | 72384 |
| For. OutProf | : n/a | n/a |
| Dro. InProf | : 0 | n/a |
| Dro. OutProf | : n/a | n/a |

```

At time t = 22 sec (Mode: Delta)
-----
Sap Aggregation Group Statistics
-----

Last Cleared Time      : N/A

Dropped Egress Cells (unconfigured vpi/vci): 14

          Packets          Octets
Forwarding Engine Stats (Ingress)
Dropped          : 0          n/a
Off. HiPrio      : 232        n/a
Off. LowPrio     : n/a        n/a

Queueing Stats(Ingress QoS Policy 1)
Dro. HiPrio      : 0          n/a
Dro. LowPrio     : n/a        n/a
For. InProf      : 0          0
For. OutProf     : 232        77488

Forwarding Engine Stats (Egress)
Dropped          : 0          n/a

Queueing Stats(Egress QoS Policy 1)
Dro. InProf      : 0          n/a
Dro. OutProf     : n/a        n/a
For. InProf      : 233        72696
For. OutProf     : n/a        n/a
-----
Sap Aggregation Group per Queue Stats
-----

          Packets          Octets

Ingress Queue 1 (Priority)
Off. HiPrio      : 232        n/a
Off. LoPrio      : n/a        n/a
Dro. HiPrio      : 0          n/a
Dro. LoPrio      : n/a        n/a
For. InProf      : 0          0
For. OutProf     : 232        77488

Egress Queue 1
For. InProf      : 233        72696
For. OutProf     : n/a        n/a
Dro. InProf      : 0          n/a
Dro. OutProf     : n/a        n/a

```

sdp

- Syntax** `sdp {sdp-id | far-end ip-address} [interval seconds] [repeat repeat] [absolute | rate]`
- Context** monitor>service>id
- Description** This command displays statistics for an SDP binding associated with this service.
- Parameters** *sdp-id* — specifies the SDP identifier
- Values** 1 to 17407
- ip-address* — the system address of the far-end 7705 SAR for the SDP
- seconds* — configures the interval for each display in seconds
- Values** 11 to 60
- Default** 11
- repeat* — configures how many times the command is repeated
- Values** 1 to 999
- Default** 10
- absolute** — displays raw statistics, without processing. No calculations are performed on the delta or rate statistics
- rate** — displays the rate per second for each statistic instead of the delta
- Output** The following output is an example of statistics for the SDP binding associated with the service.

Output Example

```
ALU-12# monitor service id 100 sdp 10 repeat 2
=====
Monitor statistics for Service 100 SDP binding 10
=====
-----
At time t = 0 sec (Base Statistics)
-----
I. Fwd. Pkts.   : 0                      I. Dro. Pkts.   : 0
E. Fwd. Pkts.   : 0                      E. Fwd. Octets  : 0
-----
At time t = 11 sec (Mode: Delta)
-----
I. Fwd. Pkts.   : 0                      I. Dro. Pkts.   : 0
E. Fwd. Pkts.   : 0                      E. Fwd. Octets  : 0
-----
At time t = 22 sec (Mode: Delta)
-----
I. Fwd. Pkts.   : 0                      I. Dro. Pkts.   : 0
E. Fwd. Pkts.   : 0                      E. Fwd. Octets  : 0
-----
=====
ALU-12#
```

3.11.2.4 Candidate Commands

candidate

| | |
|--------------------|---|
| Syntax | candidate |
| Context | <root> |
| Description | <p>This command enables the context to edit candidate configurations and must preface every command in the candidate CLI branch.</p> <p>Commands in the candidate CLI branch, except for the edit command, are available only when in candidate edit mode.</p> |
| Default | n/a |

edit

| | |
|--------------------|---|
| Syntax | edit [exclusive] |
| Context | candidate |
| Description | <p>This command enables the candidate edit mode where changes can be made to the candidate configuration and sets the edit point to the end of the candidate. The edit point is the point after which new commands are inserted into the candidate configuration. In candidate edit mode, the CLI prompt displays edit-cfg near the root of the prompt. All other commands in the candidate CLI branch are blocked until the user enters candidate edit mode.</p> <p>The exclusive parameter allows the user to modify the candidate configuration and block all other users (and other sessions of the same user) from entering candidate edit mode. This parameter can only be used if the candidate configuration is empty and no user is already in candidate edit mode. Before quitting exclusive candidate edit mode, the user must either commit or discard their changes. If the user commits a candidate configuration with the confirmed option while in exclusive candidate edit mode, the exclusive lock is removed during the countdown time to allow any user to confirm the changes.</p> <p>If the CLI session times out while the user is in exclusive candidate edit mode, the contents of the candidate configuration are discarded. If the user has the candidate configuration locked, the admin disconnect command can be used to forcibly disconnect them and to clear the contents of the candidate.</p> |
| Default | n/a |
| Parameters | exclusive — enables exclusive candidate edit mode |

commit

| | |
|--------------------|--|
| Syntax | commit [confirmed <i>timeout</i>] [comment <i>comment</i>]
commit no-checkpoint [confirmed <i>timeout</i>] |
| Context | candidate |
| Description | <p>This command applies the changes in the candidate configuration to the active or operational configuration.</p> <p>When a candidate configuration is committed, the confirmed keyword can be used to require an additional confirmation, which is useful when changes are being made that could impact management reachability to the router. The contents of the candidate configuration remain visible but cannot be edited until the timeout is completed or the commit is confirmed. If the confirmation is not given with the confirm command within the configured timeout period, the router automatically reverts to a configuration state before the candidate configuration changes were applied.</p> <p>Standard line-by-line, non-transactional configuration commands (including via SNMP) are not blocked during the countdown period, but any changes made to the configuration during the countdown period will be rolled back if the timeout expires.</p> <p>A rollback revert is blocked during the countdown period until the commit has been confirmed.</p> <p>If the commit operation is successful, all the candidate changes take operational effect and the candidate configuration is cleared. If there is an error processing the commit, or if the candidate confirm command is not issued and an auto-revert occurs, the router automatically reverts to a configuration state before the candidate configuration changes were applied. If the automatic reversion occurs, the candidate configuration is not cleared and users can continue to edit it and try the commit later.</p> <p>By default, the 7705 SAR automatically creates a new rollback checkpoint after a successful commit operation that contains the new configuration changes made by the commit. The rollback checkpoint remains available even if the commit is not confirmed. The no-checkpoint keyword allows users to commit the candidate configuration without creating a rollback checkpoint.</p> <p>A commit operation is blocked if a rollback revert is currently being processed.</p> |
| Default | n/a |
| Parameters | <p>confirmed — requires the confirm command to be issued before the end of the timeout period to avoid an auto-revert of the configuration</p> <p><i>timeout</i> — the auto-revert timeout period, in minutes</p> <p>Values 1 to 168</p> <p>no-checkpoint — blocks the creation of a rollback checkpoint for a successful commit</p> <p><i>comment</i> — a string up to 255 characters in length describing the automatic rollback checkpoint file</p> |

confirm

| | |
|--------------------|--|
| Syntax | confirm |
| Context | candidate |
| Description | <p>This command is used to confirm a candidate configuration. If the optional confirmed parameter is used with the commit command, this command must be issued before the timeout period expires; otherwise, the router automatically reverts to a configuration state before the candidate configuration changes were applied. After the automatic reversion, the candidate configuration remains available for editing and a subsequent commit.</p> <p>During the countdown, the contents of the candidate remain visible with the candidate view command but changes to the candidate are blocked until the timeout is completed or this command is issued.</p> <p>This command also clears the contents of the candidate configuration and allows users to enter candidate edit mode again.</p> |
| Default | n/a |

copy

| | |
|--------------------|--|
| Syntax | copy [<i>line</i>] |
| Context | candidate |
| Description | <p>This command copies the selected CLI branch, including all sub-branches, into a temporary buffer that can be used with a subsequent insert command. The contents of the temporary buffer are deleted when the operator exits candidate edit mode. Line numbers can be displayed with the candidate view command.</p> |
| Default | edit-point |
| Parameters | <p><i>line</i> — specifies which line to copy</p> <p>Values <i>line</i> <i>offset</i> first edit-point last</p> <p><i>line</i> — the absolute line number</p> <p><i>offset</i> — the line relative to the current edit point, prefixed with either + or - to indicate before or after the current edit point</p> <p>first — keyword to indicate the first line</p> <p>edit-point — keyword to indicate the current edit point</p> <p>last — keyword to indicate the last line that is not “exit”</p> |

delete

| | |
|--------------------|--|
| Syntax | delete [<i>line</i>] |
| Context | candidate |
| Description | This command deletes the selected CLI branch, including all sub-branches. The deleted lines are also copied into a temporary buffer that can be used with a subsequent insert command. Line numbers can be displayed with the candidate view command. |
| Default | edit-point |
| Parameters | <i>line</i> — specifies which line to delete |
| Values | <i>line</i> <i>offset</i> first edit-point last
<i>line</i> — the absolute line number
<i>offset</i> — the line relative to the current edit point, prefixed with either + or - to indicate before or after the current edit point
first — keyword to indicate the first line
edit-point — keyword to indicate the current edit point
last — keyword to indicate the last line that is not “exit” |

discard

| | |
|--------------------|---|
| Syntax | discard [now] |
| Context | candidate |
| Description | This command deletes the entire contents of the candidate configuration and exits candidate edit mode. The undo command cannot be used to recover a candidate configuration that has been discarded with this command. |
| Default | n/a |
| Parameters | now — deletes the candidate configuration with no confirmation prompt for the discard |

goto

| | |
|--------------------|---|
| Syntax | goto <i>line</i> |
| Context | candidate |
| Description | This command changes the edit point of the candidate configuration. The edit point is the point after which new commands are inserted into the candidate configuration as an operator navigates the CLI and issues commands in candidate edit mode. Line numbers can be displayed with the candidate view command. |
| Default | edit-point |

Parameters *line* — specifies which line is to be the edit point for the insertion of new commands

Values *line* | *offset* | **first** | **edit-point** | **last**

line — the absolute line number

offset — the line relative to the current edit point, prefixed with either + or - to indicate before or after the current edit point

first — keyword to indicate the first line

edit-point — keyword to indicate the current edit point

last — keyword to indicate the last line that is not “exit”

insert

Syntax **insert** [*line*]

Context candidate

Description This command inserts the contents of the temporary buffer (populated with a previous **copy** or **delete** command) into the candidate configuration. The operator can specify any line in the candidate configuration to be the insertion point, but by default, the contents are inserted after the current edit point. The contents of the temporary buffer are deleted when the operator exits candidate edit mode.

Insertions are context-aware. The temporary buffer always stores the CLI context (such as the current CLI branch) for each line deleted or copied. If the contents to be inserted are supported at the context of the insertion point, they are simply inserted into the configuration. If the contents to be inserted are not supported at the context of the insertion point, the following actions are automatically performed by the system:

1. The context at the insertion point is closed using multiple exit statements.
2. The context of the lines to be inserted is built (added) into the candidate configuration at the insertion point.
3. The contents of the temporary buffer are added.
4. The context of the inserted lines is closed using exit statements.
5. The context from the original insertion point is rebuilt, leaving the context at the same point as it was before the insertion.

Line numbers can be displayed with the **candidate view** command.

Default edit-point

Parameters *line* — specifies where to insert the contents of the temporary buffer

Values *line* | *offset* | **first** | **edit-point** | **last**

line — the absolute line number

offset — the line relative to the current edit point, prefixed with either + or - to indicate before or after the current edit point

first — keyword to indicate the first line

edit-point — keyword to indicate the current edit point
last — keyword to indicate the last line that is not “exit”

load

| | |
|--------------------|---|
| Syntax | load <i>file-url</i> [overwrite insert append] |
| Context | candidate |
| Description | <p>This command loads a previously saved candidate configuration into the current candidate. The edit point is set to the end of the loaded configuration lines. The current candidate configuration cannot be modified while a load is in progress.</p> <p>If the current candidate configuration is empty, this command will load the file into the candidate without requiring any of the optional parameters. If the current candidate is not empty, the user must specify overwrite, insert, or append.</p> |
| Default | n/a |
| Parameters | <p><i>file-url</i> — the directory and filename to load</p> <p>overwrite — discards the contents of the current candidate and replaces them with the contents of the file</p> <p>insert — inserts the contents of the file at the current edit point</p> <p>append — inserts the contents of the file at the end of the current candidate</p> |

quit

| | |
|--------------------|---|
| Syntax | quit |
| Context | candidate |
| Description | This command exits candidate edit mode. The contents of the current candidate configuration are not deleted and the user can continue editing them later. |
| Default | n/a |

redo

| | |
|--------------------|---|
| Syntax | redo [<i>count</i>] |
| Context | candidate |
| Description | This command reapplies the changes to the candidate that were previously removed using the undo command. All undo or redo history is lost when the operator exits candidate edit mode. |

The **redo** command is blocked if another user has made changes in a CLI branch that would be impacted during the redo operation.

| | |
|-------------------|--|
| Default | n/a |
| Parameters | <i>count</i> — specifies the number of previous changes to reapply |
| Values | 1 to 50 |
| Default | 1 |

replace

| | |
|--------------------|--|
| Syntax | replace [<i>line</i>] |
| Context | candidate |
| Description | This command displays the specified line (a single line only) and allows it to be changed.

Line numbers can be displayed with the candidate view command. |
| Default | edit-point |
| Parameters | <i>line</i> — specifies the line to replace |
| Values | <i>line</i> <i>offset</i> first edit-point last
<i>line</i> — the absolute line number
<i>offset</i> — the line relative to the current edit point, prefixed with either + or - to indicate before or after the current edit point
first — keyword to indicate the first line
edit-point — keyword to indicate the current edit point
last — keyword to indicate the last line that is not “exit” |

save

| | |
|--------------------|---|
| Syntax | save <i>file-url</i> |
| Context | candidate |
| Description | This command saves the current candidate configuration to a file. |
| Default | n/a |
| Parameters | <i>file-url</i> — specifies the directory and filename |

undo

| | |
|--------------------|--|
| Syntax | undo [<i>count</i>] |
| Context | candidate |
| Description | <p>This command removes the most recent changes done to the candidate. The changes can be reapplied using the redo command. The undo and redo history is lost when the operator exits candidate edit mode. This command cannot be used to recover a candidate that has been discarded with a candidate discard command.</p> <p>This command is blocked if another user has made changes in any of the CLI branches that would be impacted during the undo operation.</p> |
| Default | 1 |
| Parameters | <i>count</i> — specifies the number of previous changes to remove |

view

| | |
|--------------------|--|
| Syntax | view [<i>line</i>] |
| Context | candidate |
| Description | This command displays the candidate configuration along with line numbers that can be used for editing the candidate configuration. |
| Default | edit-point |
| Parameters | <p><i>line</i> — displays the candidate configuration starting at the specified point</p> <p>Values <i>line</i> <i>offset</i> first edit-point last</p> <p><i>line</i> — the absolute line number</p> <p><i>offset</i> — the line relative to the current edit point, prefixed with either + or - to indicate before or after the current edit point</p> <p>first — keyword to indicate the first line</p> <p>edit-point — keyword to indicate the current edit point</p> <p>last — keyword to indicate the last line that is not “exit”</p> |

3.11.2.5 Rollback Commands

rollback

| | |
|--------------------|--|
| Syntax | rollback |
| Context | admin
config>system |
| Description | This command enables the context to configure rollback command parameters. |
| Default | n/a |

compare

| | |
|--------------------|---|
| Syntax | compare [to <i>source2</i>]
compare <i>source1</i> to <i>source2</i> |
| Context | admin
admin>rollback
config>xx (where xx is any sub-branch at any level below config, but not at the config context itself) |
| Description | This command compares two configuration files. If the compare command is entered with no parameters defined, it compares the active configuration to the most recent rollback file. If the command is entered with the <i>source2</i> parameter defined, it compares the active configuration to the specified file. If the command is entered with both source parameters defined, it compares the first specified file to the second specified file. |



Note: In the CLI, the *source1* and *source2* parameters are called *checkpoint1* and *checkpoint2* in the **admin>rollback** context for this command. For simplicity, this command description uses *source1* and *source2* for all contexts.

The **compare** command with no parameters can only be used in the **admin>rollback** context. The **compare to *source2*** command can only be used in the **admin>rollback** or **config>xx** context. In the **admin** context, both source parameters must be specified.



Caution: A compare operation does not check authorization of each line of output. Permission to execute the **compare** command from the **admin** branch should only be given to users who are allowed to view the entire system configuration.

The defaults for the source parameters are context-dependent and differ based on the branch in which the command is executed.

| | |
|-------------------|---|
| Default | admin context: no defaults (<i>source1</i> and <i>source2</i> must be specified)
admin>rollback context: <i>source1</i> = active-cfg, <i>source2</i> = latest-rb
config>xx context: <i>source1</i> = active-cfg, no default for <i>source2</i> |
| Parameters | <i>source1</i> , <i>source2</i> — the configuration files to compare |
| | Values |
| | active-cfg the active operational system configuration |
| | rescue the rollback rescue file from the configured rescue location |
| | latest-rb the most recent rollback checkpoint file from the configured rollback location, with the suffix *.rb |
| | <i>checkpoint-id</i> The ID value (x) of a specific rollback checkpoint file from the configured rollback location with the suffix *.rb.x.
The default range is 1 to 9 but the maximum value depends on the local-max-checkpoints and remote-max-checkpoints configurations. |

delete

| | |
|--------------------|---|
| Syntax | delete <i>checkpoint-rescue</i> |
| Context | admin>rollback |
| Description | This command deletes a rollback checkpoint file and decrements the suffix ID numbers of all older rollback checkpoint files.

If the config>redundancy>rollback-sync command is enabled, deleting a rollback checkpoint file also deletes the backup file and decrements the suffix ID numbers on the standby CSM. |
| Default | n/a |
| Parameters | <i>checkpoint-rescue</i> — identifies a rollback checkpoint or rescue file to delete |
| | Values |
| | rescue the rollback rescue file from the configured rescue location |
| | latest-rb the most recent rollback checkpoint file from the configured rollback location, with the suffix *.rb |
| | <i>checkpoint-id</i> The ID value (x) of a specific rollback checkpoint file from the configured rollback location with the suffix *.rb.x.
The default range is 1 to 9 but the maximum value depends on the local-max-checkpoints and remote-max-checkpoints configurations. |

 revert

| | | | | | | | |
|----------------------|--|--------|--|-----------|--|----------------------|---|
| Syntax | revert <i>checkpoint-rescue</i> [now] | | | | | | |
| Context | admin>rollback | | | | | | |
| Description | <p>This command initiates a CLI configuration rollback revert operation that returns the configuration state of the node to a previously saved checkpoint file or rescue file. The rollback reversion minimizes impacts to running services. Configuration parameters that have changed since the last rollback checkpoint file was created, or items on which changed configurations have dependencies, are first reset to their default values and then restored to their previous values from the rollback checkpoint file.</p> <p>Performing a configuration reversion can be briefly service-impacting in changed areas. There are no service impacts to configuration areas that did not change since the rollback checkpoint file was created.</p> | | | | | | |
| Default | n/a | | | | | | |
| Parameters | <p><i>checkpoint-rescue</i> — identifies the rollback checkpoint or rescue file to revert to</p> <p>Values</p> <table> <tr> <td>rescue</td> <td>the rollback rescue file from the configured rescue location</td> </tr> <tr> <td>latest-rb</td> <td>the most recent rollback checkpoint file from the configured rollback location, with the suffix *.rb</td> </tr> <tr> <td><i>checkpoint-id</i></td> <td> <p>The ID value (<i>x</i>) of a specific rollback checkpoint file from the configured rollback location with the suffix *.rb.<i>x</i>.</p> <p>The default range is 1 to 9 but the maximum value depends on the local-max-checkpoints and remote-max-checkpoints configurations.</p> </td> </tr> </table> <p>now — forces a rollback reversion without prompting for confirmation</p> | rescue | the rollback rescue file from the configured rescue location | latest-rb | the most recent rollback checkpoint file from the configured rollback location, with the suffix *.rb | <i>checkpoint-id</i> | <p>The ID value (<i>x</i>) of a specific rollback checkpoint file from the configured rollback location with the suffix *.rb.<i>x</i>.</p> <p>The default range is 1 to 9 but the maximum value depends on the local-max-checkpoints and remote-max-checkpoints configurations.</p> |
| rescue | the rollback rescue file from the configured rescue location | | | | | | |
| latest-rb | the most recent rollback checkpoint file from the configured rollback location, with the suffix *.rb | | | | | | |
| <i>checkpoint-id</i> | <p>The ID value (<i>x</i>) of a specific rollback checkpoint file from the configured rollback location with the suffix *.rb.<i>x</i>.</p> <p>The default range is 1 to 9 but the maximum value depends on the local-max-checkpoints and remote-max-checkpoints configurations.</p> | | | | | | |

save

| | |
|--------------------|--|
| Syntax | save [comment <i>comment</i>] [rescue] |
| Context | admin>rollback |
| Description | <p>This command saves the current operational configuration as a rollback checkpoint file at the configured rollback location, using the filename specified by the rollback-location command, with the suffix *.rb. The suffixes of all previously saved rollback checkpoint files are automatically incremented by one (*.rb becomes *.rb.1, *.rb.1 becomes *.rb.2, and so on).</p> |

By default, there can be a maximum of 10 rollback checkpoint files, the latest with suffix `*.rb` and nine older files with suffixes `*.rb.1` through `*.rb.9`. If the maximum number of checkpoint files is reached and a new one is saved, the oldest checkpoint file is deleted. The maximum number of rollback checkpoint files that can be saved can be configured with the [local-max-checkpoints](#) and [remote-max-checkpoints](#) commands.

If the **rescue** keyword is used, this command saves the current operational configuration as a rescue rollback file at the location and with the filename specified by the [rescue-location](#) command. The rescue file uses the suffix `*.rc`. There can be only one rescue file saved at a time. Saving a new rescue file deletes and replaces any existing rescue file.

A valid rollback checkpoint and rescue location must be configured with the [rollback-location](#) and [rescue-location](#) commands before saving a checkpoint or rescue file.

Default n/a

Parameters *comment* — a string up to 255 characters in length describing the associated rollback checkpoint file

rescue — saves the current operational configuration as a rollback rescue file with the suffix `*.rc`

view

Syntax **view** [*checkpoint-rescue*]

Context admin>rollback

Description This command displays the configuration settings saved in a rollback checkpoint or rescue file, or the active operational system configuration.

Default latest-rb

Parameters *checkpoint-rescue* — identifies the configuration file to view

Values

| | |
|----------------------|---|
| <i>rescue</i> | the rollback rescue file from the configured rescue location |
| <i>latest-rb</i> | the most recent rollback checkpoint file from the configured rollback location, with the suffix <code>*.rb</code> |
| <i>checkpoint-id</i> | The ID value (<i>x</i>) of a specific rollback checkpoint file from the configured rollback location with the suffix <code>*.rb.x</code> .
The default range is 1 to 9 but the maximum value depends on the local-max-checkpoints and remote-max-checkpoints configurations. |

local-max-checkpoints

| | |
|--------------------|--|
| Syntax | local-max-checkpoints <i>[number]</i>
no local-max-checkpoints |
| Context | config>system>rollback |
| Description | <p>This command configures the maximum number of rollback checkpoint files that can be saved to the local compact flash.</p> <p>When the maximum number of files are saved, the oldest rollback checkpoint file will actually have an ID value one less than the configured maximum, because one rollback checkpoint file is always the latest file and does not have an ID number. For example, if you configure the maximum number of checkpoints as 50, after performing 50 rollback save commands, there will be a latest rollback checkpoint file with extension *.rb, and 49 older files with extension *.rb.1 to *.rb.49.</p> <p>The no form of this command resets the maximum value to the default.</p> |
| Default | 10 |
| Parameters | <i>number</i> — the maximum number of rollback checkpoint files |
| | Values 1 to 50 |

remote-max-checkpoints

| | |
|--------------------|--|
| Syntax | remote-max-checkpoints <i>[number]</i>
no remote-max-checkpoints |
| Context | config>system>rollback |
| Description | <p>This command configures the maximum number of rollback checkpoint files that can be saved on a remote device.</p> <p>When the maximum number of files are saved, the oldest rollback checkpoint file will actually have an ID value one less than the configured maximum, because one rollback checkpoint file is always the latest file and does not have an ID number. For example, if you configure the maximum number of checkpoints as 50, after performing 50 rollback save commands, there will be a latest rollback checkpoint file with extension *.rb, and 49 older files with extension *.rb.1 to *.rb.49.</p> <p>The no form of this command resets the maximum value to the default.</p> |
| Default | 10 |
| Parameters | <i>number</i> — the maximum number of rollback checkpoint files |
| | Values 1 to 200 |

rescue-location

| | | | | | | | | | | | | | | | |
|--------------------|--|---------------|--|-----------|---|------------|--|-------------|---|--------------|---------|--------------|--|-----------|--------------------|
| Syntax | [no] rescue-location <i>file-url</i> <i>rescue filename</i> | | | | | | | | | | | | | | |
| Context | config>system>rollback | | | | | | | | | | | | | | |
| Description | <p>This command configures the location and generic filename of the rollback rescue configuration file.</p> <p>A rescue file can be saved locally on the compact flash or on a remote device. The file URL must not include a filename extension. The suffix for the rollback rescue configuration file is *.rc and is automatically appended when the file is saved.</p> <p>A valid rollback rescue location must be configured before a rollback save command is executed.</p> | | | | | | | | | | | | | | |
| Default | no rescue-location | | | | | | | | | | | | | | |
| Parameters | <p><i>file-url</i> — the local or remote file path for the rollback rescue configuration file</p> <table border="0"> <tr> <td colspan="2">Values</td> </tr> <tr> <td>local-url</td> <td>[<i>cflash-id</i>]/[<i>file-path</i>] 200 chars max, including cflash-id directory length 99 chars max each</td> </tr> <tr> <td>remote-url</td> <td>[[ftp://]<i>login:pswd@ remote-locn</i>]/[<i>file-path</i>] 255 chars max directory length 99 chars max each</td> </tr> <tr> <td>remote-locn</td> <td>[<i>hostname</i> <i>ipv4-address</i> <i>ipv6-address</i>]</td> </tr> <tr> <td>ipv4-address</td> <td>a.b.c.d</td> </tr> <tr> <td>ipv6-address</td> <td>x:x:x:x:x:x:x[-<i>interface</i>]
x:x:x:x:x:d.d.d.d[-<i>interface</i>]
x - [0..FFFF]H
d - [0..255]D
<i>interface</i>: the interface name, 32 chars max, mandatory for link local addresses</td> </tr> <tr> <td>cflash-id</td> <td>cf3: cf3-A: cf3-B:</td> </tr> </table> <p><i>rescue filename</i> — the generic filename for rollback rescue configuration files</p> | Values | | local-url | [<i>cflash-id</i>]/[<i>file-path</i>] 200 chars max, including cflash-id directory length 99 chars max each | remote-url | [[ftp://] <i>login:pswd@ remote-locn</i>]/[<i>file-path</i>] 255 chars max directory length 99 chars max each | remote-locn | [<i>hostname</i> <i>ipv4-address</i> <i>ipv6-address</i>] | ipv4-address | a.b.c.d | ipv6-address | x:x:x:x:x:x:x[- <i>interface</i>]
x:x:x:x:x:d.d.d.d[- <i>interface</i>]
x - [0..FFFF]H
d - [0..255]D
<i>interface</i> : the interface name, 32 chars max, mandatory for link local addresses | cflash-id | cf3: cf3-A: cf3-B: |
| Values | | | | | | | | | | | | | | | |
| local-url | [<i>cflash-id</i>]/[<i>file-path</i>] 200 chars max, including cflash-id directory length 99 chars max each | | | | | | | | | | | | | | |
| remote-url | [[ftp://] <i>login:pswd@ remote-locn</i>]/[<i>file-path</i>] 255 chars max directory length 99 chars max each | | | | | | | | | | | | | | |
| remote-locn | [<i>hostname</i> <i>ipv4-address</i> <i>ipv6-address</i>] | | | | | | | | | | | | | | |
| ipv4-address | a.b.c.d | | | | | | | | | | | | | | |
| ipv6-address | x:x:x:x:x:x:x[- <i>interface</i>]
x:x:x:x:x:d.d.d.d[- <i>interface</i>]
x - [0..FFFF]H
d - [0..255]D
<i>interface</i> : the interface name, 32 chars max, mandatory for link local addresses | | | | | | | | | | | | | | |
| cflash-id | cf3: cf3-A: cf3-B: | | | | | | | | | | | | | | |

rollback-location

| | |
|--------------------|---|
| Syntax | [no] rollback-location <i>file-url</i> <i>rollback filename</i> |
| Context | config>system>rollback |
| Description | <p>This command configures the location and generic filename of rollback checkpoint files. Files can be saved locally on the compact flash or on a remote device.</p> |

The *file-url* or *filename* must not include a filename extension. The suffixes for rollback checkpoint files are *.rb and *.rb.1 to *.rb.x, and are automatically appended when the file is saved.

A valid rollback checkpoint location must be configured before a rollback **save** command is executed.

Default no rollback-location

Parameters *file-url* — the local or remote file path for rollback checkpoint files

Values

| | |
|--------------|--|
| local-url | [<i>cflash-id</i>][<i>file-path</i>] 200 chars max, including <i>cflash-id</i> directory length 99 chars max each |
| remote-url | [{ftp://} <i>login:pswd@ remote-locn</i>][<i>file-path</i>] 255 chars max directory length 99 chars max each |
| remote-locn | [<i>hostname</i> <i>ipv4-address</i> <i>ipv6-address</i>] |
| ipv4-address | a.b.c.d |
| ipv6-address | x:x:x:x:x:x[- <i>interface</i>]
x:x:x:x:x:d.d.d.d[- <i>interface</i>]
x - [0..FFFF]H
d - [0..255]D
<i>interface</i> : the interface name, 32 chars max, mandatory for link local addresses |
| cflash-id | cf3: cf3-A: cf3-B: |

rollback filename — the generic filename for rollback checkpoint files

rollback-sync

Syntax **rollback-sync**

Context admin>redundancy

Description This command copies all existing rollback checkpoint files from the active CSM compact flash to the standby CSM compact flash on a 7705 SAR-8 Shelf V2 or 7705 SAR-18. You can also enable the system to save an automatic backup of each new rollback checkpoint file with the **rollback-sync** command in the **config>redundancy** context.

Rollback checkpoint files can only be backed up from local sources and only by using the two dedicated **rollback-sync** commands. The **synchronize** commands in the **config>redundancy** and **admin>redundancy** contexts do not apply to rollback checkpoint files.

Default n/a

rollback-sync

| | |
|--------------------|---|
| Syntax | [no] rollback-sync |
| Context | config>redundancy |
| Description | <p>This command enables automatic synchronization of locally saved rollback checkpoint files between the active CSM and standby CSM.</p> <p>When automatic rollback synchronization is enabled, a rollback save will cause the new checkpoint file to be saved on both the active and standby CSMs if the rollback location is a local location. The suffixes of all older checkpoint files on both active and standby CSMs are incremented by one. Automatic synchronization only causes new rollback checkpoint files to be copied to both CSMs. Any rollback checkpoint files that were created before rollback-sync was enabled are not copied to the standby CSM. You can manually back up all files using the rollback-sync command in the admin>redundancy context.</p> <p>Rollback checkpoint files can only be backed up from local sources and only by using the two dedicated rollback-sync commands. The synchronize commands in the config>redundancy and admin>redundancy contexts do not apply to rollback checkpoint files.</p> <p>The no form of this command disables automatic synchronization of new rollback checkpoint files.</p> |
| Default | no rollback-sync |

3.11.2.6 Show Commands



Note: The following command outputs are examples only; actual displays may differ depending on supported functionality and user configuration.

alias

Syntax `alias`

Context `show`

Description This command displays a list of existing aliases.

Output The following output is an example of alias information, and [Table 13](#) describes the fields.

Output Example

```
ALU-103>config>system# show alias
=====
Alias-Name           Alias-command-name
=====
sri                  show router interface
sse                  show service service-using cpipe
ssv11                show service service-using v11
-----
Number of aliases : 3
=====
ALU-103>config>system#
```

Table 13 Alias Field Descriptions

| Label | Description |
|--------------------|--|
| Alias-Name | Displays the name of the alias |
| Alias-command-name | The command and parameter syntax that define the alias |
| Number of aliases | The total number of aliases configured on the router |

candidate

Syntax `candidate`

Context `show>system`

Description This command shows candidate configuration information.

Default n/a

Output The following output is an example of candidate information, and [Table 14](#) describes the output fields.

Output Example

```
*A:~# show system candidate
=====
Candidate Config Information
=====
Candidate configuration state           : modified

Num editors/
viewers                               : 1

Candidate cfg exclusive locked        : no

Last commit state                     : success

Last commit time                       : 2021/04/
08 21:13:00

Last commit initiated user            : admin

Checkpoint created with last commit   : yes

Scheduled revert time                 : N/
A

Last commit revert time                : N/
A

-----

Users in edit-
cfg mode

-----

Username          Type (from)
-----

admin             Telnet (192.0.2.123)

=====

*A:~#
```

Table 14 Candidate Configuration Field Descriptions

| Label | Description |
|-------------------------------------|---|
| Candidate configuration state | empty — there are no uncommitted changes in the candidate configuration
modified — there are uncommitted changes in the candidate configuration
unconfirmed — there are no uncommitted changes in the candidate configuration but the result of the last commit will automatically revert to a previous configuration unless it is confirmed before the timeout expires |
| Num editors/viewers | The number of CLI sessions currently in candidate edit mode |
| Candidate cfg exclusive locked | Indicates if a user has exclusively locked the candidate configuration using the candidate edit exclusive command |
| Last commit state | none — there have been no commits since the last reboot of the node
in-progress — the system is currently committing the candidate configuration
success — the last commit finished successfully
revert-pending — the last commit finished successfully but has not been confirmed yet and an auto-revert will occur if it is not confirmed before the timeout expires
failed — the last commit failed and has been undone
revert-in-progress — the last commit finished successfully but was not confirmed in time and the system is currently reverting to a previous configuration
reverted — the last commit finished successfully but was not confirmed in time and the system has reverted to a previous configuration
revert-failed — the last commit finished successfully but was not confirmed in time and the system attempted a reversion but failed |
| Last commit time | The time at which the last commit attempt was started |
| Last commit initiated user | The name of the user who initiated the last candidate commit |
| Checkpoint created with last commit | Indicates if a rollback checkpoint was created after the previous commit completed |
| Scheduled revert time | The currently scheduled auto-revert time if the confirmed option is being used with a candidate commit |

Table 14 Candidate Configuration Field Descriptions (Continued)

| Label | Description |
|-------------------------|--|
| Last commit revert time | The time the system was last reverted to a previous configuration |
| Users in edit-cfg mode | Lists all the user sessions that are currently in candidate edit mode |
| Username | The name of the user that is currently in candidate edit mode |
| Type (from) | The type of session (such as console or Telnet) and the source of the session (such as the source IP address of the remote host) |

4 File System Management

This chapter provides information about file system management.

Topics in this chapter include:

- [The File System](#)
- [Common Configuration Tasks](#)
- [File System Command Reference](#)

4.1 The File System

The 7705 SAR file system is used to store files used and generated by the system; for example, image files, configuration files, logging files, and accounting files.

The **file** commands allow you to copy, create, move, and delete files and directories, navigate to a different directory, and display file or directory contents and the image version.

4.1.1 Compact Flash Device

The file system is based on a DOS file system. On the 7705 SAR, each CSM has an integrated compact flash device. The names for these devices are:

- cf3:
- cf3-A:
- cf3-B:

The first device name above (cf3:) is a relative device name in that it refers to the device local to the control processor on the CSM running the current console session. As in the DOS file system, the colon (":") at the end of the name indicates that it is a device.

The second and third device names (cf3-A: and cf3-B:) are absolute device names that refer directly to the device on CSM A or CSM B (CSM B applies only to chassis with redundant CSMs).

The device cf3-B: does not apply to the following chassis because they do not have redundant CSMs:

- 7705 SAR-A
- 7705 SAR-Ax
- 7705 SAR-M
- 7705 SAR-H
- 7705 SAR-Hc
- 7705 SAR-W
- 7705 SAR-Wx
- 7705 SAR-X

**Note:**

- The 7705 SAR-8 Shelf V2, 7705 SAR-18, 7705 SAR-H, and 7705 SAR-M have removable compact flash cards.
- The 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-Hc, 7705 SAR-W, and 7705 SAR-Wx do not have removable compact flash cards; they are shipped with integrated memory that is used to store system boot software, OS software, and configuration files and logs.
- The 7705 SAR-X has two removable compact flash cards but they are not field-replaceable. Replacement of the devices is done as a repair service.

On the 7705 SAR-18, cf3: is used to store the software image required for system startup and operation, including the application load. The 7705 SAR-18 CSM also has two optional compact flash slots for two compact flash devices (cf1: and cf2:). These compact flash devices are also referred to as cf1-A:/cf1-B: and cf2-A:/cf2-B: to indicate whether they are on CSM A or CSM B. All the compact flash devices can be used to store software upgrades, statistics, logging files, accounting files, scripts, and configuration data.



Note: To prevent corruption of open files in the file system, compact flashes should be removed on those chassis that have replaceable compact flash cards only when the CFs are administratively shut down. The 7705 SAR gracefully closes any open files on the device so that it can be safely removed.

4.1.2 URLs

The arguments for the 7705 SAR file commands are modeled after the standard universal resource locator (URL).

A URL can refer to a file (a *file-url*) or a directory (a *directory-url*).

The 7705 SAR supports operations on both the local file system and on remote files. For the purposes of categorizing the applicability of commands to local and remote file operations, URLs are divided into three types of URLs: local, ftp, and tftp.

The syntax for each of the URL types is listed in [Table 15](#).

Table 15 URL Types and Syntax

| URL Type | Syntax | Notes |
|-------------------|---|--|
| <i>local-url</i> | <i>[cflash-id]</i> <i>[file-path]</i> | <p><i>cflash-id</i> is the compact flash device name
 Values: cf1: cf1-A: cf1-B: cf2: cf2-A: cf2-B: cf3: cf3-A: cf3-B:
 (the 7705 SAR-18 supports all values; the 7705 SAR-8 Shelf V2 supports cf3:, cf3-A:, and cf3-B.; all fixed platforms support cf3: and cf3-A.)
 Length: 200 characters maximum, including <i>cflash-id</i>; directory length is 99 characters maximum each</p> <p><i>path</i> is the path to the directory or file</p> |
| <i>remote-url</i> | ftp:// <i>login:pswd@remote-locn/</i> <i>[file-path]</i> | <p>An absolute ftp path from the root of the remote file system:
 Length: 255 characters maximum (could be less depending on command); directory length is 99 characters maximum each</p> <p><i>login</i> is the ftp user name</p> <p><i>pswd</i> is the ftp user password</p> <p><i>remote-locn</i> is the remote host (hostname or IP address)
 Values:</p> <ul style="list-style-type: none"> • <i>hostname</i>: host name of the remote location, up to 128 characters maximum • <i>ipv4-address</i>: a.b.c.d • “[<i>ipv6-address</i>]” (address must be enclosed in square brackets) <ul style="list-style-type: none"> – x:x:x:x:x:x:–<i>interface</i> – x:x:x:x:x:d.d.d.d.–<i>interface</i> – x: [0 to FFFF]H – d: [0 to 255]D – <i>interface</i>: the interface name, 32 characters maximum, mandatory for link local addresses <p><i>path</i> is the path to the directory or file</p> |
| | ftp:// <i>login:pswd]</i> @ <i>hostl./</i> <i>path</i> | A relative ftp path from the user's home directory. Note the period and slash (“./”) in this syntax, as compared to the absolute path. |
| <i>tftp-url</i> | tftp:// <i>login:pswd@remote-locn/</i> <i>file-path</i> | tftp is only supported for operations on file-urls |

Table 16 lists the commands that are supported both locally and remotely.

Table 16 File Command Local and Remote File System Support

| Command | local-url | ftp-url | tftp-url |
|----------------|-------------|---------|----------|
| attrib | ✓ | | |
| cd | ✓ | ✓ | |
| copy | ✓ | ✓ | ✓ |
| delete | ✓ | ✓ | |
| dir | ✓ | ✓ | |
| md | | ✓ | |
| move | ✓ | ✓ | |
| rd | | ✓ | |
| repair | | | |
| scp | source only | | |
| type | ✓ | ✓ | ✓ |
| version | ✓ | ✓ | ✓ |

The 7705 SAR accepts either forward slash (“/”) or backslash (“\”) characters to delimit directory and/or filenames in URLs. Similarly, the 7705 SAR SCP client application can use either slash or backslash characters, but not all SCP clients treat backslash characters as equivalent to slash characters. In particular, UNIX systems will often interpret the backslash character as an “escape” character. This can cause problems when using an external SCP client application to send files to the 7705 SAR SCP server. If the external system treats the backslash like an escape character, the backslash delimiter will get stripped by the parser and will not be transmitted to the 7705 SAR SCP server.

For example, a destination directory specified as “cf3:\dir1\file1” will be transmitted to the 7705 SAR SCP server as “cf3:dir1file1” where the backslash escape characters are stripped by the SCP client system before transmission. On systems where the client treats the backslash like an “escape” character, a double backslash “\\” or the forward slash “/” can typically be used to properly delimit directories and the filename.

4.1.3 Wildcards

The 7705 SAR supports the standard DOS wildcard characters. The asterisk (*) can represent zero or more characters in a string of characters, and the question mark (?) can represent any one character.

Example:

```
ALU-1>file cf3:\ # copy test*.cfg siliconvalley
cf3:\testfile.cfg
1 file(s) copied.
ALU-1>file cf3:\ # cd siliconvalley
ALU-1>file cf3:\siliconvalley\ # dir
Volume in drive cf3 on slot A has no label.
Directory of cf3:\siliconvalley\
05/10/2006 11:32p      <DIR>          .
05/10/2006 11:14p      <DIR>          ..
05/10/2006 11:32p                    7597 testfile.cfg
      1 File(s)                    7597 bytes.
      2 Dir(s)                    1082368 bytes free.
ALU-1>file cf3:\siliconvalley\ #
```

As in a DOS file system, the 7705 SAR wildcard characters can only be used in some of the file commands.

4.2 Common Configuration Tasks

The following sections describe the basic system tasks that can be performed.

- [Modifying File Attributes](#)
- [Creating and Navigating Directories](#)
- [Copying Files](#)
- [Moving Files](#)
- [Deleting Files and Removing Directories](#)
- [Displaying Directory and File Information](#)
- [Repairing the File System](#)



Note: When a file system operation is performed with a command that can potentially delete or overwrite a file system entry (such as a **copy**, **delete**, **move**, **rd**, or **scp** command), a prompt appears to confirm the action. The **force** keyword performs the copy, delete, move, rd, or scp action without displaying the confirmation prompt.

4.2.1 Modifying File Attributes

The system administrator can change the read-only attribute in the local file. Enter the **attrib** command with no options to display the contents of the directory and the file attributes.

Use the CLI syntax displayed below to modify file attributes:

```
CLI Syntax:  file>
                attrib [+r | -r] file-url
```

The following displays an example of the command syntax:

```
Example:     # file
                file cf3:\ # attrib
                file cf3:\ # attrib +r BOF.SAV
                file cf3:\ # attrib
```

The following displays the file configuration:

```
ALU-1>file cf3:\ # attrib
cf3:\bootlog.txt
cf3:\bof.cfg
cf3:\boot.ldr
cf3:\bootlog_prev.txt
```

```
cf3:\BOF.SAV
ALU-1>file cf3:\ # attrib +r BOF.SAV
ALU-1>file cf3:\ # attrib
cf3:\bootlog.txt
cf3:\bof.cfg
cf3:\boot.ldr
cf3:\bootlog_prev.txt
R cf3:\BOF.SAV
```

4.2.2 Creating and Navigating Directories

Use the **md** command to create a new directory in the local file system, one level at a time.

Use the **cd** command to navigate to different directories.

Use the CLI syntax displayed below to create a new directory:

CLI Syntax:

```
file>
      md file-url
```

The following displays an example of the command syntax:

Example:

```
file cf3:\ # md test1
file cf3:\ # cd test1
file cf3:\test1\ # md test2
file cf3:\test1\ # cd test2
file cf3:\test1\test2\ # md test3
file cf3:\test1\test2\ # cd test3
file cf3:\test1\test2\test3 #
```

4.2.3 Copying Files

Use the **copy** command to upload or download an image file, configuration file, or other file types to or from a flash card or a TFTP server.

The **scp** command copies files between hosts on a network. It uses SSH for data transfer, and uses the same authentication and provides the same security as SSH.

The source file for the **scp** command must be local. The file must reside on the 7705 SAR router. The destination file must be in the format: `user@host:file-name`. The destination does not need to be local.

Use the CLI syntax displayed below to copy files:

CLI Syntax: `file>`
`copy source-file-url dest-file-url [force]`
`scp local-file-url destination-file-url [router router`
`name | service-id] [force]`

The following displays an example of the **copy** command syntax:

Example:

```
ALU-1>file cf3::\ # copy 104.cfg cf3::\test1\test2\test3\test.cfg
ALU-1>file cf3::\ # scp file1 admin@192.168.x.x:cf3::\file1
ALU-1>file cf3::\ # scp file2 user2@192.168.x.x:/user2/file2
ALU-1>file cf3::\ # scp cf3::/file3 admin@192.168.x.x:cf3::\file3
```

4.2.4 Moving Files

Use the **move** command to move a file or directory from one location to another.

Use the CLI syntax displayed below to move files:

CLI Syntax: `file>`
`move old-file-url new-file-url [force]`

The following displays an example of the command syntax:

Example:

```
ALU-1>file cf3::\test1\test2\test3\ # move test.cfg cf3::\test1
cf3::\test1\test2\test3\test.cfg
ALU-1>file cf3::\test1\test2\test3\ # cd ..
ALU-1>file cf3::\test1\test2\ # cd ..
ALU-1>file cf3::\test1\ # dir

Directory of cf3::\test1\
05/04/2006 07:58a <DIR> .
05/04/2006 07:06a <DIR> ..
05/04/2006 07:06a <DIR> test2
05/04/2006 07:58a 25278 test.cfg
1 File(s) 25278 bytes.
3 Dir(s) 1056256 bytes free.
ALU-1>file cf3::\test1\ #
```

4.2.5 Deleting Files and Removing Directories

Use the **delete** and **rd** commands to delete files and remove directories. Directories can be removed even if they contain files and/or subdirectories. To remove a directory that contains files and/or subdirectories, use the **rd rf** command. When files or directories are deleted, they cannot be recovered.

The **force** option deletes the file or directory without prompting the user to confirm.

Use the CLI syntax displayed below to delete files and then remove directories:

```
CLI Syntax:  file>
              delete file-url [force]
              rd file-url [force]
```

The following displays an example of the command syntax:

```
ALU-1>file cf3::\test1\ # delete test.cfg
ALU-1>file cf3::\test1\ # delete abc.cfg
ALU-1>file cf3::\test1\test2\ # cd test3
ALU-1>file cf3::\test1\test2\test3\ # cd ..
ALU-1>file cf3::\test1\test2\ # rd test3
ALU-1>file cf3::\test1\test2\ # cd ..
ALU-1>file cf3::\test1\ # rd test2
ALU-1>file cf3::\test1\ # cd ..
ALU-1>file cf3::\ # rd test1
ALU-1>file cf3::\ #
```

Use the CLI syntax displayed below to remove a directory without first deleting files or subdirectories:

```
CLI Syntax:  file>
              rd file-url rf
```

4.2.6 Displaying Directory and File Information

Use the **dir** command to display a list of files on a file system.

Use the **type** command to display the contents of a file.

Use the **version** command to display the version of a 7705 SAR both.tim file.

Use the CLI syntax displayed below to display directory and file information:

CLI Syntax: file>
 dir [file-url]
 type file-url
 version file-url

The following displays an example of the command syntax:

```
A:ALU-1# file
A:ALU-1>file cf3::\ # dir

Volume in drive cf3: on slot A has no label.

Volume in drive cf3: on slot A is formatted as FAT32.

Directory of cf3::\

02/08/2008  11:23a                140584 boot.ldr
02/07/2008  12:19p                 786 bof.cfg
02/13/2008  05:42p                2058 bootlog.txt
01/13/2008  05:42p                2434 bootlog_pre.txt
01/30/2008  05:17p                 797 bof.cfg.arash
01/25/2008  04:11p                <DIR>      TXT
01/30/2008  11:36a                 787 bof.cfg.ftp
01/30/2008  01:11p                 736 bof.cfg.root
01/30/2008  11:35a                 886 bof.cfg.deep
01/30/2008  11:35a                 483 bof.cfg.JC
                8 File(s)                411097 bytes.
                1 Dir(s)                1043456 bytes free.

A:ALU-1>file cf3::\ # type bof.cfg
# TiMOS-B-1.1.R1 both/hops NOKIA SAR 7705
# Copyright (c) 2016 Nokia.
# All rights reserved. All use subject to applicable license agreements.
# Built on Wed Apr 9 09:53:01 EDT 2016 by csabuild in /rel2.0/b1/R1/panos/main

# Generated WED APR 09 20:18:06 2016 UTC

primary-image  ftp://*:*@xxx.xxx.xxx.xx/home/csahwreg17/images/both.tim
primary-config ftp://*:*@ xxx.xxx.xxx.xx /home/csahwreg17/images/dut-a.cfg
address        xxx.xxx.xxx.xx /24 active
address        xxx.xxx.xxx.xx /24 standby
primary-dns    xxx.xxx.xxx.xx
dns-domain     labs.ca.alcatel-lucent.com
static-route   xxx.xxx.0.0/16 next-hop xxx.xxx.xxx.x
autonegotiate
duplex         full
speed         100
wait          3
persist       off
console-speed 115200

A:ALU-1>file cf3::\ #
```

4.2.7 Repairing the File System

Use the **repair** command to check a compact flash device for errors and repair any errors found.

Use the CLI syntax displayed below to check and repair a compact flash device:

CLI Syntax: file
 repair [*flash-id*]

The following displays an example of the command syntax:

```
ALU-1>file cf3:\ # repair
Checking drive cf3: on slot A for errors...
Drive cf3: on slot A is OK.
```

4.3 File System Command Reference

4.3.1 Command Hierarchy

4.3.1.1 Configuration Commands

file

- **attrib** [+r | -r] *file-url*
- **attrib**
- **cd** [*file-url*]
- **copy** *source-file-url dest-file-url* [**force**]
- **delete** *file-url* [**force**]
- **dir** [*file-url*] [**sort-order** {d | n | s}] [**reverse**]
- **format** [*flash-id*] [**reliable**]
- **md** *file-url*
- **move** *old-file-url new-file-url* [**force**]
- **rd** *file-url rf*
- **rd** *file-url* [**force**]
- **repair** [*flash-id*]
- **scp** *local-file-url destination-file-url* [**router router-instance**] [**force**]
- **scp** *local-file-url destination-file-url* [**service service-name**] [**force**]
- [**no**] **shutdown** [**active**] [**standby**]
- [**no**] **shutdown** *flash-id*
- **type** *file-url*
- **version** *file-url* [**check**]

4.3.2 Command Descriptions

- [Configuration Commands](#)

4.3.2.1 Configuration Commands

file

| | |
|--------------------|---|
| Syntax | file |
| Context | root |
| Description | <p>This command enters the context to perform file system operations.</p> <p>When entering the file context, the prompt changes to reflect the present working directory. Navigating the file system with the cd .. command results in a changed prompt.</p> <p>The exit all command leaves the file system/file operation context and returns to the <ROOT> CLI context. The state of the present working directory is maintained for the CLI session. Entering the file command returns the cursor to the working directory where the exit command was issued.</p> |

attrib

| | |
|--------------------|---|
| Syntax | attrib [+r -r] file-url
attrib |
| Context | file |
| Description | <p>This command sets or clears/resets the read-only attribute for a file in the local file system.</p> <p>To list all files and their current attributes, enter attrib or attrib x where x is either the filename or a wildcard (*).</p> <p>When an attrib command is entered to list a specific file or all files in a directory, the file's attributes are displayed with or without an "R" preceding the filename. The "R" implies that the +r is set and that the file is read-only. Files without the "R" designation imply that the -r is set and that the file is read-write-all. For example:</p> |

```

ALU-1>file cf3:\ # attrib
          cf3:\bootlog.txt
          cf3:\bof.cfg
          cf3:\boot.ldr
          cf3:\sr1.cfg
          cf3:\test
          cf3:\bootlog_prev.txt
R        cf3:\BOF.SAV

```

| | |
|-------------------|--|
| Parameters | <p><i>file-url</i> — the URL for the local file (see Table 15 for parameter descriptions)</p> <p>+r — sets the read-only attribute on the specified file</p> <p>-r — clears/resets the read-only attribute on the specified file</p> |
|-------------------|--|

cd

| | |
|--------------------|---|
| Syntax | cd <i>[file-url]</i> |
| Context | file |
| Description | This command displays or changes the current working directory in the local file system. |
| Parameters | <p><i>file-url</i> — the URL for the local file (see Table 15 for parameter descriptions)</p> <p><i><none></i> — displays the current working directory</p> <p><i>..</i> — signifies the parent directory. This can be used in place of an actual directory name in a <i>directory-url</i>.</p> <p><i>directory-url</i> — the destination directory</p> |

copy

| | |
|--------------------|---|
| Syntax | copy <i>source-file-url dest-file-url [force]</i> |
| Context | file |
| Description | <p>This command copies a file or all files in a directory from a source URL to a destination URL. At least one of the specified URLs should be a local URL. The optional wildcard (*) can be used to copy multiple files that share a common (partial) prefix and/or (partial) suffix.</p> <p>When a file is copied to a destination with the same filename, the original file is overwritten by the new file specified in the operation. The following prompt appears if the destination file already exists:</p> <p>“Overwrite destination file (y/n)?”</p> <p>For example:</p> <p>To copy a file named <i>srcfile</i> in a directory called <i>test</i> on <i>cf3</i>: in slot CSM B to a file called <i>destfile</i> in a directory called <i>production</i> on <i>cf3</i>: in slot CSM A, the syntax is:</p> <pre>file cf3:\ # copy cf3-B:/test/srcfile cf3-A:/production/destfile</pre> <p>To FTP a file named <i>121201.cfg</i> in directory <i>mydir</i> stored on <i>cf3</i>: in slot CSM A to a network FTP server with IP address <i>192.0.2.255</i> in a directory called <i>backup</i> with a destination filename of <i>121201.cfg</i>, the FTP syntax is:</p> <pre>copy cf3-A:/mydir/121201.cfg 192.0.2.255.79/backup/121201.cfg</pre> |
| Parameters | <p><i>source-file-url</i> — the location of the source file or directory to be copied (see <i>file-url</i>)</p> <p><i>dest-file-url</i> — the destination of the copied file or directory (see <i>file-url</i>)</p> <p>force — forces an immediate copy of the files without displaying a user prompt message</p> <p><i>file-url</i> — the local or remote URL (see Table 15 for parameter descriptions)</p> |

delete

| | |
|--------------------|---|
| Syntax | delete <i>file-url</i> [force] |
| Context | file |
| Description | <p>This command deletes the specified file.</p> <p>The optional wildcard “*” can be used to delete multiple files that share a common (partial) prefix and/or (partial) suffix. When the wildcard is entered, the following prompt displays for each file that matches the wildcard:</p> <p>“Delete file <filename> (y/n)?”</p> |
| Parameters | <p><i>file-url</i> — the filename to delete (see Table 15 for parameter descriptions)</p> <p>force — forces an immediate deletion of the specified files</p> <p>file delete * force deletes all the wildcard matching files without displaying a user prompt message</p> |

dir

| | |
|--------------------|---|
| Syntax | dir [<i>file-url</i>] [sort-order { d n s }] [reverse] |
| Context | file |
| Description | <p>This command displays a list of files and subdirectories in a directory. The sort-order keyword sorts the files by date, name, or size. The default is to list in ascending order (oldest to newest, A to Z, or smallest to largest); to list the files in descending order, use the reverse keyword.</p> |
| Parameters | <p><i>file-url</i> — the path or directory name (see Table 15 for parameter descriptions)</p> <p>Use <i>file-url</i> with the optional wildcard (*) to reduce the number of files to list.</p> <p>Default lists all files in the present working directory, sorted by name (in ascending order)</p> <p>sort-order — specifies the order by which the files are sorted</p> <p>Values</p> <ul style="list-style-type: none"> d – sorts by date n – sorts by filename s – sorts by file size <p>reverse — sorts the files in descending order</p> |

format

| | |
|--------------------|--|
| Syntax | format [<i>flash-id</i>] [reliable] |
| Context | file |
| Description | This command formats the compact flash. The compact flash must be shut down before formatting. |
| Parameters | <i>flash-id</i> — the compact flash type (see Table 15 for parameter descriptions and values)
reliable — enables the reliance file system and disables the default DOS file system.
This option is valid only on compact flashes 1 and 2. |

md

| | |
|--------------------|--|
| Syntax | md <i>file-url</i> |
| Context | file |
| Description | This command creates a new directory in a file system.

Directories can only be created one level at a time. |
| Parameters | <i>file-url</i> — the directory name to be created (see Table 15 for parameter descriptions) |

move

| | |
|--------------------|---|
| Syntax | move <i>old-file-url</i> <i>new-file-url</i> [force] |
| Context | file |
| Description | This command moves a local file, system file, or a directory. If the target already exists, the command fails and an error message displays.

The following prompt appears if the destination file already exists:
“Overwrite destination file (y/n)?” |
| Parameters | <i>old-file-url</i> — the file or directory to be moved (see Table 15 for parameter descriptions)
<i>new-file-url</i> — the new destination to place the <i>old-file-url</i> (see Table 15 for parameter descriptions)
force — forces an immediate move of the specified files
file move force executes the command without displaying a user prompt message |

rd

| | |
|--------------------|---|
| Syntax | rd <i>file-url</i> rf
rd <i>file-url</i> [force] |
| Context | file |
| Description | This command removes (deletes) a directory in a file system.

If the directory is empty, the rd command is used to remove it. The force option executes the command without prompting the user to confirm the action.

If the directory contains files and/or subdirectories, the rf parameter must be used to remove the directory. |
| Parameters | <i>file-url</i> — the directory to be removed (see Table 15 for parameter descriptions)
rf — forces a recursive delete (directory and its subdirectories/files)
force — forces an immediate deletion of the specified directory; no user prompt is displayed |

repair

| | |
|--------------------|---|
| Syntax | repair [<i>flash-id</i>] |
| Context | file |
| Description | This command checks a compact flash device for errors and repairs any errors found. |
| Parameters | <i>cflash-id</i> — the compact flash slot ID to be shut down or enabled. When a specific <i>cflash-id</i> is specified, then that drive is shut down. If no <i>cflash-id</i> is specified, the drive referred to by the current working directory is assumed. If a slot number is not specified, then the active CSM is assumed.

Values see Table 15 for parameter descriptions and values
Default the current compact flash device |

scp

| | |
|--------------------|---|
| Syntax | scp <i>local-file-url</i> <i>destination-file-url</i> [router <i>router-instance</i>] [force]
scp <i>local-file-url</i> <i>destination-file-url</i> [service <i>service-name</i>] [force] |
| Context | file |
| Description | This command copies a local file to a remote host file system. It uses ssh for data transfer, and uses the same authentication and provides the same security as ssh . When the command is entered, the following prompt appears: |

“Are you sure (y/n)?”

The destination must specify a user and a host.

Parameters *local-file-url* — the local source file or directory (see [Table 15](#) for parameter descriptions)

destination-file-url — the destination file:

Values

| | |
|--------------------------------|---|
| <i>user@hostname:file-path</i> | 255 characters maximum |
| <i>user:</i> | the SSH user, 32 characters maximum |
| <i>hostname:</i> | <i>dns-name</i> <i>ipv4-address</i> “[<i>ipv6-address</i>]” (IPv6 address must be enclosed in square brackets) |
| <i>dns-name:</i> | 128 characters maximum |
| <i>ipv4-address:</i> | a.b.c.d |
| <i>ipv6-address:</i> | x:x:x:x:x:x[- <i>interface</i>]
x:x:x:x:x:d.d.d.d[- <i>interface</i>]
x: [0..FFFF]H
d: [0..255]D
<i>interface</i> : the interface name, 32 characters maximum, mandatory for link local addresses |
| <i>file-path:</i> | the destination file path, 200 characters maximum, directory length is 99 characters maximum each |

router-instance — specifies the router name or service ID

| | |
|---------------|--------------------------------------|
| Values | <i>router-name:</i> Base, management |
| | <i>service-id:</i> 1 to 2147483647 |

Default Base

service-name — specifies the service name, 64 characters maximum

force — forces an immediate copy of the specified file

file scp *local-file-url destination-file-url* [**router** *router-instance* | **service-name** *service-name*] **force** executes the command without displaying a user prompt message

shutdown

| | |
|--------------------|---|
| Syntax | [no] shutdown [active] [standby]
[no] shutdown <i>flash-id</i> |
| Context | file |
| Description | This command shuts down (unmounts) the specified CSMs. |

Use the **no shutdown [active] [standby]** command to enable one or both CSMs.

Use the **no shutdown *flash-id*** command to enable a compact flash (cf3: on all platforms; cf1: or cf2: on the 7705 SAR-18) on the CSM. The **no shutdown** command can be issued for a specific slot when no compact flash is present. When a compact flash is installed in the slot, the device will be activated upon detection.

In redundant systems, use the **no shutdown** command on cf3: on both CSMs in order to facilitate synchronization. See the [synchronize](#) command in the **config>redundancy** context.

The **shutdown** command must be issued prior to removing a compact flash. If no parameters are specified, the drive referred to by the current working directory will be shut down.

LED status indicators — the following states are possible for the compact flash:

Operational: If a compact flash is present in a drive and operational (**no shutdown**), the respective LED is lit green. The LED flickers when the compact flash is accessed. Do **not** remove the compact flash during a read/write operation.

State: admin = up, operational = up, equipped

Flash defective: If a compact flash is defective, the respective LED blinks amber to reflect the error condition and a trap is raised.

State: admin = up/down, operational = faulty, equipped = no

Flash drive shut down: When the compact flash drive is shut down and a compact flash is present, the LED is lit amber. In this state, the compact flash can be ejected.

State: admin = down, operational = down, equipped = yes

No compact flash present, drive shut down: If no compact flash is present and the drive is shut down, the LED is unlit.

State: admin = down, operational = down, equipped = no

No compact flash present, drive enabled: If no compact flash is present and the drive is not shut down, the LED is unlit.

State: admin = up, operational = down, equipped = no

Ejecting a compact flash: The compact flash drive should be shut down before ejecting a compact flash. The LED should turn to solid (not blinking) amber. This is the only way to safely remove the compact flash. If a compact flash drive is not shut down before a compact flash is ejected, the LED blinks amber for approximately 5 s before shutting off.

State: admin = down, operational = down, equipped = yes

The **shutdown** or **no shutdown** state is not saved in the configuration file. Following a reboot, all compact flash drives are in their default state.

Default no shutdown — compact flash device is administratively enabled

Parameters *cflash-id* — the compact flash slot ID to be shut down or enabled. If a *cflash-id* is specified, the drive is shut down or enabled. If no *cflash-id* is specified, the drive referred to by the current working directory is assumed. If a slot number is not specified, the active CSM is assumed.

Values see [Table 15](#) for parameter descriptions and values

active — all drives on the active CSM are shut down or enabled

standby — all drives on the standby CSM are shut down or enabled

If both **active** and **standby** keywords are specified, all drives on both CSMs are shut down or enabled.

type

Syntax **type file-url**

Context file

Description This command displays the contents of a text file.

Parameters *file-url* — the file contents to display (see [Table 15](#) for parameter descriptions)

version

Syntax **version file-url [check]**

Context file

Description This command displays the version of a TiMOS both.tim file.

Parameters *file-url* — the filename of the target file (see [Table 15](#) for parameter descriptions)
check — validates the .tim file

Output The following example shows the version of a TiMOS both.tim file.

Output Example

```
A:ALU-1# file version cf3:/both.tim
TIMOS-B-0.0.R1 for NOKIA SAR 7705
A:ALU-1# file version ftp://timos:timos@xxx.xxx.xx.xx/./both.tim check
Validation successful
TIMOS-I-0.0.R1 for NOKIA SAR 7705
B:Performance#
```

5 Boot Options

This chapter provides information about configuring boot option parameters.

Topics in this chapter include:

- [System Initialization](#)
- [Initial System Startup Process Overview](#)
- [Boot Loader File Protection](#)
- [Accessing the CLI](#)
- [Accessing the Management Port on a 7705 SAR-W](#)
- [Accessing MPT Radios Connected to a 7705 SAR](#)
- [Configuration Notes](#)
- [Configuring Boot File Options with the CLI](#)
- [BOF Command Reference](#)

5.1 System Initialization

Depending on the chassis, the primary copy of 7705 SAR software is located either on a removable compact flash card that is shipped with the 7705 SAR router or in the router on-board flash memory. The compact flash (**cf3**) contains a copy of the 7705 SAR image, the bootstrap file (**boot.ldr**), and the boot option file (BOF). The compact flash can also be used to store configurations and executable images. These configurations and images can also be stored at an FTP file location.

The following chassis have removable compact flash cards:

- 7705 SAR-8 Shelf V2
- 7705 SAR-18
- 7705 SAR-H
- 7705 SAR-M

All other chassis have integrated memory that cannot be removed.



Note: In most cases you must have a console connection in order to access the node when there is no network connectivity to the node. Some commands can be given to the node through the ACO/LT button before there is network connectivity. See [Automatic Discovery Protocol](#). Also refer to the appropriate chassis installation guide, “Automatic Discovery Protocol”.

Starting a 7705 SAR begins with hardware initialization (a reset or power cycle). By default, the system searches the compact flash (cf3) for the **boot.ldr** file (also known as the boot loader or bootstrap file). The **boot.ldr** file is the image that reads and executes the system initialization commands configured in the BOF. The default value to initially search for the **boot.ldr** file on cf3 cannot be modified.

If the system cannot load or cannot find the **boot.ldr** file on the compact flash memory device (cf3), the system will reboot continuously in an attempt to successfully find and load the file. If this happens, the available options depend on the chassis.

For the 7705 SAR-8 Shelf V2 and 7705 SAR-18, there are two options:

- remove the compact flash, connect it to a PC, and download another software package from OLCS; contact your Nokia support representative for detailed instructions
- return the faulty CSM to Nokia for replacement

For the 7705 SAR-M, there are two options:

- remove the compact flash, connect it to a PC, and download another software package from OLCS; contact your Nokia support representative for detailed instructions
- return the faulty chassis to Nokia for replacement

For the 7705 SAR-H, there are one or two options:

- if the compact flash is accessible, connect it to a PC, and download another software package from OLCS; contact your Nokia support representative for detailed instructions
- return the faulty chassis to Nokia for replacement

For the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-Hc, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X, return the faulty chassis to Nokia for replacement.

When the bootstrap image is loaded, the BOF is read to obtain the location of the image and configuration files. The BOF should be located on the same compact flash drive as the **boot.ldr** file. If the BOF cannot be found or loaded, the system prompts the user for alternate software and configuration file locations.

The following example displays the output when the boot sequence is interrupted.

```

...

Hit a key within 3 seconds to change boot parms...
You must supply some required Boot Options. At any prompt, you can type:
  "restart" - restart the query mode.
  "reboot"  - reboot.
  "exit"    - boot with existing values.

Press ENTER to begin, or 'flash' to enter firmware update...

Software Location
-----
  You must enter the URL of the TiMOS software.
  The location can be on a Compact Flash device,
  or on the network.

  Here are some examples
  cf3:/timos2.0R1
  ftp://user:passwd@192.168.xx.xxx/./timos2.0R1
  tftp://192.168.xx.xxx/./timos2.0R1

The existing Image URL is 'ftp://*.*@192.168.xx.xxx/./rel/0.0/xx'
Press ENTER to keep it.
Software Image URL:
Using: 'ftp://*.*@192.168.xx.xxx/./rel/0.0/xx'

Configuration File Location
-----

```

You must enter the location of configuration file to be used by TiMOS. The file can be on a Compact Flash device, or on the network.

Here are some examples
 cf1:/config.cfg
 ftp://user:passwd@192.168.xx.xxx/./config.cfg
 tftp://192.168.xx.xxx/./config.cfg

The existing Config URL is 'cf3:/config.cfg'
 Press ENTER to keep it, or the word 'none' for no Config URL.
 Config File URL:
 Using: 'cf3:/config.cfg'

Network Configuration

 You specified a network location for either the software or the configuration file. You need to assign an IP address for this system.

The IP address should be entered in standard dotted decimal form with a network length.
 example: 192.168.xx.xxx/24

Display on Non-Redundant Models

The existing IP address is 192.168.xx.xxx/20. Press ENTER to keep it.
 Enter IP Address:
 Using: 192.168.xx.xxx/20

Display on Redundant Models

The existing Active IP address is 192.168.xx.xxx/20. Press ENTER to keep it.
 Enter Active IP Address:
 Using: 192.168.xx.xxx/20

The existing Standby IP address is 192.168.xx.xxx/20. Press ENTER to keep it.
 Enter Standby IP Address (Type 0 if none desired):
 Using: 192.168.xx.xxx/20

Would you like to add a static route? (yes/no) y

Static Routes

 You specified network locations which require static routes to reach. You will be asked to enter static routes until all the locations become reachable.

Static routes should be entered in the following format:
 prefix/mask next-hop ip-address
 example: 192.168.xx.xxx/16 next-hop 192.168.xx.xxx

Enter route: 1.x.x.0/24 next-hop 192.168.xx.xxx


```

OK

Would you like to add another static route? (yes/no) n

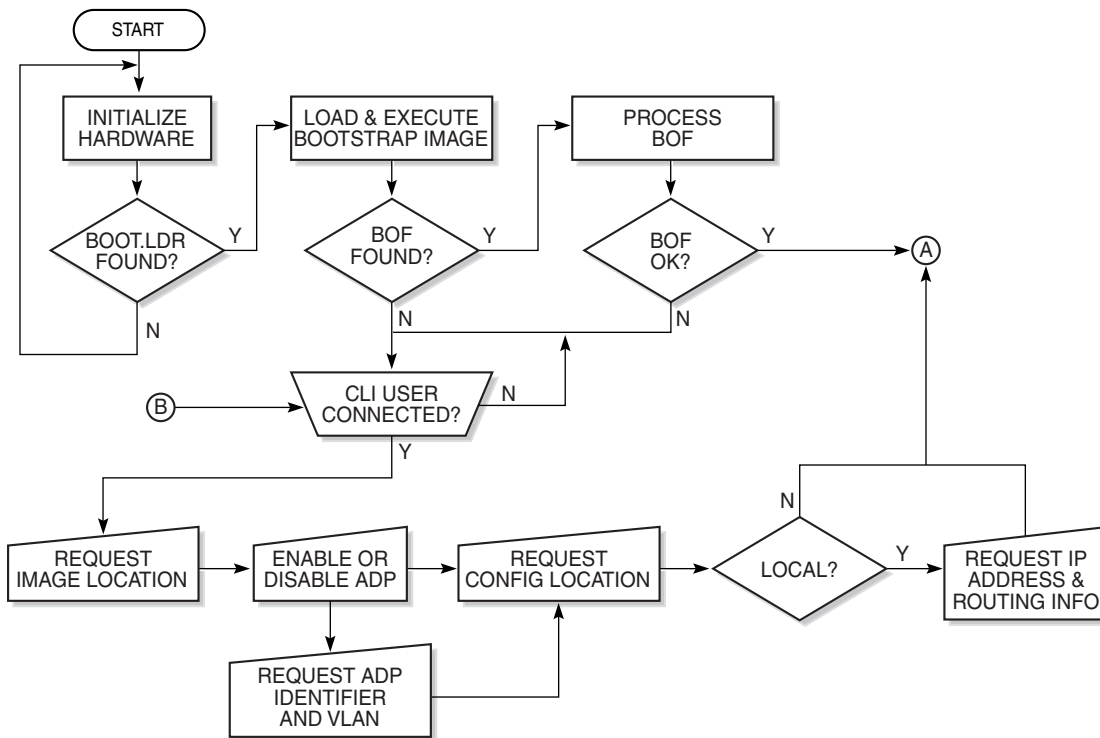
New Settings
-----
primary-image      ftp://*.*@192.168.xx.xx/./rel/0.0/xx
primary-config     cf3:/config.cfg
address            192.168.xx.xx/20 active
primary-dns        192.168.xx.xx
dns-domain         xxx.xxx.com
static-route       1.x.x.0/24 next-hop 192.168.xx.xxx
autonegotiate
duplex             full
speed              100
wait               3
persist            off

Do you want to overwrite cf3:/bof.cfg with the new settings? (yes/no) : y

Successfully saved the new settings in cf3:/bof.cfg
    
```

Figure 5 displays the system initialization sequence.

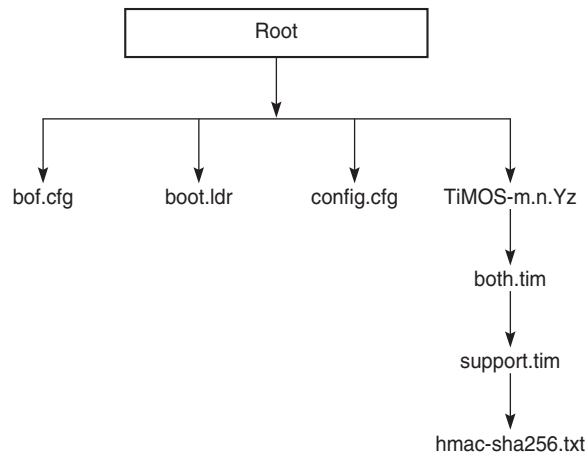
Figure 5 System Initialization - Part 1



21702

Figure 6 displays the compact flash directory structure and filenames.

Figure 6 Files on the Compact Flash



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Files on the compact flash are:

- bof.cfg — boot option file
- boot.ldr — bootstrap image
- config.cfg — default configuration file
- TiMOS-m.n.Yz:
 - m — major release number
 - n — minor release number
 - Y: type of release
 - A — Alpha release
 - B — Beta release
 - M — maintenance release
 - R — released software
 - z — version number
 - both.tim — CSM image file
 - support.tim — field-programmable gate array (FPGA) file
 - hmac-sha256.txt



Note:

- The support.tim file is included in the software bundles for the following platforms only: 7705 SAR-8 Shelf V2, 7705 SAR-18, 7705 SAR-H, 7705 SAR-M, and 7705 SAR-X.
- The hmac-sha256.txt file is supported in FIPS-140-2 mode only. See [FIPS-140-2 Mode](#) for more information.

5.1.1 Configuration and Image Loading

When the system executes the **boot.ldr** file, the initialization parameters from the BOF are processed. Three locations can be configured for the system to search for the files that contain the runtime image. The locations can be local or remote. The first location searched is the primary image location. If not found, the secondary image location is searched, and lastly, the tertiary image location is searched.

If the files cannot be found or loaded, the system enters a console message dialog session prompting the user to enter alternate file locations and filenames.

When the runtime image is successfully loaded, control is passed from the bootstrap loader to the image. Depending on the options in the BOF file, the runtime image loads the configuration in one of two ways.

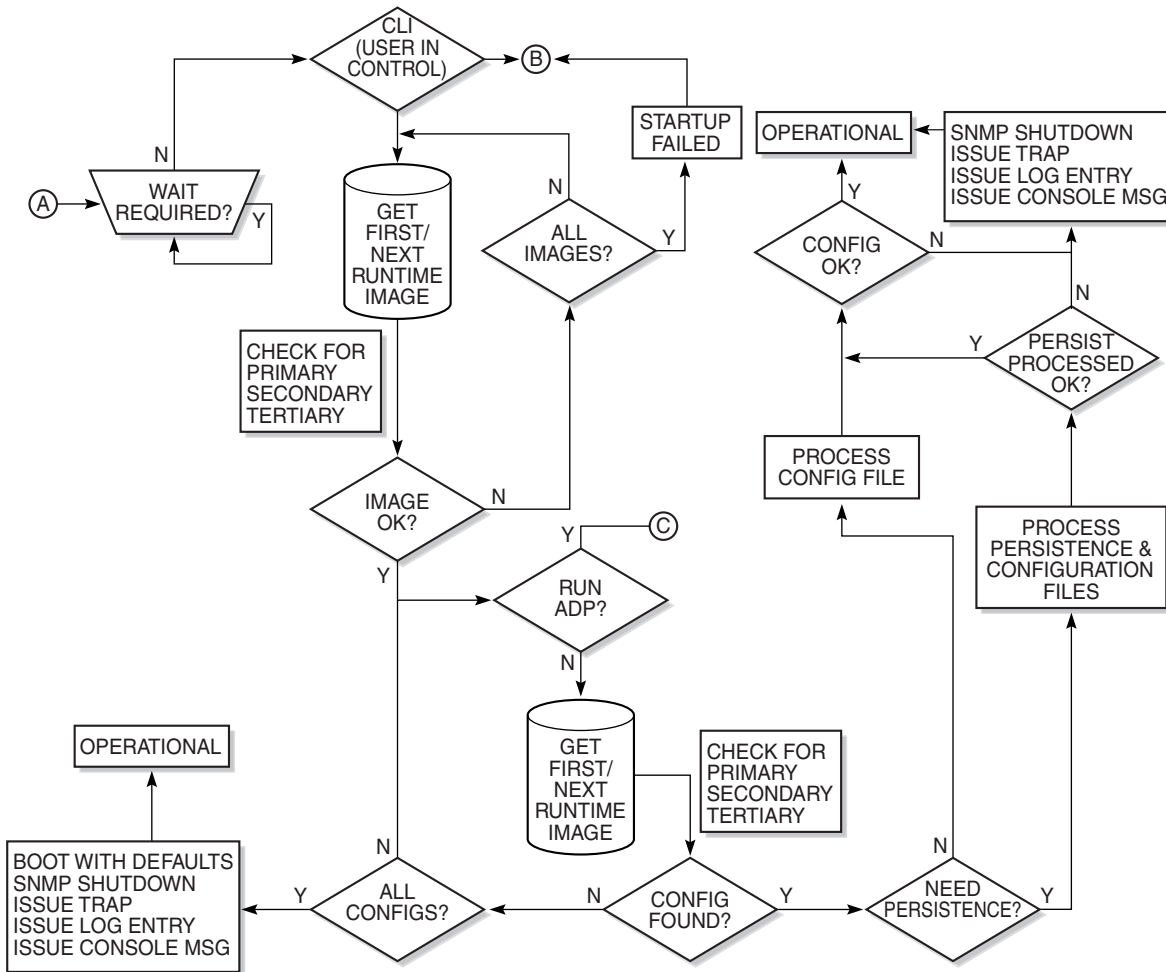
If ADP is enabled, no configuration files are processed at startup. Instead, ADP discovers the node configuration from the network and the **primary-config** file is generated based on the configuration discovered by ADP. Any existing **primary-config** file is backed up, then overwritten.

If ADP is not enabled, the runtime image attempts to locate the configuration file as configured in the BOF. Like the runtime image, three locations can be configured for the system to search for the configuration file. The locations can be local or remote. The first location searched is the primary configuration location. If not found, the secondary configuration location is searched, and lastly, the tertiary configuration location is searched.

The configuration file includes chassis, CSM, adapter card and port configurations, as well as system, routing, and service configurations.

[Figure 7](#) displays the boot sequence.

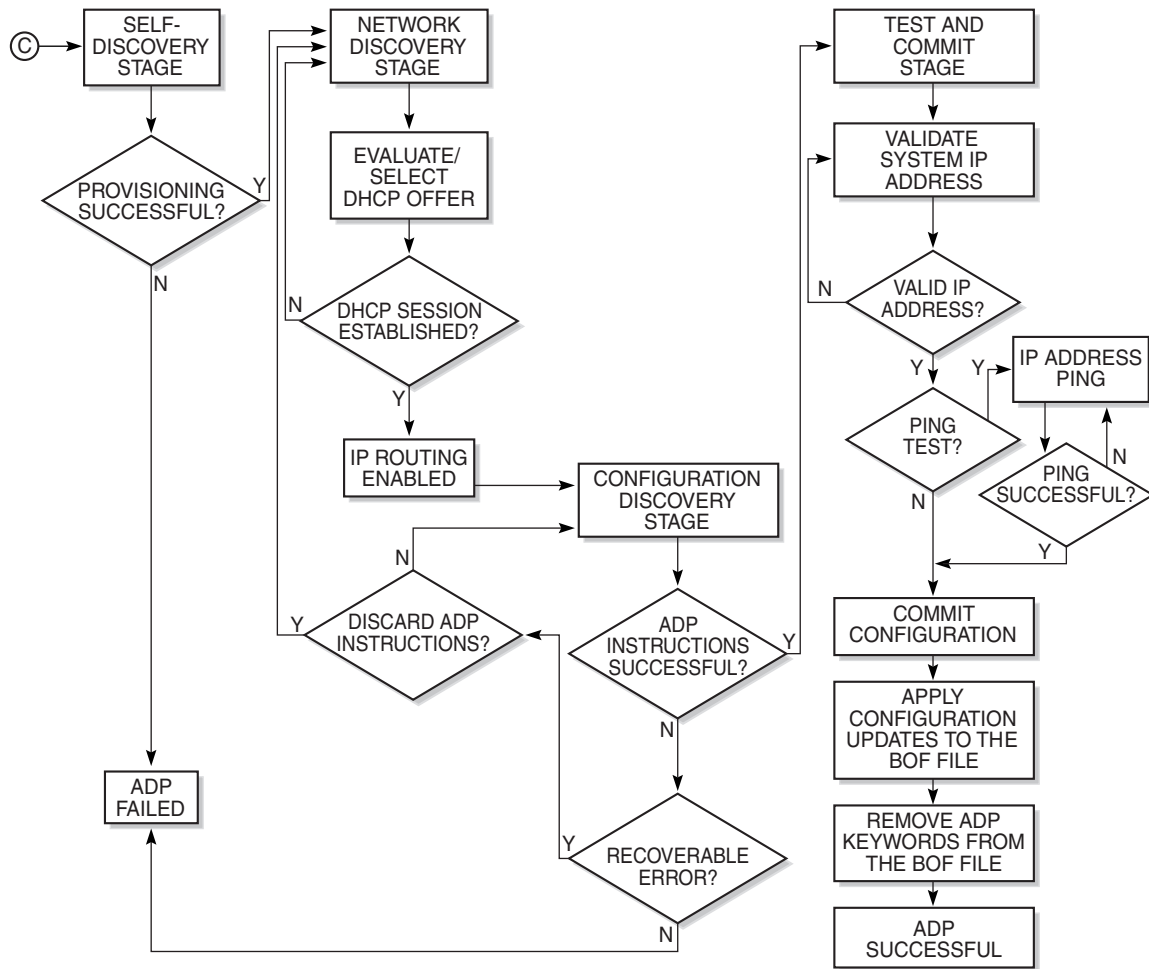
Figure 7 System Initialization - Part 2



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Figure 8 shows the boot sequence if Automatic Discovery Protocol (ADP) is run on the system.

Figure 8 System Initialization With ADP



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5.1.1.1 Persistence

The BOF **persist** parameter can specify whether the system should preserve system indexes when a **save** command is executed. During a subsequent boot, the index file is read along with the configuration file. As a result, a number of system indexes are preserved between reboots, including the interface index, LSP IDs, and path IDs. If persistence is not required and the configuration file is successfully processed, the system becomes operational. If persistence is required, a matching **x.ndx** file must be located and successfully processed before the system can become operational. Matching files (configuration and index files) must have the same filename prefix, such as **test123.cfg** and **test123.ndx**, and are created at the same time when a **save** command is executed. The persistence option must be enabled to deploy the Network Management System (NMS). The default is off.

Traps, logs, and console messages are generated if problems occur, and SNMP shuts down for all SNMP gets and sets; however, traps are issued.

5.1.2 Automatic Discovery Protocol

Automatic Discovery Protocol (ADP) is triggered by a factory-installed boot option and automates the initial commissioning of 7705 SAR nodes. When the 7705 SAR is started for the first time, an ADP keyword in the BOF causes automatic discovery to run as part of the TiMOS application image. Refer to the appropriate chassis installation guide, “Automatic Discovery Protocol”, for more information on ADP.

ADP supports null, dot1q, and qinq encapsulation on:

- all ports on the 8-port Ethernet Adapter card
- all ports on the 6-port Ethernet 10Gbps Adapter card
- all ports on the 8-port Gigabit Ethernet Adapter card
- all ports on the 10-port 1GigE/1-port 10GigE X-Adapter card (supported on the 7705 SAR-18 only)
- all ports on the 6-port SAR-M Ethernet module
- all Ethernet ports on the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X



Caution: For XOR ports, ADP will not run successfully if the connection to the network is made from the SFP connector because the default connector is RJ-45.



Note: ADP is not supported on the 4-port SAR-H Fast Ethernet module.

When run on the system, ADP goes through four basic stages:

- [Self-discovery](#)
- [Network Discovery](#)
- [Configuration Discovery](#)
- [Test and Commit](#)

5.1.2.1 Self-discovery

During the self-discovery stage, all supported adapter cards and CSMs are detected and automatically provisioned. The 7705 SAR then brings up all Ethernet ports. Depending on the physical connectivity of the port, some ports may fail to come up. If at least one port connected to the transport network becomes operationally up, ADP moves to the next stage.

5.1.2.2 Network Discovery

During the network discovery stage, the 7705 SAR sends a DHCP DISCOVER message from all operational ports. [Table 17](#) describes the DHCP DISCOVER message options.

Table 17 DHCP DISCOVER Message Options

| Option | Name | Description |
|--------|-------------------------|---|
| chaddr | Client HW Address | The MAC address of the port |
| 51 | Lease Time | Always set to Infinite |
| 60 | Class Identifier | The class of 7705 SAR router:
ALU-AD SAR-8
ALU-AD SAR-18
ALU-AD SAR-A
ALU-AD SAR-Ax
ALU-AD SAR-H
ALU-AD SAR-Hc
ALU-AD SAR-M
ALU-AD SAR-W
ALU-AD SAR-Wx
ALU-AD SAR-X |
| 61 | Client Identifier | Not sent by default, but can be configured to be the chassis MAC address or an operator-defined string |
| 82 | Relay Agent Information | Network uplink information, such as circuit ID and gateway address, added by the relay agent, if applicable |

No client identifier is sent by default, but you can configure this option during boot-up, or with the **auto-discover** command, to be the chassis MAC address or a unique string. During boot-up, you can also configure the VLAN ID for ADP with dot1q or qinq encapsulation.

The ADP network discovery phase has been enhanced to automatically scan the entire VLAN range on every datapath Ethernet port on supported cards and nodes. During startup a new node will act as an ADP client and send DHCP discovery packets across the entire VLAN range to automatically discover the Ethernet virtual connection (EVC) VLAN. If at least one DHCP discovery packet reaches a server and that server responds with a DHCP offer packet, the ADP client node registers the new interface against that server's VLAN.

5.1.2.3 Configuration Discovery

During the configuration discovery stage, the DHCP server receives the DHCP DISCOVER message and replies with a DHCP OFFER message that contains an IP address assigned to the network interface. Table 18 describes the options included in the DHCP OFFER. If any of the required options are not included, the packet may be dropped and not processed.

Table 18 DHCP OFFER Message Options

| Option | Name | Description | Required |
|--------|-------------------|---|----------|
| yiaddr | Client Ip-Address | The network interface IP address
For network consistency, it is recommended that this IP address be a fixed IP address, not assigned randomly from a DHCP server IP pool | Yes |
| 1 | Subnet Mask | The network interface subnet mask | Yes |
| 3 | Router | The network interface default gateway
Only the first router is used – all others are ignored | No |
| 12 | Host Name | The network interface host name | No |
| 51 | Lease Time | The least time, validated as infinite | Yes |
| 54 | Server Address | Identifies the DHCP server | No |
| 67 | Bootfile Name | Contains the ADP instructions or a URL to an ADP instructions file | No |

DHCP OFFER messages are not dropped if they contain a yiaddr that does not match the local configured subnets on the DHCP relay interface. This applies only to regular IES and VPRN interfaces with **no lease-populate** configured on the DHCP relay interface.

Option 67 contains further configuration information in the form of keyword text files interpreted by ADP as instructions and executed during the Configuration and Test phases. For basic reachability, option 67 is not mandatory; however, it can be used to send the system IP address of a newly discovered node, making it possible to communicate with the NSP NFM-P and complete ADP.

If a system IP address is made available with the DHCP OFFER and a template configuration file is also executed using the **load-cfg** keyword, then the system IP address specified in the template configuration file is used instead of the one in the DHCP OFFER.

Table 19 describes the keywords used in ADP instructions. A DHCP offer message can contain a maximum of 15 instructions in either the Bootfile Name option, or in an external file referenced by the **include** keyword. If more than 15 instructions are included, ADP fails to complete and the system generates an error message in the ADP log.

Table 19 ADP Instructions

| Keyword | Description | Format |
|-----------------|--|-----------------------------------|
| sys-addr | Specifies the system interface IP address and the system base routing instance subnet | sys-addr 10.10.10.1/32 |
| sys-name | Specifies the chassis name | sys-name SITE43_7705 |
| sys-loc | Specifies the chassis location | sys-loc 600_MARCH_ROAD |
| load-cfg | Specifies the URL of a template configuration file to load into the router's runtime configuration | load-cfg ftp://.....@.../7705.cfg |
| test-ip | Specifies an IP address that must be successfully pinged before committing configuration and declaring ADP a success | test-ip 192.20.2.30 |
| include | Specifies the URL of a file containing additional ADP instructions | include ftp://.....@.../7705.tmp |
| Any BOF keyword | Interpreted as instructions to update the specified field in the BOF | As per BOF |

5.1.2.4 Test and Commit

In order for ADP to be declared successful during the test and commit stage, the discovered configuration must contain an IP address. If the optional **test-ip** keyword is included in the ADP instructions, the node pings the IP address included in the DHCP OFFER message. If ADP is successful, the system stores the configuration and opens an SSH session to provide remote operators access to the router.

ADP can be controlled, without a connected PC or ASCII terminal, by the ACO/LT button on the Fan module. You can use the ACO/LT button to terminate or restart ADP, or reboot the chassis.



Note: The ACO/LT button is not available on the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, or 7705 SAR-Wx.

ADP runs in the background to allow continued CLI access for status queries and troubleshooting. Periodic progress updates are sent to the console and can be viewed through a connected PC. Additionally, dump commands are available to display information and detailed logs about ADP during and after running on the system. The logs are not retained over a chassis reboot.

ADP runs only once on a router during initial startup if the automatic discovery is successful. The learned network interface configuration is retained in the local database. On subsequent reboots, the router uses its local database to reload its network configuration. After ADP successfully completes, or if it is manually terminated, the system sends a command to the BOF to remove the ADP keyword. You can terminate ADP at any time while it is running by using the CLI or the ACO/LT button.

Any temporary configuration done by ADP is not stored; however, network configuration and remote access remain enabled to allow the router to be manually provisioned remotely. ADP does not run again on future system reboots unless it is re-enabled via the CLI. If a standby CSM with ADP enabled is inserted into a running system that does not have the ADP keyword in its BOF file, the ADP keyword is automatically removed from the inactive card's BOF file during reconcile.

5.1.3 FIPS-140-2 Mode

The 7705 SAR provides the **fips-140-2** boot command to allow a node to run in FIPS-140-2 mode. This mode limits the use of cryptographic algorithms on both the CSM and data plane to only those that are in accordance with security level 1 of the Federal Information Processing Standards 140 series, version 2 (FIPS-140-2).

FIPS-140-2 mode is supported on the CSM on all 7705 SAR platforms that are equipped with a CSM.

FIPS-140-2 mode is supported on both the CSM and data plane on the following platforms:

- 7705 SAR-8 Shelf V2 and 7705 SAR-18 when equipped with the following adapter cards:
 - 8-port Gigabit Ethernet Adapter card, version 3
 - 2-port 10GigE (Ethernet) Adapter card

- 10-port 1GigE/1-port 10GigE X-Adapter card, version 2 (supported on the 7705 SAR-18 only)
- 7705 SAR-Ax
- 7705 SAR-H
- 7705 SAR-Hc
- 7705 SAR-W
- 7705 SAR-Wx
- 7705 SAR-X

On the 7705 SAR-A and 7705 SAR-M, FIPS-140-2 mode is supported on the CSM only.

To support the implementation of FIPS-140-2, the TiMOS software image contains an HMAC-SHA-256 secret key that is verified upon boot-up. When FIPS-140-2 is enabled on the node, an HMAC-SHA-256 integrity check is performed during the loading of the both.tim file to ensure that the calculated HMAC-SHA-256 secret key of the loaded image matches that stored in the hmac-sha256.txt file. This is a signature file that has been added to the TiMOS software image and only applies to FIPS-140-2.



Note: The hmac-sha256.txt file must be stored in the same directory as the TiMOS image.

If the image fails the HMAC-SHA-256 check, the node does not boot up, an error message is displayed, and the node tries to reboot the load after a delay of 60 s. The node keeps trying to reboot until the operator cancels the reboot. If the software image is verified by the HMAC-SHA-256 check, the node boots up normally and a message indicating that the software load has passed verification is displayed.

The node performs its normal boot-up sequence, including reading the config.cfg file and loading the configuration. The config.cfg file that is used to boot the node in FIPS-140-2 mode must not contain any configuration that is not supported by the FIPS-140-2 implementation. If such a configuration is present in the config.cfg file when the node boots up, the node loads the config.cfg file until the unsupported configuration is reached and then stops. A failure message is also displayed.

When the node boots in FIPS-140-2 mode, Cryptographic Module Validation Program (CMVP) startup tests are executed on the CSM and applicable data plane. CMVP conditional tests, such as manual key entry tests, pairwise consistency checks, and RNG tests, are executed when required during normal operation.

5.1.3.1 CSM and Data Path Security Features and Algorithms in FIPS-140-2 Mode

Table 20 and Table 21 show the CSM and data path security features and associated algorithms for a 7705 SAR node running in FIPS-140-2 mode.

Table 20 CSM Algorithms

| FIPS-140-2 CSM Algorithms | SSHv2 | IPSec (IKEv1, IKEv2) | NGE | SNMPv3 | SCP, SFTP | IGP, BGP, MPLS | PKI |
|---------------------------|---|--|-----|--------------------|-----------|--|--|
| Authentication | RSA 2048
DSA 1024
Preference to RSA in SSH negotiation | PSK
(DH G14,
DH G15) | SSH | N/A | SSH | N/A | N/A |
| Asymmetric Key | DH G14
($P \geq 2K$ prime numbers,
$q > 224$) | DH G14,
DH G15
($P \geq 2K$ prime numbers,
$q > 224$) | SSH | N/A | SSH | N/A | RSA/
DSA 2048 |
| Symmetric Key | AES-CBC
(128,192, 256)
3DES-CBC | AES-CBC
(128,192, 256)
3DES-CBC | N/A | AES-128 | SSH | N/A | N/A |
| Hash Algorithm | SHA-1 (128)
–HMAC-MD5
–HMAC-RIPEMD-160
–HMAC-SHA1-96
–HMAC-MD5-96 | SHA-1 (128)
SHA-2
(256, 384, 512) | N/A | SHA-1
(SHA-128) | SSH | SHA-1
(128)
SHA-2
(256)
AES-18-
CMAC-96 | SHA1
SHA-224
SHA-256
SHA-384
SHA-512 |
| Digital Signature | RSA 2048
DSA 1024 | N/A | N/A | N/A | N/A | N/A | RSA/
DSA 2048 |



Note: MD5 algorithms are not blocked from configuration in FIPS-140-2 mode. Although MD5 is not a FIPS-140-2-approved algorithm, it is allowed to be used when running in FIPS-140-2 mode.

Table 21 Data Path Algorithms

| FIPS-140-2 Data Path Algorithms | SSHv2 | IPSec | NGE/L3 Encryption | SNMPv3 | SCP, SFTP | IGP, BGP, MPLS |
|---------------------------------|-------|--------------------------------------|--------------------|--------|-----------|----------------|
| Authentication | N/A | N/A | N/A | N/A | N/A | N/A |
| Asymmetric Key | N/A | N/A | N/A | N/A | N/A | N/A |
| Symmetric Key | N/A | AES-CBC (128, 192, 256)
3DES-CBC | AES-CBC (128, 256) | N/A | N/A | N/A |
| Hash Algorithm | N/A | SHA-1 (128)
SHA-2 (256, 384, 512) | N/A | N/A | N/A | N/A |

5.1.3.2 SSHv2 Approved Algorithms in FIPS-140-2 Mode

SSHv1 is not supported in FIPS-140-2 mode and is therefore blocked from configuration; only SSHv2 is supported. The following algorithms, configured using the **client-cipher-list** or **server-cipher-list** command, are available for SSHv2 when the node is running in FIPS-140-2 mode:

- aes128-cbc
- 3des-cbc
- aes192-cbc
- aes256-cbc
- aes128-ctr
- aes192-ctr
- aes256-ctr

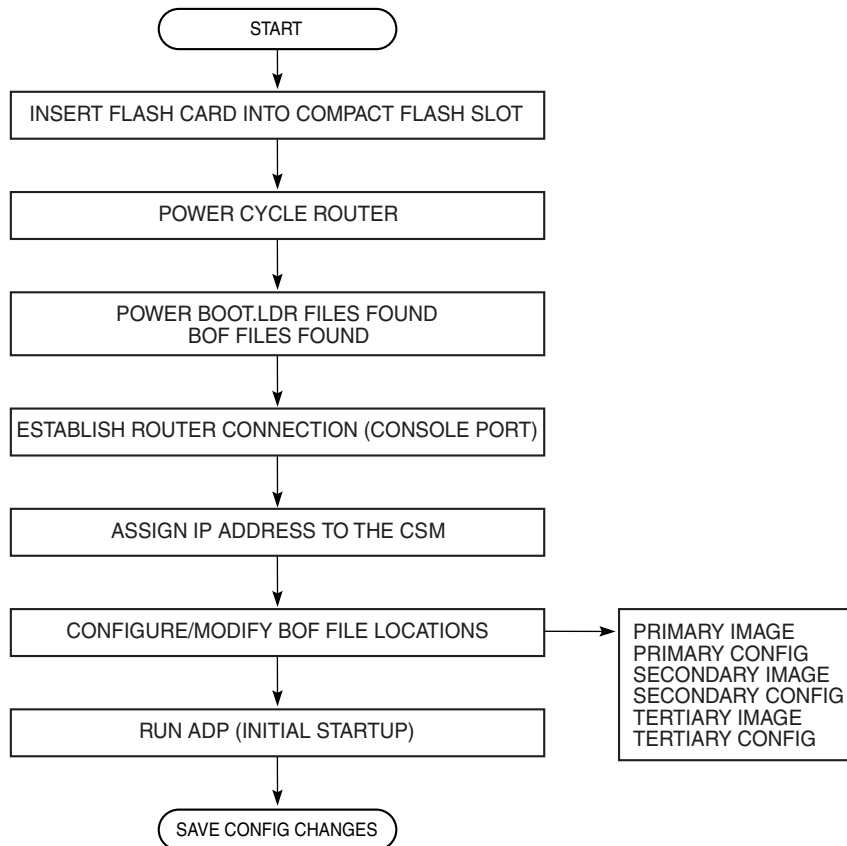
The following algorithms are not available for SSHv2 when the node is running in FIPS-140-2 mode:

- blowfish-cbc
- cast128-cbc
- arcfour
- rijndael-cbc

5.2 Initial System Startup Process Overview

Figure 9 displays the process for starting a system that has a removable compact flash. This example assumes that the boot loader, BOF, and the image and configuration files are successfully located. For a system with a non-removable compact flash, the first step in Figure 9 does not apply.

Figure 9 System Startup Flow



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5.3 Boot Loader File Protection

Nokia recommends that the boot loader file on all 7705 SAR platforms be upgraded using a specific command. This command is mandatory on all 7705 SAR platforms that do not have a removable compact flash drive and is part of a mechanism that protects the boot loader file from accidental overwrites on these platforms.

The command checks that the new **boot.ldr** file is a valid image and that it is at least a minimum supported variant for the hardware platform on which it is being loaded. Once this has been verified, the command overwrites the **boot.ldr** file that is stored on the system.

5.3.1 Before Upgrading

Before starting the upgrade, all 7705 SAR image files must be copied to the cf3: device on the system. Nokia recommends copying all the image files for a given release into an appropriately named subdirectory off the root directory; for example, cf3:\7705-TiMoS-R6.1.R2. Copying the **boot.ldr** and other files in a given release to a separate subdirectory ensures that all files for that release are available in case it is necessary to downgrade the software version.



Note: On systems that do not have removable flash drives, you cannot overwrite the **boot.ldr** file in the root directory on cf3:. Instead, copy the file into a subdirectory, or allow the **update boot-loader** command to obtain the file from a network address. Nokia strongly recommends following this process for all 7705 SAR systems.

5.3.2 Performing the Upgrade

Upgrade the boot loader file using the command **admin>update boot-loader source_url**, where the source URL specifies the new **boot.ldr** filename and its location; for example, in the format cf3:\sub_directory\boot.ldr.



Warning: The file upgrade command takes several minutes to complete. Do not reset or power down the system, or insert or remove cards or modules, while the upgrade is in progress, as this could render the system inoperable.

On systems with redundant CSMs, the upgraded boot.ldr file can be copied to the secondary CSM by using the command **admin>redundancy>synchronize boot-env**.

Refer to the latest 7705 SAR Software Release Notes, “Standard Software Upgrade Procedure” section, for complete instructions.

5.4 Accessing the CLI

There are three ways to access management of the 7705 SAR:

- console connection
- Telnet connection
- SSH connection

To access the CLI to configure the software for the first time, follow these steps:

1. Ensure that the CSM is installed and power to the chassis is turned on. The 7705 SAR software then automatically begins the boot sequence.
2. When the boot loader and BOF image and configuration files are successfully located, establish a router connection (console session).

5.4.1 Console Connection

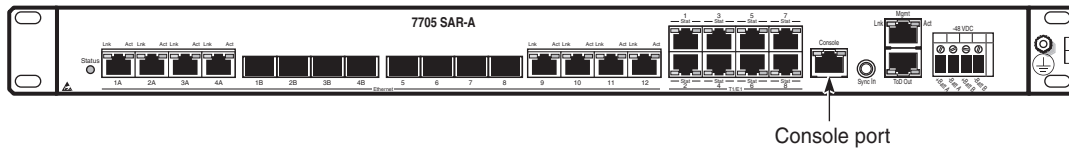
To establish a console connection, you will need the following:

- an ASCII terminal or a PC running terminal emulation software set to the parameters shown in [Table 22](#)
- a standard serial cable with a male DB9 connector

Table 22 Console Configuration Parameter Values

| Parameter | Value |
|--------------|---------|
| Baud Rate | 115 200 |
| Data Bits | 8 |
| Parity | None |
| Stop Bits | 1 |
| Flow Control | None |

[Figure 10](#) displays an example of the Console port on a 7705 SAR front panel.

Figure 10 7705 SAR Console Port

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To establish a console connection:

- Step 1.** Connect the terminal to the Console port on the front panel (Figure 10) using the serial cable.
- Step 2.** Power on the terminal.
- Step 3.** Establish the connection by pressing the <Enter> key a few times on your terminal keyboard.
- Step 4.** At the router prompt, enter the login and password.
The default login is **admin**.
The default password is **admin**.

5.4.2 Telnet Connection

Telnet access via a connection to the Management port provides the same options for user and administrator access as those available through the Console port or SSH. You can access the chassis with a Telnet connection from a PC or workstation connected to the network once the following conditions are met:

- the chassis has successfully initialized
- Telnet connections have been enabled using the **config>system>security>telnet-server** (or **telnet6-server**) command
- the Management port has been configured using the **bof>address** command as shown below.

CLI Syntax: `bof
address ip-prefix/ip-prefix-length [active | standby]`

where:

address is an IPv4 (or IPv6) address

5.4.2.1 Running Telnet

After the Management port IP address is configured, the CLI can be accessed with a Telnet connection. To establish a Telnet connection, run a Telnet program and issue the **telnet** command, followed by the Management port IP address.

The following displays an example of a Telnet login:

```
C:\>telnet 192.168.1.xx1
Login: admin
Password: #####
ALU-1#
```

The default login is **admin**.

The default password is **admin**.

5.4.3 SSH Connection

SSH access via a connection to the Management port provides the same options for user and administrator access as those available through the console port or Telnet; however, SSH is more secure than Telnet. You can access the chassis with an SSH connection from a PC or workstation connected to the network once the following conditions are met:

- the chassis has successfully initialized
- the Management port has been configured using the **bof>address** command as shown below:

CLI Syntax: `bof address ip-prefix/ip-prefix-length [active | standby]`

where:

`address` is an IPv4 or IPv6 address



Note: SSH connection attempts after a reboot may generate key warnings as the node generates new SSH keys on each reboot. To avoid these key warnings, enable key preservation using the **config>system>security>ssh>preserve-key** command.

5.4.3.1 Running SSH

After the IP parameters are configured, the CLI can be accessed with an SSH connection. To establish an SSH connection, run an SSH program and issue the SSH command, followed by -l and the user name (optional), followed by the IP address.

The following displays an example of an SSH connection with the default admin user (the default password is **admin**).

```
C:\>ssh -l admin 192.168.1.xx1
TiMOS-B-0.0.I2263 both/hops NOKIA SAR 7705
Copyright (c) 2016 Nokia.
All rights reserved. All use subject to applicable license agreements.
Built on Wed Jul 30 00:11:49 EDT 2016 by csabuild in /rel0.0/I2263/panos/main

admin@192.168.1.xx1's password: #####
```

5.5 Accessing the Management Port on a 7705 SAR-W

The 7705 SAR-W supports in-band and out-of-band node management communication. The RJ-45 Management port provides physical access for out-of-band communication. When the Inband/Local switch on the chassis is in the Inband position, the management interface on the CSM processor connects to the internal data port on the datapath for in-band management, and the external RJ-45 Management port is disabled.

The internal data port is identified in the CLI as **vrtl-mgmt**, and as port 1/1/6 in SNMP. The **vrtl-mgmt** port only supports access mode and Epipe service, where the port has **encap-type** null, dot1q, or qinq with VLAN 0.

See the “Installation and Provisioning” section in the 7705 SAR-W Chassis Installation Guide for details on setting up in-band management connections.

5.6 Accessing MPT Radios Connected to a 7705 SAR

The Wavence MPT Craft Terminal Launcher (MCT Launcher) is an application that runs on a Windows PC. By connecting the PC to the 7705 SAR out-of-band Management (Mgmt) port on the active CSM, local MPT radios can be configured and monitored using this application.

To reach both local and remote MPT radios, the PC must be connected to an Ethernet data port on an adapter card and requires a service access point (SAP) to enable in-band management. An IES service together with a local DHCP server configured on the 7705 SAR provides this capability to on-site technicians.

The following output shows a configuration example for a local DHCP server and an IES service.

```
A:SAR18>config>port# info
-----
description "Craft Port for MW Technicians"
ethernet
exit
no shutdown
-----

*A:SAR18>config>router>dhcp>server# info
-----
description "DHCP server to serve on-site microwave technician pc"
pool "craft_pool" create
description "Single address pool"
use-gi-address
subnet 192.168.1.0/30 create
options
    subnet-mask 255.255.255.252
    default-router 192.168.1.1
exit
address-range 192.168.1.2 192.168.1.2
exit
no shutdown
-----

*A:SAR18>config>service>ies>if$ info
-----
address 192.168.1.1/30
dhcp
    server 192.168.1.1
    gi-address 192.168.1.1
    no shutdown
exit
local-dhcp-server "craft_dhcp_server"
sap 1/3/2 create
exit
-----
```

Refer to the *Wavence MPT Craft Terminal User Manual for Single NE Mode with 7705 SAR* for information on using the MCT Launcher.

5.7 Configuration Notes

The following describes BOF configuration guidelines and caveats.

- For router initialization on devices with a removable compact flash, the compact flash card must be installed in the compact flash slot.
- The loading sequence is based on the order in which it is placed in the configuration file (not based on service ID, for example) and it is loaded as it is read in at boot time.

5.7.1 Reference Sources

For information on supported IETF drafts and standards as well as standard and proprietary MIBs, refer to [Standards and Protocol Support](#).

5.8 Configuring Boot File Options with the CLI

This section provides information to configure BOF parameters with the CLI.

Topics in this section include:

- [BOF Configuration Overview](#)
- [Basic BOF Configuration](#)
- [Configuring BOF Parameters](#)
- [Service Management Tasks](#)

5.9 BOF Configuration Overview

The 7705 SAR routers do not contain a boot EEPROM. The boot loader code is loaded from the **boot.ldr** file. The BOF file performs the following tasks:

1. Sets up the CSM Management port (speed, duplex, auto)
2. Assigns the IP address for the CSM Management port
3. Creates static routes for the CSM Management port
4. Sets the console port speed
5. Configures the Domain Name System (DNS) name and DNS servers
6. Configures the primary, secondary, tertiary configuration source
7. Configures the primary, secondary, and tertiary image source
8. Configures operational parameters



Note: The CSM Management port is referred to as the CPM Management port in the CLI to align with the CLI syntax used with other SR products.

5.10 Basic BOF Configuration

The parameters that specify the location of the image filename that the router will try to boot from and the configuration file are in the BOF.

The most basic BOF configuration should have the following:

- primary address
- primary image location
- primary configuration location

The following displays an example of a basic BOF configuration.

```
A:ALU-1# show bof
=====
BOF (Memory)
=====
primary-image      ftp://*:*@xxx.xxx.xxx.xx/home/csahwreg17/images/both.tim
primary-config     ftp://*:*@ xxx.xxx.xxx.xx /home/csahwreg17/images/dut-a.cfg
address            xxx.xxx.xxx.xx /24 active
address            xxx.xxx.xxx.xx /24 standby
primary-dns        xxx.xxx.xxx.xx
dns-domain          labs.ca.alcatel-lucent.com
static-route       xxx.xxx.0.0/16 next-hop xxx.xxx.xxx.x
autonegotiate
duplex              full
speed              100
wait               3
persist            off
FIPS-140-2
console-speed      115200
=====
A:ALU-1#
```

5.11 Configuring BOF Parameters

Use the CLI syntax displayed below to configure BOF components:

CLI Syntax: `bof`

```

address ip-prefix/ip-prefix-length [active | standby]
autonegotiate
auto-discover
console-speed baud-rate
dns-domain dns-name
duplex {full | half}
fips-140-2
persist {on | off}
primary-config file-url
primary-dns ip-address
primary-image file-url
save [cflash-id]
secondary-config file-url
secondary-dns ip-address
secondary-image file-url
speed speed
static-route ip-prefix/ip-prefix-length next-hop ip-
address
tertiary-config file-url
tertiary-dns ip-address
tertiary-image file-url
wait seconds

```

The following example displays BOF command usage:

Example:

```

ALU-1# bof
ALU-1>bof# address 10.10.10.103/8 active
ALU-1>bof# dns-domain ca.alcatel.com
ALU-1>bof# duplex full
ALU-1>bof# fips-140-2
ALU-1>bof# persist on
ALU-1>bof# wait 3
ALU-1>bof# primary-image cf3:\TIMOS.5.0.R0
ALU-1>bof# primary-config cf3:\test123.cfg
ALU-1>bof# primary-dns 10.10.10.103
ALU-1>bof# save cf3:

```

```
A:ALU-1# show bof
=====
BOF (Memory)
=====
primary-image      ftp://*:*@xxx.xxx.xxx.xx/home/csahwreg17/images/both.tim
primary-config    ftp://*:*@ xxx.xxx.xxx.xx /home/csahwreg17/images/dut-a.cfg
address           xxx.xxx.xxx.xx /24 active
address           xxx.xxx.xxx.xx /24 standby
primary-dns       xxx.xxx.xxx.xx
dns-domain        labs.ca.alcatel-lucent.com
static-route      xxx.xxx.0.0/16 next-hop xxx.xxx.xxx.x
autonegotiate
duplex            full
speed            100
wait              3
persist           off
FIPS-140-2
console-speed     115200
=====
A:ALU-1#
```

5.12 Service Management Tasks

This section describes system administration commands.

5.12.1 System Administration Commands

Use the following administrative commands to perform management tasks.

CLI Syntax:

```
ALU-1# admin
      display-config
      reboot [active | standby | upgrade] [now]
      save [file-url] [detail] [index]
```

5.12.1.1 Viewing the Current Configuration

Use the following CLI command to display the current configuration. The **detail** option displays all default values. The **index** option displays only the persistent indexes.

CLI Syntax: admin# display-config [detail | index]

The following displays an example of a configuration file:

```
A:ALU-1# admin display-config
# TiMOS-B-0.0.R3 both/hops NOKIA SAR 7705
# Copyright (c) 2018 Nokia.
# All rights reserved. All use subject to applicable license agreements.
# Built on Wed Jan 17 01:05:13 EST 2016 by csabuild in /re8.0/I297/panos/main

# Generated THU JAN 18 21:21:21 2018 UTC

exit all
configure
#-----
echo "System Configuration"
#-----
  system
    name "ALU-1"
  exit
  login-control
    idle-timeout disable
    pre-login-message "CSAxxx - 7705" name
  exit
  time
    sntp
      server-address 192.0.2.37 preferred
```

```
        server-address 192.0.2.200
        no shutdown
    exit
    zone EST
exit
thresholds
    rmon
    exit
exit
exit
exit
#-----
echo "System Security Configuration"
#-----
    system
        security
            telnet-server
            ftp-server
            snmp
    exit
...exit all

# Finished THU JAN 17 21:57:11 2016 UTC
A:ALU-1#
```

5.12.1.2 Modifying or Deleting BOF Parameters

You can modify or delete BOF parameters. The **no** form of these commands removes the parameter from configuration. The changes remain in effect only during the current power cycle unless a **save** command is executed. Changes are lost if the system is powered down or the router is rebooted without saving.



Caution: All BOF parameters can be configured, modified, or deleted locally through a console session or remotely using Telnet or SSH. However, when modifying or deleting the BOF address, the following behaviors must be considered.

- If you have a dual IPv4/IPv6 BOF address configuration and you are running a Telnet IPv6 session or an SSH session, changing or deleting the active IPv4 address will not affect the session.
- If you have a dual IPv4/IPv6 BOF address configuration and you are running a Telnet IPv4 session or an SSH session, changing or deleting the active IPv6 address will not affect the session.
- If you have a dual IPv4/IPv6 BOF address configuration and you change or delete the active IP address that is the same version as the session (for example, you delete the active IPv4 address while running a Telnet IPv4 session), the session will hang once the change executes, and CLI access will be lost. You can either close the session (if possible) or wait until it times out. You must start a new session, using the new or existing active BOF address, to regain CLI access.
- If there is only **one** active BOF address on the port (that is, not the dual IPv4/IPv6 configuration), and it is deleted through a Telnet or SSH session, the session will hang and CLI access will be lost. You must use a directly connected console session to create a new BOF address. It is strongly recommended that you do not delete a single active BOF address through Telnet or SSH.

Use the following CLI syntax to remove BOF configuration parameters:

CLI Syntax: `bof# save [cflash-id]`

Example:

```
ALU-1# bof
ALU-1>bof# save cf3:
ALU-1>bof#
```

Example:

```
bof#
  no address ip-prefix/ip-prefix-length [active |
  standby]
  no autonegotiate
  no console-speed
  no dns-domain
  no primary-config
  no primary-dns
  no primary-image
  no secondary-config
  no secondary-dns
  no secondary-image
  no static-route ip-prefix/ip-prefix-length next-hop
  ip-address
  no tertiary-config
  no tertiary-dns
  no tertiary-image
```

5.12.1.3 Saving a Configuration

If you modify a configuration file, the changes remain in effect only during the current power cycle unless a **save** command is executed. Changes are lost if the system is powered down or the router is rebooted without saving.

- Specify the file URL location to save the running configuration. If a destination is not specified, the files are saved to the location where the files were found for that boot sequence. The same configuration can be saved with different filenames to the same location or to different locations.
- The **detail** option adds the default parameters to the saved configuration.
- The **index** option forces a save of the index file.

Use either of the following CLI syntaxes to save a configuration:

CLI Syntax: `bof# save [cflash-id]`

Example:

```
ALU-1# bof
ALU-1>bof# save cf3:
ALU-1>bof#
```

CLI Syntax: `admin# save [file-url] [detail] [index]`

Example:

```
ALU-1# admin save cf3:\test123.cfg
Saving config.# Saved to cf3:\test123.cfg
... complete
ALU-1#
```



Note: If the **persist** option is enabled and the **admin save file-url** command is executed with an FTP path used as the *file-url* parameter, two FTP sessions simultaneously open to the FTP server. The FTP server must be configured to allow multiple sessions from the same login; otherwise, the configuration and index files will not be saved correctly.

5.12.1.4 Saving a Configuration to a Different Filename

Save the current configuration with a unique filename to have additional backup copies and to edit parameters with a text editor. You can save your current configuration to an ASCII file.

Use either of the following CLI syntaxes to save a configuration to a different location:

CLI Syntax: bof# save [*cflash-id*]

Example: ALU-1# bof
ALU-1>bof# save cf3:
ALU-1>bof#

or

CLI Syntax: admin# save [*file-url*] [*detail*] [*index*]

Example: ALU-1>admin# save cf3:\testABC.cfg
Saving config.# Saved to cf3:\testABC.cfg
... complete
ALU-1#

5.12.1.5 Rebooting

When an **admin>reboot** command is issued, routers with redundant CSMs are rebooted. Changes are lost unless the configuration is saved. Use the **admin>save *file-url*** command to save the current configuration. If no command line options are specified, the user is prompted to confirm the reboot operation.

Use the following CLI syntax to reboot:

CLI Syntax: admin# reboot [*active* | *standby*] [*now*]

Example: ALU-1>admin# reboot
A:DutA>admin# reboot

Are you sure you want to reboot (y/n)? y

Resetting...OK

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....

5.13 BOF Command Reference

5.13.1 Command Hierarchies

- [Configuration Commands](#)
- [Show Commands](#)

5.13.1.1 Configuration Commands

bof

- [no] **address** *ip-prefix/ip-prefix-length* [active | standby]
- [no] **autonegotiate**
- **auto-discover** [*id client-identifier*] [**vlan** *vlan-id*]
- [no] **auto-discover**
- **console-speed** *baud-rate*
- **no console-speed**
- **dns-domain** *dns-name*
- **no dns-domain**
- **duplex** {full | half}
- [no] **fips-140-2**
- **persist** {on | off}
- **primary-config** *file-url*
- **no primary-config**
- **primary-dns** *ip-address*
- **no primary-dns**
- **primary-image** *file-url*
- **no primary-image**
- **save** [*cflash-id*]
- **secondary-config** *file-url*
- **no secondary-config**
- **secondary-dns** *ip-address*
- **no secondary-dns**
- **secondary-image** *file-url*
- **no secondary-image**
- **speed** *speed*
- [no] **static-route** *ip-prefix/prefix-length* **next-hop** *ip-address*
- **tertiary-config** *file-url*
- **no tertiary-config**
- **tertiary-dns** *ip-address*
- **no tertiary-dns**
- **tertiary-image** *file-url*
- **no tertiary-image**
- **wait** *seconds*

5.13.1.2 Show Commands

show

- **bof** [*cflash-id* | booted]
- **boot-messages**

5.13.2 Command Descriptions

- [Configuration Commands](#)
- [Show Commands](#)

5.13.2.1 Configuration Commands

- [File Management Commands](#)
- [BOF Processing Control Commands](#)
- [Console Port Configuration Commands](#)
- [Image and Configuration Management Commands](#)
- [CSM Management Configuration Commands](#)
- [DNS Configuration Commands](#)

5.13.2.1.1 File Management Commands

bof

| | |
|--------------------|--|
| Syntax | bof |
| Context | <root> |
| Description | <p>This command creates or edits the boot option file (BOF) for the specified local storage device.</p> <p>A BOF file specifies where the system searches for runtime images, configuration files, and other operational parameters during system initialization.</p> <p>BOF parameters can be modified. Changes can be saved to a specified compact flash. The BOF must be located in the root directory of either an internal or external compact flash local to the system and have the mandatory filename of bof.cfg.</p> <p>When modifications are made to in-memory parameters that are currently in use or operating, the changes are effective immediately. For example, if the IP address of the CSM Management port is changed, the change takes place immediately.</p> <p>Only one entry of the BOF configuration command statement can be saved once the statement has been found to be syntactically correct.</p> <p>When opening an existing BOF that is not the BOF used in the most recent boot, a message is issued notifying the user that the parameters will not affect the operation of the node.</p> <p>The pound (#) sign is used at the beginning of the File syntax. Using the command file type bof.cfg displays the # character as a comment delimiter at the top of the raw file. No default boot option file exists. The router boots with the factory default boot sequence and options.</p> |
| Default | n/a |

save

| | |
|--------------------|---|
| Syntax | save [<i>cf-flash-id</i>] |
| Context | bof |
| Description | <p>This command uses the boot option parameters currently in memory and writes them from the boot option file to the specified compact flash.</p> <p>The BOF must be located in the directory of the compact flash drives local to the system and have the mandatory filename of bof.cfg.</p> <p>The BOF is saved to the compact flash drive associated with the active CSM. The slot name is not case-sensitive. You can use uppercase or lowercase "A" or "B".</p> |

Command usage:

- **bof save** — saves the BOF to the default drive (cf3:) associated with the active CSM (either in slot A or B)
- **bof save cf3:** — saves the BOF to cf3: associated with the active CSM (either in slot A or B)

To save the BOF to a compact flash drive associated with the standby CSM (for example, the redundant (standby) CSM is installed in slot B), specify the -A or -B option.

Command usage:

- **bof save cf3-A:** — saves the BOF to cf3: associated with the CSM in slot A whether it is active or standby
- **bof save cf3-B:** — saves the BOF to cf3: associated with the CSM in slot B whether it is active or standby

The slot name is not case-sensitive. You can use uppercase or lowercase “A” or “B”.

The **bof save** and **show bof** commands allow you to save to or read from the compact flash of the standby CSM. Use the **show card** command to determine the active and standby CSM (A or B).

| | |
|-------------------|---|
| Default | saves must be explicitly executed; the BOF is saved to cf3: if a location is not specified |
| Parameters | <i>cf3-id</i> — the compact flash ID where the bof.cfg is to be saved (see Table 15 for parameter descriptions and values) |

5.13.2.1.2 BOF Processing Control Commands

wait

| | |
|--------------------|--|
| Syntax | wait <i>seconds</i> |
| Context | bof |
| Description | <p>This command configures a pause, in seconds, at the start of the boot process, which allows system initialization to be interrupted at the console.</p> <p>When system initialization is interrupted, the operator is allowed to manually override the parameters defined in the boot option file (BOF).</p> <p>Only one wait command can be defined in the BOF.</p> |
| Default | 3 |
| Parameters | <i>seconds</i> — the time to pause at the start of the boot process, in seconds |
| | Values 1 to 10 |

5.13.2.1.3 Console Port Configuration Commands

console-speed

| | |
|--------------------|--|
| Syntax | console-speed <i>baud-rate</i>
no console-speed |
| Context | bof |
| Description | <p>This command configures the console port baud rate.</p> <p>When this command is issued while editing the BOF file used for the most recent boot, both the BOF file and the active configuration are changed immediately.</p> <p>The no form of the command reverts to the default value.</p> |
| Default | 115200 — console configured for 115 200 b/s operation |
| Parameters | <i>baud-rate</i> — the console port baud rate, expressed as a decimal integer |
| | Values 9600, 19200, 38400, 57600, 115200 |

5.13.2.1.4 Image and Configuration Management Commands

persist

Syntax `persist {on | off}`

Context bof

Description This command specifies whether the system will preserve system indexes when a **save** command is executed. During a subsequent boot, the index file is read along with the configuration file. As a result, a number of system indexes are preserved between reboots, including the interface index, LSP IDs, and path IDs. This reduces resynchronizations of the Network Management System (NMS) with the affected network element.

In the event that persist is **on** and the reboot with the appropriate index file fails, SNMP is operationally shut down to prevent the management system from accessing and possibly synchronizing with a partially booted or incomplete network element. To enable SNMP access, enter the **config>system>snmp>no shutdown** command.

If **persist** is enabled and the **admin save <url>** command is executed with an FTP path used as the *<url>* parameter, two FTP sessions simultaneously open to the FTP server. The FTP server must be configured to allow multiple sessions from the same login; otherwise, the configuration and index files will not be saved correctly.



Note:

- Persistency files (.pst) should not be saved on the same disk as the configuration files and the image files.
- When an operator sets the location for the persistency file, the system checks to ensure that the disk has enough free space. If there is not enough free space, the persistency will not become active and a trap is generated. The operator must free up adequate disk space before persistency will become active. The system performs a space availability check every 30 seconds. As soon as the space is available the persistency becomes active on the next 30-second check.

Default off

Parameters **on** — preserves the system index when saving the configuration
off — disables the system index saves between reboots

primary-config

| | |
|--------------------|--|
| Syntax | primary-config <i>file-url</i>
no primary-config |
| Context | bof |
| Description | <p>This command specifies the name and location of the primary configuration file.</p> <p>The system attempts to use the configuration specified in primary-config. If the specified file cannot be located, the system automatically attempts to obtain the configuration from the location specified in secondary-config and then in tertiary-config.</p> <p>If an error in the configuration file is encountered, the boot process aborts.</p> <p>The no form of the command removes the primary-config configuration.</p> |
| Default | n/a |
| Parameters | <i>file-url</i> — the primary configuration file location (see Table 15 for parameter descriptions) |

primary-image

| | |
|--------------------|--|
| Syntax | primary-image <i>file-url</i>
no primary image |
| Context | bof |
| Description | <p>This command specifies the primary directory location for runtime image file loading.</p> <p>The system attempts to load all runtime image files configured in the primary-image first. If this fails, the system attempts to load the runtime images from the location configured in the secondary-image. If the secondary image load fails, the tertiary image specified in tertiary-image is used.</p> <p>The no form of the command removes the primary-image configuration.</p> |
| Default | n/a |
| Parameters | <i>file-url</i> — the <i>location-url</i> can either be local (this CSM) or a remote FTP server (see Table 15 for parameter descriptions) |

secondary-config

| | |
|--------------------|---|
| Syntax | secondary-config <i>file-url</i>
no secondary-config |
| Context | bof |
| Description | <p>This command specifies the name and location of the secondary configuration file.</p> <p>The system attempts to use the configuration as specified in secondary-config if the primary config cannot be located. If the secondary-config file cannot be located, the system attempts to obtain the configuration from the location specified in the tertiary-config.</p> <p>If an error in the configuration file is encountered, the boot process aborts.</p> <p>The no form of the command removes the secondary-config configuration.</p> |
| Default | n/a |
| Parameters | <i>file-url</i> — the secondary configuration file location (see Table 15 for parameter descriptions) |

secondary-image

| | |
|--------------------|--|
| Syntax | secondary-image <i>file-url</i>
no secondary-image |
| Context | bof |
| Description | <p>This command specifies the secondary directory location for runtime image file loading.</p> <p>The system attempts to load all runtime image files configured in the primary-image first. If this fails, the system attempts to load the runtime images from the location configured in the secondary-image. If the secondary image load fails, the tertiary image specified in tertiary-image is used.</p> <p>The no form of the command removes the secondary-image configuration.</p> |
| Default | n/a |
| Parameters | <i>file-url</i> — the <i>file-url</i> can either be local (this CSM) or a remote FTP server (see Table 15 for parameter descriptions) |

tertiary-config

| | |
|--------------------|---|
| Syntax | tertiary-config <i>file-url</i>
no tertiary-config |
| Context | bof |
| Description | <p>This command specifies the name and location of the tertiary configuration file.</p> <p>The system attempts to use the configuration specified in tertiary-config if both the primary and secondary config files cannot be located. If this file cannot be located, the system boots with the factory default configuration.</p> <p>If an error in the configuration file is encountered, the boot process aborts.</p> <p>The no form of the command removes the tertiary-config configuration.</p> |
| Default | n/a |
| Parameters | <i>file-url</i> — the tertiary configuration file location (see Table 15 for parameter descriptions) |

tertiary-image

| | |
|--------------------|---|
| Syntax | tertiary-image <i>file-url</i>
no tertiary-image |
| Context | bof |
| Description | <p>This command specifies the tertiary directory location for runtime image file loading.</p> <p>The system attempts to load all runtime image files configured in the primary-image first. If this fails, the system attempts to load the runtime images from the location configured in the secondary-image. If the secondary image load fails, the tertiary image specified in tertiary-image is used.</p> <p>All runtime image files (both.tim) must be located in the same directory.</p> <p>The no form of the command removes the tertiary-image configuration.</p> |
| Default | n/a |
| Parameters | <i>file-url</i> — the <i>file-url</i> can either be local (this CSM) or a remote FTP server (see Table 15 for parameter descriptions) |

5.13.2.1.5 CSM Management Configuration Commands

address

| | |
|--------------------|--|
| Syntax | [no] address <i>ip-prefix/ip-prefix-length</i> [active standby] |
| Context | bof |
| Description | This command assigns an IP address to the CSM Management port in the running configuration and the Boot Option File (BOF) on the active CSM, or the CSM Management port on the standby CSM for systems using redundant CSMs. |

Either an IPv4 or IPv6 address can be assigned to the CSM Management port. If an address already exists, it will be overwritten with the new address. If no address exists, a new one will be created.

Before changing an active IPv4 or IPv6 address, you must ensure that:

- all static routes are removed
- the standby address is removed; address changes are not allowed unless both addresses are on the same subnet

In previous releases, if an IPv6 address was assigned to the CSM Management port, an IPv4 address was also required on the port. This setup is no longer required; therefore, for configurations with both IPv4 and IPv6 addresses, the IPv4 address can be deleted from the BOF.

The **no** form of the command deletes the IP address from the CSM Management port.

If you delete an active IPv4 address from the BOF, or you replace an IPv4 address with an IPv6 address, the following must be considered.

- IPv4 static routes must be removed before the IPv4 active address can be deleted.
- If remote directory locations are used for the primary image file ([primary-image](#)) and primary configuration file ([primary-config](#)), you must also change the primary image and primary configuration paths (as well as the secondary and tertiary image and configuration files) to use IPv6 addresses. Otherwise, when the 7705 SAR reboots, it will try to load the image using IPv4, which will cause continuous reboots.
- If a primary DNS server is configured ([primary-dns](#)), the server address must be changed to an IPv6 address in order for it to be reachable.

If the IPv4 address is removed before any Telnet sessions can be established, Telnet IPv6 servers must be enabled using the **config>system>security>telnet6-server** command. Refer to the 7705 SAR System Management Guide for the command description.



Caution:

- If you have a dual IPv4/IPv6 BOF address configuration and you are running a Telnet IPv6 session or an SSH session, changing or deleting the active IPv4 address will not affect the session.
- If you have a dual IPv4/IPv6 BOF address configuration and you are running a Telnet IPv4 session or an SSH session, changing or deleting the active IPv6 address will not affect the session.
- If you have a dual IPv4/IPv6 BOF address configuration and you change or delete the active IP address that is the same version as the session (for example, you delete the active IPv4 address while running a Telnet IPv4 session), the session will hang once the change executes, and CLI access will be lost. You can either close the session (if possible) or wait until it times out. You must start a new session, using the new or existing active BOF address, to regain CLI access.
- If there is only **one** active BOF address on the port (that is, not the dual IPv4/IPv6 configuration), and it is deleted through a Telnet or SSH session, the session will hang and CLI access will be lost. You must use a directly connected console session to create a new BOF address. It is strongly recommended that you do not delete a single active BOF address through Telnet or SSH.

Default no address — there are no IP addresses assigned to CSM Management ports

Parameters *ip-prefix/ip-prefix-length* — the IP address for the CSM Management port

Values

| | |
|---------------------------|---|
| <i>ipv4-prefix</i> | a.b.c.d |
| <i>ipv4-prefix-length</i> | 0 to 30 |
| <i>ipv6-prefix</i> | x:x:x:x:x:x:x (eight 16-bit pieces)
x:x:x:x:x:d.d.d.d
x: [0 to FFFF]H
d: [0 to 255]D |
| <i>ipv6-prefix-length</i> | 0 to 126 |

active | standby — specifies which CSM Management port address is being configured: the active CSM Management port or the standby CSM Management port

Default active

autonegotiate

| | |
|--------------------|---|
| Syntax | [no] autonegotiate |
| Context | bof |
| Description | <p>This command enables speed and duplex autonegotiation on the CSM Management port in the running configuration and the Boot Option File (BOF).</p> <p>When autonegotiation is enabled, the link attempts to automatically negotiate the link speed and duplex parameters. If autonegotiation is enabled, then the configured duplex and speed parameters are ignored.</p> <p>The no form of the command disables the autonegotiate feature on this port.</p> |
| Default | autonegotiate |

auto-discover

| | |
|--------------------|--|
| Syntax | [no] auto-discover [id <i>client-identifier</i>] [vlan <i>vlan-id</i>]
[no] auto-discover |
| Context | bof |
| Description | <p>This command enables ADP as part of the boot-up sequence by adding an ADP keyword to the BOF file. ADP will run the next time the chassis is rebooted. You can also use this command to specify an optional unique identifier to use in the automatic discovery broadcast. You can use any unique identifier of up to 16 characters. If you specify <i>mac</i>, the chassis MAC address is used. If you run ADP with 802.1q encapsulation, you can specify the VLAN ID.</p> |
| Parameters | <p><i>client-identifier</i> — indicates the unique system identifier to use in the auto-discovery broadcast. If you use <i>mac</i> as the client identifier, the chassis MAC address is used.</p> <p>Values any combination of up to 16 alphanumeric characters with no spaces</p> <p><i>vlan-id</i> — indicates the VLAN ID for ADP with 802.1q encapsulation</p> <p>Values 0 to 4094</p> |

duplex

| | |
|--------------------|---|
| Syntax | duplex {full half} |
| Context | bof |
| Description | <p>This command configures the duplex mode of the CSM Management port when autonegotiation is disabled in the running configuration and the Boot Option File (BOF).</p> <p>This configuration command allows for the configuration of the duplex mode of the CSM Management port. If the port is configured to autonegotiate, this parameter will be ignored.</p> |

- Default** duplex full — full duplex operation
- Parameters**
 - full** — sets the link to full duplex mode
 - half** — sets the link to half duplex mode

fips-140-2

- Syntax** [no] fips-140-2
- Context** bof
- Description** This command is used to enable the node to support security level 1 of Federal Information Processing Standards 140 series, version 2 (FIPS-140-2). This mode limits the use of cryptographic algorithms on both the CSM and data plane to only those that are in accordance with FIPS-140-2. The node must be rebooted after executing this command in order for the node to begin operating in FIPS-140-2 mode.



Caution: Before using this command, the operator must ensure that no current configuration exists in the configuration file that is not supported in FIPS-140-2 mode. Failing to remove unsupported configurations will result in the node being unable to boot up.

The **no** form of the command disables support for security level 1 of FIPS-140-2 on the node.

- Default** no fips-140-2

speed

- Syntax** speed *speed*
- Context** bof
- Description** This command configures the speed for the CSM Management port when autonegotiation is disabled in the running configuration and the Boot Option File (BOF).

If the port is configured to autonegotiate, this parameter is ignored.
- Default** speed 100 — 100 Mb/s operation
- Parameters**
 - 10** — sets the link to 10 Mb/s speed
 - 100** — sets the link to 100 Mb/s speed

static-route

| | | |
|--------------------|--|--|
| Syntax | [no] static-route <i>ip-prefix/prefix-length</i> next-hop <i>ip-address</i> | |
| Context | bof | |
| Description | <p>This command creates a static route entry for the CSM Management port in the running configuration and the Boot Option File (BOF).</p> <p>This command allows manual configuration of static routing table entries. These static routes are only used by traffic generated by the CSM Management port. To reduce configuration, manual address aggregation should be applied where possible.</p> <p>A static default route (0.0.0.0/0) cannot be configured on the CSM Management port. A maximum of 10 IPv4 and 10 IPv6 static routes can be configured on the CSM Management port.</p> <p>Each unique next hop of active static routes configured on both the active and standby CSM Management ports are tested every 60 seconds. If the next hop is unreachable, an alarm is raised. The alarm condition is cleared when the preferred static route becomes reachable.</p> <p>The no form of the command deletes the static route.</p> | |
| Default | n/a | |
| Parameters | <i>ip-prefix/prefix-length</i> — the destination address requiring the static route | |
| | Values | <i>ipv6-prefix</i> x:x:x:x:x:x:x (eight 16-bit pieces)
x:x:x:x:x:d.d.d.d
x: [0 to FFFF]H
d: [0 to 255]D |
| | | <i>ipv6-prefix-length</i> 0 to 128 |
| | next-hop <i>ip-address</i> — the next hop IP address used to reach the destination | |
| | Values | <i>ipv4-address</i> a.b.c.d
<i>ipv6-address</i> x:x:x:x:x:x:x (eight 16-bit pieces)
x:x:x:x:x:d.d.d.d
x: [0 to FFFF]H
d: [0 to 255]D |

5.13.2.1.6 DNS Configuration Commands

dns-domain

- Syntax** **dns-domain** *dns-name*
 no dns-domain
- Context** bof
- Description** This command configures the domain name used when performing DNS address resolution.

This is a required parameter if DNS address resolution is required. Only a single domain name can be configured. If multiple domain statements are configured, the last one encountered is used.

The **no** form of the command removes the domain name from the configuration.
- Default** no dns-domain — no DNS domain name is configured
- Parameters** *dns-name* — the DNS domain name

primary-dns

- Syntax** **primary-dns** *ip-address*
 no primary-dns
- Context** bof
- Description** This command configures the primary DNS server used for DNS name resolution.

DNS name resolution can be used when executing ping, traceroute, and service-ping, and also when defining file URLs. DNS name resolution is not supported when DNS names are embedded in configuration files.

The **no** form of the command removes the primary DNS server from the configuration.
- Default** no primary-dns — no primary DNS server is configured
- Parameters** *ip-address* — the IP address of the primary DNS server

| | | |
|---------------|---------------------|-------------------------------------|
| Values | <i>ipv4-address</i> | a.b.c.d |
| | <i>ipv6-address</i> | x:x:x:x:x:x:x (eight 16-bit pieces) |
| | | x:x:x:x:x:d.d.d.d |
| | | x: [0 to FFFF]H |
| | | d: [0 to 255]D |

secondary-dns

| | | | | | | | | | | | | | | | | |
|--------------------|--|-------------------------------------|---------------------|---------|--|---------------------|-------------------------------------|--|--|-------------------|--|--|-----------------|--|--|----------------|
| Syntax | secondary-dns <i>ip-address</i>
no secondary-dns | | | | | | | | | | | | | | | |
| Context | bof | | | | | | | | | | | | | | | |
| Description | <p>This command configures the secondary DNS server for DNS name resolution.</p> <p>The secondary DNS server is used only if the primary DNS server does not respond.</p> <p>DNS name resolution can be used when executing ping, traceroute, and service-ping, and also when defining file URLs. DNS name resolution is not supported when DNS names are embedded in configuration files.</p> <p>The no form of the command removes the secondary DNS server from the configuration.</p> | | | | | | | | | | | | | | | |
| Default | no secondary-dns — no secondary DNS server is configured | | | | | | | | | | | | | | | |
| Parameters | <i>ip-address</i> — the IP address of the secondary DNS server | | | | | | | | | | | | | | | |
| | <table> <tr> <td>Values</td> <td><i>ipv4-address</i></td> <td>a.b.c.d</td> </tr> <tr> <td></td> <td><i>ipv6-address</i></td> <td>x:x:x:x:x:x:x (eight 16-bit pieces)</td> </tr> <tr> <td></td> <td></td> <td>x:x:x:x:x:d.d.d.d</td> </tr> <tr> <td></td> <td></td> <td>x: [0 to FFFF]H</td> </tr> <tr> <td></td> <td></td> <td>d: [0 to 255]D</td> </tr> </table> | Values | <i>ipv4-address</i> | a.b.c.d | | <i>ipv6-address</i> | x:x:x:x:x:x:x (eight 16-bit pieces) | | | x:x:x:x:x:d.d.d.d | | | x: [0 to FFFF]H | | | d: [0 to 255]D |
| Values | <i>ipv4-address</i> | a.b.c.d | | | | | | | | | | | | | | |
| | <i>ipv6-address</i> | x:x:x:x:x:x:x (eight 16-bit pieces) | | | | | | | | | | | | | | |
| | | x:x:x:x:x:d.d.d.d | | | | | | | | | | | | | | |
| | | x: [0 to FFFF]H | | | | | | | | | | | | | | |
| | | d: [0 to 255]D | | | | | | | | | | | | | | |

tertiary-dns

| | |
|--------------------|--|
| Syntax | tertiary-dns <i>ip-address</i>
no tertiary-dns |
| Context | bof |
| Description | <p>This command configures the tertiary DNS server for DNS name resolution.</p> <p>The tertiary DNS server is used only if the primary DNS server and the secondary DNS server do not respond.</p> <p>DNS name resolution can be used when executing ping, traceroute, and service-ping, and also when defining file URLs. DNS name resolution is not supported when DNS names are embedded in configuration files.</p> <p>The no form of the command removes the tertiary DNS server from the configuration.</p> |
| Default | no tertiary-dns — no tertiary DNS server is configured |

| | |
|-------------------|---|
| Parameters | <i>ip-address</i> — the IP address of the tertiary DNS server |
| Values | <i>ipv4-address</i> a.b.c.d |
| | <i>ipv6-address</i> x:x:x:x:x:x (eight 16-bit pieces) |
| | x:x:x:x:x:d.d.d.d |
| | x: [0 to FFFF]H |
| | d: [0 to 255]D |

5.13.2.2 Show Commands



Note: The following command outputs are examples only; actual displays may differ depending on supported functionality and user configuration.

bof

| | |
|--------------------|--|
| Syntax | bof [<i>cflash-id</i> booted] |
| Context | show |
| Description | This command displays the Boot Option File (BOF) executed on the last system boot or on the specified device.

If no device is specified, the BOF used in the last system boot displays. If the BOF has been modified since the system boot, a message displays. |
| Parameters | <i>cflash-id</i> — the cflash directory name. The slot name is not case-sensitive. Use uppercase or lowercase “A” or “B” for the slot name.

Values see Table 15 for parameter descriptions and values

booted — displays the boot option file used to boot the system |
| Output | The following outputs are examples of BOF information, and Table 23 describes the fields. |

Output Example

```
A:ALU-1# show bof cf3:
=====
BOF on CF3:
=====
primary-image      ftp://*:*@xxx.xxx.xxx.xx/home/csahwreg17/images/both.tim
primary-config    ftp://*:*@ xxx.xxx.xxx.xx /home/csahwreg17/images/dut-a.cfg
address           xxx.xxx.xxx.xx /24 active
address           xxx.xxx.xxx.xx /24 standby
primary-dns       xxx.xxx.xxx.xx
dns-domain        labs.ca.alcatel-lucent.com
static-route      xxx.xxx.0.0/24 next-hop xxx.xxx.xxx.x
autonegotiate
duplex            full
speed            100
wait              3
persist           off
no fips-140-2
console-speed     115200
=====
A:ALU-1#
```

```

A:ALU-1# show bof booted
=====
System booted with BOF
=====
primary-image      ftp://*:*@xxx.xxx.xxx.xx/home/csahwreg17/images/both.tim
primary-config     ftp://*:*@ xxx.xxx.xxx.xx /home/csahwreg17/images/dut-a.cfg
address            xxx.xxx.xxx.xx /24 active
address            xxx.xxx.xxx.xx /24 standby
primary-dns        xxx.xxx.xxx.xx
dns-domain          labs.ca.alcatel-lucent.com
static-route       xxx.xxx.0.0/16 next-hop xxx.xxx.xxx.x
autonegotiate
duplex             full
speed              100
wait               3
persist            off
no fips-140-2
console-speed      115200
=====
A:ALU-1#
    
```

Table 23 BOF Field Descriptions

| Label | Description |
|----------------|--|
| primary-image | The primary location of the directory that contains the runtime images of the CSM card |
| primary-config | The primary location of the file that contains the configuration |
| address | The IP address and mask associated with the CSM Management port or the secondary CSM Management port |
| primary-dns | The primary DNS server for resolution of host names to IP addresses |
| dns-domain | The domain name used when performing DNS address resolution |
| static-route | The static route entry for the CSM Management port in the running configuration and the BOF |
| autonegotiate | No autonegotiate — autonegotiate not enabled |
| | Autonegotiate — autonegotiate is enabled |
| autonegotiate | No autonegotiate — autonegotiate not enabled |
| | Autonegotiate — autonegotiate is enabled |
| duplex | half — specifies that the system uses half duplex |
| | full — specifies that the system uses full duplex |
| speed | The speed of the CSM Ethernet interface |

Table 23 BOF Field Descriptions (Continued)

| Label | Description |
|---------------|---|
| wait | The time configured for the boot to pause while waiting for console input |
| persist | Indicates whether the system will preserve system indexes when a save command is executed |
| fips-140-2 | Indicates whether FIPS-140-2 is enabled on the node |
| console speed | The console port baud rate |

boot-messages

Syntax boot-messages

Context show

Description This command displays boot messages generated during the last system boot.

Output The following output is an example of boot messages.

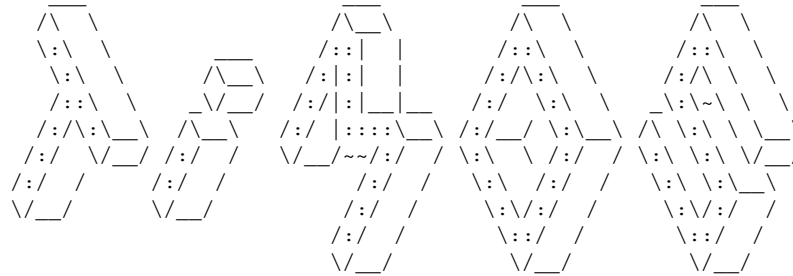
Output Example

```
A:ALU-1# show boot-messages
=====
cf3:/bootlog.txt
=====
Boot log started on CPU#0
  Build: X-2.1.R1 on Tue Apr 1 16:25:56 EDT 2016 by csabuild

Total Memory: 992MB Chassis Type: sar8 Card Type: corona_r1
TiMOS-L-2.1.R1 boot/hops NOKIA SAR 7705
Copyright (c) 2016 Nokia.
All rights reserved. All use subject to applicable license agreements.
Built on Wed Apr 9 09:36:02 EDT 2016 by csabuild in /rel2.0/b1/R1/panos/main

TiMOS BOOT LOADER
Time from clock is FRI APR 11 13:31:16 2016 UTC
Switching serial output to sync mode...
Total Memory: 992MB Chassis Type: sar8 Card Type: corona_r1

TiMOS-B-2.1.R1 both/hops NOKIA SAR 7705
Copyright (c) 2016 Nokia.
All rights reserved. All use subject to applicable license agreements.
Built on Wed Apr 9 09:53:01 EDT 2016 by csabuild in /rel2.0/b1/R1/panos/main
```



Time from clock is FRI APR 11 13:31:57 2016 UTC
 Initial DNS resolving preference is ipv4-only

CRITICAL: CLI #1001 Cannot locate the configuration file -
 Using default configuration values.

MAJOR: CLI #1008 The SNMP daemon is disabled. To enable SNMP, execute the command 'config>system>snmp no shutdown'.
 TiMOS-B-2.1.R1 both/hops NOKIA SAR 7705
 Copyright (c) 2016 Nokia.
 All rights reserved. All use subject to applicable license agreements.
 Built on Wed Apr 9 09:53:01 EDT 2016 by csabuild in /rel2.0/b1/R1/panos/main

Login:

=====
 cf3:/bootlog_prev.txt
 =====

Boot log started on CPU#0
 Build: X-2.1.R1 on Tue Apr 1 16:25:56 EDT 2016 by csabuild

Total Memory: 992MB Chassis Type: sar8 Card Type: corona_r1
 TiMOS-L-2.1.R1 boot/hops NOKIA SAR 7705
 Copyright (c) 2016 Nokia.
 All rights reserved. All use subject to applicable license agreements.
 Built on Wed Apr 9 09:36:02 EDT 2016 by csabuild in /rel2.0/b1/R1/panos/main

TiMOS BOOT LOADER

Time from clock is FRI APR 11 13:30:38 2016 UTC
 Switching serial output to sync mode...

reboot

6 System Management

This chapter provides information about configuring basic system management parameters.

Topics in this chapter include:

- [System Management Parameters](#)
- [High Availability](#)
- [CSM Synchronization and Redundancy](#)
- [Node Timing](#)
- [System Configuration Process Overview](#)
- [Configuration Notes](#)
- [Configuring System Management with CLI](#)
- [System Command Reference](#)

6.1 System Management Parameters

System management commands allow you to configure basic system management functions such as the system name, the router's location, coordinates, and CLI code, as well as time zones, Network Time Protocol (NTP), Simple Network Time Protocol (SNTP) properties, CRON, and synchronization properties.

6.1.1 System Information

System information components include:

- [System Name](#)
- [System Contact](#)
- [System Location](#)
- [System Coordinates](#)
- [Common Language Location Identifier](#)
- [System Identifier](#)
- [PoE Power Source](#)

6.1.1.1 System Name

The system name is the MIB II (RFC 1907, *Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2)*) sysName object. By convention, this text string is the node's fully qualified domain name. The system name can be any ASCII printable text string of up to 32 characters.

6.1.1.2 System Contact

The system contact is the MIB II sysContact object. By convention, this text string is a textual identification of the contact person for this managed node, together with information on how to contact this person. The system contact can be any ASCII printable text string of up to 80 characters.

6.1.1.3 System Location

The system location is the MIB II `sysLocation` object, which is a text string conventionally used to describe the node's physical location; for example, "Bldg MV-11, 1st Floor, Room 101". The system location can be any ASCII printable text string of up to 80 characters.

6.1.1.4 System Coordinates

The Nokia Chassis MIB `tmnxChassisCoordinates` object defines the system coordinates. This text string indicates the Global Navigation Satellite System (GNSS) coordinates of the location of the chassis.

Two-dimensional GNSS positioning offers latitude and longitude information as a four-dimensional vector:

(direction, hours, minutes, seconds)

where:

direction is one of the four basic values: N, S, W, E

hours range from 0 to 180 (for latitude) and 0 to 90 (for longitude)

minutes and *seconds* range from 0 to 60

<W, 122, 56, 89> is an example of longitude and <N, 85, 66, 43> is an example of latitude.

System coordinates can be expressed in different notations; for example:

- N 45 58 23, W 34 56 12
- N37 37' 00 latitude, W122 22' 00 longitude
- N36 × 39.246' W121 × 40.121

The system coordinates can be any ASCII printable text string up to 80 characters.

6.1.1.5 Common Language Location Identifier

A Common Language Location Identifier (CLLI) code string for the device is an 11-character standardized geographic identifier that uniquely identifies the geographic location of places and certain functional categories of equipment unique to the telecommunications industry. The CLLI code is stored in the Nokia Chassis MIB `tmnxChassisCLLIcode` object.

The CLLI code can be any ASCII printable text string of up to 11 characters.

6.1.1.6 System Identifier

A system identifier is a manually configured IPv4 address that can be used to uniquely identify the 7705 SAR in the network in situations where the more commonly used system IP address may change dynamically, causing loss of historical data attributed to the node. For example, the system IP address can change dynamically using DHCP when the 7705 SAR is acting as a DHCP client and the DHCP server-facing interface is unnumbered. In this situation, a static system identifier may be desirable.

The system identifier can be any IPv4 address.

6.1.1.7 PoE Power Source

The 7705 SAR-H supports Power over Ethernet (PoE) on all four 10/100/1000 copper Ethernet ports. To use PoE, the PoE power source must be configured at the system level as either internal or external. When the system is configured for the internal PoE power source option, PoE capability can be enabled on ports 5 and 6 only. In addition, port 5 can be enabled for PoE+ but in that case, port 6 cannot support any PoE capability. When the system is configured for the external PoE power source option, a mix of PoE and PoE+ is available on ports 5, 6, 7, and 8. Refer to the 7705 SAR-H Chassis Installation Guide, “Ethernet Ports”, for information about supported combinations of PoE and PoE+.

To enable PoE or PoE+ on a PoE-capable port on the 7705 SAR-H, use the **config>port>ethernet>poe** command; refer to the 7705 SAR Interface Configuration Guide, “Configuration Command Reference”, for more information.

The PoE-capable ports on the 7705 SAR-H act as a Power Source Equipment (PSE) device. They support IEEE 802.3at and IEEE 802.3af.

The 7705 SAR-W supports PoE+ on the two RJ-45 Ethernet ports with PoE+. The 7705 SAR-Wx (variants 3HE07616AA and 3HE07617AA) supports PoE+ on the RJ-45 Ethernet port with PoE+. The PoE+ ports are used to deliver power to a “Powered Device”, such as a non-line-of-sight (NLOS) or line-of-sight (LOS) microwave radio, at levels compatible with the IEEE 802.3at standard.

To enable PoE+ on a PoE+-capable port on the 7705 SAR-W or 7705 SAR-Wx, use the **config>port>ethernet>poe plus** command; refer to the 7705 SAR Interface Configuration Guide, “Configuration Command Reference”, for more information.

6.1.2 System Time

The 7705 SAR routers are equipped with a real-time system clock for time-keeping purposes. When set, the system clock always operates on Coordinated Universal Time (UTC), but the 7705 SAR software has options for local time translation as well as system clock synchronization.

System time parameters include:

- [Time Zones](#)
- [NTP](#)
- [SNTP Time Synchronization](#)
- [PTP](#)
- [Time-of-Day Measurement \(ToD-1pps\)](#)
- [GNSS](#)
- [CRON](#)

6.1.2.1 Time Zones

Setting a time zone in the 7705 SAR allows for times to be displayed in the local time rather than in UTC. The 7705 SAR has both user-defined and system-defined time zones.

A user-defined time zone has a user-assigned name of up to four printable ASCII characters that is different from the system-defined time zones. For user-defined time zones, the offset from UTC is configured as well as any summer time adjustment for the time zone.

The 7705 SAR system-defined time zones are listed in [Table 24](#), which includes both time zones with and without summer time correction.

Table 24 System-defined Time Zones

| Acronym | Time Zone Name | UTC Offset |
|----------------|---------------------|------------|
| Europe: | | |
| GMT | Greenwich Mean Time | UTC |
| BST | British Summer Time | UTC +1 |
| IST | Irish Summer Time | UTC +1* |

Table 24 System-defined Time Zones (Continued)

| Acronym | Time Zone Name | UTC Offset |
|-----------------------|-------------------------------|---|
| WET | Western Europe Time | UTC |
| WEST | Western Europe Summer Time | UTC +1 |
| CET | Central Europe Time | UTC +1 |
| CEST | Central Europe Summer Time | UTC +2 |
| EET | Eastern Europe Time | UTC +2 |
| EEST | Eastern Europe Summer Time | UTC +3 |
| MSK | Moscow Time | UTC +3 |
| MSD | Moscow Summer Time | UTC +4 |
| US and Canada: | | |
| AST | Atlantic Standard Time | UTC -4 |
| ADT | Atlantic Daylight Time | UTC -3 |
| EST | Eastern Standard Time | UTC -5 |
| EDT | Eastern Daylight Saving Time | UTC -4 |
| ET | Eastern Time | Either as EST or EDT, depending on place and time of year |
| CST | Central Standard Time | UTC -6 |
| CDT | Central Daylight Saving Time | UTC -5 |
| CT | Central Time | Either as CST or CDT, depending on place and time of year |
| MST | Mountain Standard Time | UTC -7 |
| MDT | Mountain Daylight Saving Time | UTC -6 |
| MT | Mountain Time | Either as MST or MDT, depending on place and time of year |
| PST | Pacific Standard Time | UTC -8 |
| PDT | Pacific Daylight Saving Time | UTC -7 |

Table 24 System-defined Time Zones (Continued)

| Acronym | Time Zone Name | UTC Offset |
|-------------------|--------------------------------------|---|
| PT | Pacific Time | Either as PST or PDT, depending on place and time of year |
| HST | Hawaiian Standard Time | UTC -10 |
| AKST | Alaska Standard Time | UTC -9 |
| AKDT | Alaska Standard Daylight Saving Time | UTC -8 |
| Australia: | | |
| AWST | Western Standard Time | UTC +8 |
| ACST | Central Standard Time | UTC +9.5 |
| AEST | Eastern Standard/Summer Time | UTC +10 |

6.1.2.2 NTP

NTP is the Network Time Protocol defined in RFC 1305, *Network Time Protocol (Version 3) Specification, Implementation and Analysis* and RFC 5905, *Network Time Protocol Version 4: Protocol and Algorithms Specification*. It allows for the participating network nodes to keep time more accurately and maintain time in a more synchronized fashion among all participating network nodes.

NTP uses stratum levels to define the number of hops from a reference clock. The reference clock is considered to be a Stratum-0 device that is assumed to be accurate with little or no delay. Stratum-0 servers cannot be used in a network. However, they can be directly connected to devices that operate as Stratum-1 servers. A Stratum-1 server is an NTP server with a directly connected device that provides Coordinated Universal Time (UTC), such as a GNSS or atomic clock.

The higher stratum levels are separated from the Stratum-1 server over a network path; thus a Stratum-2 server receives its time over a network link from a Stratum-1 server. A Stratum-3 server receives its time over a network link from a Stratum-2 server.

The 7705 SAR runs a single NTP clock that operates NTP message exchanges with external NTP clocks. Exchanges can be made with external NTP clients, servers, and peers. These exchanges can be through the base, management, or VPRN routing instances.

When NTP is enabled, the NTP clock in the 7705 SAR operates as an NTP client by default. The 7705 SAR typically operates as a Stratum-2 device, relying on an external Stratum-1 server to source accurate time into the network.

Alternatively, the NTP clock in the 7705 SAR can recover time from a local PTP or GNSS source. This is achieved by configuring the PTP clock or GNSS receiver as the internal system time. The internal system time can then be identified as the preferred source of NTP timing into the network with the command **config>system>time>ntp>server>system-time>prefer**. This configuration makes the local PTP or GNSS source appear as a Stratum-0 server. When the internal PTP clock or GNSS is identified as the server for NTP, NTP will promote the internal NTP server (the 7705 SAR) to Stratum-1 level, which may affect the NTP network topology.

The 7705 SAR can also operate as an NTP server and provide timing to downstream clients with the **ntp-server** command. When the NTP server is enabled with authentication, any NTP clients must authenticate using the proper key.

In server mode, the 7705 SAR advertises the ability to act as a clock source for other network elements. By default, the router transmits NTP packets in NTP version 4 mode. Server mode is supported on the CSM Management port, in the base routing context, and in the VPRN routing context.

As an NTP server, the 7705 SAR can peer with an external NTP server in another router that is considered more trustworthy or accurate than other routers carrying NTP in the system. This allows the peers to act as mutual backups where they can obtain time from or supply time to the other server as required. If both servers are peering each other, the router is in symmetric active mode. This mode requires that the peer association is set on both routers so that the local and remote router designate each other as a peer. If only one server is peering the other (that is, the other peer has not specifically configured the peer association), the router is in symmetric passive mode.

The 7705 SAR can be configured to transmit broadcast NTP packets on a specified interface with the **broadcast** command. The interface can be the management interface, interfaces in the base routing context, or an interface in the VPRN context. The messages are transmitted using a destination address that is the NTP broadcast address. Only IPv4 addressing is supported.

The 7705 SAR can also be configured to receive broadcast NTP packets on interfaces in the base routing context or on the management interface with the **broadcastclient** command.

The router can be configured to transmit or receive multicast NTP packets on the CSM Management port. The **multicast** command configures the transmission of NTP multicast messages. The **multicastclient** command configures the receipt of multicast NTP packets. When receiving or sending multicast NTP messages, the default address 224.0.1.1 is used. Only IPv4 addressing is supported.

The following NTP elements are supported:

- authentication keys — both DES and MD5 authentication are supported as well as multiple keys, to provide increased security support in carrier and other networks
- server and peer addressing — external servers and external peers may be defined using IPv4 or IPv6 addresses
- alert when NTP server is not available — when none of the configured servers are reachable on the node, the system reverts to manual timekeeping and issues a critical alarm. When a server becomes available, a trap is issued indicating that standard operation has resumed.
- NTP and SNTP — if both NTP and SNTP are enabled on the router, SNTP transitions to an operationally down state. If NTP is removed from the configuration or shut down, SNTP resumes an operationally up state.
- NTP priority — if a higher-priority time source such as GNSS or PTP is selected on the router, NTP transitions to an operationally down state. If the higher-priority time source is disqualified or disabled, NTP resumes an operationally up state.
- gradual clock adjustment — because several applications (such as Service Assurance Agent (SAA)) can use the clock, if a major adjustment (128 ms or more) must be performed, the adjustment is performed by programmatically setting the clock. If a minor adjustment (less than 128 ms) must be performed, the adjustment is performed by either speeding up or slowing down the clock.
- to facilitate proper operation once the standby CSM takes over from the active CSM, the time on the secondary CSM must be synchronized with the clock of the active CSM
- to prevent the generation of too many events and traps, the NTP module will rate-limit the generation of events and traps to three per second. At that point, a single trap will be generated that indicates that event/trap blocking is taking place.

NTP accuracy depends on the accuracy of NTP packet timestamping. By default, NTP packets are timestamped by the CSM where the NTP protocol is executed. However, an enhanced NTP mode is available where the timestamping is performed on the adapter card by the network processor. This reduces variations introduced by packet delay within the router as well as by a busy CPU in the CSM. This enhanced mode is only available for in-band NTP over a network interface. When enhanced NTP mode is used, NTP authentication is not supported.

6.1.2.3 SNTP Time Synchronization

For synchronizing the system clock with outside time sources, the 7705 SAR includes a Simple Network Time Protocol (SNTP) client. As defined in RFC 2030, SNTP Version 4 is an adaptation of the Network Time Protocol (NTP). SNTP typically provides time accuracy within 100 ms of the time source. SNTP can only receive the time from NTP servers; it cannot be used to provide time services to other systems. SNTP is a compact, client-only version of NTP. SNTP does not authenticate traffic.

SNTP can be configured in both unicast client modes (point-to-point) and broadcast client modes (point-to-multipoint). SNTP should be used only at the extremities of the synchronization subnet. SNTP clients should operate only at the highest stratum (leaves) of the subnet and in configurations where no NTP or SNTP client is dependent on another SNTP client for synchronization. SNTP time servers should operate only at the root (Stratum 1) of the subnet and then only in configurations where no other source of synchronization other than a reliable radio clock is available.

The 7705 SAR SNTP client can be configured for either broadcast or unicast client mode.

6.1.2.4 PTP

Precision Time Protocol (PTP) is a timing-over-packet protocol defined in the IEEE 1588v2 standard *1588 2008*.

PTP provides the capability to synchronize network elements to a Stratum-1 clock or primary reference clock (PRC) traceable source over a network that may or may not be PTP-aware. PTP has several advantages over ACR. It is a standards-based protocol, has lower bandwidth requirements, can transport both frequency and time, and can potentially provide better performance.

For more information about PTP, see [IEEE 1588v2 PTP](#).

6.1.2.5 Time-of-Day Measurement (ToD-1pps)

The 7705 SAR can receive and extract time of day/phase recovery from a 1588 grand master clock or boundary clock and transmit the recovered time of day/phase signal to an external device such as a base station through an external time of day port, where available. Transmission is through the ToD or ToD/PPS Out port with a 1 pulse/s output signal. The port interface communicates the exact time of day by the rising edge of the 1 pulse/s signal.

For more information about ToD-1pps, see [PTP Ordinary Slave Clock for Time of Day/Phase Recovery](#).

6.1.2.6 GNSS

The 7705 SAR supports frequency synchronization via a Layer 1 interface such as synchronous Ethernet, and ToD synchronization via a protocol such as NTP or PTP. In cases where these methods are not possible, or where accuracy cannot be ensured for the service, you can deploy a GNSS receiver as a synchronous timing source. GNSS data is used to provide network-independent frequency and ToD synchronization.

GNSS receivers on the following platforms support GPS reference only, or combined GPS and GLONASS reference:

- 7705 SAR-Ax
- 7705 SAR-H with a GPS Receiver module
- 7705 SAR-Wx variants with a GPS RF port
- 7705 SAR-8 Shelf V2 with a GNSS Receiver card
- 7705 SAR-18 with a GNSS Receiver card

A 7705 SAR chassis equipped with a GNSS receiver and an attached GNSS antenna can be configured to receive frequency traceable to Stratum-1 (PRC/PRS). The GNSS receiver provides a synchronization clock to the SSU in the router with the corresponding QL for SSM. This frequency can then be distributed to the rest of the router from the SSU as configured with the **ref-order** and **ql-selection** commands. The GNSS reference is qualified only if the GNSS receiver is operational, has five or more satellites locked, and has a frequency successfully recovered. A PTP master/boundary clock can also use this frequency reference with PTP peers.

In the event of GNSS signal loss or jamming resulting in the unavailability of timing information, the GNSS receiver automatically prevents output of clock or synchronization data to the system, and the system can revert to alternate timing sources.

6.1.2.7 CRON

On the 7705 SAR, the CRON feature supports periodic and date- and time-based scheduling. CRON can be used, for example, to schedule Service Assurance Agent (SAA) functions. CRON functions include the ability to specify scripts that need to be run and when they will be scheduled. Reboots, peer turn-ups, and SAA tests can be scheduled with CRON, as well as OAM events such as connectivity checks or troubleshooting runs.

CRON supports the schedule function. The schedule function is used to configure the type of schedule to run, including one-time-only (one-shot), periodic, or calendar-based runs. All runs are scheduled by month, day, hour, minute, and interval (seconds).

Scripts that have been configured under the **config>system>script-control** context are referenced by the CRON schedule. For information on scripts, see [CLI Script Control](#).

6.2 High Availability

This section discusses the high availability routing options and features available to service providers that help diminish vulnerability at the network or service provider edge and alleviate the effect of a lengthy outage on IP/MPLS networks.

High availability is an important feature in service provider routing and switching systems. High availability is gaining momentum due to the unprecedented growth of IP/MPLS services and applications in service provider networks driven by the demand from the enterprise and residential communities. Downtime can be very costly, and, in addition to lost revenue, customer information and business-critical communications can be lost. High availability is the combination of continuous uptime over long periods (Mean Time Between Failures (MTBF)) and the speed at which failover or recovery occurs (Mean Time To Repair (MTTR)).

The popularity of high availability routing is evident at the network or service provider edge where thousands of connections are hosted and rerouting options around a failed piece of equipment can often be limiting. Or, a single access link exists to a customer because of additional costs for redundant links. As service providers converge business-critical services such as real-time voice (VoIP), video, and VPN applications over their IP/MPLS networks, high availability becomes much more stringent compared to the requirements for best-effort data.

Network and service availability become critical aspects when offering advanced IP/MPLS services, which dictate that IP routers that are used to construct the foundations of these networks be resilient to component and software outages.

For high availability configuration information, see [CSM Synchronization and Redundancy](#).

6.2.1 High Availability Features

As more and more critical commercial applications move onto the IP/MPLS networks, providing high availability services becomes increasingly important. This section describes high availability features for the 7705 SAR. Most of these features only apply to routers with two Control and Switching Modules (CSMs).

- [Redundancy](#)
- [Nonstop Routing \(NSR\)](#)
- [In-service Upgrade](#)
- [CSM Switchover](#)
- [Synchronization](#)

6.2.1.1 Redundancy

The following redundancy features enable the duplication of data elements and software functionality to maintain service continuation in case of outages or component failure.

- [Software Redundancy](#)
- [Configuration Redundancy](#)
- [Component Redundancy](#)
- [Accounting Configuration Redundancy](#)
- [Multi-Chassis LAG Redundancy](#)

6.2.1.1.1 Software Redundancy

Software outages are challenging even when baseline hardware redundancy is in place. There should be a balance to provide high availability routing; otherwise, router problems typically propagate throughout the service provider network and externally to other connected networks possibly belonging to other service providers. This could affect customers on a broad scale. There are several software availability features that contribute to the percentage of time that a router is available to process and forward traffic.

6.2.1.1.2 Configuration Redundancy

Features configured on the active CSM are saved on the standby CSM as well. When the active CSM fails, these features are brought up on the standby CSM that takes over the mastership.

Even with modern modular and stable software, the failure of hardware or software can cause the router to reboot or cause other service impacting events. In the best circumstances, failure leads to the initialization of a redundant route processor, which hosts the standby software configuration to become the active processor.

The 7705 SAR supports hot standby. With hot standby, the router image, configuration, and network state are already loaded on the standby; it receives continual updates from the active route processor and the swap over is immediate. Newer-generation service routers like the 7705 SAR have extra processing built into the system so that router performance is not affected by frequent synchronization, which consumes system resources.

6.2.1.1.3 Component Redundancy

7705 SAR component redundancy is critical to reducing MTTR for the routing system. Component redundancy consists of the following features:

- dual Control and Switching modules — for a highly available architecture, redundant Control and Switching Modules (CSMs) are essential
- redundant power supply feed — a power feed can be removed without impact on traffic
- redundant fan — if one fan fails, the others will continue to operate and provide cooling to the system without impacting traffic
- hot swap — components in a live system can be replaced or become active without taking the system down or affecting traffic flow to or from other modules

6.2.1.1.4 Accounting Configuration Redundancy

When there is a switchover and the standby CSM becomes active, the accounting servers will be checked, and if they are administratively up and capable of coming online (media present and so on), then the standby will be brought online and new accounting files will be created at that point. Users must manually copy the accounting records from the failed CSM.

6.2.1.1.5 Multi-Chassis LAG Redundancy

Multi-chassis LAG (MC-LAG) prevents service interruptions that are caused by 7705 SAR nodes that are taken out of service for maintenance, upgrades, or relocation. MC-LAG also provides redundancy for incidents of peer nodal failure. This improves network resiliency. When typically used at access or aggregation sites, MC-LAG ensures high availability without service disruptions by providing redundant access or aggregation nodes.

MC-LAG extends the link level redundancy provided by LAG to include protection against failure of a 7705 SAR node. With MC-LAG, a CE device can be connected to two redundant-pair peer nodes. The redundant-pair peer nodes act like a single node, using active/standby signaling to ensure that only one peer node is used at a time. The redundant-pair peer nodes appear to be a single system as they share the same MAC address and system priority when implementing MC-LAG. Availability and status information are exchanged through an MC-LAG Control Protocol (MCCP). It is used to ensure that one peer is active and to synchronize information between the peers.



Note: The 7705 SAR nodes must be of the same type, except for the 7705 SAR-8 Shelf V2 and 7705 SAR-18, which can be used together in a redundant-pair configuration.

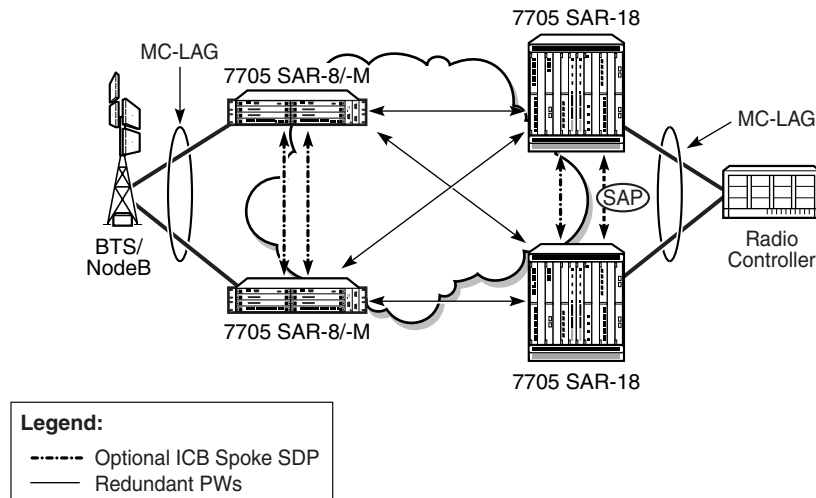
A peer is configured by specifying its IP address, to which the MCCP packets are sent. The LAG ID, system priority, and MAC address for the MC-LAG are also configured under the peer. Up to 16 MC-LAGs can be configured and they can either use the same peer or different peers up to a maximum of 4 peers.

It is possible to specify the remote LAG ID in the MC-LAG lag command to allow the local and remote LAG IDs to be different on the peers. If there are two existing nodes which already have LAG IDs that do not match, and an MC-LAG is to be created using these nodes, then the remote LAG ID must be specified so that the matching MC-LAG group can be found. If no matching MC-LAG group can be found between neighbor systems, the individual LAGs will operate as usual and no MC-LAG operation is established.

Two timer options, **keep-alive-interval** and **hold-on-neighbor-failure**, are available in the MC-LAG configuration. The **keep-alive-interval** option specifies the frequency of the messages expected to be received from the remote peer and is used to determine if the remote peer is still active. If **hold-on-neighbor-failure** messages are missed, then it is assumed that the remote peer is down.

Figure 11 shows an example of MC-LAG deployed at access and aggregation sites.

Figure 11 MC-LAG at Access and Aggregation Sites



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Inter-Chassis Backup (ICB) spoke SDPs are supported for use with Epipe services in an MC-LAG configuration. ICB spoke SDPs provide resiliency by reducing packet loss when an active endpoint is switched from a failed node of an MC-LAG group to a standby node. For example, if a port on an active MC-LAG node fails, the port on one of the peers becomes active, but traffic continues to route to the previously active MC-LAG node until it detects the failure. ICB spoke SDPs ensure that in-flight packets are delivered to the newly active MC-LAG node. Two ICB spoke SDPs must be created. The ICB associated with the MC-LAG on the first node must be associated with the pseudowire on the second node. Likewise, the ICB associated with the MC-LAG on the second node must be associated with the pseudowire on the first node.



Note: A 7705 SAR node in an MC-LAG configuration that has an ICB spoke SDP configured on it with the MC-LAG in standby mode does not terminate Ethernet CFM frames. It transparently switches the frames to the other node of the MC-LAG group. This mode of operation is consistent with the 7705 SAR operating in S-PE mode.

Enabling the LAG slave-to-partner parameter ensures synchronized activity switching between the multi-chassis and the single-chassis endpoints. When multi-chassis endpoints are configured in slave-to-partner mode, multi-chassis endpoints always follow the single-chassis activity. The link that is promoted as active via the single-chassis endpoint is used as the active link. Enabling slave-to-partner ensures that out-of-sync scenarios do not occur for the LAG. A multi-chassis pair with pseudowire redundancy and ICBs is always able to direct traffic to the active endpoint, so enabling slave-to-partner does not impose any risk on the network side.

MC-LAG includes support for hash-based peer authentication, configurable heartbeat timers between peers, heartbeat multiplier, LAG bound to MC-LAG with LACP and support for any valid IP link between peers for the multi-chassis Control Protocol (MCCP). MC-LAG supports a configurable fault propagation delay and also provides an option to shut down a MEP on a standby endpoint.

MC-LAG maintains state across a CSM switchover event. The switchover event is transparent to peer MC-LAG nodes where sessions and state are preserved. MC-LAG is supported on the following platforms, adapter cards, and modules:

- 8-port Ethernet Adapter card
- 8-port Gigabit Ethernet Adapter card
- 6-port Ethernet 10Gbps Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card (supported on the 7705 SAR-18 only)
- Packet Microwave Adapter card
- 6-port SAR-M Ethernet module
- 7705 SAR-M (the port must be in access mode and autonegotiation must be off or limited)
- 7705 SAR-X



Note: The 7705 SAR only supports MC-LAG for Epipes and VPLS.

6.2.1.2 Nonstop Routing (NSR)

With NSR on the 7705 SAR, routing neighbors are unaware of a routing process fault. If a fault occurs, a reliable and deterministic activity switch to the inactive control complex occurs such that routing topology and reachability are not affected, even in the presence of routing updates. NSR achieves high availability through parallelization by maintaining up-to-date routing state information, at all times, on the standby route processor. This capability is achieved independently of protocols or protocol extensions, providing a more robust solution than graceful restart protocols between network routers.

The NSR implementation on the 7705 SAR applies to all supported routing protocols. NSR makes it possible to keep the existing sessions (such as LDP) during a CSM switchover, including support for MPLS signaling protocols. Peers will not see any change.

Traditionally, high availability issues have been patched through non-stop forwarding solutions. NSR overcomes these limitations by delivering an intelligent hitless failover solution.

The following NSR entities remain intact after a switchover:

- ATM/IMA VPs/VCs
- LDP
- PPP and MLPPP sessions
- RIP neighbors

6.2.1.3 In-service Upgrade

In-service upgrades allow new routing engine software and microcode to be installed on the 7705 SAR while existing services continue to operate. Software upgrades can be performed only for certain maintenance releases (generally R4 loads and higher). Software upgrades also require NSR. If software or microcode on the CSM needs to be upgraded, CSM redundancy is required.



Note: The in-service upgrade requires the adapter cards to be reset. This will cause a short outage.

Follow the steps below to upgrade routing engine software on the 7705 SAR without affecting existing services:

1. Install new software on the standby CSM.
2. Reboot the standby CSM for the new software to take effect.
3. Perform a manual switchover on the active CSM by using the force-switchover command on the CLI. The standby CSM becomes the active CSM, placing the formerly active CSM into standby.
4. Repeat steps 1 and 2 to upgrade the standby CSM.

6.2.1.4 CSM Switchover

During a switchover, system control and routing protocol execution are transferred from the active to the standby CSM. A switchover may occur automatically or manually.

An automatic switchover may occur under the following conditions:

- a fault condition arises that causes the active CSM to crash or reboot
- the active CSM is declared down (not responding)
- online removal of the active CSM

Users can manually force the switchover from the active CSM to the standby CSM by using the **admin redundancy force-switchover now** CLI command or the **admin reboot active [now]** CLI command.

With the 7705 SAR, the **admin reboot active [now]** CLI command does not cause both CSMs to reboot.

6.2.1.5 Synchronization

Synchronization between the CSMs includes the following:

- [Configuration and boot-env Synchronization](#)
- [State Database Synchronization](#)

6.2.1.5.1 Configuration and boot-env Synchronization

Configuration and boot-env synchronization are supported in **admin>redundancy>synchronize** and **config>redundancy>synchronize** contexts.

6.2.1.5.2 State Database Synchronization

If a new standby CSM is inserted into the system, it synchronizes with the active CSM upon a successful boot process.

If the standby CSM is rebooted, it synchronizes with the active CSM upon a successful boot process.

When configuration or state changes occur, an incremental synchronization is conducted from the active CSM to the standby CSM.

If the synchronization fails, the standby CSM does not reboot automatically. The **show redundancy synchronization** command displays synchronization output information.

If the active and standby CSMs are not synchronized for some reason, users can manually synchronize the standby CSM by rebooting the standby by issuing the **admin reboot standby** command.

6.3 CSM Synchronization and Redundancy

The 7705 SAR uses a 1:1 redundancy scheme. Redundancy methods facilitate system synchronization between the active and standby CSMs so that they maintain identical operational parameters to prevent inconsistencies in the event of a CSM failure.

When automatic system synchronization is enabled for an entity, any save or delete file operations configured on the primary, secondary, or tertiary choices on the active CSM file system are mirrored in the standby CSM file system.

Although software configurations and images can be copied or downloaded from remote locations, synchronization can only occur locally between compact flash drives (cf3-A: and cf3-B:).

Synchronization can occur:

- automatically — automatic synchronization is disabled by default. To enable automatic synchronization, the **config>redundancy>synchronize** command must be specified with either the **boot-env** parameter or the **config** parameter.

When the **boot-env** parameter is specified, the BOF, boot.ldr, config, and image files are automatically synchronized. When the **config** parameter is specified, only the config files are automatically synchronized.

Automatic synchronization also occurs whenever the BOF is modified with persistence on and when an **admin>save** command is entered with no filename specified.

- manually — to execute synchronization manually, the **admin>redundancy>synchronize** command must be entered with the **boot-env** parameter or the **config** parameter.

When the **boot-env** parameter is specified, the BOF, boot.ldr, config, and image files are synchronized. When the **config** parameter is specified, only the config files are synchronized.

The following shows the output displayed during a manual synchronization of configuration files.

```
ALU-1>admin>redundancy# synchronize config
Syncing configuration.....
Syncing configuration.....Completed.
ALU-1#
```

6.3.1 Active and Standby Designations

Typically, the first CSM installed in a 7705 SAR chassis assumes the role as active, regardless of being inserted in Slot A or B. The next CSM installed in the same chassis then assumes the role as the standby CSM. If two CSMs are inserted simultaneously (or almost simultaneously) and are booting at the same time, preference is given to the CSM installed in Slot A.

If only one CSM is installed in a 7705 SAR, it becomes the active CSM regardless of the slot it is installed in.

To visually determine the active and standby designations, the MS/CTL LED on the faceplate is lit green (steady) to indicate the active designation. The MS/CTL LED on the second CSM faceplate is flashing green to indicate the standby designation.

The following output shows that the CSMv2 installed in Slot A on a 7705 SAR-8 Shelf V2 is acting as the active CSM and the CSMv2 installed in Slot B is acting as the standby.

```
ALU-1# show card
=====
Card Summary
=====
Slot   Provisioned Type           Admin Operational  Comments
      Equipped Type (if different) State State
-----
1      iom-sar                    up    up
A      csmv2-10g                  up    up/active
B      csmv2-10g                  up    down/standby
=====
```

6.3.2 When the Active CSM Goes Offline

When an active CSM goes offline (due to reboot, removal, or failure), the standby CSM takes control without rebooting or initializing itself. It is assumed that the CSMs are synchronized; therefore, there is no delay in operability. When the CSM that went offline boots and then comes back online, it becomes the standby CSM.

6.3.3 Persistence

The persistence feature allows lease information on DHCP servers to be kept across reboots. This information can include data such as the IP address, MAC binding information, and lease length information.

The system performs the following tasks to make data persistent. In systems with only one CSM, only task 1 applies. In systems with dual CSMs, both tasks apply.

1. When a DHCP ACK is received from a DHCP server, the entry information is written to the active CSM compact flash. If persistence fails completely (bad cflash), a trap is generated indicating that persistence can no longer be guaranteed.
2. DHCP message information is sent to the standby CSM, and the DHCP information is also written to the compact flash. If persistence fails on the standby CSM also, a trap is generated.

6.3.4 Administrative Tasks

This section contains information to perform administrative tasks:

- [Saving Configurations](#)
- [Specifying Post-Boot Configuration Files](#)

6.3.4.1 Saving Configurations

Whenever configuration changes are made, the modified configuration must be saved so that it will not be lost when the system is rebooted.

Configuration files are saved by executing explicit command syntax that includes the file URL location to save the configuration file as well as options to save both default and non-default configuration parameters. Boot option file (BOF) parameters specify where the system should search for configuration and image files as well as other operational parameters during system initialization.

For more information about boot option files, see the chapter on [Boot Options](#) in this guide.

6.3.4.2 Specifying Post-Boot Configuration Files

Two post-boot configuration extension files are supported and are triggered when either a successful or failed boot configuration file is processed. The **boot-bad-exec** and **boot-good-exec** commands specify URLs for the CLI scripts to be run following the completion of the boot-up configuration. A URL must be specified or no action is taken.

For example, after a configuration file is successfully loaded, the specified URL can contain a nearly identical configuration file with certain commands enabled or disabled, or particular parameters specified and according to the script which loads that file.

6.3.5 Automatic Synchronization

Use the CLI syntax displayed below to configure synchronization components relating to active-to-standby CSM switchover. In redundant systems, synchronization ensures that the active and standby CSMs have identical operational parameters, including the active configuration, CSM, and IOM images in the event of a failure or reset of the active CSM.

The **force-switchover** command forces a switchover to the standby CSM card.

To enable automatic synchronization, either the **boot-env** parameter or the **config** parameter must be specified. The synchronization occurs when the **admin save** or **bof save** commands are executed.

When the **boot-env** parameter of the **synchronize** command is specified, the BOF, boot.ldr, config, and image files are automatically synchronized. When the **config** parameter is specified, only the configuration files are automatically synchronized.

Synchronization also occurs whenever the BOF is modified with persistence on and when an **admin>save** command is entered with no filename specified.

6.3.5.1 Boot-Env Option

The **boot-env** option enables a synchronization of all the files used in system initialization.

When configuring the system to perform this synchronization, the following occurs:

1. The BOF used during system initialization is copied to the same compact flash on the standby CSM (in redundant systems).
Note: The synchronization parameters on the standby CSM are preserved.
2. The primary, secondary, and tertiary images (provided they are locally stored on the active CSM) are copied to the same compact flash on the standby CSM.
3. The primary, secondary, and tertiary configuration files (provided they are locally stored on the active CSM) are copied to the same compact flash on the standby CSM.

6.3.5.2 Config Option

The **config** option synchronizes configuration files by copying the files specified in the active CSM BOF file to the same compact flash on the standby CSM.

6.3.6 Manual Synchronization

The **admin redundancy synchronize** command performs manual CSM synchronizations. The **boot-env** parameter synchronizes the BOF, image, and configuration files in redundant systems. The **config** parameter synchronizes only the configuration files in redundant systems.

6.3.6.1 Forcing a Switchover

The **force-switchover now** command forces an immediate switchover to the standby CSM card.

If the active and standby CSMs are not synchronized for some reason, users can manually synchronize the standby CSM by rebooting the standby by issuing the **admin reboot standby** command on the active CSM.

6.4 Node Timing

The 7705 SAR supports a centralized synchronization system with an SSU in each CSM. The SSU can be synchronized to a traceable primary reference clock through an external timing port, line interface, or timing-over-packet technology. The transmit clock of each T1/E1, DS3/E3, SONET/SDH port or synchronous Ethernet-capable port (referred to as a synchronous Ethernet port in this guide) can then be configured to use the node clock or alternatives.

The 7705 SAR supports three timing references — one external and two internal. The timing references can be configured as an ordered list of highest to lowest priority. The system uses an available valid timing reference with the highest priority. If a failure on the current timing reference occurs, the next highest timing reference takes over. The reference switching can be configured to operate in a revertive or non-revertive manner with the **sync-if-timing revert** command. Revertive switching always selects the highest-priority valid timing reference as the current source. If a reference with a higher priority becomes valid, the system automatically switches to that timing reference. Non-revertive switching means that the active timing reference remains selected while it is valid, even if a higher-priority timing reference becomes available. If the current timing reference becomes invalid, then a switch to the highest-priority available timing reference is initiated. If all the timing references fail or have not been configured, the SSU enters holdover mode of its Stratum 3 oscillator (if it was previously synchronized) or free-run mode.

The external timing reference input with a 2.048 MHz G.703 signal, 5 MHz sine wave, or 10 MHz sine wave, is available directly on the following:

- 7705 SAR-M
- 7705 SAR-H
- 7705 SAR-Hc
- 7705 SAR-A
- 7705 SAR-Ax
- 7705 SAR-X

The CSMv2 on the 7705 SAR-8 Shelf V2 does not support a 5 MHz signal. On the 7705 SAR-18, the external timing reference input with a 2.048 MHz G.703, T1 (100 Ω), or E1 (120 Ω), is supported by the BITS ports 1 and 2 located on the Alarm module.

The two internal timing references originate from timing extracted from interface ports. This timing can be recovered directly from physical layer framing on a T1/E1 port, from adaptive timing recovery for TDM pseudowires, or from a synchronous Ethernet port.

On the 7705 SAR-M, all RJ-45 Ethernet ports and SFP ports support synchronous Ethernet and can supply a timing reference to be used as a source of node synchronization. On the 7705 SAR-M variants with T1/E1 ports, two T1/E1 ports can supply a timing reference. The 2-port 10GigE (Ethernet) module or 6-port SAR-M Ethernet module can supply two timing references.

On the 7705 SAR-H and 7705 SAR-Hc, all RJ-45 Ethernet ports and SFP ports support synchronous Ethernet and can supply a timing reference to be used as a source of node synchronization. When the 4-port T1/E1 and RS-232 Combination module is installed in the 7705 SAR-H, a single T1/E1 port on the module can supply a timing reference; it can be independently configured for loop-timing or node-timing. When the GPS Receiver module is installed in the 7705 SAR-H, the GPS RF port can be used as a source of node synchronization. All ports on the 4-port SAR-H Fast Ethernet module support synchronous Ethernet and can supply a timing reference to be used as a source of node synchronization.

On the 7705 SAR-A, all synchronous Ethernet ports can supply a timing reference to be used as a source of node synchronization. Synchronous Ethernet is supported on the XOR ports (1 to 4), configured as either RJ-45 ports or SFP ports. Synchronous Ethernet is also supported on SFP ports 5 to 8. Ports 9 to 12 do not support synchronous Ethernet (except when 10/100/1000BaseT copper SFP is used) and, therefore, cannot be used as a timing reference. On the 7705 SAR-A variant with T1/E1 ports, two T1/E1 ports can also supply a timing reference.

On the 7705 SAR-Ax, all Ethernet ports support synchronous Ethernet and IEEE 1588v2 PTP and can supply a timing reference to be used as a source of node synchronization. The 7705 SAR-Ax can also derive its timing from a GPS antenna signal using the GNSS RF port.

On the 7705 SAR-W and 7705 SAR-Wx, all RJ-45 Ethernet ports and SFP ports support synchronous Ethernet and IEEE 1588v2 PTP, and can supply a timing reference to be used as a source of node synchronization. For 7705 SAR-Wx variants with a GPS RF port, the GPS RF port can be used as a source of node synchronization.

On the 7705 SAR-X, all Ethernet ports support synchronous Ethernet and IEEE 1588v2 PTP. Ethernet ports and T1/E1 ports can supply two timing references to be used as a source of node synchronization. In addition, each T1/E1 port can be independently configured for loop timing.

The 7705 SAR-8 Shelf V2 and 7705 SAR-18 can receive one or two timing references depending on the port and card type supplying the reference. A timing reference can come from:

- a single SONET/SDH port on the 4-port OC3/STM1 Clear Channel Adapter card
- a single synchronous Ethernet port on the 8-port Ethernet Adapter card

- two DS3/E3 ports on the 4-port DS3/E3 Adapter card
- two SONET/SDH ports on the 2-port OC3/STM1 Channelized Adapter card or 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- two synchronous Ethernet ports on:
 - the 6-port Ethernet 10Gbps Adapter card
 - the 8-port Gigabit Ethernet Adapter card
 - the 10-port 1GigE/1-port 10GigE X-Adapter card (supported on the 7705 SAR-18 only)
 - the 2-port 10GigE (Ethernet) Adapter card
- two T1/E1 ports on the 16-port T1/E1 ASAP Adapter card or the 32-port T1/E1 ASAP Adapter card. References must be from different framers; the framers each have eight ports and are grouped as ports 1 to 8, 9 to 16, 17 to 24, and 25 to 32.
- two ports on the Packet Microwave Adapter card: on port 1 or 2, it could be a synchronous Ethernet or PCR-enabled port; on port 3 or 4, it could be a synchronous Ethernet (optical SFP only) or PCR-enabled port (copper-based SFP only); on ports 5 through 8, it could be a synchronous Ethernet (optical SFP only) port.
- the GNSS RF port on the GNSS Receiver card

The 7705 SAR-8 Shelf V2 and 7705 SAR-18 can also use IEEE 1588v2 PTP as a source of node synchronization.

Each T1/E1 port can be independently configured for loop-timing (recovered from an Rx line) or node-timing (recovered from the SSU in the active CSM).

In addition, T1/E1 CES circuits on the following can be independently configured for adaptive timing (clocking is derived from incoming TDM pseudowire packets):

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 7705 SAR-M (variants with T1/E1 ports)
- 7705 SAR-A (variant with T1/E1 ports)
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

T1/E1 CES circuits on the following can be independently configured for differential timing (recovered from RTP in TDM pseudowire packets):

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card (DS1/E1 channels)

- 4-port DS3/E3 Adapter card (DS1/E1 channels on DS3 ports; E3 ports cannot be channelized); DCR on DS1/E1 channels is supported only on the first three ports of the card
- 7705 SAR-M (variants with T1/E1 ports)
- 7705 SAR-A (variant with T1/E1 ports)
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

Adaptive timing and differential timing are not supported on DS1 or E1 channels that have CAS signaling enabled.

A T1/E1 port can be configured to be a timing source for the node.

Each SONET/SDH port and each T1/E1 CES circuit on a 2-port OC3/STM1 Channelized Adapter card can be independently configured to be loop-timed or node-timed; each DS3 circuit can be independently configured to be loop-timed or free-run. A SONET/SDH port can be configured to be a timing source for the node.

Each SONET/SDH port on a 4-port OC3/STM1 Clear Channel Adapter card can be independently configured to be loop-timed or node-timed. A SONET/SDH port can be configured to be a timing source for the node.

Each SONET/SDH port on a 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card can be independently configured to be node-timed; each T1/E1 CES circuit can be independently configured to be node-timed, loop-timed, or differential-timed. A SONET/SDH port can be configured to be a timing source for the node.

Each clear channel DS3/E3 port on a 4-port DS3/E3 Adapter card can be independently configured to be loop-timed, node-timed, or differential-timed. When a DS3 port is channelized, each DS1 or E1 channel can be independently configured to be loop-timed, node-timed, or differential-timed (differential timing on DS1/E1 channels is supported only on the first three ports of the card). When not configured for differential timing, a DS3/E3 port can be configured to be a timing source for the node.

6.4.1 External Timing Mode

The external input and output timing ports are located on the CSM on the 7705 SAR-8 Shelf V2 and directly on the 7705 SAR-H and 7705 SAR-M. The 7705 SAR-A, 7705 SAR-Ax, and 7705 SAR-X have an external timing input port only, located on their faceplates. The external input timing port allows the SSU to be synchronized to an external timing reference. The external output timing port provides a synchronization output signal from the 7705 SAR to an external device. These external timing references typically would come from a GNSS, Building Integrated Timing System (BITS), or the external output timing ports from other telecom equipment.

The timing ports can be configured for the following:

- 2.048 MHz G.703 section 13 signal
- 5 MHz sine wave (not available on the 7705 SAR-8 Shelf V2 CSMv2)
- 10 MHz sine wave

On the 7705 SAR-18, the BITS ports 1 and 2 can be configured for the following:

- 2.048 MHz G.703 section 13 signal
- T1 (ESF or SF)
- E1 (PCM30CRC or PCM31CRC)

When redundant CSMs are used on the 7705 SAR-8 Shelf V2, the external synchronization inputs in each CSM must come from the same synchronization source; that is, you cannot select each input of the two CSMs as two of the three timing references. A Y-cable can be used to connect to a single reference connector. The synchronization output on each CSM is clocked by its own SSU clock.

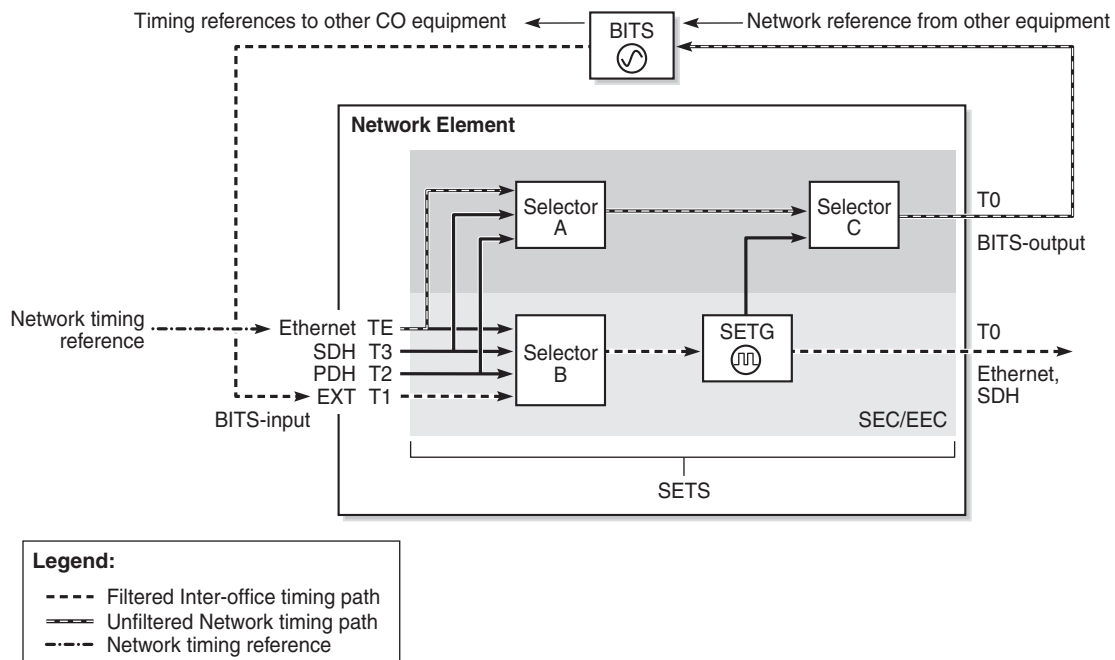
On the 7705 SAR-18, either BITS port 1 or port 2 is available as an input and output source. When both inputs are connected and available, then the quality level (QL) from Synchronization Status Messaging (SSM) is used to determine which port is used by the CSMs as the BITS input. If SSM is not available, then BITS port 1 is the preferred input. BITS port 2 is used if BITS port 1 is not available. In this case, the operation is non-revertive. The BITS output ports 1 and 2 are clocked by the active CSM's SSU clock.

The BITS output **source** command can be used to configure the BITS output ports' source path on the 7705 SAR-18 to be either:

- the filtered clock from the Synchronous Equipment Timing Generator (SETG)
- the alternate unfiltered path from the BITS output port via Selector A and C, as per ITU-T G.8262

Figure 12 shows an example of a timing source path. The BITS port is configured to deliver an input reference directly to a dedicated timing device such as a BITS or standalone synchronization equipment (SASE) device in a customer facility. The external BITS clock can have multiple references and can provide a common high-quality clock to all network elements at the customer location, including the 7705 SAR-18 node.

Figure 12 BITS Timing Source Path



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When configuring the priority order of the timing references with the **ref-order** command for unfiltered BITS output (T4), all reference sources are valid options, except the BITS input, which is excluded to avoid a timing loop. Because the same priority order is used for the SETG output (T0), the BITS input option must be set as the first (highest-priority) reference option.

Because both input and output clock pins are inside the physical RJ-45 port for each BITS port, a custom cable is required to connect input and output ports to different equipment. Refer to the 7705 SAR-18 Chassis Installation Guide, BITS Ports and Pinouts.

6.4.2 Line Timing Mode

Line timing from a synchronous port, such as a T1/E1 port or synchronous Ethernet port, provides the best synchronization performance through a synchronization distribution network. Line timing mode derives an 8 kHz clock from the framing of T1/E1, DS3/E3, and SONET/SDH signaling that can be used as an accurate reference between nodes in a network. Line timing mode is immune to any packet delay variation (PDV) occurring on Layer 2 or Layer 3 links.

On the 7705 SAR-M variants with T1/E1 ports, line timing is supported on the T1/E1 ports. Line timing is also supported on all RJ-45 Ethernet ports and SFP ports on the 7705 SAR-M and on the following 7705 SAR-M modules:

- 2-port 10GigE (Ethernet) module
- 6-port SAR-M Ethernet module

On the 7705 SAR-X, line timing is supported on T1/E1 ports and Ethernet ports.

On the 7705 SAR-H and 7705 SAR-Hc, line timing is supported on all Ethernet ports. Line timing is also supported on the following 7705 SAR-H modules:

- 4-port SAR-H Fast Ethernet module
- T1/E1 ports of the 4-port T1/E1 and RS-232 Combination module

On the 7705 SAR-A variant with T1/E1 ports, line timing is supported on the T1/E1 ports. Line timing is also supported on all synchronous Ethernet ports on the 7705 SAR-A. Synchronous Ethernet is supported on the XOR ports (1 to 4), configured as either RJ-45 ports or SFP ports. Synchronous Ethernet is also supported on SFP ports 5 to 8. Ports 9 to 12 do not support synchronous Ethernet and therefore do not support line timing.

On the 7705 SAR-Ax, line timing is supported on all Ethernet ports.

On the 7705 SAR-W and 7705 SAR-Wx, line timing is supported on all Ethernet RJ-45 ports and SFP ports.

On the 7705 SAR-8 Shelf V2 and 7705 SAR-18, line timing is supported on the following adapter cards:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 8-port Ethernet Adapter card, on the two Ethernet SFP ports with SFPs that support synchronous Ethernet
- 6-port Ethernet 10Gbps Adapter card
- 8-port Gigabit Ethernet Adapter card (dual-rate and copper SFPs do not support synchronous Ethernet)
- 2-port 10GigE (Ethernet) Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card (supported on the 7705 SAR-18 only)
- 4-port DS3/E3 Adapter card
- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- 4-port OC3/STM1 Clear Channel Adapter card
- Packet Microwave Adapter card on ports that support synchronous Ethernet and on ports that support PCR

6.4.3 Adaptive Clock Recovery (ACR)

Adaptive Clock Recovery (ACR) is a timing-over-packet technology that transports timing information via periodic packet delivery over a pseudowire. ACR may be used when there is no other Stratum 1 traceable clock available.

ACR is supported on T1/E1 CES circuits on the following:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 7705 SAR-M (variants with T1/E1 ports)
- 7705 SAR-A (variant with T1/E1 ports)
- T1/E1 ports of the 4-port T1/E1 and RS-232 Combination module
- T1/E1 ports on the 7705 SAR-X

ACR is not supported on DS1 or E1 channels that have CAS signaling enabled.

ACR is supported for Cpipe services. In addition, ACR is supported on MEF 8 Epipe services. The MEF 8 Epipe may be a TDM SAP to Ethernet SAP or a TDM SAP to spoke SDP. Refer to the 7705 SAR Services Guide, “MEF 8”, for information on MEF 8.

There is no extra equipment cost to implement ACR in a network because this technique uses the packet arrival rate of a TDM pseudowire within the 7705 SAR to regenerate a clock signal. Additionally, the nodes in the network that are traversed between endpoints do not need special ACR capabilities. However, because the TDM pseudowire is transported over Layer 2 links, the packet flow is susceptible to PDV.

To achieve the best ACR performance, follow these recommendations:

- use a packet rate between 1000 pps and 4000 pps. Lower packet rates cause ACR to be more susceptible to PDV in the network.
- limit the number of nodes traversed between the source-end and the ACR-end of the TDM pseudowire
- enable QoS in the network with the TDM pseudowire enabled for ACR classified as NC (network control)
- maintain a constant temperature, as much as possible, because temperature variations will affect the natural frequency on the internal oscillators in the 7705 SAR
- ensure that the network does not contain a timing loop when it is designed

6.4.3.1 ACR States

There are five potential ACR states:

- normal
- phase tracking
- frequency tracking
- holdover
- free-run

When a port's ACR state is normal, phase tracking, or frequency tracking, the recovered ACR clock is considered to be a qualified reference source for the SSU. If this reference source is being used, then transitions between any of these three states will not affect SSU operation.

When a port's ACR state is free-run or holdover, the recovered ACR clock is disqualified as a reference source for the SSU. If this reference source is being used, then transitions to either of these two states cause the SSU to drop the reference and switch to the next highest prioritized reference source. This can potentially be SSU holdover.

6.4.3.2 ACR Statistics

The system collects statistics on all ACR-capable ports. ACR statistics detail how the digital phase locked loop (DPLL) is functioning in one or more ACR instances in the adapter card. ACR statistics assist with isolating a problem during degraded synchronization performance or with anticipating future issues.

Within the DPLL, there are two values that contribute to ACR statistics:

- DCO frequency
- input phase error of each 2-second update interval

The DCO is the digitally controlled oscillator that produces the regenerated clock signal. The input phase error is the correction signal that provides feedback to the DPLL in order to tune the DCO output. The input phase error should approach zero as the DPLL locks in to the source timing information and stabilizes the output.

The continuous 2-second updates to the output DCO frequency are directly applied as the clock output of the ACR instance. ACR statistics allow you to view the mean frequency and the standard deviation of the output DCO frequency.

During every 2-second update interval, the input phase error and the output DCO frequency are recorded. The input phase error mean, input phase error standard deviation, output DCO mean (Hz and ppb), and output DCO standard deviation are calculated every 60 seconds.

Entering a **show** CLI command on a port with ACR displays the mean and standard deviation values for the previous 60-second interval. A **show detail** command on the same port displays the previous 15 sets of 60-second intervals and a list of state and event counts. An SNMP MIB is also available with these statistics.

6.4.4 Differential Clock Recovery (DCR)

Differential Clock Recovery (DCR) is an alternative method to ACR to maintain the service clock across the packet network for a circuit emulated service. DCR is supported on:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card (DS1/E1 channels)
- 4-port DS3/E3 Adapter card (clear channel DS3/E3 ports and DS1/E1 channels on channelized DS3 ports (E3 ports cannot be channelized)); DCR on DS1/E1 channels is supported only on the first three ports of the card
- 7705 SAR-M (variants with T1/E1 ports)
- 7705 SAR-A (variant with T1/E1 ports)
- T1/E1 ports of the 4-port T1/E1 and RS-232 Combination module
- T1/E1 ports on the 7705 SAR-X

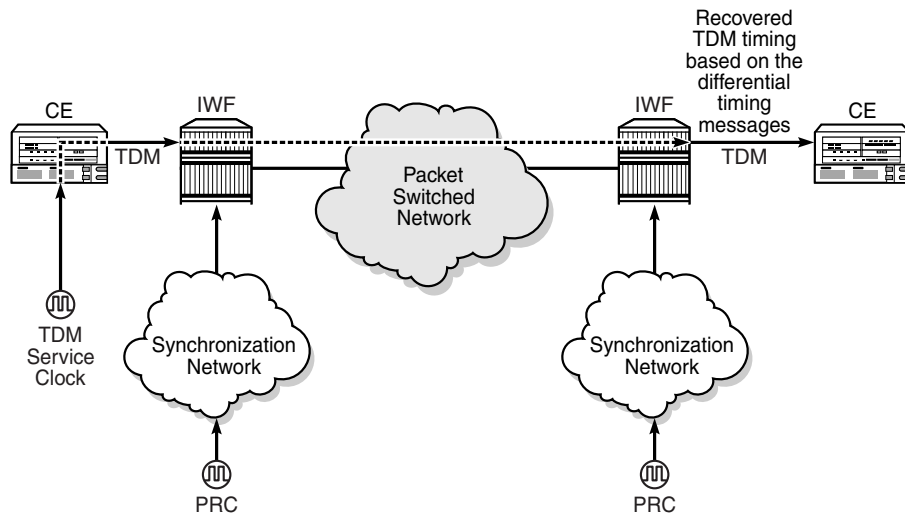
In addition, DCR is supported between TDM SAPs and Ethernet SAPs and between TDM SAPs and spoke SDPs in a MEF 8 configuration for the above platforms, adapter cards, and modules. Refer to the 7705 SAR Services Guide, “MEF 8”, for information on MEF 8.

DCR is not supported on DS1 or E1 channels that have CAS signaling enabled.

DCR uses channel group 1 for timing recovery. If a T1 or E1 port is channelized, all TDM PWs that share the port use the timing recovered from channel group 1.

To enable DCR, the network must have a common clock between the routers performing the TDM-to-packet interworking function or between the two terminating SAPs or SAP/spoke SDP using MEF 8. The common clock can come from two PRC-traceable clocks or one clock that is made available to both ends, such as the transmitted clock of a SONET/SDH or synchronous Ethernet port.

In each direction, the service clock is compared to the common clock and the difference is encoded into the RTP header in the TDM PW overhead. At the other end of the network, the original service clock is reproduced by comparing the common clock to the frequency difference in the RTP header. [Figure 13](#) shows an example of a network using DCR.

Figure 13 Differential Clock Recovery on a Network

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RTP headers are disabled by default and must be enabled for all circuit emulation services that require DCR. RTP must be enabled for the TDM PW that uses channel group 1. All channel groups on the same DS1 or E1 channel must be configured for the same mode of operation.

To achieve the best DCR performance, it is recommended that you use a Layer 1 network synchronization method to ensure the common clock has the best stability. If a timing-over-packet technique is used to transfer the common clock, then the number and type of nodes, the traffic profile, and the temperature variations will affect DCR synchronization performance. As well, a packet rate of at least 200 pps is recommended (up to 4000 pps is supported). Packet rates lower than 200 pps may affect system performance.

6.4.4.1 DCR Frequencies

Each DS1, E1, DS3, or E3 circuit configured with DCR executes its own clock recovery from the packet stream. This allows each circuit to have an independent frequency.

Table 25 lists the supported timestamp frequencies for each platform and adapter card.

Table 25 Supported Timestamp Frequencies for DCR-timed Circuits

| | Timestamp Frequency (MHz) | | | |
|---|---------------------------|-------------|----|-------|
| | 103.68 | 77.76 | 25 | 19.44 |
| 16-port T1/E1 ASAP Adapter card | | ✓ (default) | | ✓ |
| 32-port T1/E1 ASAP Adapter card | | ✓ (default) | | ✓ |
| 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card | | ✓ (default) | | |
| 4-port DS3/E3 Adapter card | | ✓ (default) | | |
| 7705 SAR-M | ✓ (default) | ✓ | ✓ | ✓ |
| 7705 SAR-A | ✓ (default) | ✓ | ✓ | ✓ |
| 4-port T1/E1 and RS-232 Combination module | ✓ (default) | ✓ | ✓ | ✓ |
| 7705 SAR-X | ✓ (default) | ✓ | ✓ | ✓ |

The timestamp frequency is configured at the adapter card level and is used by all DCR ports or channels on the supporting platforms and cards. Both ends of a TDM pseudowire using DCR must be running the same frequency. If a network contains different types of equipment using DCR, a common frequency must be selected that is supported by all equipment.

DCR complies with published jitter and wander specifications (G.823, G.824, and G.8261) for traffic interfaces under typical network conditions and for synchronous interfaces under specified packet network delay, loss, and delay variance (jitter) conditions.

6.4.5 Serial Clock Transport (DCR Serial)

A **dcr-serial** parameter option is available on the 12-port Serial Data Interface card, version 3, to support the SAToP serial virtual channel (vc) type of Cpipe. The **dcr-serial** option can be configured using the **serial>clock-source** command; it is only supported on synchronous RS-232 and RS-530 interfaces. Refer to the 7705 SAR Interface Configuration Guide, “Serial Commands”, for more information on how to configure DCR serial. Refer to the 7705 SAR Services Guide, “SAToP Serial”, for information on SAToP serial.

During the normal transport of serial data traffic across a 7705 SAR IP/MPLS network, the time reference used to clock the data in/out of the 7705 SAR to the end device is based on the 7705 SAR system clock.

Some encryption applications, however, require both end devices on an encrypted link to run off the same time reference. In order to meet this requirement, the **dcr-serial** option is used to transport the system clock but only in a single direction: from the DTE-designated port of a SAToP serial Cpipe to the DCE-designated port at the other end. The source of the service clock is referenced to the Rx Clk signal of the DTE port on the 12-port Serial Data Interface card, version 3. One end of the a SAToP serial Cpipe must be set to DTE while the other end is set to DCE.



Note:

- Only one clock can be transported per port.
- The clock recovered by DCR serial is suitable only for clocking data into the attached device, not as a source of network synchronization.
- The input frequency clock tolerance must within 4.5% of the configured port rate.
- Although DCR serial is supported on 600 b/s port speeds, clock deviations from a nominal 600 b/s port speed are not supported. This applies to both RS-232 and RS-530 ports.
- There can be a maximum of 12 DCR serial timing instances per 12-port Serial Data Interface card, version 3.

6.4.6 Proprietary Clock Recovery (PCR)

PCR is a copper synchronous Ethernet-based, timing-over-packet technology. It is supported on the Packet Microwave Adapter card on the two copper RJ-45 synchronous Ethernet 1000Base-T Microwave Awareness (MWA) ports (ports 1 and 2) and on a copper SFP Ethernet port (ports 3 and 4).

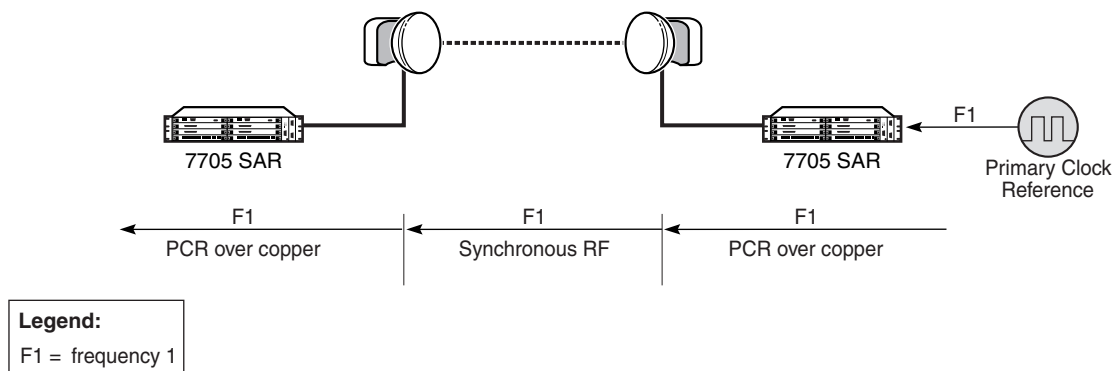
There is no CLI configuration requirement for PCR; it is turned on automatically when a microwave link is enabled on an MWA RJ-45 port or on a copper SFP Ethernet port (ports 3 and 4).



Note: On the MPR-e side, PCR requires that the MAC address of the 7705 SAR-8 Shelf V2 or 7705 SAR-18 be configured on the MPR-e radio that is connected to the 7705 SAR-8 Shelf V2 or 7705 SAR-18 chassis. Refer to the latest version of the MPR-e user manual for the required information.

PCR provides the same frequency recovery capability as standard-based copper synchronous Ethernet without having to endure a traffic hit whenever a synchronous source switching occurs. See [Figure 14](#).

Figure 14 Proprietary Clock Recovery



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By running PCR between the MPR-e radio and the MWA port, frequency synchronization can be delivered in either direction. With standard-based copper synchronous Ethernet, there is a traffic hit every time a clock source change occurs on a 7705 SAR-8 Shelf V2 or 7705 SAR-18 because the 7705 SAR-8 Shelf V2 or 7705 SAR-18 and the MPR-e radio to which it is connected must bring down the Ethernet link MAC layer before it can renegotiate and reverse the master and slave clock role. This MAC layer renegotiation affects the data plane and the signaling and routing plane. All MPLS signaling links and the label switched path (LSP) are taken down during the renegotiation process; the routing signaling advertises the down state of the link throughout the network.

However, with PCR running on the microwave link, the physical layer transmit clock on a copper synchronous Ethernet port on the Packet Microwave Adapter card is always set to master. The reversal of the clock role only occurs at the PCR “layer”. This means that a synchronous source change does not disrupt the data plane and the signaling and routing plane on the 7705 SAR-8 Shelf V2 or 7705 SAR-18.

6.4.7 IEEE 1588v2 PTP

Precision Time Protocol (PTP) is a timing-over-packet protocol defined in the IEEE 1588v2 standard *1588 2008*.

PTP can be deployed as an alternative timing-over-packet option to ACR. PTP provides the capability to synchronize network elements to a Stratum-1 clock or primary reference clock (PRC) traceable source over a network that may or may not be PTP-aware. PTP has several advantages over ACR. It is a standards-based protocol, has lower bandwidth requirements, can transport both frequency and time, and can potentially provide better performance.

There are five basic types of PTP devices, as listed below:

- ordinary clock (master or slave)
- boundary clock
- end-to-end transparent clock
- peer-to-peer transparent clock
- management node

[Table 26](#) lists the types of PTP support on each fixed platform; [Table 27](#) lists the types of PTP support on each adapter card for the 7705 SAR-8 Shelf V2 and the 7705 SAR-18.



Note:

- All clock types, with the exception of transparent clock, support PTP messaging using UDP/ IPv4 or UDP/IPv6.
- IPv6 messaging is supported on all platforms and cards listed in [Table 26](#) and [Table 27](#) with the exception of the 8-port Ethernet Adapter card.
- Boundary clocks support dual mode; that is, the clock can be configured for both IPv4 and IPv6. Dual mode is not supported on ordinary clocks; the clock can only be configured for IPv4 or IPv6.

Table 26 IEEE 1588v2 PTP Support per Fixed Platform

| Sync Type | PTP Clock Type | 7705 SAR-A
7705 SAR-Ax
7705 SAR-H
7705 SAR-Hc
7705 SAR-M
7705 SAR-W
7705 SAR-Wx
7705 SAR-X |
|-----------------------|------------------------------|---|
| Freq | Ordinary Slave | ✓ |
| | Boundary Clock | ✓ |
| | End-to-End Transparent Clock | ✓ |
| | Ordinary Master | ✓ |
| Time of day/
phase | Ordinary Slave | ✓ |
| | Boundary Clock | ✓ |
| | End-to-End Transparent Clock | ✓ ¹ |
| | Ordinary Master | ✓ ² |

Notes:

1. The 2-port 10GigE (Ethernet) module supports transparent clock functionality when installed in the 7705 SAR-M.
2. Only supported on the 7705 SAR-H with a GPS Receiver module and 7705 SAR-Wx variants with a GPS RF port.

All the platforms listed in [Table 26](#) support one ordinary slave clock, ordinary master clock, or boundary clock. The platforms also support an additional PTP clock for transparent clock functionality.

Table 27 IEEE 1588v2 PTP Support per Card on the 7705 SAR-8 Shelf V2 and 7705 SAR-18

| Sync Type | PTP Clock Type | 8-port Ethernet Adapter Card | 6-port Ethernet 10Gbps Adapter Card | 8-port Gigabit Ethernet Adapter Card | Packet Microwave Adapter Card | 2-port 10GigE (Ethernet) Adapter Card | 10-port 1GigE/ 1-port 10GigE X-Adapter Card ¹ |
|--------------------|------------------------------|------------------------------|-------------------------------------|--------------------------------------|-------------------------------|---------------------------------------|--|
| Freq | Ordinary Slave | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Boundary Clock | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | End-to-End Transparent Clock | | | | | | |
| | Ordinary Master | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Time of day/ phase | Ordinary Slave | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Boundary Clock | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | End-to-End Transparent Clock | | | | | | |
| | Ordinary Master | | ✓ ² | ✓ ² | ✓ ² | ✓ ² | ✓ ² |

Notes:

1. Not supported on the 7705 SAR-8 Shelf V2.
2. Supported on chassis with an active GNSS Receiver card.

The 7705 SAR-8 Shelf V2 supports up to six ordinary slave clocks, ordinary master clocks, or boundary clocks. The 7705 SAR-18 supports up to eight ordinary slave clocks, ordinary master clocks, or boundary clocks.

Each of the cards listed in [Table 27](#) supports one PTP clock.

A nodal clock is equipped in each CSM on the 7705 SAR-8 Shelf V2 and 7705 SAR-18 or directly on the fixed platforms listed in [Table 26](#). Up to two PTP ordinary or boundary clocks can be configured per node as references to the nodal clock.

Each PTP slave clock can be configured to receive timing from up to two PTP master clocks in the network.

6.4.7.1 Best Master Clock Algorithm

Each master clock has its own configuration for IP address, packet rate, and messaging timeouts, and for statistics, alarms, and events. Each available master clock advertises its presence and information using announce messages. If both master clocks are available, the slave clock uses the Best Master Clock Algorithm (BMCA) to dynamically compare the information in the announce messages of each master clock to determine to which of the two master clocks it should synchronize. This master clock is known as the best master. After the slave clock has determined which is the best master, it may begin to negotiate with it for unicast synchronization communication.

The configured setting for the **profile** command determines the precedence order for selecting the best master clock algorithm. The 7705 SAR supports the following profile settings: **ieee1588-2008**, **itu-telecom-freq**, **g8275dot1-2014**, **g8275dot2-2016**, and **iec-61850-9-3-2016**. For information about the **g8275dot1-2014** and **g8275dot2-2016** profile parameters, see [ITU-T G.8275.1](#) and [G.8275.2](#). For information about the **iec-61850-9-3-2016** profile parameter, see [IEC/IEEE 61850-9-3](#).

If the **profile** setting for the clock is **ieee1588-2008** or **iec-61850-9-3-2016**, the precedence order for the best master selection algorithm is as follows:

- priority1 (user-configurable on the master clock side)
- clock class
- clock accuracy
- PTP variance (offsetScaledLogVariance)
- priority2 (user-configurable on the master clock side)
- clock identity
- distance (number of boundary clocks)

If the **profile** setting for the clock is **itu-telecom-freq** (ITU-T G.8265.1 profile), the precedence order for the best master selection algorithm is as follows:

- clock class
- peer ID

If the **profile** setting for the clock is **g8275dot1-2014** or **g8275dot2-2016**, the precedence order for the best master selection algorithm is as follows if the grand master clock is connected to a primary reference time clock (PRTC) in locked mode:

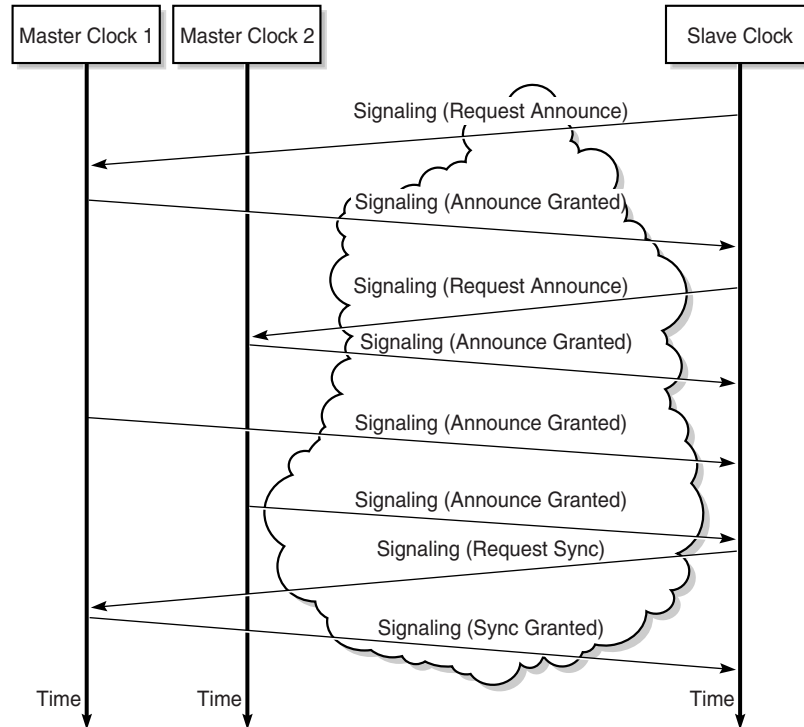
- clock class
- clock accuracy
- PTP variance (offsetScaledLogVariance)
- priority2 (user-configurable on the master clock side)
- localPriority
- steps removed from the grand master
- port identities
- port numbers

If the **profile** setting for the clock is **g8275dot1-2014** or **g8275dot2-2016**, the precedence order for the best master selection algorithm is as follows if the grand master clock is in holdover and out of holdover specification, or is without a time reference since startup:

- clock class
- clock accuracy
- PTP variance (offsetScaledLogVariance)
- priority2 (user-configurable on the master clock side)
- localPriority
- clock identity
- steps removed from the grand master
- port identities
- port numbers

[Figure 15](#) shows an example of the messaging sequence between the PTP slave clock and the two PTP master clocks.

Figure 15 Messaging Sequence Between the PTP Slave Clock and PTP Master Clocks



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6.4.7.2 PTP Clock Synchronization

The IEEE 1588v2 standard synchronizes the frequency and time from a master clock to one or more slave clocks over a packet stream. This packet-based synchronization can be over UDP/IP or Ethernet and can be unicast (for IP) or multicast (for Ethernet). For UDP/IP, both IPv4 and IPv6 unicast mode with unicast negotiation is supported.

As part of the basic synchronization timing computation, a number of event messages are defined for synchronization messaging between the PTP slave clock and PTP master clock. A one-step or two-step synchronization operation can be used, with the two-step operation requiring a follow-up message after each synchronization message. Currently, only one-step operation is supported when the 7705 SAR is a master clock; PTP frequency and time can be recovered from both one-step and two-step operation when the 7705 SAR is acting as a slave or boundary clock.

For IPv4, the two-step operation is optional. For IPv6, the two-step operation is a mandatory requirement for the 7705 SAR.



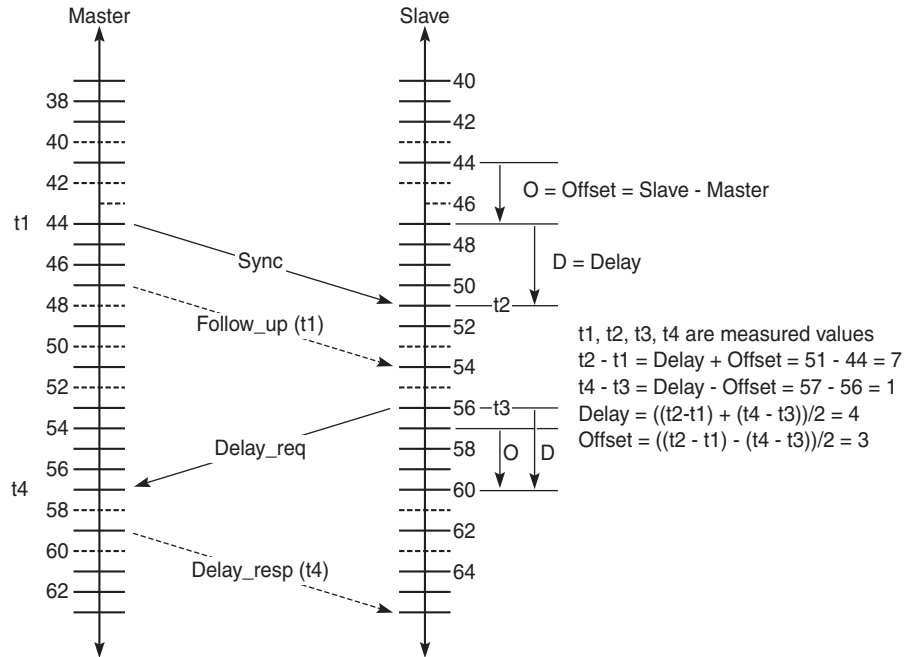
Note: Two-step operation does not apply if PTP packets are routed over a physical port on the 7705 SAR-X or on the 6-port Ethernet 10Gbps Adapter card.

In one-step operation, a timestamp is inserted in the synchronization message when the packet is transmitted to the slave clock. In two-step operation, the timestamp is sent in the follow-up message. If the timestamp is changed in the synchronization message, the checksum field is recomputed. Because the checksum field is a mandatory field for IPv6 (optional for IPv4), the 7705 SAR requires the timestamp to be sent separately to avoid potential checksum corruption in the packet.

During startup, the PTP slave clock receives the synchronization messages from the PTP master clock before a network delay calculation is made. Prior to any delay calculation, the delay is assumed to be zero. A drift compensation is activated after a number of synchronization message intervals occur. The expected interval between the reception of synchronization messages is user-configurable.

The basic synchronization timing computation between the PTP slave clock and PTP best master is illustrated in [Figure 16](#). This figure illustrates the offset of the slave clock referenced to the best master signal during startup.

Figure 16 PTP Slave Clock and Master Clock Synchronization Timing Computation



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6.4.7.3 Performance Considerations

Although IEEE 1588v2 can be used on a network that is not PTP-aware, the use of PTP-aware network elements (boundary clocks) within the packet switched network improves synchronization performance by reducing the impact of PDV between the grand master clock and the slave clock.

Note:



- The grand master clock is the master clock for the network. The best master clock is the clock that the slave clock selects as its master. For example, the slave clock’s best master clock might be a boundary clock, which is connected to a grand master clock.
- A 7705 SAR equipped with a GNSS receiver can function as a grand master clock.

The performance objective is to meet the synchronization interface maximum time interval error (MTIE) mask. Similar to ACR, the number of factors with the PSN will contribute to how well PTP can withstand, and still meet, those requirements.

6.4.7.4 PTP Capabilities

PTP messages are supported via IPv4 unicast with a fixed IP header size or via IPv6.

PTP messaging is supported on network interfaces. If a node loopback address is used as the source interface for 1588 packets, the packets can ingress any network IP interface on the router. If the source interface is associated with a physical port, packets must be sent to the interface on that port.

PTP messaging is also supported on IES interfaces for access ports.

The 7705 SAR can also forward IPv4-encapsulated PTP messages over BGP-LU routes for frequency synchronization. The following profiles are supported for these messages: **ieee1588-2008**, **itu-telecom-freq**, and **g8275dot2-2016**.

[Table 28](#) describes the supported message rates for slave and master states for IP-encapsulated PTP traffic, based on the profile configured. The ordinary clock can be either in the slave or master state. The boundary clock can be in both of these states.

Table 28 Rates for IP-Encapsulated PTP Messages

| | | ieee1588-2008 | itu-telecom-freq | g8275dot1-2014
g8275dot2-2016 |
|----------------|---------------------------|----------------------|-------------------------|--|
| Announce | Minimum rate | 1 per 16 seconds | 1 per 16 seconds | 1 per 16 seconds |
| | Maximum rate | 8 per second | 8 per second | 8 per second |
| | Default rate | 1 per 2 seconds | 1 per 2 seconds | 8 per second |
| Sync and Delay | Minimum rate ¹ | 64 per second | 64 per second | 16 per second |
| | Maximum rate | 128 per second | 128 per second | 128 per second |
| | Default rate | 64 per second | 64 per second | 16 per second |

Note:

1. In the master clock state, the minimum rate granted is 1 per 16 seconds if requested by the slave clock.

See [Table 31](#) for the supported message rates for Ethernet-encapsulated PTP traffic.

State and statistics data for each master clock are available to assist in the detection of failures or unusual situations.

The PTP algorithm is able to recover the clock using both the upstream and downstream directions in both ordinary slave and boundary clock modes. The ability to perform bidirectional recovery will improve the performance of networks where the upstream and downstream load is not symmetrical.

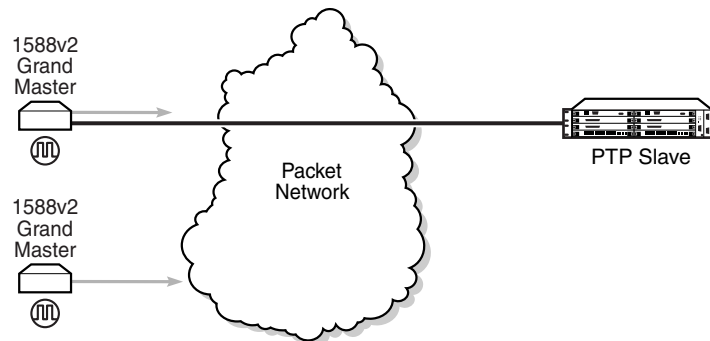
The Bell Labs algorithm looks at the PTP packet exchange in both directions between the master and slave. There can be more packet delay variation in one direction if there is a high utilization rate or congestion in that direction. The algorithm assesses the stability and reliability of the packet exchange in each direction and assigns weight values based on the results. The system gives preference to frequency synchronization from the direction with a higher weight value. The weight values change dynamically and can be viewed with detailed PTP show commands.

6.4.7.5 PTP Ordinary Slave Clock For Frequency

The PTP ordinary clock with slave capability on the 7705 SAR provides an option to reference a Stratum-1 traceable clock across a packet switched network. The recovered clock can be referenced by the internal SSU and distributed to all slots and ports.

Figure 17 shows a PTP ordinary slave clock network configuration.

Figure 17 Slave Clock



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The PTP slave capability is implemented on the Ethernet ports of the platforms listed in Table 26 and on the cards listed in Table 27.

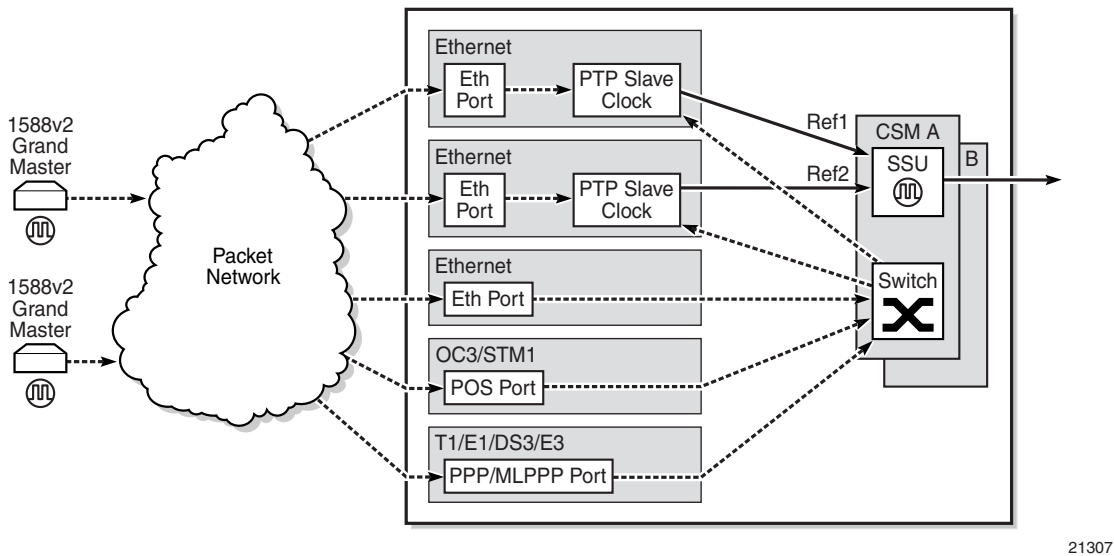
The 7705 SAR-8 Shelf V2 can support up to six slave clocks and the 7705 SAR-18 can support up to eight slave clocks.

All other fixed platforms listed in [Table 26](#) can support up to two PTP clocks when one of those clock types is configured as transparent; otherwise, they support only one slave clock.

Each slave clock can provide a separate frequency reference to the SSU.

[Figure 18](#) shows the operation of an ordinary PTP clock in slave mode.

Figure 18 Ordinary Slave Clock Operation



Each PTP ordinary slave clock is configured for a specific slot where the card (see [Table 27](#)) or Ethernet port (see [Table 26](#)) will perform the slave function. On the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, and 7705 SAR-Wx, this slot is always 1/1. On the 7705 SAR-X, this slot is always either 1/2 or 1/3. When the 7705 SAR-M is receiving PTP packets on the 2-port 10GigE (Ethernet) module, its PTP clock continues to use slot 1/1. Each slave is also associated with an IP interface on a specific port, adapter card, or loopback address for the router; however, the IP interface configured on a 2-port 10GigE (Ethernet) module cannot be associated with a slave clock.

For best performance, the network should be designed so that the IP messaging between the master clock and the slave clock will ingress and egress through a port where the slave is configured. If the ingress and egress flow of the PTP messages is via a different port or adapter card on the 7705 SAR, then the packets will be routed through the fabric to the Ethernet card with the PTP slave.

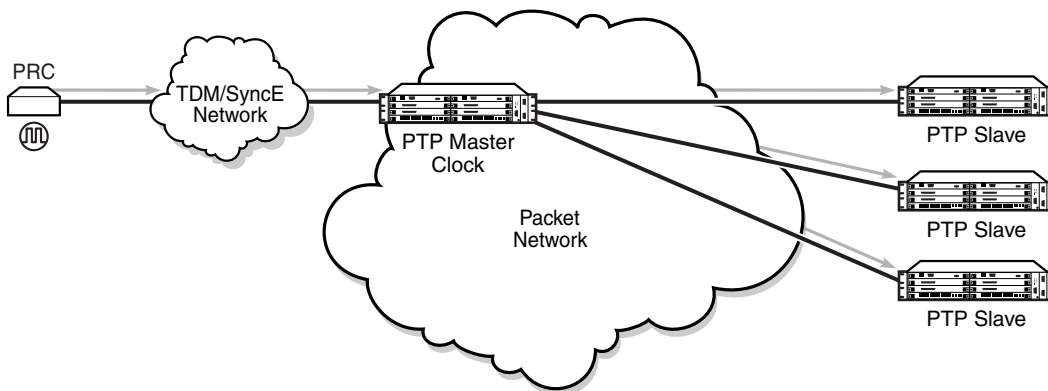
It is possible that the PTP IP packets may be routed through another Ethernet port/VLAN, OC3/STM1 or OC12/STM4 clear channel POS, OC3/STM1 or OC12/STM4 channelized MLPPP, DS3/E3 PPP, or DS1/E1 MLPPP. The PTP slave performance may be slightly worse in this case because of the extra PDV experienced through the fabric. Packets will be routed this way only if the clock is configured with a loopback address. If the clock is configured with an address tied to a physical port, the packets will arrive on that physical port as described above.

6.4.7.6 PTP Ordinary Master Clock For Frequency

The 7705 SAR supports the PTP ordinary clock in master mode. Normally, a 1588v2 grand master is used to support many slaves and boundary clocks in the network. In cases where only a small number of slaves and boundary clocks exist and only frequency is required, a PTP integrated master clock can greatly reduce hardware and management costs to implement PTP across the network. It also provides an opportunity to achieve better performance by placing a master clock deeper into the network, as close to the slave clocks as possible.

Figure 19 shows a PTP master clock network configuration.

Figure 19 PTP Master Clock

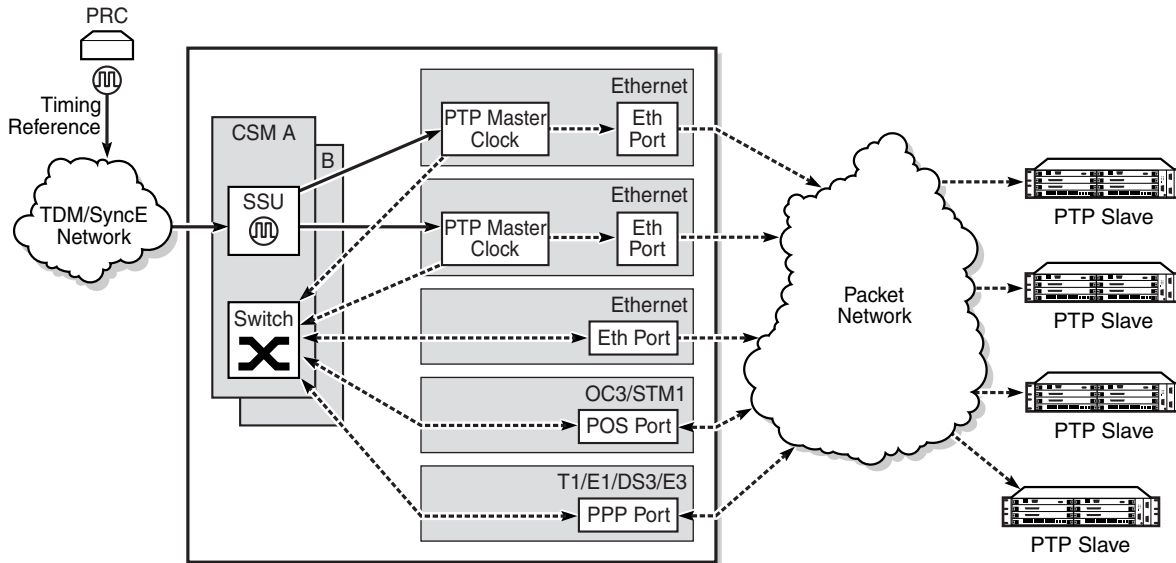


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The PTP master clock capability is implemented on the Ethernet ports of the platforms listed in Table 26 and on the cards listed in Table 27.

The 7705 SAR-8 Shelf V2 can support up to six master clocks and the 7705 SAR-18 can support up to eight master clocks. The fixed platforms listed in Table 26 can each support one master clock.

Figure 20 shows the operation of an ordinary PTP clock in master mode.

Figure 20 Ordinary Master Clock Operation

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Each PTP master clock is configured for a specific slot where the card (see [Table 27](#)) or Ethernet port (see [Table 26](#)) will perform the master function. On the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, and 7705 SAR-Wx, this slot is always 1/1. On the 7705 SAR-X, this slot is always either 1/2 or 1/3. When the 7705 SAR-M is receiving PTP packets on a 2-port 10GigE (Ethernet) module, its PTP clock continues to use slot 1/1. Each master is also associated with an IP interface on a specific port, adapter card, or loopback address for the router; however, the IP interface configured on a 2-port 10GigE (Ethernet) module cannot be associated with a master clock. All packets that ingress or egress through a port where the master is configured are routed to their destination via the best route as determined in the route table.

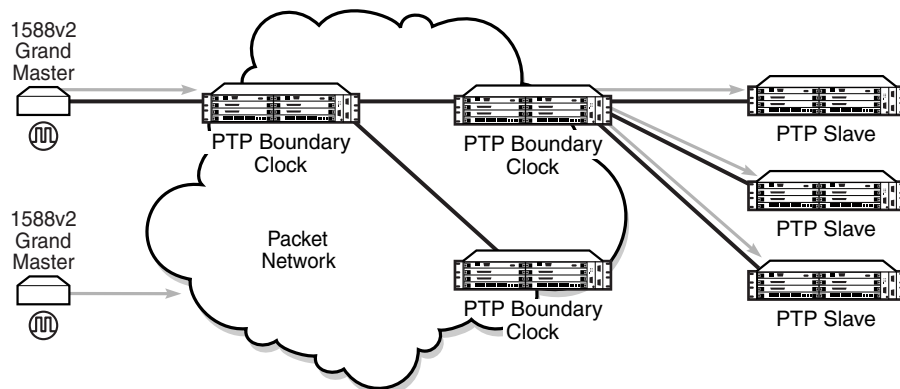
Each master clock can peer with up to 50 slaves or boundary clocks. The IP addresses of these peers can be statically configured via CLI or dynamically accepted via PTP signaling messages. A statically configured peer may displace a dynamic peer on a particular PTP port. If there are fewer than 50 peers, then that dynamic peer can signal back and be granted a different PTP-port instance.

6.4.7.7 PTP Boundary Clock For Frequency

The 7705 SAR supports boundary clock PTP devices in both master and slave states. IEEE 1588v2 can function across a packet network that is not PTP-aware; however, the performance may be unsatisfactory and unpredictable. PDV across the packet network varies with the number of hops, link speeds, usage rates, and the inherent behavior of the routers. By using routers with boundary clock functionality in the path between the grand master clock and the slave clock, one long path over many hops is split into multiple shorter segments, allowing better PDV control and improved slave performance. This allows PTP to function as a valid timing option in more network deployments and allows for better scalability and increased robustness in certain topologies, such as rings.

Boundary clocks can simultaneously function as a PTP slave of an upstream grand master (ordinary clock) or boundary clock, and as a PTP master of downstream slaves (ordinary clock) and/or boundary clocks. [Figure 21](#) shows the operation of a boundary clock.

Figure 21 Boundary Clock



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The PTP boundary clock capability is implemented on the Ethernet ports of the platforms listed in [Table 26](#) and on the cards listed in [Table 27](#).

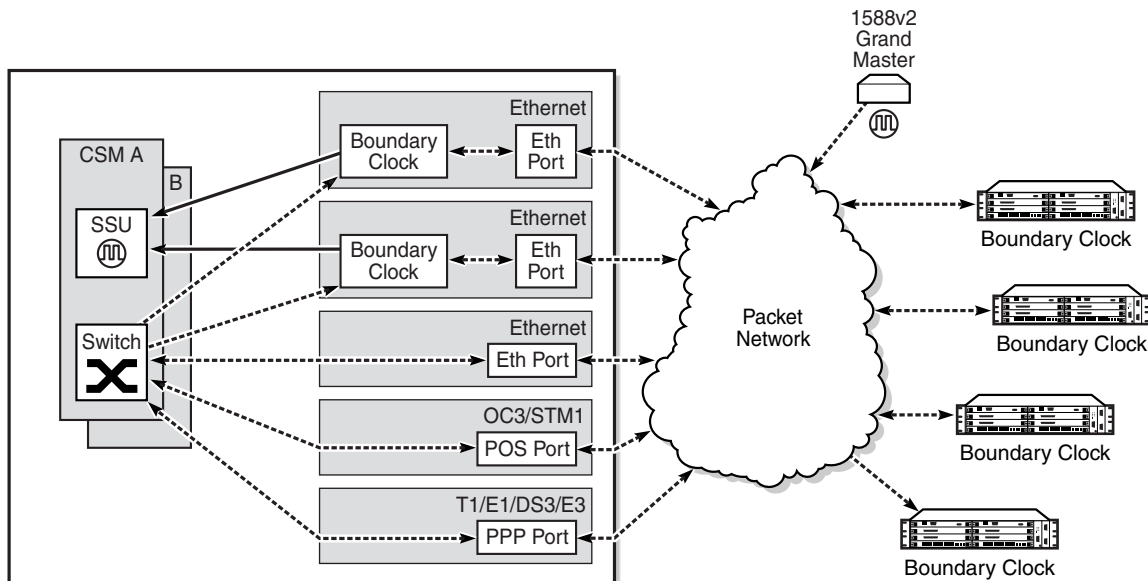
The 7705 SAR-8 Shelf V2 can support up to six boundary clocks and the 7705 SAR-18 can support up to eight boundary clocks. The fixed platforms listed in [Table 26](#) can each support one boundary clock.

Each PTP boundary clock is configured for a specific slot where the card (see [Table 27](#)) or Ethernet port (see [Table 26](#)) will perform the boundary clock function. On the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, and 7705 SAR-Wx, this slot is always 1/1. On the 7705 SAR-X, this slot is always either 1/2 or 1/3. When the 7705 SAR-M is receiving PTP packets on a 2-port 10GigE (Ethernet) module, its PTP clock continues to use slot 1/1. Each boundary clock is also associated with a loopback address for the router; however, the IP interface configured on a 2-port 10GigE (Ethernet) module cannot be associated with a boundary clock.

Each boundary clock can be peered with up to 50 slaves, boundary clocks, or grand master clocks. The IP addresses of these peers can be statically configured via CLI or dynamically accepted via PTP signaling messages. A statically configured peer may displace a dynamic peer on a particular PTP port. If there are fewer than 50 peers, that dynamic peer can signal back and be granted a different PTP-port instance.

[Figure 22](#) shows an example of boundary clock operation.

Figure 22 Boundary Clock Operation



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6.4.7.8 PTP Ordinary Slave Clock for Time of Day/Phase Recovery

The following equipment supports PTP slave clock for time of day/phase recovery:

- all fixed platforms listed in [Table 26](#)
- all cards listed in [Table 27](#) with the exception of the 8-port Ethernet Adapter card

The 7705 SAR can receive and extract time of day/phase recovery from a 1588 grand master clock or boundary clock and transmit the recovered time of day/phase signal to an external device such as a base station through an external time of day port, where available. The PTP slave clock can be used as a reference for the router system time clock, providing high-accuracy OAM timestamping and measurements for the 7705 SAR chassis.

On the 7705 SAR-8 Shelf V2 CSMv2, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-M, and 7705 SAR-X, transmission is through the ToD port with a 1 pulse/s output signal that is phase-aligned with other routers that are similarly time of day/phase synchronized. An RS-422 serial interface within the ToD port connector communicates the exact time of day of the rising edge of the 1 pulse/s signal. The serial interface on the ToD out port and the ToD in port on the CSMv2 are currently not supported; therefore, the 7705 SAR-8 Shelf V2 does not support Time of Day messages.

On the 7705 SAR-H, transmission is through the IRIG-B Out port. An RJ-45 interface is used for the IRIG-B Out port to communicate the exact time of day by the rising edge of the 1 pulse/s signal, an IRIG-B000 unmodulated time code signal, and an IRIG-B12X modulated time code signal.

On the 7705 SAR-H, the Time of Day message output is only available when the router is configured with an active IP PTP slave clock or boundary clock. For all other routers, the Time of Day message output is available when the router is configured with an active IP PTP slave clock or boundary clock or when Time of Day is recovered from an Ethernet PTP clock or integrated GNSS.

[Table 29](#) lists the 1 pulse/s signal (1pps) support and Time of Day messaging support per platform.

Table 29 1pps/ToD Message Support

| | 1pps Out | ToD Messages Out | 1pps In | ToD Messages In |
|---------------------------|----------|--|---------|-----------------|
| 7705 SAR-8 Shelf V2 CSMv2 | Yes | No | No | No |
| 7705 SAR-A | Yes | Yes for IP PTP
Yes for Ethernet PTP | No | No |

Table 29 1pps/ToD Message Support (Continued)

| | 1pps Out | ToD Messages Out | 1pps In | ToD Messages In |
|-------------|----------|--|---------|-----------------|
| 7705 SAR-Ax | Yes | Yes for IP PTP
Yes for Ethernet PTP | No | No |
| 7705 SAR-H | Yes | Yes for IP PTP
No for Ethernet PTP | No | No |
| 7705 SAR-M | Yes | Yes for IP PTP
Yes for Ethernet PTP | No | No |
| 7705 SAR-X | Yes | Yes for IP PTP
Yes for Ethernet PTP | No | No |

Table 30 describes the format of the ToD message.

Table 30 ToD Messages

| Byte Offset | Length | Field Name | Description |
|-------------|--------|---------------------|--|
| 0 | 4 | Second time of week | The GPS time of week, in seconds |
| 4 | 4 | Reserved | n/a |
| 8 | 2 | Week | The GPS week (GPS time) |
| 10 | 1 | LeapS | Leap seconds (GPS-UTC) |
| 11 | 1 | 1PPS status | The 1pps signal value ¹ : <ul style="list-style-type: none"> • 0x00 – 1pps is in a normal state and is time-traceable to PRTC and frequency-traceable to PRS/PRC • 0x02 – 1pps is not traceable |
| 12 | 1 | TAcc | The jitter level of 1PPS. This field is currently not in use. |
| 13 | 1 | Reserved | n/a |
| 14 | 1 | Reserved | n/a |
| 15 | 1 | Reserved | n/a |

Note:

1. Enhanced ToD 1pps values are not supported on the 7705 SAR-H.

For incoming IEEE 1588 packets, the destination IP address is the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, or 7705 SAR-X loopback address. The ingress interface can be an SFP Ethernet port on the faceplate of the chassis, an RJ-45 port on the faceplate of the chassis, or a port on an installed module.

Each PTP slave clock can be configured to receive timing from up to two PTP master clocks in the network. If both master clocks are available, the slave clock uses default BMCA to determine which of the two master clocks it should synchronize.

PTP messaging between the PTP master clock and PTP slave clock is done over UDP/IP using IPv4 unicast mode with a fixed IP header size or using IPv6. Unicast negotiation is supported. Each PTP instance supports up to 128 synchronization messages per second.

PTP recovered time accuracy depends on the delay of the forward path and the reverse path being symmetrical. It is possible to correct for known path delay asymmetry by using the **ptp-asymmetry** command for PTP packets destined for the local slave clock or downstream PTP slave clock.

6.4.7.9 PTP Boundary Clock for Time of Day/Phase Recovery

The following equipment supports PTP boundary clock capability for time of day/phase recovery:

- all fixed platforms listed in [Table 26](#)
- all cards listed in [Table 27](#) with the exception of the 8-port Ethernet Adapter card

The 7705 SAR-8 Shelf V2 can support up to six boundary clocks and the 7705 SAR-18 can support up to eight boundary clocks. The fixed platforms can each support one boundary clock. PTP boundary clocks that recover time of day/phase from a grand master clock or another boundary clock can be used as a reference for the router system time clock, providing high-accuracy OAM timestamping and measurements for the 7705 SAR chassis.

Each PTP boundary clock for time of day/phase is configured for a specific slot where the adapter card or port will perform the boundary clock function. On fixed platforms, with the exception of the 7705 SAR-X, this slot is always 1/1. On the 7705 SAR-X, this slot is always either 1/2 or 1/3. Each boundary clock is also associated with a loopback or system address for the router.

6.4.7.10 PTP End-to-End Transparent Clock for Time of Day/Phase Recovery

PTP end-to-end transparent clock for time of day/phase recovery is supported on the following:

- the fixed platforms listed in [Table 26](#)
- 2-port 10GigE (Ethernet) module

Transparent clock functionality is supported for PTP packets over UDP/IP over Ethernet (with and without VLAN tags).

For high-accuracy 1588 PTP clock recovery, timestamping of incoming and outgoing messages should be done as close to ingress and egress as possible when the 7705 SAR is acting as a 1588 transparent clock. Edge timestamping is performed on all packets from all Ethernet ports, including SFP and RJ-45 ports on the faceplate of the chassis or a port on an installed module.

PTP recovered time accuracy depends on the delay of the forward path and the reverse path being symmetrical. It is possible to correct for known path delay asymmetry by using the **ptp-asymmetry** command to configure an asymmetry delay setting in nanoseconds per direction for each edge.

To enable transparent clock processing at the node level, configure a PTP clock with the **transparent-e2e** clock type (using the **clock-type** command). Deconfiguring such a PTP clock will disable transparent clock processing.

6.4.7.11 PTP Master Clock for Time of Day/Phase Distribution

PTP master clock capability for time of day/phase distribution is implemented on the following platforms:

- 7705 SAR-H with a GPS Receiver module
- 7705 SAR-Wx variants with a GPS RF port
- 7705 SAR-8 Shelf V2 with a GNSS Receiver card
- 7705 SAR-18 with a GNSS Receiver card

Time of day input must be enabled using the **use-node-time** command before the node can be used as a PTP grand master clock. GNSS must also be the active system time reference for nodes that are being used as a grand master clock. When the **use-node-time** command is enabled, the PTP master clock uses the system time as a source of PTP time and can be used for time of day/phase distribution. When the **use-node-time** command is disabled, the PTP master clock can be used for frequency only.

6.4.7.12 PTP Clock Redundancy

Each PTP slave clock can be configured to receive timing from up to two PTP master clocks. If two PTP master clocks are configured, and if communication to the best master is lost or if the BMCA determines that the other PTP master clock is better, then the PTP slave clock switches to the other PTP master clock.

For a redundant or simple CSM configuration on the 7705 SAR-8 Shelf V2 and 7705 SAR-18, a maximum of two PTP slave clocks can be configured as the source of reference (ref1 and ref2) to the SSU. If a failure occurs between the PTP slave clock and the master clock, the SSU detects that ref1 or ref2 is unavailable and automatically switches to the other reference source. This switching provides PTP hot redundancy for hardware failures (on the 8-port Ethernet Adapter card, 6-port Ethernet 10Gbps Adapter card, 8-port Gigabit Ethernet Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, or Packet Microwave Adapter card) or port or facility failures (SFP or cut fiber). If a loopback address is used, PTP packets may arrive on any router network interface and the PTP clock will remain up.

The 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X support only one PTP slave clock. This slave clock can be configured as the source of reference (ref1 or ref2) to the SSU.

6.4.7.13 PTP Ethernet Capabilities

The 7705 SAR can be configured to transmit and receive PTP messages over a port that uses Ethernet encapsulation. The encapsulation type can be null, dot1q, or qinq. Ethernet-encapsulated PTP messages are processed on the node CSM or CSM functional block, and they are supported on ordinary slave, ordinary master, or boundary clocks for either frequency or time of day/phase recovery. The 7705 SAR-Ax can also support a grand master clock. The 7705 SAR-H, 7705 SAR-Wx, 7705 SAR-8 Shelf V2, and 7705 SAR-18 can also support a grand master clock when equipped to support GNSS. A PTP clock using Ethernet encapsulation can support up to 50 external peer clocks.

All platforms and cards that support PTP functionality support Ethernet-encapsulated PTP messages, except for the 8-port Ethernet Adapter card and the 2-port 10GigE (Ethernet) Adapter card/module. See [Table 26](#) and [Table 27](#) for a complete list of supported platforms and cards.

Ethernet encapsulation is configured on a per-port basis using the **config>system>ptp>clock** command, with the *clock-id* parameter set to **csm**. Ports can simultaneously support IPv4-encapsulated or IPv6-encapsulated PTP messages and Ethernet-encapsulated PTP messages. As well, the 7705 SAR supports the interworking of a PTP slave using IPv4-encapsulated or IPv6-encapsulated messages with a PTP master using Ethernet-encapsulated messages.

When a PTP clock is configured for Ethernet encapsulation, the following profiles are available:

- **ieee1588-2008**
- **g8275dot1-2014**
- **iec-61850-9-3-2016**

[Table 31](#) describes the supported message rates for slave and master states for Ethernet-encapsulated PTP traffic, based on the profile configured. The ordinary clock can be either in the slave or master state. The boundary clock can be in both of these states.

Table 31 Rates for Ethernet-Encapsulated PTP Messages

| | | ieee1588-2008 | g8275dot1-2014 | iec-61850-9-3-2016 |
|----------|--------------|----------------------|-----------------------|---------------------------|
| Announce | Minimum rate | 1 per 16 seconds | 1 per 16 seconds | 1 per 16 seconds |
| | Maximum rate | 8 per second | 8 per second | 8 per second |
| | Default rate | 1 per 2 seconds | 8 per second | 1 per second |
| Sync | Minimum rate | 1 per second | 1 per second | 1 per second |
| | Maximum rate | 64 per second | 64 per second | 64 per second |
| | Default rate | 64 per second | 16 per second | 1 per second |
| Delay | Minimum rate | 1 per second | 1 per second | 1 per second |
| | Maximum rate | 64 per second | 64 per second | 64 per second |
| | Default rate | 64 per second | 16 per second | 1 per second |

See [Table 28](#) for the supported message rates for IP-encapsulated PTP traffic.

PTP messages are transported within Ethernet frames with the Ethertype set to 0X88F7. Ports can be configured with one of two reserved multicast destination addresses:

- 01-1B-19-00-00-00 — used for all PTP messages except for peer delay mechanism messages
- 01-80-C2-00-00-0E — used for peer delay mechanism messages

Either address can be used for all messages depending on customer requirements. Refer to Recommendation ITU-T G.8275.1/Y.1369.1. When the profile configuration is **iec-61850-9-3-2016**, the 01-80-C2-00-00-0E address must be used for peer delay. Refer to IEC/IEEE 61850-9-3.

When the profile configuration is **ieee1588-2008** or **iec-61850-9-3-2016**, the PTP clock's **priority1** and **priority2** settings are used by the BMCA to help determine which clock should provide timing for the network. When the profile configuration is **g8275dot1-2014**, the **local-priority** value is used to choose between PTP masters in the BMCA.

6.4.7.14 ITU-T G.8275.1 and G.8275.2

The 7705 SAR supports Recommendation ITU-T G.8275.1 and ITU-T G.8275.2, which specify the architecture that allows the distribution of time and phasing. ITU-T G.8275.1 supports full timing support from the network and ITU G.8275.2 supports partial timing support and assisted partial timing support. It is assumed that these profiles will be used in well-planned cases where network behavior and performance can be constrained within well-defined limits, including limits on static asymmetry. When configured for the G.8275.1 or G.8275.2 profile, the 7705 SAR can operate as boundary clock, an ordinary master clock, or an ordinary slave clock.



Note: Support for control of static asymmetries is not yet available with G.8275.2 and assisted partial timing support.

When the 7705 SAR is configured for the G.8275.1 or G.8275.2 profile, it uses an alternate BMCA for best master clock selection. This BMCA includes a PTP dataset comparison that is defined in IEEE 1588-2008, but with the following differences:

- the **priority1** attribute value is removed from the dataset comparison
- the **master-only** parameter value must be considered

- multiple active grand master clocks are allowed; therefore, the BMCA will select the nearest clock of equal quality
- a port-level **local-priority** attribute value is used to select a slave port if two ports receive an Announce message. This attribute is used as a tiebreaker in the dataset comparison algorithm if all other previous attributes of the datasets being compared are equal.
- the **local-priority** parameter value is considered for the default dataset

The ITU-T G.8275.1 and G.8275.2 profiles have the following characteristics.

- The default domain setting is 24 for G.8275.1; the allowed range is 0 to 255. The default domain setting is 44 for G.8275.2; the allowed range is 0 to 255.
- Both one-step and two-step clocks are supported on slave capable PTP ports.
- G.8275.2 supports IP encapsulation. G.8275.1 supports IP encapsulation and Ethernet encapsulation. When Ethernet encapsulation is used, the following points apply.
 - Ethernet multicast addressing is used for transmitting PTP messages. Both the non-forwardable multicast address 01-80-C2-00-00-0E and forwardable multicast address 01-1B-19-00-00-00 are supported.
 - Virtual local area network (VLAN) tags within Ethernet frames carrying PTP messages are not supported. When a PTP clock receives a PTP message within a frame containing a VLAN tag, it discards this frame. A PTP clock that is compliant with the profile described in Recommendation ITU-T G.8275.1 must comply with IEEE 1588 – 2008 Annex F.
- Synchronization messages are sent at a rate of 16 packets/s; announce messages are sent at a rate of 8 packets/s.
- On the 7705 SAR, the priority1 value is set to the default value (128) and cannot be changed.
- On the 7705 SAR, if the **clock-type** parameter is set to **ordinary slave**, the priority2 value is set to the default value (255) and cannot be changed.

For further details, refer to Recommendation ITU-T G.8275.1/Y.1369.1 and ITU-T G.8275.2/Y.1369.2.

6.4.7.14.1 Synchronization Certainty/Uncertainty

As described in [IEEE 1588v2 PTP](#), master clocks transmit Announce messages containing the clock priority and quality. Each clock in the network can use the BMCA and the clock properties received from the Announce messages to select the best clock to synchronize to.

Within a PTP-aware network, there could be situations where boundary clocks advertise clockClass 6 in the Announce message, which indicates that the parent clock is connected to a traceable primary reference source/clock (PRS/PRC) in locked mode (for example, locked to GNSS), and is therefore designated as the synchronization time source. However, the PTP network may still be in a transient state and stabilizing.

For example, this may occur when:

- a grand master clock locks and relocks to GNSS
- an intermediate boundary clock is started or restarted
- a new parent clock is chosen

Depending on the application, it may be important for a downstream boundary clock or slave clock to know whether the PTP network has stabilized or is still “synchronization uncertain”.

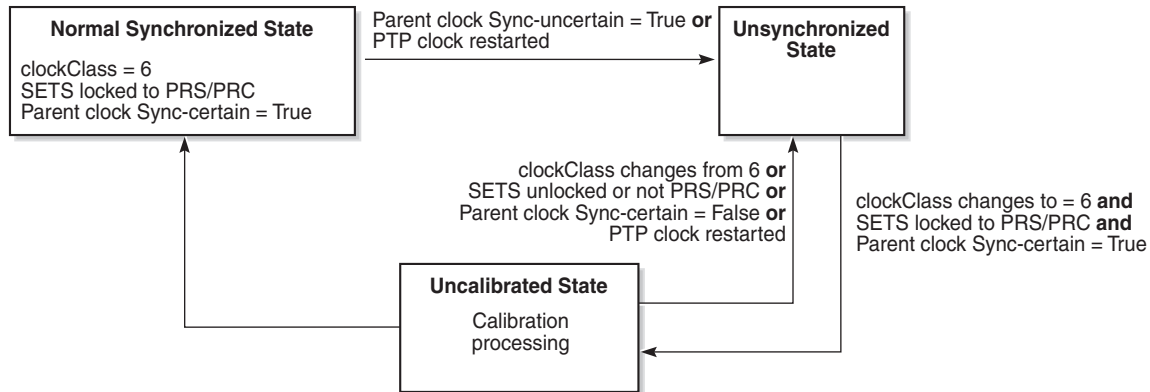
Specifically when the G.8275.1 profile (with IP encapsulation) or the G.8275.2 profile is used, the synchronizationUncertain flag is added to the Announce message. The use of this flag is optional. The 7705 SAR PTP grand master, boundary, and slave clocks support the processing of the synchronization state as follows.

- If a grand master clock has its synchronous equipment timing source (SETS) frequency clock and time clock locked to GNSS and its clockClass equals 6, it is in a “synchronization certain” state. The synchronizationUncertain flag in the Announce message is set to FALSE.
- If a grand master clock does not meet the above criteria, it is in a “synchronization uncertain” state. The synchronizationUncertain flag in the Announce message is set to TRUE.
- In order for a boundary clock to be in the “synchronization certain” state, its parent clock’s clockClass must be “synchronization certain”, its SETS must be locked and PRS/PRC traceable, and PTP must have sufficient time to stabilize to the parent clock. At that point, its PTP port state will transition from an Uncalibrated state to a Slave state.

The transition period is 16 s for G.8275.1 and 256 s for G.8275.2. To be selected as a system time reference, a G.8275.1 or G.8275.2 clock must be in the “synchronization certain” state.

- A boundary clock can fall back to the “synchronization uncertain” state if its parent clock changes to the “synchronization uncertain” state, its SETS becomes unlocked or not PRS/PRC traceable, or the local clock is restarted or reset. The PTP port state will transition away from the Slave state.

This behavior is shown in [Figure 23](#).

Figure 23 Synchronization Certain/Uncertain States

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Because the synchronizationUncertain flag is newly agreed upon in standards, most base station slave clocks do not look at this bit. Therefore, in order to ensure that the downstream clocks are aware of the state of the network, the PTP clock (grand master, boundary, slave) may optionally be configured to transmit Announce and Sync messages only if the clock is in a “synchronization certain” state. This is done using the **no tx-while-sync-uncertain** command.

6.4.7.15 IEC/IEEE 61850-9-3

The 7705 SAR supports IEC/IEEE 61850-9-3, which is a profile that allows PTP to act as a timing source in power utility networks.

The IEC/IEEE 61850-9-3 profile supports only Ethernet encapsulation with multicast addressing. IEC/IEEE 61850-9-3 uses the peer delay mechanism instead of the delay-request/response mechanism.

When configured for the IEC/IEEE 61850-9-3, the 7705 SAR can operate as a grand master clock, a boundary clock, or an ordinary slave clock and supports recovery of frequency as well as time of day/phase. Grand master clock functionality is only available for 7705 SAR variants with integrated GNSS.

Synchronous Ethernet can be used for frequency recovery as an optional mode for best time/phase recovery.

The IEC/IEEE 61850-9-3 profile has the following characteristics:

- The default domain setting is 0 for 61850-9-3; the allowed range is 0 to 255.

- One-step clock operation is supported, without the need for follow-up messages.
- When Ethernet encapsulation is used, virtual local area network (VLAN) tags within Ethernet frames carrying PTP messages are not supported. When a PTP clock receives a PTP message within a frame containing a VLAN tag, it discards this frame.
- Synchronization messages, announce messages, and peer delay messages are sent, by default, at the rate of 1 packet/s.
- By default, the priority1 and priority 2 values are set to 255 when the clock type is ordinary slave and 128 when the clock type is ordinary master. The priority values can be configured to be between 0 and 255.

For further details, refer to the IEC/IEEE 61850-9-3 standard.

6.4.7.16 PTP Statistics

The 7705 SAR provides the capability to collect statistics, state, and events data for the PTP slave clock's interaction with PTP peer clock 1 and PTP peer clock 2. This data is collected separately for each peer clock and can be displayed using the **show system ptp clock ptp-port** command. This data can be used to monitor the PTP slave clock performance in relation to the peer clocks and to diagnose a problem or analyze the performance of a packet switched network for the transport of synchronization messages. The following data is collected:

PTP peer-1/PTP peer-2 statistics:

- number of signaling packets
- number of unicast request announce packets
- number of unicast request announce timeouts
- number of unicast request announce packets rejected
- number of unicast request synchronization packets
- number of unicast request synchronization timeouts
- number of unicast request synchronization packets rejected
- number of unicast request delay response packets
- number of unicast request delay response packets timeouts
- number of unicast request delay response packets rejected
- number of unicast grant announce packets
- number of unicast grant announce packets rejected
- number of unicast grant synchronization packets
- number of unicast grant synchronization packets rejected

-
- number of unicast grant delay response packets
 - number of unicast grant delay response packets rejected
 - number of unicast cancel announce packets
 - number of unicast cancel synchronization packets
 - number of unicast cancel delay response packets
 - number of unicast acknowledge cancel announce packets
 - number of unicast acknowledge cancel synchronization packets
 - number of unicast acknowledge cancel delay response packets
 - number of announce packets
 - number of synchronization packets
 - number of follow-up packets
 - number of delay response packets
 - number of delay request packets
 - number of out-of-order synchronization packets
 - total number of UDP (port 320) packets
 - total number of UDP (port 319) packets
 - number of alternate master packets discarded
 - number of bad domain packets discarded
 - number of bad version packets discarded
 - number of duplicate messages packets discarded
 - number of step RM greater than 255 discarded

PTP master-1/PTP master-2 algorithm state statistics (in seconds):

- number of free-run states
- number of acquiring states
- number of phase-tracking states
- number of hold-over states
- number of locked states

PTP master-1/PTP master-2 algorithm event statistics:

- number of excessive frequency errors detected
- number of excessive packet losses detected
- number of packet losses spotted
- number of excessive phase shifts detected
- number of high PDVs detected

- number of synchronization packet gaps detected

6.4.8 Synchronous Ethernet

Synchronous Ethernet is a variant of line timing that derives the physical layer transmitter clock from a high-quality timing reference, traceable to a primary reference clock. Synchronous Ethernet uses the physical layer of the Ethernet link to distribute a common clock signal to all nodes in the network. Each node has a local or system clock that determines the outgoing clock rate of each interface. The system clock of each node in the network is derived from the incoming clock at an input interface or from a dedicated timing interface; for example, a BITS port.

Synchronous Ethernet works at Layer 1 and is concerned only with the precision of the timing of signal transitions to relay and recover accurate frequencies. It is not impacted by traffic load and is therefore not affected by packet loss or PDV that occurs with timing methods that use higher layers of the networking technology.

Synchronous Ethernet is automatically enabled on ports and SFPs that support synchronous Ethernet. The operator can select an Ethernet SFP port as a candidate timing reference. The recovered timing from this port is distributed to the nodes in the network over the physical layer of the Ethernet link. This allows the operator to ensure that any of the system outputs are locked to a stable, traceable frequency source. The transmit timing of all SFP ports with SFPs that support synchronous Ethernet is then derived from the node's SSU.

Synchronous Ethernet can only be used for end-to-end network synchronization when all intermediate switching nodes in the network have hardware and software support for synchronous Ethernet.

Synchronous Ethernet is supported on the following cards and platforms:

- 8-port Ethernet Adapter card (ports 7 and 8)
- 6-port Ethernet 10Gbps Adapter card
- 8-port Gigabit Ethernet Adapter card
- 2-port 10GigE (Ethernet) Adapter card
- 2-port 10GigE (Ethernet) module
- 10-port 1GigE/1-port 10GigE X-Adapter card
- Packet Microwave Adapter card
- 6-port SAR-M Ethernet module
- 7705 SAR-M (on all Ethernet ports)
- 7705 SAR-Hc (on all Ethernet ports)

- 7705 SAR-W (on all Ethernet ports)
- 7705 SAR-Wx (on all Ethernet ports)
- 7705 SAR-H (on all Ethernet ports)
- 4-port SAR-H Fast Ethernet module
- 7705 SAR-A (supported on the XOR ports (1 to 4), configured as either RJ-45 ports or SFP ports, and on SFP ports 5 to 8. Ports 9 to 12 do not support synchronous Ethernet.)
- 7705 SAR-Ax (on all Ethernet ports)
- 7705 SAR-X (on all Ethernet ports)

If an SFP that does not support synchronous Ethernet is installed, the Ethernet card will use its local oscillator for transmit timing and an event is logged. If the Ethernet port is configured as a source of node synchronization and an SFP that does not support synchronous Ethernet is installed, a clock will not be supplied to the SSU and an event is logged.

Each synchronous Ethernet port can be configured to recover received timing and send it to the SSU. On the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, and 7705 SAR-Wx, any synchronous Ethernet-capable port can be used as an available reference. In addition, two references are available on the 7705 SAR-X and on the 2-port 10GigE (Ethernet) module or 6-port SAR-M Ethernet module. On the 7705 SAR-8 Shelf V2 and 7705 SAR-18:

- one reference is available on the 8-port Ethernet Adapter card
- two references are available on:
 - the 6-port Ethernet 10Gbps Adapter card
 - the 8-port Gigabit Ethernet Adapter card
 - the 2-port 10GigE (Ethernet) Adapter card
 - the 10-port 1GigE/1-port 10GigE X-Adapter card (supported on the 7705 SAR-18 only)
 - the Packet Microwave Adapter card

Synchronous Ethernet ports always use node timing from the SSU. Configuration of one port automatically configures the other port.

If timing is recovered from a synchronous Ethernet port from an upstream non-synchronous Ethernet free-running port and selected as the reference to the SSU, then this clock may not be of sufficient quality or accuracy for node operations. This reference may be disqualified because the frequency may not be within the pull-in range of the SSU Stratum 3 oscillator.

On the 7705 SAR-M, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, 7705 SAR-X, and on the Packet Microwave Adapter card, a copper-based, RJ-45 synchronous Ethernet port phy-tx-clock must be configured as slave before the port is configured to be a timing source for the node. If a copper-based, RJ-45 synchronous Ethernet port is a timing source for the node, the port **phy-tx-clock** cannot be changed to another mode.

6.4.9 Synchronization Status Messaging with Quality Level Selection

Synchronization Status Messaging (SSM) provides a mechanism for downstream network elements to determine the quality level of the source.

The quality level values are processed by the 7705 SAR system timing module (SSU) to track the network timing flow and select the highest-quality source. The selection process is described in [Timing Reference Selection Based on Quality Level](#). Also see [Figure 24](#). SSM also allows the network elements to autonomously reconfigure the timing path to select the best possible source for timing and to avoid timing loops. This function is especially useful in a ring topology where network timing may be passed in both directions around the ring.

Synchronization status messages containing the quality level values are placed in prescribed overhead bytes for SONET and SDH signals and in bit-oriented messages within the data link for DS1 (ESF) and E1 physical ports.

For synchronous Ethernet interfaces, there is no equivalent fixed location to convey synchronization status messages; therefore, the quality level values are transported using Ethernet frames over a message channel. This channel, called the Ethernet Synchronization Message Channel (ESMC), uses an Ethernet protocol based on an IEEE Organization Specific Slow Protocol (OSSP). The 4-bit quality level value is carried within a Type-Length-Value (TLV) byte of an Ethernet OAM Protocol Data Unit (PDU) that uses the OSSP subtype.

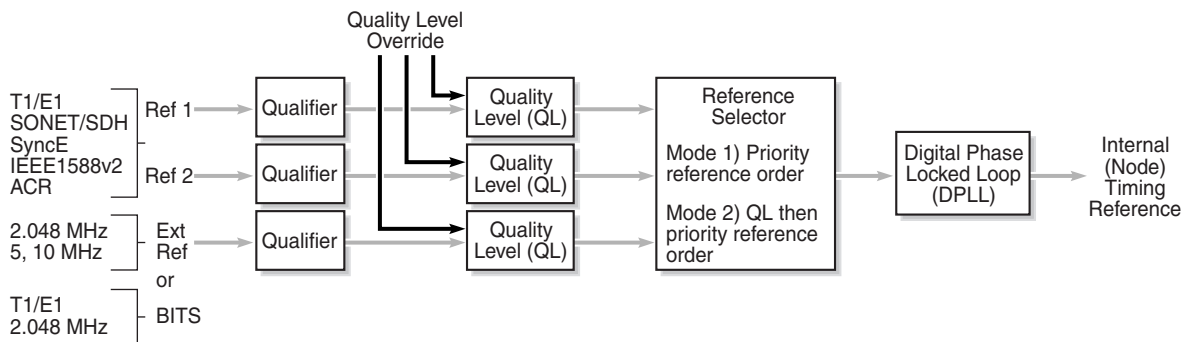
The clock source quality levels identified for the purpose of tracking network timing flow are listed below. They make up all of the defined network deployment options given in Recommendations G.803 and G.781 (option I pertains to the SDH model and Option II pertains to the SONET model).

The received quality level values for the two network options based on the specific interfaces within these options are provided in the first two columns of [Table 32](#) (for SONET, SDH, and Synchronous Ethernet interfaces) and [Table 33](#) (for E1 and T1 interfaces). The transmitted quality level values are shown in the last two columns of [Table 32](#) and [Table 33](#).

- prs — SONET Primary Reference Source Traceable
- stu — SONET Synchronous Traceability Unknown
- st2 — SONET Stratum 2 Traceable
- tnc — SONET Transit Node Clock Traceable
- st3e — SONET Stratum 3E Traceable
- st3 — SONET Stratum 3 Traceable
- smc — SONET Minimum Clock Traceable
- eec1 — SDH Ethernet Equipment Clock Option 1 Traceable
- eec2 — SONET Ethernet Equipment Clock Option 2 Traceable
- prc — SDH Primary Reference Clock Traceable
- ssu-a — SDH Primary Level Synchronization Supply Unit Traceable
- ssu-b — SDH Second Level Synchronization Supply Unit Traceable
- sec — SDH Synchronous Equipment Clock Traceable

The user may override the received quality level value of the system synchronization reference input by using the **ql-override** command to configure one of the above values as a static value. This in turn may affect the transmitted quality level value on each SSM-capable port. Also, the user may use the **tx-dus** command to force the quality level value that is transmitted on the SSM channel to be set to dnu (do not use) or dus (do not use for synchronization). This capability is provided to block the interface from being a timing source for the 7705 SAR. The dus/dnu quality level value cannot be overridden.

Figure 24 Timing Reference Selection Based on Quality Level



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The G.803 and G.781 standards also define additional codes for internal use.

- QL-INVx is generated internally by the system when an unallocated synchronization status message value is received; x represents the binary value of this synchronization status message. Within the 7705 SAR, all these independent values are assigned a single value of QL-INVALID.
- QL-FAILED is generated internally by the system when the terminated network synchronization distribution trail is in the signal fail state.
- QL-UNKNOWN is generated internally by the system to differentiate from a received QL-STU code. It is equivalent to QL-STU for the purposes of quality level selection.
- If the node clock is in a holdover state, a holdover message is generated internally by the system and the transmitted SSM quality level value on an SSM-capable port is st3, eec1, eec2, or ssu-b, depending on the type of interface (as shown in [Table 32](#) and [Table 33](#)).

Table 32 Quality Level (QL) Values by Interface Type (SDH, SONET, SyncE)

| SSM Quality Level Value Received on Port | | Internal Relative Quality Level | SSM Quality Level Value to be Transmitted | |
|---|---|---|---|---|
| SDH interface
SyncE interface in
SDH mode | SONET interface
SyncE interface in
SONET mode | | SDH interface
SyncE interface in
SDH mode | SONET interface
SyncE interface in
SONET mode |
| 0010 (prc) | 0001 (prs) | Best quality ¹ | 0010 (prc) | 0001 (prs) |
| — | 0000 (stu) | | 0100 (ssu-a) | 0000 (stu) |
| — | 0111 (st2) | | 0100 (ssu-a) | 0111 (st2) |
| 0100 (ssu-a) | 0100 (tnc) | | 0100 (ssu-a) | 0100 (tnc) |
| — | 1101 (st3e) | | 1000 (ssu-b) | 1101 (st3e) |
| 1000 (ssu-b) | — | | 1000 (ssu-b) | 1010 (st3/eec2) |
| — | 1010 (st3/eec2) | | 1011 (sec/eec1) | 1010 (st3/eec2) |
| 1011 (sec/eec1) | — | Lowest quality qualified in QL-enabled mode | 1011 (sec/eec1) | 1100 (smc) |
| — | 1100 (smc) | See note ² | 1111 (dnu) | 1100 (smc) |
| 1111 (dnu) | 1111 (dus) | See note ² | 1111 (dnu) | 1111 (dus) |
| Any other | Any other | QL-INVALID | 1111 (dnu) | 1111 (dus) |
| — | — | QL-FAILED | 1111 (dnu) | 1111 (dus) |
| — | — | QL-UNC | 1011 (sec/eec1) | 1010 (st3/eec2) |

Notes:

1. As the received QL on the port drops from prc/prs to sec/eec1 (row 1 to row 8), the quality level of the internal SSU drops from “Best quality” to “Lowest quality”.
2. These quality level indications are considered to be lower than the internal clock of the system. They are relayed to the line interfaces when ql-selection is disabled. When ql-selection is enabled, these inputs are never selected. If there is no valid reference available for the internal clock, then the clock enters holdover mode and the quality level is QL-UNC.

Table 33 Quality Level (QL) Values by Interface Type (E1 and T1)

| SSM Quality Level Value Received on Port | | Internal Relative Quality Level | SSM Quality Level Value to be Transmitted | |
|--|-----------------------------|---|---|-----------------------------|
| E1 interface | T1 interface (ESF) | | E1 interface | T1 interface (ESF) |
| 0010 (prc) | 00000100
11111111 (prs) | Best quality ¹ | 0010 (prc) | 00000100
11111111 (prs) |
| — | 00001000
11111111 (stu) | | 0100 (ssu-a) | 00001000
11111111 (stu) |
| — | 00001100
11111111 (st2) | | 0100 (ssu-a) | 00001100
11111111 (st2) |
| 0100 (ssu-a) | 01111000
11111111 (tnc) | | 0100 (ssu-a) | 01111000
11111111 (tnc) |
| — | 01111100
11111111 (st3e) | | 1000 (ssu-b) | 01111100
11111111 (st3e) |
| 1000 (ssu-b) | — | | 1000 (ssu-b) | 00010000
11111111 (st3) |
| — | 00010000
11111111 (st3) | | 1011 (sec) | 00010000
11111111 (st3) |
| 1011 (sec) | — | Lowest quality qualified in QL-enabled mode | 1011 (sec) | 00100010
11111111 (smc) |
| — | 00100010
11111111 (smc) | See note ² | 1111 (dnu) | 00100010
11111111 (smc) |
| 1111 (dnu) | 00110000
11111111 (dus) | See note ² | 1111 (dnu) | 00110000
11111111 (dus) |
| Any other | N/A | QL-INVALID | 1111 (dnu) | 00110000
11111111 (dus) |
| — | — | QL-FAILED | 1111 (dnu) | 00110000
11111111 (dus) |

Table 33 Quality Level (QL) Values by Interface Type (E1 and T1) (Continued)

| SSM Quality Level Value Received on Port | | Internal Relative Quality Level | SSM Quality Level Value to be Transmitted | |
|--|--------------------|---------------------------------|---|----------------------------|
| E1 interface | T1 interface (ESF) | | E1 interface | T1 interface (ESF) |
| — | — | QL-UNC | 1011 (sec) | 00010000
11111111 (st3) |

Notes:

1. As the received QL on the port drops from prc/prs to sec/eec1 (row 1 to row 8), the quality level of the internal SSU drops from “Best quality” to “Lowest quality”.
2. These quality level indications are considered to be lower than the internal clock of the system. They are relayed to the line interfaces when ql-selection is disabled. When ql-selection is enabled, these inputs are never selected. If there is no valid reference available for the internal clock, then the clock enters holdover mode and the quality level is QL-UNC.

6.4.9.1 Timing Reference Selection Based on Quality Level

For a SONET/SDH interface, a BITS DS1 or E1 physical port, or an E1 port interface that supports SSM, or for a synchronous Ethernet interface that supports ESMC, a timing input provides a quality level value to indicate the source of timing of the far-end transmitter. These values provide input to the selection processes on the nodal timing subsystem. This selection process determines which input to use to generate the signal on the SSM egress ports and the reference to use to synchronize the nodal clock, as described below.

- For the two reference inputs (ref1 and ref2) and for the BITS input ports, if the interface configuration supports the reception of a QL over SSM or ESMC, then the quality level value is associated with the timing derived from that input.
- For the two reference inputs and for the BITS input ports, if the interface configuration is T1 with SF framing, then the quality level associated with the input is QL-UNKNOWN.
- For the two reference inputs, if they are synchronous Ethernet ports and the ESMC is disabled, then the quality level value associated with that input is QL-UNKNOWN.
- For the two reference inputs and for the BITS input ports, if the interface configuration supports the reception of a QL over SSM (and not ESMC), and no SSM value has been received, then the quality level value associated with the input is QL-STU.

- For the two reference inputs and for the BITS input ports, if the interface configuration supports the reception of a QL over SSM or ESMC, but the quality level value received over the interface is not valid for the type of interface, then the quality level value associated with that input is QL-INVALID.
- For the two reference inputs, if they are external synchronization, DS3, or E3 ports, then the quality level value associated with the input is QL-UNKNOWN.
- For the two reference inputs, if they are synchronous Ethernet ports and the ESMC is enabled but no valid ESMC Information PDU has been received within the previous 5 s, then the quality level value associated with that input is QL-FAILED.
- If the user has configured an override for the quality level associated with an input, the node displays both the received and override quality level value for the input. If no value has been received, then the associated value is displayed instead.

After the quality level values have been associated with the system timing inputs, the two reference inputs and the external input timing ports are processed by the system timing module to select a source for the SSU. This selection process is described below.

- Before an input can be used as a potential timing source, it must be enabled using the **ql-selection** command. If **ql-selection** is disabled, then the priority order of the inputs for the Synchronous Equipment Timing Generator (SETG) is the priority order configured under the **ref-order** command.
- If **ql-selection** is enabled, then the priority of the inputs is calculated using the associated quality level value of the input and the priority order configured under the **ref-order** command. The inputs are ordered by the internal relative quality level (shown in the middle row in [Table 32](#)) based on their associated quality level values. If two or more inputs have the same quality level value, then they are placed in order based on where they appear in the **ref-order** priority. The priority order for the SETG is based on both the reference inputs and the external synchronization input ports.
- Once a prioritized list of inputs is calculated, the SETG and the external synchronization output ports are configured to use the inputs in their respective orders.
- Once the SETG and external synchronization output ports priority lists are programmed, then the highest-qualified priority input is used. To be qualified, the signal is monitored to ensure that it has the expected format and that its frequency is within the pull-in range of the SETG.

6.4.9.1.1 SSM/ESMC QL Transmission

If a port is using the SETG output as its timing reference, the port transmits the SSM corresponding to the QL of the SETG.

On the port that is selected as the reference for the SETG, the port transmits the DNU/DUS value in the SSM/ESMC.

If a BITS port is selected as the reference for the SETG, both BITS ports transmit DNU/DUS value.

An Ethernet port with a copper SFP always transmits DNU/DUS when SSM is enabled on the port. When SSM is enabled on a copper-based RJ45 Ethernet port, DNU/DUS is transmitted if the port phy-tx-clock is not configured as master. When SSM is enabled on a copper-based RJ45 Ethernet port and the port phy-tx-clock is configured as master, the port transmits the SSM value corresponding to the determined by the SSU.

DS1 Physical Port QL Transmission

DS1 signals can carry the quality level value of the timing source via the SSM transported within the 1544 kb/s signal Extended Super Frame (ESF) Data Link (DL), as specified in Recommendation G.704.

The format of the ESF data link messages is 0xxx xxx0 1111 1111, with the rightmost bit transmitted first. The 6 bits denoted by xxx xxx contain the message; some of these messages are reserved for synchronization messaging. It takes 32 frames (4 ms) to transmit all 16 bits of a complete DL message.

SSM over DS1 ESF is supported on the 7705 SAR-18 via the BITS ports.

E1 Physical Port QL Transmission

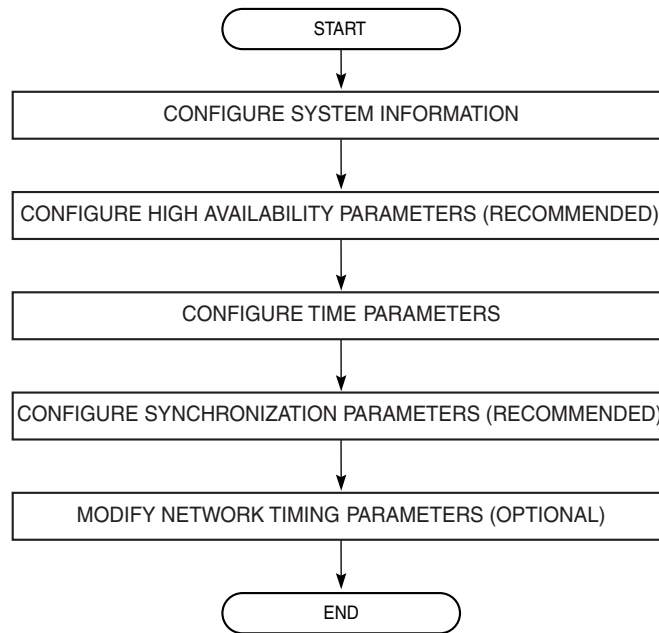
E1 signals can carry the quality level value of the timing source via one of the Sa bits (Sa4 to Sa8) in a synchronization status message, as described in G.704, section 2.3.4. Choosing which Sa bit carries the SSM is user-configurable.

SSM over E1 is supported on the 7705 SAR-18 via the BITS ports. SSM via an E1 port is supported on the 16-port T1/E1 ASAP Adapter card, the 32-port T1/E1 ASAP Adapter card, and the 7705 SAR-M, 7705 SAR-A, and 7705 SAR-X nodes.

6.5 System Configuration Process Overview

Figure 25 displays the process to provision basic system parameters.

Figure 25 System Configuration and Implementation Flow



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6.6 Configuration Notes

This section describes system configuration guidelines and caveats.

- The 7705 SAR must be properly initialized and the boot loader and BOF files successfully executed in order to access the CLI.

6.6.1 Reference Sources

For information on supported IETF drafts and standards as well as standard and proprietary MIBs, refer to [Standards and Protocol Support](#).

6.7 Configuring System Management with CLI

This section provides information about configuring system management features with CLI.

Topics in this section include:

- [System Management Configuration](#)
- [Basic System Configuration](#)
- [Common Configuration Tasks](#)
- [Configuring System Monitoring Thresholds](#)
- [Configuring LLDP](#)

6.8 System Management Configuration

6.8.1 Saving Configurations

Whenever configuration changes are made, the modified configuration must be saved so that the changes will not be lost when the system is rebooted. The system uses the configuration and image files, as well as other operational parameters necessary for system initialization, according to the locations specified in the boot option file (BOF) parameters. For more information about boot option files, see [Boot Options](#).

Configuration files are saved by executing explicit or implicit command syntax.

- An explicit save writes the configuration to the location specified in the **save** command syntax (the *file-url* option).
- An implicit save writes the configuration to the file specified in the primary configuration location.

If the *file-url* option is not specified in the **save** command syntax, the system attempts to save the current configuration to the current BOF primary configuration source. If the primary configuration source (path and/or filename) changed since the last boot, the new configuration source is used.

The **save** command includes an option to save both default and non-default configuration parameters (the **detail** option).

The **index** option specifies that the system preserves system indexes when a **save** command is executed, regardless of the persistent status in the BOF file. During a subsequent boot, the index file is read along with the configuration file. As a result, a number of system indexes are preserved between reboots, including the interface index, LSP IDs, and path IDs. This reduces resynchronizations of the Network Management System (NMS) with the affected network element.

If the save attempt fails at the destination, an error occurs and is logged. The system does not try to save the file to the secondary or tertiary configuration sources unless the path and filename are explicitly named with the **save** command.

6.9 Basic System Configuration

This section provides information to configure system parameters and provides configuration examples of common configuration tasks. The minimal system parameters that should be configured are:

- [System Information Parameters](#)
- [System Time Elements](#)

The following example displays a basic system configuration:

```
ALU-1>config>system# info
#-----
echo "System Configuration"
#-----
      name "ALU-1"
      coordinates "Unknown"
      snmp
      exit
      security
        snmp
          community "private" rwa version both
        exit
      exit
      time
        ntp
          server 192.168.15.221
          no shutdown
        exit
      snmp
        shutdown
      exit
      zone GMT
      exit
-----
ALU-1>config>system#
```

6.10 Common Configuration Tasks

This section provides a brief overview of the tasks that must be performed to configure system parameters and provides the CLI commands.

- [System Information](#)
- [Configuring Script Parameters](#)
- [Configuring Synchronization and Redundancy](#)
- [Configuring ATM Parameters](#)
- [Configuring Backup Copies](#)
- [Configuring System Administration Parameters](#)
- [System Timing](#)

6.10.1 System Information

This section covers the basic system information parameters to configure the physical location of the 7705 SAR, contact information, router location information such as an address, floor, and room number, global navigation satellite system (GNSS) coordinates, and system name.

Use the CLI syntax displayed below to configure the following system components:

- [System Information Parameters](#)
- [System Time Elements](#)

6.10.1.1 System Information Parameters

General system parameters include:

- [Name](#)
- [Contact](#)
- [Location](#)
- [CLLI Code](#)
- [Coordinates](#)
- [System Identifier](#)


```

CLI Syntax:  config>system
                name system-name
                contact contact-name
                location location
                clli-code clli-code
                coordinates coordinates

```

6.10.1.1.1 Name

Use the **system name** command to configure a name for the device. The name is used in the prompt string. Only one system name can be configured. If multiple system names are configured, the last one encountered overwrites the previous entry.

Use the following CLI syntax to configure the system name:

```

CLI Syntax:  config>system
                name system-name

```

```

Example:    config>system# name ALU-1

```

The following example displays the system name:

```

ALU-1>config>system# info
#-----
echo "System Configuration"
#-----
      name "ALU-1"
. . .
      exit
-----
ALU-1>config>system#

```

6.10.1.1.2 Contact

Use the **contact** command to specify the name of a system administrator, IT staff member, or other administrative entity.

```

CLI Syntax:  config>system
                contact contact-name

```

```

Example:    config>system# contact "Fred Information Technology"

```

6.10.1.1.3 Location

Use the **location** command to specify the system location of the device. For example, enter the city, building address, floor, and room number where the router is located.

Use the following CLI syntax to configure the location:

CLI Syntax: `config>system
 location location`

Example: `config>system# location "Bldg.1-floor 2-Room 201"`

6.10.1.1.4 CLLI Code

The Common Language Location Code (CLLI code) is an 11-character standardized geographic identifier that is used to uniquely identify the geographic location of a 7705 SAR.

Use the following CLI command syntax to define the CLLI code:

CLI Syntax: `config>system
 clli-code clli-code`

Example: `config>system# clli-code abcdefg1234`

6.10.1.1.5 Coordinates

Use the optional **coordinates** command to specify the GNSS location of the device. If the string contains spaces, the entire string must be enclosed within double quotes.

Use the following CLI syntax to configure the location:

CLI Syntax: `config>system
 coordinates coordinates`

Example: `config>system# coordinates "N 45 58 23, W 34 56 12"`

The following example displays the configuration output of the general system commands:

```
ALU-1>config>system# info  
#-----  
echo "System Configuration"
```

```
#-----  
name "ALU-1"  
    contact "Fred Information Technology"  
    location "Bldg.1-floor 2-Room 201"  
    clii-code "abcdefg1234"  
    coordinates "N 45 58 23, W 34 56 12"  
  
. . .  
    exit  
-----  
ALU-1>config>system#
```

6.10.1.1.6 System Identifier

The system identifier is an IPv4 address that can be used to uniquely identify the 7705 SAR in the network in situations where the system IP address may change dynamically.

Use the following CLI command syntax to define the system identifier:

CLI Syntax: `config>system
 identifier id`

Example: `config>system# identifier 192.0.2.255`

6.10.1.2 System Time Elements

The system clock maintains time according to Coordinated Universal Time (UTC). Configure information time zone and summer time (daylight savings time) parameters to correctly display time according to the local time zone.

Time elements include:

- [Zone](#)
- [Summer Time Conditions](#)
- [NTP](#)
- [SNTP](#)
- [PTP](#)
- [Time-of-Day Measurement \(ToD-1pps\)](#)
- [GNSS](#)
- [CRON](#)

Use the following CLI syntax to configure system time elements. The **authentication-key des** keyword is not supported if the 7705 SAR node is running in FIPS-140-2 mode.

```

CLI Syntax:  config>system
                 time
                 dst-zone zone-name
                   end {end-week} {end-day} {end-month}
                     [hours-minutes]
                 offset offset
                 start {start-week} {start-day} {start-month}
                     [hours-minutes]
                 gnss
                   port port-id time-ref-priority priority-value
                 ntp
                   authentication-check
                   authentication-key key-id {key key} [hash | hash2]
                     {type des | message-digest}
                   broadcastclient [router router-name] {interface ip-
                     int-name} [authenticate]
                   mda-timestamp
                   multicastclient [authenticate]
                   server {ip-address | ipv6-address} [key-id key-id]
                     [version version] [prefer]
                   no shutdown
                 ptp
                   clock clock-id time-ref-priority priority-value
                   clock csm time-ref-priority priority-value
                 sntp
                   broadcast-client
                   server-address ip-address [version version-number]
                     [normal | preferred] [interval seconds]
                   no shutdown
                 tod1-pps
                   message-type {ct | cm | irig-b002-b122 | irig-b003-
                     b123 | irig-b006-b126 | irig-b007-b127}
                   zone {std-zone-name | non-std-zone-name} [hh[:mm]]

```

6.10.1.2.1 Zone

The **zone** command sets the time zone and/or time zone offset for the router. The 7705 SAR supports system-defined and user-defined time zones. The system-defined time zones are listed in [Table 34](#).

CLI Syntax: `config>system>time`
`zone {std-zone-name | non-std-zone-name}`
`[hh [:mm]]`

Example: `config>system>time# zone GMT`

The following example displays the zone output:

```
ALU-1>config>system>time# info
-----
ntp
    server 192.168.15.221
    no shutdown
exit
sntp
    shutdown
exit
zone UTC
-----
ALU-1>config>system>time#
```

Table 34 System-defined Time Zones

| Acronym | Time Zone Name | UTC Offset |
|-----------------------|------------------------------|--------------|
| Europe: | | |
| GMT | Greenwich Mean Time | UTC |
| WET | Western Europe Time | UTC |
| WEST | Western Europe Summer Time | UTC +1 hour |
| CET | Central Europe Time | UTC +1 hour |
| CEST | Central Europe Summer Time | UTC +2 hours |
| EET | Eastern Europe Time | UTC +2 hours |
| EEST | Eastern Europe Summer Time | UTC +3 hours |
| MSK | Moscow Time | UTC +3 hours |
| MSD | Moscow Summer Time | UTC +4 hours |
| US and Canada: | | |
| AST | Atlantic Standard Time | UTC -4 hours |
| ADT | Atlantic Daylight Time | UTC -3 hours |
| EST | Eastern Standard Time | UTC -5 hours |
| EDT | Eastern Daylight Saving Time | UTC -4 hours |

Table 34 System-defined Time Zones (Continued)

| Acronym | Time Zone Name | UTC Offset |
|-----------------------------------|--------------------------------------|----------------|
| CST | Central Standard Time | UTC -6 hours |
| CDT | Central Daylight Saving Time | UTC -5 hours |
| MST | Mountain Standard Time | UTC -7 hours |
| MDT | Mountain Daylight Saving Time | UTC -6 hours |
| PST | Pacific Standard Time | UTC -8 hours |
| PDT | Pacific Daylight Saving Time | UTC -7 hours |
| HST | Hawaiian Standard Time | UTC -10 hours |
| AKST | Alaska Standard Time | UTC -9 hours |
| AKDT | Alaska Standard Daylight Saving Time | UTC -8 hours |
| Australia and New Zealand: | | |
| AWST | Western Standard Time | UTC +8 hours |
| ACST | Central Standard Time | UTC +9.5 hours |
| AEST | Eastern Standard/Summer Time | UTC +10 hours |
| NZT | New Zealand Standard Time | UTC +12 hours |
| NZDT | New Zealand Daylight Saving Time | UTC +13 hours |

6.10.1.2.2 Summer Time Conditions

The **dst-zone** command configures the start and end dates and offset for summer time or daylight savings time to override system defaults or for user-defined time zones.

When configured, the time will be adjusted by adding the configured offset when summer time starts and subtracting the configured offset when summer time ends.

CLI Syntax:

```

config>system>time
  dst-zone zone-name
    end {end-week} {end-day} {end-month}
      [hours-minutes]
  offset offset
  start {start-week} {start-day} {start-month}
    [hours-minutes]

```

Example:

```
config>system>time# dst-zone pt
config>system>time>dst-zone# start second sunday april
02:00
end first sunday october 02:00
config>system>time>dst-zone# offset 0
```

If the time zone configured is listed in [Table 34](#), then the starting and ending parameters and offset do not need to be configured with this command unless there is a need to override the system defaults. The command will return an error if the start and ending dates and times are not available either in [Table 34](#) or entered as optional parameters in this command.

The following example displays the configured parameters.

```
A:ALU-1>config>system>time>dst-zone# info
-----
start second sunday april 02:00
end first sunday october 02:00
offset 0
-----
A:ALU-1>config>system>time>dst-zone# offset 0
```

6.10.1.2.3 NTP

Network Time Protocol (NTP) is defined in RFC 1305, *Network Time Protocol (Version 3) Specification, Implementation and Analysis*. It allows for participating network nodes to keep time more accurately and maintain time in a synchronized manner between all participating network nodes.

NTP time elements include:

- [Authentication-check](#)
- [Authentication-key](#)
- [Broadcastclient](#)
- [MDA-timestamp](#)
- [Multicastclient](#)
- [Server](#)

CLI Syntax:

```
config>system>time
ntp
authentication-check
authentication-key key-id {key key} [hash | hash2]
{type des | message-digest}
broadcastclient [router router-name] {interface ip-
int-name} [authenticate]
```

```
mda-timestamp
multicastclient [authenticate]
server {ip-address | ipv6-address} [key-id key-id]
    [version version] [prefer]
no shutdown
```

Authentication-check

The **authentication-check** command provides for the option to skip the rejection of NTP PDUs that do not match the authentication key or authentication type requirements. The default behavior when authentication is configured is to reject all NTP protocol PDUs that have a mismatch in either the authentication key ID, type, or key.

When authentication-check is configured, NTP PDUs are authenticated on receipt. However, mismatches cause a counter to be increased, one counter for key ID, one for type, and one for key value mismatches.

CLI Syntax: `config>system>time>ntp
authentication-check`

Example: `config>system>time>ntp# authentication-check
config>system>time>ntp# no shutdown`

Authentication-key

This command configures an authentication key ID, key type, and key used to authenticate NTP PDUs sent to and received from other network elements participating in the NTP protocol. For authentication to work, the authentication key ID, authentication type, and authentication key value must match.

CLI Syntax: `config>system>time>ntp
authentication-key key-id {key key} [hash | hash2]
type {des | message-digest}`

Example: `config>system>time>ntp# authentication-key 1 key A type
des
config>system>time>ntp# no shutdown`

The following example shows NTP disabled with the **authentication-key** parameter enabled.

```
A:ALU-1>config>system>time>ntp# info
-----
      shutdown
      authentication-key 1 key "OAwgNULbZgI" hash2 type des
-----
A:ALU-1>config>system>time>ntp#
```

Broadcastclient

The **broadcastclient** command enables listening to NTP broadcast messages on the specified interface.

CLI Syntax:

```
config>system>time>ntp
  broadcastclient[router router-name] {interface
    ip-int-name} [authenticate]
```

Example:

```
config>system>time>ntp# broadcastclient interface int11
config>system>time>ntp# no shutdown
```

The following example shows NTP enabled with the **broadcastclient** parameter enabled.

```
ALU-1>config>system>time# info
-----
      ntp
      broadcastclient interface int11
      no shutdown
      exit
      dst-zone PT
      start second sunday april 02:00
      end first sunday october 02:00
      offset 0
      exit
      zone UTC
-----
ALU-1>config>system>time#
```

MDA-timestamp

The **mda-timestamp** command enables timestamping on an adapter card by the network processor in order to allow more accurate timestamping for in-band NTP packets. Timestamping on an adapter card is only performed on Ethernet-based adapter cards. This command can only be set if NTP is shut down and all the NTP servers are not associated with an authentication key. This command does not change the behavior of NTP over the management port. Use the **no** form of this command to revert to the default behavior of having NTP packets timestamped by the CSM.

CLI Syntax: `config>system>time>ntp
 mda-timestamp`

Example: `config>system>time>ntp# mda-timestamp
config>system>time>ntp# no shutdown`

The following example shows enhanced NTP performance enabled using the **mda-timestamp** command.

```
A:ALU-1>config>system>time>ntp# info
-----
                shutdown
                no authentication-key 1
                mda-timestamp
-----
A:ALU-1>config>system>time>ntp#
```

Multicastclient

This command is used to configure an address to receive multicast NTP messages on the CSM Management port. The **no** form of this command removes the multicast client.

If multicastclient is not configured, all NTP multicast traffic will be ignored.

CLI Syntax: `config>system>time>ntp
 multicastclient [authenticate]`

Example: `config>system>time>ntp# multicastclient authenticate
config>system>time>ntp# no shutdown`

The following example shows NTP enabled with the **multicastclient** command configured.

```
ALU-1>config>system>time# info
-----
server 192.168.15.221
multicastclient
no shutdown
-----
ALU-1>config>system>time##
```

Server

The **server** command is used when the node should operate in client mode with the NTP server specified in the address field. Use the **no** form of this command to remove the server with the specified address from the configuration.

Up to five NTP servers can be configured.

CLI Syntax: `config>system>time>ntp`
`server {ip-address | ipv6-address} [key-id key-id]`
`[version version] [prefer]`

Example: `config>system>time>ntp# server 192.168.1.1 key-id 1`
`config>system>time>ntp# no shutdown`

The following example shows NTP enabled with the **server** command configured.

```
A:sim1>config>system>time>ntp# info
-----
no shutdown
server 192.168.1.1 key 1
-----
A:sim1>config>system>time>ntp#
```

6.10.1.2.4 SNTP

SNTP is a compact, client-only version of the NTP. SNTP can only receive the time from SNTP/NTP servers; it cannot be used to provide time services to other systems. SNTP can be configured in either broadcast or unicast client mode.

SNTP time elements include:

- [Broadcast-client](#)
- [Server-address](#)

CLI Syntax: config>system>time
 sntp
 broadcast-client
 server-address *ip-address* [version *version-number*]
 [normal | preferred] [interval *seconds*]
 no shutdown

Broadcast-client

The **broadcast-client** command enables listening at the global device level to SNTP broadcast messages on interfaces with broadcast client enabled.

CLI Syntax: config>system>time>sntp
 broadcast-client

Example: config>system>time>sntp# broadcast-client
 config>system>time>sntp# no shutdown

The following example shows SNTP enabled with the **broadcast-client** parameter enabled.

```
ALU-1>config>system>time# info
-----
      sntp
      broadcast-client
      no shutdown
    exit
  dst-zone PT
      start second sunday april 02:00
      end first sunday october 02:00
      offset 0
    exit
  zone GMT
-----
ALU-1>config>system>time#
```

Server-address

The **server-address** command configures an SNTP server for SNTP unicast client mode.

CLI Syntax: config>system>time>sntp
 server-address *ip-address* version *version-number*
 [normal | preferred] [interval *seconds*]

Example: config>system>time>sntp# server-address 10.10.0.94
 version 1 preferred interval 100

The following example shows SNTP enabled with the **server-address** parameter configured.

```
ALU-1>config>system>time# info
-----
      sntp
      server-address 10.10.0.94 version 1 preferred interval 100
      no shutdown
      exit
      dst-zone PT start-date 2018/04/04 12:00 end-date 2018/10/25 12:00
      zone GMT
-----
ALU-1>config>system>time#
```

6.10.1.2.5 PTP

Precision Time Protocol (PTP) is a timing-over-packet protocol defined in the IEEE 1588v2 standard *1588 2008*. PTP provides the capability to synchronize network elements to a Stratum-1 clock or primary reference clock (PRC) traceable source over a network that may or may not be PTP-aware.

The **ptp** command specifies the PTP source as an option for recovered time. The specific PTP clock is identified by *clock-id* (from 1 to 16 for PTP clocks that use IPv4 or IPv6 encapsulation, and **cs**m for PTP clocks that use Ethernet encapsulation) and has an assigned *priority-value* (from 1 to 16).

CLI Syntax:

```
config>system>time
  ptp
    clock clock-id time-ref-priority priority-value
    clock csm time-ref-priority priority-value
```

Example:

```
config>system>time# ptp
config>system>time>ptp# clock 1 time-ref-priority 1
```

6.10.1.2.6 Time-of-Day Measurement (ToD-1pps)

The 7705 SAR can receive and extract time of day/phase recovery from a 1588 grand master clock or boundary clock and transmit the recovered time of day/phase signal to an external device such as a base station through an external time of day port, where available. Transmission is through the ToD or ToD/PPS Out port with a 1 pulse/s output signal. The port interface communicates the exact time of day by the rising edge of the 1 pulse/s signal.

The **tod-1pps** command specifies the format for the time of day (ToD) message that is transmitted out the ToD or ToD/PPS Out port and specifies whether the 1pps output is enabled.

CLI Syntax:

```
config>system>time
  tod-1pps
    message-type {ct | cm | irig-b002-b122 | irig-b003-
      b123 | irig-b006-b126 | irig-b007-b127}
    output
```

Example:

```
config>system>time# tod-1pps
config>system>time>tod-1pps# message-type ct
config>system>time>tod-1pps# output
```

6.10.1.2.7 GNSS

For a 7705 SAR chassis that is equipped with a GNSS receiver and an attached GNSS antenna, the GNSS receiver can be used as a synchronous timing source. GNSS data is used to provide network-independent frequency and ToD synchronization.

The **gnss** command specifies a GNSS receiver port as a synchronous timing source. The specific GNSS receiver port is identified by *port-id* and has an assigned *priority-value* (from 1 to 16).

CLI Syntax:

```
config>system>time
  gnss
    port port-id time-ref-priority priority-value
```

Example:

```
config>system>time# gnss
config>system>time>gnss# port 1/2/1 time-ref-priority 1
```

6.10.1.2.8 CRON

The **cron** command is used for periodic and date- and time-based scheduling.

The schedule function configures the type of schedule to run, including one-time-only (one-shot), periodic, or calendar-based runs. All runs are scheduled by month, day, hour, minute, and interval (seconds). If **end-time** and **interval** are both configured, whichever condition is reached first is applied.

CLI Syntax:

```
config>system>cron
  schedule schedule-name [owner schedule-owner]
    count number
    day-of-month {day-number [..day-number] | all}
    description description-string
    end-time [date | day-name] time
    hour {hour-number [..hour-number] | all}
    interval seconds
    minute {minute-number [..minute-number] | all}
    month {month-number [..month-number] | month-name
      [..month-name] | all}
    script-policy policy-name [owner policy-owner]
    type schedule-type
    weekday {weekday-number [..weekday-number] | day-
      name [..day-name] | all}
    no shutdown
```

The following example creates a schedule named “test2” to run a script policy named “test_policy” every 15 minutes on the 17th of each month and every Friday until noon on December 17, 2018:

Example:

```
config>system>cron# schedule test2
config>system>cron>sched# day-of-month 17
config>system>cron>sched# end-time 2018/12/17 12:00
config>system>cron>sched# minute 0 15 30 45
config>system>cron>sched# weekday friday
config>system>cron>sched# script-policy "test_policy"
config>system>cron>sched# no shutdown
```

6.10.2 Configuring Script Parameters

The 7705 SAR provides centralized script management for CLI scripts that are used by CRON and the Event Handling System (EHS). Scripts contain a set of CLI commands that are executed at a scheduled time or when an event is triggered.

The **script** and **script-policy** commands within the **config>system>script-control** context configure the script parameters.

The **script** command assigns a name to the script and references its location. When the script has been defined, a **script-policy** is configured that calls the previously configured script. The **script-policy** also specifies a location and filename that stores the results of the script run.

CLI Syntax:

```
config>system
  script-control
    script script-name [owner script-owner]
      description description-string
      location file-url
      no shutdown
    script-policy policy-name [owner policy-owner]
      expire-time {seconds | forever}
      lifetime {seconds | forever}
      max-completed unsigned
      results file-url
      script script-name [owner script-owner]
      no shutdown
```

Example:

```
config>system# script-control
config>system>script-control# script "test_script"
config>system>script-control>script# location "cf3:/
test.txt"
config>system>script-control>script# no shutdown
config>system>script-control>script# exit
config>system>script-control# script-policy
"test_policy"
config>system>script-control>script-policy# results
"cf3:/script-results.txt"
config>system>script-control>script-policy# max-
completed 4
config>system>script-control>script-policy# expire-time
7200
config>system>script-control>script-policy# no shutdown
config>system>script-control>script-policy# exit
config>system>script-control># exit
```

The following displays the configuration:

```
Dut-B>config>system>script-control# info
-----
script "test_script"
  location "cf3:/test.txt"
  no shutdown
exit
script-policy "test_policy"
  results "cf3:/script-results.txt"
```



```

        script "test_script"
        max-completed 4
        expire-time 7200
        no shutdown
    exit
-----
Dut-B>config>system>script-control#

```

6.10.3 Configuring Synchronization and Redundancy

Use the CLI syntax displayed below to configure various synchronization and redundancy parameters:

- [Configuring Synchronization](#)
- [Configuring Manual Synchronization](#)
- [Forcing a Switchover](#)
- [Configuring Synchronization Options](#)
- [Configuring Multi-Chassis Redundancy](#)

6.10.3.1 Configuring Synchronization

The **switchover-exec** command specifies the location and name of the CLI script file executed following a redundancy switchover from the previously active CSM card.

CLI Syntax: `config>system`
`switchover-exec file-url`

6.10.3.2 Configuring Manual Synchronization

Automatic synchronization can be configured in the **config>system>synchronization** context.

Manual synchronization can be configured with the following command:

CLI Syntax: `admin`
`redundancy`
`synchronize {boot-env | config}`

Example: `admin>redundancy# synchronize config`

The following shows the output that displays during a manual synchronization:

```
ALU-1>admin# synchronize config
Syncing configuration.....
Syncing configuration....Completed.
ALU-1#
```

6.10.3.3 Forcing a Switchover

The **force-switchover now** command forces an immediate switchover to the standby CSM card.

CLI Syntax: admin>redundancy
force-switchover [now]

Example: admin>redundancy# force-switchover now

```
ALU-1# admin redundancy force-switchover now
ALU-1y#
Resetting...
?
```

If the active and standby CSMs are not synchronized for some reason, users can manually synchronize the standby CSM by rebooting the standby by issuing the **admin reboot standby** command on the active or the standby CSM.

6.10.3.4 Configuring Synchronization Options

Network operators can specify the type of synchronization operation to perform between the primary and secondary CSMs after a change has been made to the configuration files or the boot environment information contained in the boot options file (BOF).

Use the following CLI command to configure the **boot-env** option:

CLI Syntax: config>redundancy
synchronize {boot-env | config}

Example: config>system# synchronize boot-env

The following displays the configuration:

```
*ALU-1>config>redundancy# synchronize boot-env
*ALU-1>config>redundancy# show redundancy synchronization
=====
Synchronization Information
=====
Standby Status           : disabled
Last Standby Failure    : N/A
Standby Up Time         : N/A
Failover Time           : N/A
Failover Reason         : N/A
Boot/Config Sync Mode   : Boot Environment
Boot/Config Sync Status : No synchronization
Last Config File Sync Time : Never
Last Boot Env Sync Time : Never
=====
```

Use the following CLI command to configure the **config** option:

CLI Syntax: config>system
 synchronize {boot-env | config}

Example: config>system# synchronize config

The following example displays the configuration.

```
ALU-1>config>system# synchronize config
ALU-1>config>system# show system synchronization
=====
Synchronization Information
=====
Synchronize Mode        : Configuration
Synchronize Status      : No synchronization
Last Config Sync Time   : 2006/06/27 09:17:15
Last Boot Env Sync Time : 2006/06/24 07:16:37
=====
```

6.10.3.5 Configuring Multi-Chassis Redundancy

When configuring multi-chassis redundancy, configuration must be performed on the two nodes that will form redundant-pair peer nodes. Each node will point to its peer using the peer command.

When creating a multi-chassis LAG, the LAG must first be created under the **config>lag lag-id** context. Additionally, the LAG must be in access mode and LACP must be enabled (active or passive). Under the **multi-chassis>peer>mc-lag** context, the *lag-id* is the ID of the previously created LAG.

Use the following CLI syntax to configure multi-chassis redundancy features:

CLI Syntax:

```

config>redundancy
  multi-chassis
    peer ip-address
      authentication-key [authentication-key | hash-
        key] [hash | hash2]
      description description-string
    mc-lag
      hold-on-neighbor-failure multiplier
      keep-alive-interval interval
      lag lag-id lacp-key admin-key system-id system-
        id [remote-lag lag-id] system-priority
        system-priority
    no shutdown
    source-address ip-address
  
```

Example:

```

config>redundancy#
config>redundancy# multi-chassis
config>redundancy>multi-chassis# peer 10.10.10.2 create
config>redundancy>multi-chassis>peer# description "Mc-
  Lag peer 10.10.10.2"
config>redundancy>multi-chassis>peer# mc-lag
config>redundancy>mc>peer>mc-lag# lag 1 lacp-key 32666
  system-id 00:00:00:33:33:33 system-priority 32888
config>redundancy>mc>peer>mc-lag# no shutdown
config>redundancy>mc>peer>mc-lag# exit
config>redundancy>multi-chassis>peer# no shutdown
config>redundancy>multi-chassis>peer# exit
config>redundancy>multi-chassis# exit
config>redundancy#
  
```

The following displays the configuration:

```

A:7705:Dut-A>config>redundancy# info
-----
      multi-chassis
        peer 10.10.10.2 create
          description "Mc-Lag peer 10.10.10.2"
            mc-lag
              lag 1 lacp-key 32666 system-id 00:00:00:33:33:33 system
priority 32888
              no shutdown
            exit
          no shutdown
        exit
      exit
-----
A:7705:Dut-A>config>redundancy#
  
```

6.10.4 Configuring ATM Parameters

The ATM context configures system-wide ATM parameters.

CLI Syntax:

```
config>system#
    atm
    atm-location-id location-id
```

Example:

```
config>system# atm
config>system>atm# atm-location-id
03:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
```

The following example shows the ATM configuration.

```
ALU-1>config>system>atm# info
-----
          atm-location-id 03:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
exit
-----
ALU-1>config>system>atm#
```

6.10.5 Configuring Backup Copies

The **config-backup** command allows you to specify the maximum number of backup versions of configuration and index files kept in the primary location.

For example, if the **config-backup count** is set to 5 and the configuration file is called **xyz.cfg**, the file **xyz.cfg** is saved with a .1 extension when the **save** command is executed. Each subsequent **config-backup** command increments the numeric extension until the maximum count is reached. The oldest file (5) is deleted as more recent files are saved.

- xyz.cfg
- xyz.cfg.1
- xyz.cfg.2
- xyz.cfg.3
- xyz.cfg.4
- xyz.cfg.5
- xyz.ndx

Each persistent index file is updated at the same time as the associated configuration file. When the index file is updated, then the save is performed to **xyz.cfg** and the index file is created as **xyz.ndx**. Synchronization between the active and standby CSMs is performed for all configurations and their associated persistent index files.

CLI Syntax: `config>system`
`config-backup count`

Example: `config>system#`
`config>system# config-backup 7`

The following example shows the **config-backup** configuration.

```
ALU-1>config>system> info
#-----
echo "System Configuration"
#-----
      name "ALU-1"
      contact "Fred Information Technology"
      location "Bldg.1-floor 2-Room 201"
      clii-code "abcdefg1234"
      coordinates "N 45 58 23, W 34 56 12"
      config-backup 7
...
ALU-1>config>system>
```

6.10.6 Configuring System Administration Parameters

Use the CLI syntax displayed below to configure various system administration parameters.

Administrative parameters include:

- [Disconnect](#)
- [Set-time](#)
- [Display-config](#)
- [Tech-support](#)
- [Save](#)
- [Reboot](#)
- [Post-Boot Configuration Extension Files](#)

CLI Syntax: `admin`
`disconnect [address ip-address | username user-name |`
`{console | telnet | ftp | ssh | mct}]`
`display-config [detail | index]`
`reboot [active | standby] [upgrade] [now]`
`set-time date time`
`save [file-url] [detail] [index]`

6.10.6.1 Disconnect

The **disconnect** command immediately disconnects a user from a console, Telnet, FTP, SSH, SFTP, or MPT craft terminal (MCT) session.

The **ssh** keyword disconnects users connected to the node via SSH or SFTP.



Note: Configuration modifications are saved to the primary image file.

CLI Syntax: admin
 disconnect [address *ip-address* | username *user-name* |
 {console | telnet | ftp | ssh | mct}]

Example: admin# disconnect

The following example displays the disconnect command results.

```
ALU-1>admin# disconnect
ALU-1>admin# Logged out by the administrator
Connection to host lost.
```

6.10.6.2 Set-time

Use the **set-time** command to set the system date and time. The time entered should be accurate for the time zone configured for the system. The system will convert the local time to UTC before saving to the system clock which is always set to UTC. If SNTP or NTP is enabled (**no shutdown**), this command cannot be used. The **set-time** command does not take into account any daylight saving offset if defined.

CLI Syntax: admin
 set-time *date time*

Example: admin# set-time 2010/09/24 14:10:00

The following example displays the **set-time** command results.

```
ALU-1# admin set-time 2010/09/24 14:10:00
ALU-1# show time
Fri Sept 24 14:10:25 UTC 2010
ALU-1#
```

6.10.6.3 Display-config

The **display-config** command displays the system's running configuration.

CLI Syntax: admin
 display-config [detail] [index]

Example: admin# display-config detail

The following example displays a portion of the **display-config detail** command results.

```
ALU-1>admin# display-config detail
# TiMOS-B-0.0.current both/i386 NOKIA SAR 7705
# Copyright (c) 2016 Nokia.
# All rights reserved. All use subject to applicable license agreements.
# Built on Fri Sept 24 01:32:43 EDT 2016 by csabuild in /rel0.0/I270/panos/main

# Generated FRI SEPT 24 14:48:31 2016 UTC

exit all
configure
#-----
echo "System Configuration"
#-----
  system
    name "ALU-1"
    contact "Fred Information Technology"
    location "Bldg.1-floor 2-Room 201"
    cli-code "abcdefg1234"
    coordinates "N 45 58 23, W 34 56 12"
    config-backup 7
    boot-good-exec "ftp://*:*@xxx.xxx.xxx.xx/home/csahwreg17/images/env.cfg"
    no boot-bad-exec
    no switchover-exec
    snmp
      engineID "0000197f00006883ff000000"
      packet-size 1500
      general-port 161
      no shutdown
    exit
    login-control
      ftp
        inbound-max-sessions 3
      exit
      ssh
        no disable-graceful-shutdown
        inbound-max-sessions 5
        outbound-max-sessions 5
        ttl-security 100
      exit
    telnet
      no enable-graceful-shutdown
      inbound-max-sessions 5
      outbound-max-sessions 5
```



```

        ttl-security 50
    exit
    idle-timeout 1440
    pre-login-message "Property of Service Routing Inc.Unauthorized access
prohibited."
    motd text "Notice to all users: Software upgrade scheduled 3/2 1:00 AM"
    login-banner
    no exponential-backoff
exit
atm
    no atm-location-id
exit
security
    management-access-filter
        default-action permit
        entry 1
            no description
...
ALU-1>admin#

```

6.10.6.4 Tech-support

The **tech-support** command creates a system core dump.



Note: This command should only be used with explicit authorization and direction from the Nokia Technical Assistance Center (TAC).

6.10.6.5 Save

The **save** command saves the running configuration to a configuration file. When the **debug-save** parameter is specified, debug configurations are saved in the config file. If this parameter is not specified, debug configurations are not saved between reboots.

CLI Syntax:

```

admin
    save [file-url] [detail] [index]
    debug-save [file-url]

```

Example:

```

admin# save ftp://test:test@192.168.x.xx/./1.cfg
admin# debug-save debugsave.txt

```

The following example displays the **save** command results.

```

ALU-1>admin# save ftp://test:test@192.168.x.xx/./1.cfg
Writing file to ftp://test:test@192.168.x.xx/./1.cfg
Saving configuration ...Completed.

```

```
ALU-1>admin# debug-save ftp://test:test@192.168.x.xx/./debugsave.txt
Writing file to ftp://julie:julie@192.168.x.xx/./debugsave.txt
Saving debug configuration .....Completed.
```

6.10.6.6 Reboot

The **reboot** command reboots the router, including redundant CSMs in redundant systems. If the **now** option is not specified, you are prompted to confirm the reboot operation. The **reboot upgrade** command forces an upgrade of the boot ROM and a reboot.

CLI Syntax: admin
 reboot [active | standby] | [upgrade] [now]

Example: admin# reboot now

If synchronization fails, the standby does not reboot automatically. The **show redundancy synchronization** command displays synchronization output information.

6.10.6.7 Post-Boot Configuration Extension Files

Two post-boot configuration extension files are supported and are triggered when either a successful or failed boot configuration file is processed. The commands specify URLs for the CLI scripts to be run following the completion of the boot-up configuration. A URL must be specified or no action is taken. The commands are persistent between router (re)boots and are included in the configuration saves (**admin>save**).

CLI Syntax: config>system
 boot-bad-exec *file-url*
 boot-good-exec *file-url*

Example: config>system# boot-bad-exec ftp://t:t@192.168.xx.xxx/./fail.cfg
 config>system# boot-good-exec
 ftp://test:test@192.168.xx.xxx/./ok.cfg

The following example displays the command output:

```
ALU-1>config>system# info
#-----
echo "System Configuration"
#-----
      name "ALU-1"
      contact "Fred Information Technology"
      location "Bldg.1-floor 2-Room 201"
      clii-code "abcdefg1234"
      coordinates "N 45 58 23, W 34 56 12"
      config-backup 7
      boot-good-exec "ftp://test:test@192.168.xx.xxx/./ok.cfg"
      boot-bad-exec "ftp://test:test@192.168.xx.xxx/./fail.cfg"
      sync-if-timing
      begin
      ref-order refl ref2 bits
..
-----
ALU-1>config>system#
```

6.10.6.7.1 Show Command Output and Console Messages

The **show>system>information** command displays the current value of the bad/good exec URLs and indicates whether a post-boot configuration extension file was executed when the system was booted. If an extension file was executed, the **show>system> information** command also indicates if it completed successfully or not.

```
7705:Dut-A# show system information

=====
System Information
=====
System Name           : 7705:Dut-A
System Type           : 7705 SAR-8 v2
Chassis Topology     : Standalone
System Version       : B-0.0.I346
Crypto Module Version : SRCM 3.0
System Contact       : Fred Information Technology
System Location      : Bldg.1-floor 2-Room 201
System Coordinates   : N 45 58 23, W 34 56 12
System Active Slot   : A
System Up Time       : 1 days, 02:03:17.62 (hr:min:sec)

SNMP Port            : 161
SNMP Engine ID       : 0000197f000000164d3c3910
SNMP Engine Boots    : 58
SNMP Max Message Size : 1500
SNMP Admin State     : Enabled
SNMP Oper State      : Enabled
SNMP Index Boot Status : Not Persistent
SNMP Sync State      : OK
```

```

Tel/Tel6/SSH/FTP Admin : Enabled/Disabled/Enabled/Enabled
Tel/Tel6/SSH/FTP Oper  : Up/Down/Up/Up

BOF Source              : cf3:
Image Source            : primary
Config Source           : primary
Last Booted Config File: cf3:/config.cfg
Last Boot Cfg Version   : FRI APR 20 16:24:27 2007 UTC
Last Boot Config Header: # TiMOS-B-0.0.I346 both/i386 NOKIA SAR 7705
                        # Copyright (c) 2016 Nokia. # All rights
                        reserved. All use subject to applicable license
                        agreements. # Built on Tue Mar 11 01:43:47 EDT 2016 by
                        csabuild in /rel0.0/I346/panos/main # Generated TUE
                        MAR 11 20:00:37 2016 UTC

Last Boot Index Version: N/A
Last Boot Index Header : # TiMOS-B-0.0.I346 both/i386 NOKIA SAR 7705
                        # Copyright (c) 2016 Nokia. # All rights
                        reserved. All use subject to applicable license
                        agreements. # Built on Tue Mar 11 01:43:47 EDT 2016 by
                        csabuild in /rel0.0/I346/panos/main # Generated TUE
                        MAR 11 20:00:37 2016 UTC

Last Saved Config      : N/A
Time Last Saved        : N/A
Changes Since Last Save: Yes
User Last Modified     : admin
Time Last Modified     : 2016/03/25 10:03:09
Max Cfg/BOF Backup Rev : 5
Cfg-OK Script          : N/A
Cfg-OK Script Status   : not used
Cfg-Fail Script        : N/A
Cfg-Fail Script Status : not used

Microwave S/W Package : invalid

Management IP Addr     : 192.168.1.202/16
Primary DNS Server     : 192.168.x.x
Secondary DNS Server   : N/A
Tertiary DNS Server    : N/A
DNS Domain             : domain.com
DNS Resolve Preference : ipv4-only
BOF Static Routes     :
  To                   Next Hop
  192.168.0.0/16       192.168.1.1
ATM Location ID       : 01:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
ATM OAM Retry Up      : 2
ATM OAM Retry Down    : 4
ATM OAM Loopback Period: 10

ICMP Vendor Enhancement: Disabled
Eth QinQ untagged SAP : False
=====
7705:Dut-A#

```

When executing a post-boot configuration extension file, status messages are output to the console screen prior to the “Login” prompt.

The following is an example of a failed boot-up configuration that caused a boot-bad-exec file containing another error to be executed:

```
Attempting to exec configuration file:
'ftp://test:test@192.168.xx.xxx/./12.cfg' ...
System Configuration
Log Configuration
MAJOR: CLI #1009 An error occurred while processing a CLI command -
File ftp://test:test@192.168.xx.xxx/./12.cfg, Line 195: Command "log" failed.
CRITICAL: CLI #1002 An error occurred while processing the configuration file.
The system configuration is missing or incomplete.
MAJOR: CLI #1008 The SNMP daemon is disabled.
If desired, enable SNMP with the 'config>system>snmp no shutdown' command.
Attempting to exec configuration failure extension file:
'ftp://test:test@192.168.xx.xxx/./fail.cfg' ...
Config fail extension
Enabling SNMP daemon
MAJOR: CLI #1009 An error occurred while processing a CLI command -
File ftp://test:test@192.168.xx.xxx/./fail.cfg, Line 5: Command "abc log" failed.
TIMOS-B-5.0.R3 both/hops Nokia 7705 SAR Copyright (c) 2018 Nokia.
All rights reserved. All use subject to applicable license agreements.
Built on Wed Feb 18 12:45:00 EST 2018 by builder in /re8.0/b1/R3/panos/main
```

6.10.7 System Timing

If network timing is required for the synchronous interfaces in a 7705 SAR, a timing subsystem is used to provide a Stratum 3 quality clock to all synchronous interfaces within the system. The clock source is specified in the **config>port>tdm>ds1 | e1> clock-source** context.

This section describes the commands used to configure and control the timing subsystem.

- [Entering Edit Mode](#)
- [Configuring Timing References](#)
- [Configuring IEEE 1588v2 PTP](#)
- [Configuring QL Values for SSM](#)
- [Using the Revert Command](#)
- [Other Editing Commands](#)
- [Forcing a Specific Reference](#)

CLI Syntax:

```
config>system>sync-if-timing
  abort
  begin
  commit
  external
  input-interface
```

```

        impedance {high-impedance | 50-ohm | 75-ohm}
        type {2048khz-G703 | 5mhz | 10mhz}
    output-interface
        type {2048khz-G703 | 5mhz | 10mhz}
    ref-order first second [third]
    ref1
        source-port port-id [adaptive]
        no shutdown
    ref2
        source-port port-id [adaptive]
        no shutdown
    revert

```

6.10.7.1 Entering Edit Mode

To enter the mode to edit timing references, you must enter the **begin** keyword at the **config>system>sync-if-timing#** prompt.

Use the following CLI syntax to enter the edit mode:

CLI Syntax: `config>system>sync-if-timing
begin`

The following error message displays when you try to modify **sync-if-timing** parameters without entering **begin** first.

```

ALU-1>config>system>sync-if-timing>ref1# source-port 1/1/1
MINOR: CLI The sync-if-
timing must be in edit mode by calling begin before any changes can be made.
MINOR: CLI Unable to set source port for ref1 to 1/1/1.
ALU-1>config>system>sync-if-timing>ref1#

```

6.10.7.2 Configuring Timing References

The following example shows the command usage:

Example:

```

config>system# sync-if-timing
config>system>sync-if-timing# begin
config>system>sync-if-timing# ref1
config>system>sync-if-timing>ref1# source-port 1/1/1
config>system>sync-if-timing>ref1# no shutdown
config>system>sync-if-timing>ref1# exit
config>system>sync-if-timing# ref2
config>system>sync-if-timing>ref2# source-port 1/1/2
config>system>sync-if-timing>ref2# no shutdown

```

```
config>system>sync-if-timing>ref2# exit
config>system>sync-if-timing>commit
```

The following displays the timing reference parameters:

```
ALU-1>config>system>sync-if-timing# info
-----
ref-order ref2 ref1
ref1
  source-port 1/1/1
  no shutdown
exit
ref2
  no shutdown
  source-port 1/1/2
exit
```

6.10.7.3 Configuring IEEE 1588v2 PTP

Use the following CLI syntax to configure basic IEEE 1588v2 PTP parameters.

CLI Syntax:

```
config>system>ptp
  clock clock-id [create]
  clock-mds mds-id
  clock-type {ordinary [master | slave] | boundary |
  transparent-e2e}
  domain domain-value
  dynamic-peers
  priority1 priority-value
  priority2 priority-value
  profile ieee1588-20008
  ptp-port port-id
    anno-rx-timeout number-of-timeouts
    log-anno-interval log-anno-interval
    log-sync-interval log-sync-interval
    peer peer-id ip-address {ip-address | ipv6-
    address}
    [no] shutdown
    unicast-negotiate
    [no] shutdown
    source-interface ip-if-name
```

CLI Syntax:

```
config>system>sync-if-timing
  ref1
    source-ptp-clock clock-id
  ref2
    source-ptp-clock clock-id
```

The following example shows the command usage:

```

Example: config>system# ptp clock 1 create
config>system>ptp>clock# clock-type ordinary slave
config>system>ptp>clock# source-interface ptp-loop
config>system>ptp>clock# clock-mds 1/2
config>system>ptp>clock# domain 0
config>system>ptp>clock# no dynamic-peers
config>system>ptp>clock# priority1 128
config>system>ptp>clock# priority2 128
config>system>ptp>clock# profile ieee1588-2008
config>system>ptp>clock# ptp-port 1
config>system>ptp>clock>ptp-port# anno-rx-timeout 3
config>system>ptp>clock>ptp-port# log-anno-interval 1
config>system>ptp>clock>ptp-port# log-sync-interval -6
config>system>ptp>clock>ptp-port# unicast-negotiate
config>system>ptp>clock>ptp-port# peer 1
config>system>ptp>clock>ptp-port>peer# description "Peer
to Boundary Clock"
config>system>ptp>clock>ptp-port>peer# ip-address
10.222.222.10
config>system>ptp>clock>ptp-port>peer# exit
config>system>ptp>clock>ptp-port# peer 2
config>system>ptp>clock>ptp-port>peer# description ToGM
config>system>ptp>clock>ptp-port>peer# ip-address
192.168.2.10
config>system>ptp>clock>ptp-port>peer# exit
config>system>ptp>clock>ptp-port# no shutdown
config>system>ptp>clock>ptp-port# exit
config>system>ptp>clock# no shutdown
config>system>ptp>clock# exit
config>system>ptp# exit
config>system# sync-if-timing begin
config>system>sync-if-timing# ref1
config>system>sync-if-timing>ref1# source-ptp-clock 1
config>system>sync-if-timing>ref1# no shutdown
config>system>sync-if-timing>ref1# exit

```

The following display shows a basic IEEE 1588v2 PTP configuration:

```

ALU-1>config>system>ptp># info
#-----
echo "System IEEE 1588 PTP Configuration"
#-----
system
  ptp
    clock 1 create
      clock-type ordinary slave
      source-interface "ptp loop"
      clock-mds 1/2
      domain 0

```



```

no dynamic-peers
priority1 128
priority2 128
profile ieee1588-2008
ptp-port 1
    anno-rx-timeout 3
    log-anno-interval 1
    log-sync-interval -6
    unicast-negotiate
peer 1
    description "Peer to Boundary Clock"
    ip-address 10.222.222.10
exit
peer 2
    description "ToGM"
    ip-address 192.168.2.10
exit
no shutdown
exit
no shutdown
exit
exit
exit
exit

```

6.10.7.4 Configuring QL Values for SSM

Use the following syntax to configure the quality level (QL) values for Synchronization Status Messaging (SSM).

CLI Syntax:

```

config>system>sync-if-timing
    abort
    begin
    external
    input-interface
        impedance {high-impedance | 50-ohm | 75-ohm}
        no shutdown
        ql-override {prs | stu | st2 | tnc | st3e | st3 |
            smc | prc | ssu-a | ssu-b | sec | eec1 | eec2}
        type {2048khz-G703 | 5mhz | 10mhz}
    commit
bits
    input
        [no] shutdown
    interface-type {ds1[{esf|sf}] | e1[{pcm30crc |
        pcm31crc}] | 2048khz-G703}
    output
        line-length {110|220|330|440|550|660}
        [no] shutdown
    ql-override {prs | stu | st2 | tnc | st3e | st3 |
        smc | prc | ssu-a | ssu-b | sec | eec1 | eec2}

```

```

    ssm-bit sa-bit
    [no] shutdown
ql-selection
ref-order first second [third]
ref1
    ql-override {prs | stu | st2 | tnc | st3e | st3 |
        smc | prc | ssu-a | ssu-b | sec | eec1 | eec2}
    source-port port-id adaptive
    no shutdown
ref2
    ql-override {prs | stu | st2 | tnc | st3e | st3 |
        smc | prc | ssu-a | ssu-b | sec | eec1 | eec2}
    source-port port-id adaptive
    no shutdown

```

The following example shows the command usage:

Example:

```

config>system# sync-if-timing
config>system>sync-if-timing# begin
config>system>sync-if-timing# external
config>system>sync-if-timing>external# input-interface
config>system>sync-if-timing>external>input-interface#
impedance 50-Ohm
config>system>sync-if-timing>external>input-interface#
no shutdown
config>system>sync-if-timing>external>input-interface#
ql-override prs
config>system>sync-if-timing>external>input-interface#
exit
config>system>sync-if-timing>external# exit
config>system>sync-if-timing# commit
config>system>sync-if-timing# bits
config>system>sync-if-timing>bits# interface-type
2048khz-G703
config>system>sync-if-timing>bits# ssm-bit 8
config>system>sync-if-timing>bits# output
config>system>sync-if-timing>bits>output# line-length
220
config>system>sync-if-timing>bits>output# no shutdown
config>system>sync-if-timing>bits>output# exit
config>system>sync-if-timing>bits# ql-override prs
config>system>sync-if-timing>bits# exit
config>system>sync-if-timing# ql-selection
config>system>sync-if-timing# ref1
config>system>sync-if-timing>ref1# shutdown
config>system>sync-if-timing>ref1# ql-override prs
config>system>sync-if-timing>ref1# exit
config>system>sync-if-timing# ref2
config>system>sync-if-timing>ref2# no shutdown

```

```

config>system>sync-if-timing>ref2# ql-override prs
config>system>sync-if-timing>ref2# exit
config>system>sync-if-timing# exit

```

The following display shows a basic SSM QL configuration for the 7705 SAR-8 Shelf V2:

```

ALU-1>config>system>sync-if-timing# info
-----
ref-order external ref1 ref2
      ql-selection
      external
        input-interface
          no shutdown
          impedance 50-Ohm
          type 2048Khz-G703
          ql-override prs
        exit
      output-interface
        type 2048Khz-G703
      exit
    exit
  ref1
    no shutdown
    no source-port
    ql-override prs
  exit
  ref2
    no shutdown
    no source-port
    ql-override prs
  exit
no revert
-----
*ALU-1>>config>system>sync-if-timing#

```

The following display shows a basic SSM QL configuration for the 7705 SAR-18:

```

ALU-1>config>system>sync-if-timing# info
-----
ref-order external ref1 ref2
      ql-selection
      exit
    bits
      interface-type 2048Khz-G703
      ssm-bit 8
      ql-override prs
    output
      line-length 220
      no shutdown
    exit
  ref1
    no shutdown
    no source-port
    ql-override prs
  exit

```

```

ref2
  no shutdown
  no source-port
  ql-override prs
exit
no revert
-----

```

6.10.7.5 Using the Revert Command

The **revert** command allows the clock to revert to a higher-priority reference if the current reference goes offline or becomes unstable. With revertive switching enabled, the highest-priority valid timing reference will be used. If a reference with a higher priority becomes valid, a reference switchover to that reference will be initiated. If a failure on the current reference occurs, the next highest reference takes over.

With non-revertive switching, the active reference will always remain selected while it is valid, even if a higher-priority reference becomes available. If this reference becomes invalid, a reference switchover to a valid reference with the highest priority will be initiated. When the failed reference becomes operational, it is eligible for selection.

CLI Syntax: `config>system>sync-if-timing
revert`

6.10.7.6 Other Editing Commands

Other editing commands include:

- **commit** — saves changes made to the timing references during a session. Modifications are not persistent across system boots unless this command is entered.
- **abort** — discards changes that have been made to the timing references during a session.

CLI Syntax: `config>system>sync-if-timing
abort
commit`

6.10.7.7 Forcing a Specific Reference

You can force the system synchronous timing output to use a specific reference.



Note: The **debug sync-if-timing force-reference** command should only be used to test and debug problems. Once the system timing reference input has been forced, it will not revert to another reference unless explicitly reconfigured.

When the command is executed, the current system synchronous timing output is immediately referenced from the specified reference input. If the specified input is not available (shut down), or in a disqualified state, the timing output will enter a holdover state based on the previous input reference.

Debug configurations are not saved between reboots.

CLI Syntax: `debug>sync-if-timing
force-reference {external | ref1 | ref2}`

Example: `debug>sync-if-timing# force-reference`

6.11 Configuring System Monitoring Thresholds

6.11.1 Creating Events

The **event** command controls the generation and notification of threshold crossing events configured with the **alarm** command. When a threshold crossing event is triggered, the **rmon event** configuration optionally specifies whether an entry in the RMON-MIB log table will be created to record the occurrence of the event. It can also specify whether an SNMP notification (trap) will be generated for the event. There are two notifications for threshold crossing events, a rising alarm and a falling alarm.

Creating an event entry in the RMON-MIB log table does not create a corresponding entry in the 7705 SAR event logs. However, when the event is set to trap, the generation of a rising alarm or falling alarm notification creates an entry in the 7705 SAR event logs and that is distributed to whatever 7705 SAR log destinations are configured: console, session, memory, file, syslog, or SNMP trap destination. The 7705 SAR logger message includes a rising or falling threshold crossing event indicator, the sample type (absolute or delta), the sampled value, the threshold value, the *rmon-alarm-id*, the associated *rmon-event-id* and the sampled SNMP object identifier.

The **alarm** command configures an entry in the RMON-MIB alarm table. The **alarm** command controls the monitoring and triggering of threshold crossing events. In order for notification or logging of a threshold crossing event to occur there must be at least one associated **rmon event** configured.

The agent periodically takes statistical sample values from the MIB variable specified for monitoring and compares them to thresholds that have been configured with the **alarm** command. The **alarm** command configures the MIB variable to be monitored, the polling period (interval), sampling type (absolute or delta value), and rising and falling threshold parameters. If a sample has crossed a threshold value, the associated 'event' is generated.

Preconfigured CLI threshold commands are available. Preconfigured commands hide some of the complexities of configuring RMON alarm and event commands and perform the same functions. In particular, the preconfigured commands do not require the user to know the SNMP object identifier to be sampled. The preconfigured threshold configurations include memory warnings, alarms, and compact flash usage warnings and alarms.

To create events, use the following CLI syntax:

CLI Syntax:

```

config>system
thresholds
  cflash-cap-alarm cflash-id rising-threshold
    threshold [falling-threshold threshold] interval
    seconds [rmon-event-type] [startup-alarm alarm-
    type]
  cflash-cap-warn cflash-id rising-threshold
    threshold [falling-threshold threshold] interval
    seconds [rmon-event-type] [startup-alarm alarm-
    type]
  memory-use-alarm rising-threshold threshold
    [falling-threshold threshold] interval seconds
    [rmon-event-type] [startup-alarm alarm-type]
  memory-use-warn rising-threshold threshold
    [falling-threshold threshold] interval seconds
    [rmon-event-type] [startup-alarm alarm-type]
rmon
  alarm rmon-alarm-id variable-oid oid-string
    interval seconds [sample-type] [startup-alarm
    alarm-type] [rising-event rmon-event-id
    rising-threshold threshold] [falling-event
    rmon-event-id falling-threshold threshold]
    [owner owner-string]
    event rmon-event-id [event-type] [description
    description-string] [owner owner-string]

```

Example:

```

config>system>thresholds# cflash-cap-warn cf3-B:
  rising-threshold 2000000 falling-threshold 1999900
  interval 240 trap startup-alarm either

```

Example:

```

config>system>thresholds# memory-use-alarm
  rising-threshold 50000000 falling-threshold 45999999
  interval 500 both startup-alarm either

```

Example:

```

config>system>thresholds# rmon

```

Example:

```

config>system>thresholds>rmon# event 5 both description
  "alarm testing" owner "Timos CLI"

```

The following example displays the command output:

```
A:ALU-49>config>system>thresholds# info
-----
      rmon
        event 5 description "alarm testing" owner "Timos CLI"
      exit
      cflash-cap-warn cf1-B: rising-threshold 2000000 falling-
        threshold 1999900 interval 240 trap
      memory-use-alarm rising-threshold 50000000 falling-threshold 45999999
        interval 500
-----
A:ALU-49>config>system>thresholds#
```

6.12 Configuring LLDP

Use the following syntax to configure LLDP:

CLI Syntax:

```
config>system>lldp
    message-fast-tx time
    message-fast-tx-init count
    notification-interval time
    reinit-delay time
    tx-credit-max count
    tx-hold-multiplier multiplier
    tx-interval interval
```

Example:

```
config>system# lldp
config>system>lldp# message-fast-tx 100
config>system>lldp# notification-interval 10
config>system>lldp# reinit-delay 5
config>system>lldp# tx-credit-max 20
config>system>lldp# tx-hold-multiplier 2
config>system>lldp# tx-interval 10
```

The following example shows the system LLDP configuration:

```
A:ALU-49>config>system>lldp# info
-----
tx-interval 10
tx-hold-multiplier 2
reinit-delay 5
notification-interval 10
tx-credit-max 20
message-fast-tx 100
-----
A:ALU-49>config>system>lldp#
```

6.13 System Command Reference

6.13.1 Command Hierarchies

- Configuration Commands
 - System Information and General Commands
 - System Alarm Commands
 - Persistence Commands
 - System Time Commands
 - CRON Commands
 - Script Control Commands
 - System Synchronization Commands
 - System LLDP Commands
 - System PTP Commands
- Administration Commands
 - System Administration Commands
 - High Availability (Redundancy) Commands
- Show Commands
- Clear Commands
- Debug Commands

6.13.1.1 Configuration Commands

6.13.1.1.1 System Information and General Commands

```

config
  — system
    — atm
      — atm-location-id location-id
      — no atm-location-id
    — boot-bad-exec file-url
    — no boot-bad-exec
    — boot-good-exec file-url
    — no boot-good-exec
    — cli-code cli-code
    — no cli-code
    — config-backup count
    — no config-backup
    — contact contact-name
    — no contact
    — coordinates coordinates
    — no coordinates
    — fp
      — options
        — vpls-high-scale
        — [no] shutdown
    — [no] identifier id
    — load-balancing
      — [no] l4-load-balancing
      — lsr-load-balancing hashing-algorithm [bottom-of-stack hashing-treatment] [use-
        ingress-port]
      — no lsr-load-balancing
      — [no] system-ip-load-balancing
    — location location
    — no location
    — name system-name
    — no name
    — [no] power-feed-monitoring {A | B | C}
    — spt
      — security-aggregate-rate agg-rate (refer to the Interface Configuration Guide,
        “Adapter Card Commands” for information)
      — no security-aggregate-rate (refer to the Interface Configuration Guide, “Adapter
        Card Commands” for information)

```

6.13.1.1.2 System Alarm Commands

```

config
  — system
    — thresholds
      — cflash-cap-alarm cflash-id rising-threshold threshold [falling-threshold threshold]
         interval seconds [rmon-event-type] [startup-alarm alarm-type]
      — no cflash-cap-alarm cflash-id
      — cflash-cap-warn cflash-id rising-threshold threshold [falling-threshold threshold]
         interval seconds [rmon-event-type] [startup-alarm alarm-type]
      — no cflash-cap-warn cflash-id
      — memory-use-alarm rising-threshold threshold [falling-threshold threshold] interval
         seconds [rmon-event-type] [startup-alarm alarm-type]
      — no memory-use-alarm
      — memory-use-warn rising-threshold threshold [falling-threshold threshold] interval
         seconds [rmon-event-type] [startup-alarm alarm-type]
      — no memory-use-warn
      — [no] rmon
        — alarm rmon-alarm-id variable-oid oid-string interval seconds [sample-type]
           [startup-alarm alarm-type] [rising-event rmon-event-id rising-threshold
           threshold] [falling event rmon-event-id falling-threshold threshold] [owner
           owner-string]
        — no alarm rmon-alarm-id
        — event rmon-event-id [event-type] [description description-string] [owner
           owner-string]
        — no event rmon-event-id

```

6.13.1.1.3 Persistence Commands

```

config
  — system
    — persistence
      — dhcp-server
        — description description-string
        — no description
        — location cflash-id
        — no location

```

6.13.1.1.4 System Time Commands

```

root
  — admin
    — set-time [date] [time]

config
  — system
    — time
      — [no] dst-zone [std-zone-name | non-std-zone-name]
        — end {end-week} {end-day} {end-month} [hours-minutes]

```

- **offset** *offset*
- **start** {*start-week*} {*start-day*} {*start-month*} [*hours-minutes*]
- **gnss**
 - **port** *port-id* **time-ref-priority** *priority-value*
 - **no port**
- [no] **ntp**
 - [no] **authentication-check**
 - **authentication-key** *key-id* **key** *key* [**hash** | **hash2**] **type** {**des** | **message-digest**}
 - **no authentication-key** *key-id*
 - **broadcast** [**router** *router-name*] {**interface** *ip-int-name*} [**key-id** *key-id*] [**version** *version*] [**ttl** *ttl*]
 - **no broadcast** [**router** *router-name*] {**interface** *ip-int-name*}
 - **broadcastclient** [**router** *router-name*] {**interface** *ip-int-name*} [**authenticate**]
 - **no broadcastclient** [**router** *router-name*] {**interface** *ip-int-name*}
 - [no] **mda-timestamp**
 - **multicast** [**key-id** *key-id*] [**version** *version*]
 - **no multicast**
 - **multicastclient** [**authenticate**]
 - **no multicastclient**
 - **ntp-server** [**authenticate**]
 - **no ntp-server**
 - **peer** *ip-address* [**key-id** *key-id*] [**version** *version*] [**prefer**]
 - **no peer** *ip-address*
 - **server** {*ip-address* | **system-time**} [**key-id** *key-id*] [**version** *version*] [**prefer**]
 - **no server** {*ip-address* | **system-time**}
 - [no] **shutdown**
- **ptp**
 - **clock** *clock-id* **time-ref-priority** *priority-value*
 - **clock csm** **time-ref-priority** *priority-value*
 - **no clock**
- [no] **sntp**
 - [no] **broadcast-client**
 - **server-address** *ip-address* [**version** *version-number*] [**normal** | **preferred**] [**interval** *seconds*]
 - **no server-address** *ip-address*
 - [no] **shutdown**
- **tod-1pps**
 - **message-type** {**ct** | **cm** | **irig-b002-b122** | **irig-b003-b123** | **irig-b006-b126** | **irig-b007-b127**}
 - **no message-type**
 - [no] **output**
- **zone** {*std-zone-name* | *non-std-zone-name*} [*hh* [:*mm*]]
- **no zone**

6.13.1.1.5 CRON Commands

- ```
config
 — system
 — cron
 — [no] schedule schedule-name [owner schedule-owner]
 — count number
```

- **no count**
- **day-of-month** {*day-number* [*..day-number*] | **all**}
- **no day-of-month**
- **description** *description-string*
- **no description**
- **end-time** [*date* | *day-name*] *time*
- **no end-time**
- **hour** {*hour-number* [*..hour-number*] | **all**}
- **no hour**
- **interval** *seconds*
- **no interval**
- **minute** {*minute-number* [*..minute-number*] | **all**}
- **no minute**
- **month** {*month-number* [*..month-number*] | *month-name* [*..month-name*] | **all**}
- **no month**
- **script-policy** *policy-name* [**owner** *policy-owner*]
- **no script-policy**
- [**no**] **shutdown**
- **type** *schedule-type*
- **weekday** {*weekday-number* [*..weekday-number*] | *day-name* [*..day-name*] | **all**}
- **no weekday**

### 6.13.1.1.6 Script Control Commands

- ```

config
  — system
    — script-control
      — [no] script script-name [owner script-owner]
        — description description-string
        — no description
        — location file-url
        — no location
        — [no] shutdown
      — [no] script-policy policy-name [owner policy-owner]
        — expire-time {seconds | forever}
        — lifetime {seconds | forever}
        — max-completed unsigned
        — results file-url
        — no results
        — script script-name [owner script-owner]
        — no script
        — [no] shutdown

```

6.13.1.1.7 System Synchronization Commands

- ```

config
 — system
 — sync-if-timing
 — abort

```

- **begin**
- **bits**
  - **input**
    - **[no] shutdown**
  - **interface-type** {ds1 [{esf | sf}] | e1 [{pcm30crc | pcm31crc}] | 2048khz-G703}
  - **no interface-type**
  - **output**
    - **line-length** {110 | 220 | 330 | 440 | 550 | 660}
    - **[no] shutdown**
    - **source** {line-ref | internal-clock}
  - **ql-override** {prs | stu | st2 | tnc | st3e | st3 | smc | prc | ssu-a | ssu-b | sec | eec1 | eec2}
  - **no ql-override**
  - **ssm-bit** *sa-bit*
- **commit**
- **external**
  - **input-interface**
    - **impedance** {high-impedance | 50-Ohm | 75-Ohm}
    - **[no] shutdown**
    - **type** {2048khz-G703 | 5mhz | 10mhz}
    - **no type**
  - **output-interface**
    - **type** {2048khz-G703 | 5mhz | 10mhz}
    - **no type**
  - **ql-override** {prs | stu | st2 | tnc | st3e | st3 | smc | prc | ssu-a | ssu-b | sec | eec1 | eec2}
  - **no ql-override**
- **[no] ql-selection**
- **ref-order** *first second [third]*
- **no ref-order**
- **ref1**
  - **ql-override** {prs | stu | st2 | tnc | st3e | st3 | smc | prc | ssu-a | ssu-b | sec | eec1 | eec2}
  - **no ql-override**
  - **[no] shutdown**
  - **source-port** *port-id* [adaptive]
  - **no source-port**
  - **source-ntp-clock** *clock-id*
  - **no source-ntp-clock**
- **ref2**
  - **ql-override** {prs | stu | st2 | tnc | st3e | st3 | smc | prc | ssu-a | ssu-b | sec | eec1 | eec2}
  - **no ql-override**
  - **[no] shutdown**
  - **source-port** *port-id* [adaptive]
  - **no source-port**
  - **source-ntp-clock** *clock-id*
  - **no source-ntp-clock**
- **[no] revert**



### 6.13.1.1.8 System LLDP Commands

```

config
 — system
 — lldp
 — message-fast-tx time
 — no message-fast-tx
 — message-fast-tx-init count
 — no message-fast-tx-init
 — notification-interval time
 — no notification-interval
 — reinit-delay time
 — no reinit-delay
 — tx-credit-max count
 — no tx-credit-max
 — tx-hold-multiplier multiplier
 — no tx-hold-multiplier
 — tx-interval interval
 — no tx-interval

```

### 6.13.1.1.9 System PTP Commands

```

config
 — system
 — ptp
 — clock clock-id [create]
 — no clock
 — anno-rx-timeout number-of-timeouts
 — no anno-rx-timeout
 — clock-mds mda-id
 — no clock-mds
 — clock-type {ordinary {master | slave} | boundary | transparent-e2e}
 — no clock-type
 — domain domain-value
 — no domain
 — [no] dynamic-peers
 — freq-source {ptp | ssu}
 — no freq-source
 — local-priority priority
 — no local-priority
 — log-anno-interval log-anno-interval
 — no log-anno-interval
 — network-type {sdh | sonet}
 — no network-type
 — port port-id [create]
 — no port port-id
 — address {01:1b:19:00:00:00 | 01:80:c2:00:00:00e}
 — no address
 — local-priority priority
 — no local-priority
 — log-delay-interval log-delay-interval

```

- **no log-delay-interval**
- **log-sync-interval** *log-sync-interval*
- **no log-sync-interval**
- **master-only** {true | false}
- **[no] shutdown**
- **priority1** *priority-value*
- **no priority1**
- **priority2** *priority-value*
- **no priority2**
- **profile** {g8275dot1-2014 | g8275dot2-2016 | ieee1588-2008 | itu-telecom-freq | iec-61850-9-3-2016}
- **no profile**
- **ptp-port** *port-id*
  - **anno-rx-timeout** *number-of-timeouts*
  - **no anno-rx-timeout**
  - **local-priority** *priority*
  - **no local-priority**
  - **log-anno-interval** *log-anno-interval*
  - **no log-anno-interval**
  - **log-sync-interval** *log-sync-interval*
  - **no log-sync-interval**
  - **master-only** {true | false}
  - **peer** *peer-id*
    - **description** *description-string*
    - **no description**
    - **ip-address** {*ip-address* | *ipv6-address*}
    - **no ip-address**
  - **[no] shutdown**
  - **[no] unicast-negotiate**
- **[no] shutdown**
- **source-interface** *ip-int-name*
- **no source-interface**
- **[no] tx-while-sync-uncertain**
- **[no] use-node-time**

## 6.13.1.2 Administration Commands

### 6.13.1.2.1 System Administration Commands

- ```
root
— admin
  — debug-save file-url
  — disconnect {address ip-address | username user-name | console | telnet | ftp | ssh}
  — display-config [detail | index]
  — [no] enable-tech
  — reboot [active | standby] | [upgrade] [now]
  — save [file-url] [detail] [index]
  — tech-support [file-url]
  — update boot-loader file-url
```

- ```

config
 — system
 — security
 — tech-support
 — ts-location file-url
 — no ts-location

```

### 6.13.1.2.2 High Availability (Redundancy) Commands

- ```

root
  — admin
  — redundancy
  — force-switchover [now]
  — rollback-sync
  — synchronize {boot-env | config}

config
  — redundancy
  — bgp-evpn-multi-homing (refer to the “EVPN Command Reference” section in the
    7705 SAR Services Guide)
  — [no] cert-sync
  — multi-chassis
  — peer ip-address [create]
  — no peer ip-address
  — authentication-key [authentication-key | hash-key] [hash | hash2]
  — no authentication-key
  — description description-string
  — [no] description
  — [no] mc-firewall
  — boot-timer interval
  — no boot-timer
  — [no] encryption
  — active-outbound-sa active-outbound-sa
  — no active-outbound-sa
  — authen-algorithm authen-algorithm
  — no authen-algorithm
  — encryp-algorithm encryp-algorithm
  — no encryp-algorithm
  — security-association spi spi authentication-key authentication-key
    encryption-key encryption-key [hash | hash2]
  — no security-association spi spi
  — hold-on-neighbor-failure multiplier
  — no hold-on-neighbor-failure
  — keep-alive-interval interval
  — no keep-alive-interval
  — [no] shutdown
  — system-priority value
  — no system-priority
  — [no] mc-lag
  — hold-on-neighbor-failure multiplier
  — no hold-on-neighbor-failure

```

-
- **keep-alive-interval** *interval*
 - **no keep-alive-interval**
 - **lag** *lag-id lacp-key admin-key system-id system-id [remote-lag lag-id]*
system-priority *system-priority*
 - **no lag** *lag-id*
 - **[no] shutdown**
 - **[no] shutdown**
 - **source-address** *ip-address*
 - **no source-address**
 - **[no] rollback-sync**
 - **synchronize** {*boot-env | config*}
- config**
- **system**
 - **switchover-exec** *file-url*
 - **no switchover-exec**

6.13.1.3 Show Commands

- ```

show
 — chassis [detail]
 — chassis [environment] [power-feed]
 — redundancy
 — bgp-evpn-multi-homing (refer to the “EVPN Command Reference” section in the
 7705 SAR Services Guide)
 — multi-chassis
 — all
 — mc-firewall peer ip-address
 — mc-firewall peer ip-address statistics
 — mc-firewall statistics
 — mc-lag peer ip-address [lag lag-id]
 — mc-lag [peer ip-address [lag lag-id]] statistics
 — synchronization
 — system
 — connections [address ip-address] [port port-number] [detail]
 — cpu [sample-period seconds]
 — cron
 — schedule [schedule-name] [owner owner-name]
 — dhcp6
 — fp
 — options
 — information
 — lldp neighbor
 — load-balancing-alg [detail]
 — memory-pools
 — ntp [{peers | peer peer-address} | {servers | server server-address} | [all]] [detail]
 — poe
 — ptp
 — clock clock-id bmc
 — clock clock-id detail
 — clock clock-id standby
 — clock clock-id statistics
 — clock clock-id summary
 — clock clock-id unicast
 — clock clock-id port [port-id [detail]]
 — clock clock-id ptp-port port-id
 — peer peer-id [detail]
 — ptp timestamp-stats
 — rollback [rescue]
 — script-control
 — script [script-name] [owner script-owner]
 — script-policy policy-name [owner policy-owner]
 — script-policy run-history [run-state]
 — sntp
 — sync-if-timing
 — thresholds
 — time [detail]
 — time
 — uptime

```

### 6.13.1.4 Clear Commands

```
clear
 — screen
 — system
 — ptp
 — clock clock-id statistics
 — clock csm port port-id statistics
 — script-control
 — script-policy
 — completed [policy-name] [owner policy-owner]
 — sync-if-timing {external | ref 1 | ref2}
 — trace log
```

### 6.13.1.5 Debug Commands

```
debug
 — sync-if-timing
 — force-reference {external | ref1 | ref2}
 — no force-reference
 — [no] system
 — http-connections [host-ip-address/mask]
 — no http-connections
 — ntp [router router-name] [interface ip-int-name]
 — no ntp
 — lag [lag-id lag-id] [port port-id] [all]
 — lag [lag-id lag-id] [port port-id] [sm] [pkt] [cfg] [red] [iom-upd] [port-state] [timers] [sel-logic]
 [mc] [mc-pkt]
 — no lag [lag-id lag-id]
```

## 6.13.2 Command Descriptions

- [Configuration Commands](#)
- [Administration Commands](#)
- [Show Commands](#)
- [Clear Commands](#)
- [Debug Commands](#)

## 6.13.2.1 Configuration Commands

- [Generic Commands](#)
- [System Information and General Commands](#)
- [System Alarm Commands](#)
- [Persistence Commands](#)
- [System Time Commands](#)
- [CRON Commands](#)
- [Script Control Commands](#)
- [System Synchronization Configuration Commands](#)
- [LLDP System Commands](#)
- [System PTP Commands](#)



### 6.13.2.1.1 Generic Commands

#### shutdown

<b>Syntax</b>	<b>[no] shutdown</b>
<b>Context</b>	<pre> config&gt;redundancy&gt;multi-chassis&gt;peer config&gt;redundancy&gt;multi-chassis&gt;peer&gt;mc-firewall config&gt;redundancy&gt;multi-chassis&gt;peer&gt;mc-lag config&gt;system&gt;cron&gt;schedule config&gt;system&gt;fp&gt;options&gt;vpls-high-scale config&gt;system&gt;lldp config&gt;system&gt;ptp&gt;clock config&gt;system&gt;ptp&gt;clock&gt;port config&gt;system&gt;ptp&gt;clock&gt;ptp-port config&gt;system&gt;script-control&gt;script config&gt;system&gt;script-control&gt;script-policy config&gt;system&gt;sync-if-timing&gt;bits&gt;input config&gt;system&gt;sync-if-timing&gt;bits&gt;output config&gt;system&gt;sync-if-timing&gt;external config&gt;system&gt;sync-if-timing&gt;ref1 config&gt;system&gt;sync-if-timing&gt;ref2 config&gt;system&gt;time&gt;ntp config&gt;system&gt;time&gt;sntp </pre>
<b>Description</b>	<p>This command administratively disables the entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics.</p> <p>The operational state of the entity is disabled as well as the operational state of any entities contained within. Many objects must be shut down before they can be deleted.</p> <p>The <b>no</b> form of this command places the entity into an administratively enabled state.</p>
<b>Default</b>	no shutdown

#### description

<b>Syntax</b>	<b>description</b> <i>description-string</i> <b>no description</b>
<b>Context</b>	<pre> config&gt;redundancy&gt;multi-chassis&gt;peer config&gt;system&gt;cron&gt;schedule config&gt;system&gt;persistence&gt;dhcp-server config&gt;system&gt;ptp&gt;clock&gt;ptp-port&gt;peer config&gt;system&gt;script-control&gt;script </pre>

**Description** This command creates a text description stored in the configuration file for a configuration context.

The **description** command associates a text string with a configuration context to help identify the content in the configuration file.

The **no** form of this command removes the string from the configuration.

**Default** n/a — no description is associated with the configuration context

**Parameters** *description-string* — the description character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

### 6.13.2.1.2 System Information and General Commands

#### atm

<b>Syntax</b>	<b>atm</b>
<b>Context</b>	config>system
<b>Description</b>	This command enables the context to configure system-wide ATM parameters.

#### atm-location-id

<b>Syntax</b>	<b>atm-location-id</b> <i>location-id</i> <b>no atm-location-id</b>
<b>Context</b>	config>system>atm
<b>Description</b>	This command indicates the location ID for ATM OAM.  Refer to the 7705 SAR Quality of Service Guide, “ATM QoS Traffic Descriptor Profiles”, for information on ATM QoS policies and the 7705 SAR Services Guide, “VLL Services” for information on ATM-related service parameters.
<b>Default</b>	no atm-location-id
<b>Parameters</b>	<i>location-id</i> — specifies the 16 octets that identifies the system loopback location ID as required by the ATM OAM Loopback capability. This textual convention is defined in ITU-T standard I.610.  Invalid values include a location ID where the first octet is: 00, FF, 6A Acceptable location-ids include values where the first octet is: 01, 03 Other values are not accepted.  <b>Values</b> 01:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00

#### boot-bad-exec

<b>Syntax</b>	<b>boot-bad-exec</b> <i>file-url</i> <b>no boot-bad-exec</b>
<b>Context</b>	config>system
<b>Description</b>	Use this command to configure a URL for a CLI script to execute following a failure of a boot-up configuration. The command specifies a URL for the CLI scripts to be run following the completion of the boot-up configuration. A URL must be specified or no action is taken.

The commands are persistent between router (re)boots and are included in the configuration saves (**admin>save**).

Also refer to the related command [exec](#).

<b>Default</b>	no boot-bad-exec
<b>Parameters</b>	<i>file-url</i> — specifies the location and name of the CLI script file executed following failure of the boot-up configuration file execution. When this parameter is not specified, no CLI script file is executed. (See <a href="#">Table 15</a> for parameter descriptions.)

## boot-good-exec

<b>Syntax</b>	<b>boot-good-exec</b> <i>file-url</i> <b>no boot-good-exec</b>
<b>Context</b>	config>system
<b>Description</b>	Use this command to configure a URL for a CLI script to execute following the success of a boot-up configuration.  Also refer to the related command <a href="#">exec</a> .
<b>Default</b>	no boot-good-exec
<b>Parameters</b>	<i>file-url</i> — specifies the location and name of the CLI script file executed following successful completion of the boot-up configuration file execution. When this parameter is not specified, no CLI script file is executed. (See <a href="#">Table 15</a> for parameter descriptions.)

## cli-code

<b>Syntax</b>	<b>cli-code</b> <i>cli-code</i> <b>no cli-code</b>
<b>Context</b>	config>system
<b>Description</b>	This command creates a Common Language Location Identifier (CLLI) code string for the 7705 SAR. A CLLI code is an 11-character standardized geographic identifier that uniquely identifies geographic locations and certain functional categories of equipment unique to the telecommunications industry.  No CLLI validity checks other than truncating or padding the string to 11 characters are performed.  Only one CLLI code can be configured. If multiple CLLI codes are configured, the last one entered overwrites the previous entry.

The **no** form of the command removes the CLLI code.

**Default** n/a — no CLLI codes are configured

**Parameters** *cli-code* — the 11-character string CLLI code. Any printable, 7-bit ASCII characters can be used within the string. If the string contains spaces, the entire string must be enclosed within double quotes. If more than 11 characters are entered, the string is truncated. If fewer than 11 characters are entered, the string is padded with spaces.

## config-backup

**Syntax** **config-backup** *count*  
**no config-backup**

**Context** config>system

**Description** This command configures the maximum number of backup versions maintained for configuration files and BOF.

For example, if the **config-backup** *count* is set to 5 and the configuration file is called **xyz.cfg**, the file **xyz.cfg** is saved with a .1 extension when the **save** command is executed. Each subsequent **config-backup** command increments the numeric extension until the maximum count is reached.

- xyz.cfg
- xyz.cfg.1
- xyz.cfg.2
- xyz.cfg.3
- xyz.cfg.4
- xyz.cfg.5
- xyz.ndx

Each persistent index file is updated at the same time as the associated configuration file. When the index file is updated, then the save is performed to **xyz.cfg** and the index file is created as **xyz.ndx**. Synchronization between the active and standby CSM is performed for all configurations and their associated persistent index files.

The **no** form of the command returns the configuration to the default value.

**Default** 5

**Parameters** *count* — the maximum number of backup revisions

**Values** 1 to 9

---

## contact

<b>Syntax</b>	<b>contact</b> <i>contact-name</i> <b>no contact</b>
<b>Context</b>	config>system
<b>Description</b>	<p>This command creates a text string that identifies the contact name for the device.</p> <p>Only one contact can be configured. If multiple contacts are configured, the last one entered will overwrite the previous entry.</p> <p>The <b>no</b> form of the command reverts to the default.</p>
<b>Default</b>	n/a — no contact name is configured
<b>Parameters</b>	<i>contact-name</i> — the contact name character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains spaces, the entire string must be enclosed within double quotes.

## coordinates

<b>Syntax</b>	<b>coordinates</b> <i>coordinates</i> <b>no coordinates</b>
<b>Context</b>	config>system
<b>Description</b>	<p>This command creates a text string that identifies the system coordinates for the device location. For example, the command <b>coordinates</b> "37.390 -122.0550" is read as latitude 37.390 north and longitude 122.0550 west.</p> <p>Only one set of coordinates can be configured. If multiple coordinates are configured, the last one entered overwrites the previous entry.</p> <p>The <b>no</b> form of the command reverts to the default value.</p>
<b>Default</b>	n/a — no coordinates are configured
<b>Parameters</b>	<i>coordinates</i> — the coordinates describing the device location character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains spaces, the entire string must be enclosed within double quotes. If the coordinates are subsequently used by an algorithm that locates the exact position of this node, then the string must match the requirements of the algorithm.

## fp

<b>Syntax</b>	<b>fp</b>
---------------	-----------

---

<b>Context</b>	config>system
<b>Description</b>	This command enters the context to issue forwarding path commands.
<b>Default</b>	n/a

## options

<b>Syntax</b>	<b>options</b>
<b>Context</b>	config>system>fp
<b>Description</b>	This command enters the context to configure forwarding path options.
<b>Default</b>	n/a

## vpls-high-scale

<b>Syntax</b>	<b>vpls-high-scale</b>
<b>Context</b>	config>system>fp>options
<b>Description</b>	This command enters the context to enable or disable VPLS scalability with the <b>shutdown</b> command.

VPLS scalability is only supported on the 7705 SAR-8 Shelf V2 and the 7705 SAR-18. VPLS scalability cannot be enabled if any of the following are configured in the system:

- access or network IP interfaces (GRT/IES/VPRN) on a 16-port T1/E1 ASAP Adapter card, version 2, 32-port T1/E1 ASAP Adapter card, 4-port OC3/STM1 Clear Channel Adapter card, 2-port OC3/STM1 Channelized Adapter card, or 4-port DS3/E3 Adapter card.
- VPLS residential ATM SAPs

VPLS high-scale limits are supported on access and network links on the following cards:

- 8-port Ethernet Adapter card
- 2-port 10GigE (Ethernet) Adapter card
- 8-port Gigabit Ethernet Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card
- Packet Microwave Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card

By default, VPLS scalability is disabled and the 7705 SAR-8 Shelf V2 and 7705 SAR-18 support only 64 VPLS instances. You can enable up to 255 VPLS instances by issuing the **no shutdown** command under this context.

After the **no shutdown** command is issued, the Admin state for **vpls-high-scale** is enabled but the Oper state remains disabled and you cannot create more than 64 VPLS instances. You must issue an **admin save** command and reboot the node for the configuration change to take effect.

To disable VPLS scalability, you must lower the number of VPLS services to 64 or fewer before issuing the **shutdown** command under this context. The VPLS service ID numbers are not relevant, as long as the maximum number of services is 64. You must issue an **admin save** command and reboot the node for the configuration change to take effect.

**Default** n/a

## identifier

**Syntax** **[no] identifier** *id*

**Context** config>system

**Description** This command configures a static system identifier for the 7705 SAR. The system identifier can be used to uniquely identify the 7705 SAR in the network instead of the system IP address, as a system IP address can change dynamically using DHCP when the 7705 SAR is acting as a DHCP client and the DHCP server-facing interface is unnumbered. To prevent management systems (for example, the NSP NFM-P) from rediscovering a node based on a system IP address that has been changed via DHCP, and thus losing historical data attributed to a specific system IP address, a static system identifier should be configured.

The system identifier takes the form of an IPv4 address. This address is not advertised in IGP or BGP and is used solely as a node identifier.

The **no** form of the command deletes the system identifier.

**Default** no identifier

**Parameters** *id* — configures an IPv4 address to be used as the system identifier

**Values** any valid IPv4 address

## load-balancing

**Syntax** **load-balancing**

**Context** config>system

**Description** This command enables the context to configure load balancing parameters.



---

## I4-load-balancing

<b>Syntax</b>	<b>[no] I4-load-balancing</b>
<b>Context</b>	config>system>load-balancing
<b>Description</b>	<p>This command configures system-wide Layer 4 load balancing. The configuration at the system level can enable or disable load balancing across all IP interfaces. When enabled, Layer 4 source and destination port fields of incoming TCP/UDP packets are included in the hashing calculation to randomly determine the distribution of packets.</p> <p>Adding the Layer 4 source and destination port fields to the hashing algorithm generates a higher degree of randomness and a more even distribution of packets across the available ECMP paths or LAG ports.</p>
<b>Default</b>	no I4-load-balancing

## Isr-load-balancing

<b>Syntax</b>	<b>Isr-load-balancing</b> <i>hashing-algorithm</i> [ <b>bottom-of-stack</b> <i>hashing-treatment</i> ] [ <b>use-ingress-port</b> ] <b>no Isr-load-balancing</b>
<b>Context</b>	config>system>load-balancing
<b>Description</b>	<p>This command configures system-wide LSR load balancing. Hashing can be enabled on the IP header at an LSR to send labeled packets over multiple equal-cost paths in an LDP LSP and/or over multiple links of a LAG group in all types of LSPs.</p> <p>The <b>bottom-of-stack</b> option determines the significance of the bottom-of-stack label (VC label) based on which label stack profile option is specified.</p> <p>When LSR load balancing is enabled, the default configuration for the hashing algorithm is label-only (<b>lbl-only</b>) hashing, and the default configuration for the bottom-of-stack hashing treatment is <b>profile-1</b>.</p> <p>The <b>use-ingress-port</b> option, when enabled, specifies that the ingress port will be used by the hashing algorithm at the LSR. This option should be enabled for ingress LAG ports because packets with the same label stack can arrive on all ports of a LAG interface. In this case, using the ingress port in the hashing algorithm will result in better egress load balancing, especially for pseudowires.</p> <p>The option should be disabled for LDP ECMP so that the ingress port is not used by the hashing algorithm. For ingress LDP ECMP, if the ingress port is used by the hashing algorithm, the hash distribution could be biased, especially for pseudowires.</p> <p>LSR load-balancing configuration on an interface overrides the system-wide LSR load-balancing settings for the interface.</p>
<b>Default</b>	no Isr-load-balancing

---

<b>Parameters</b>	<i>hashing-algorithm</i> — specifies the hashing algorithm	
	<b>Values</b>	
	lbl-only	hashing is done on the MPLS label stack, up to a maximum of 10 labels
	lbl-ip	hashing is done on the MPLS label stack and the IPv4 source and destination IP address if an IPv4 header is present after the MPLS labels
	lbl-ip-l4-teid	hashing is done on the MPLS label stack, the IPv4 source and destination IP address (if present), then on the Layer 4 source and destination UDP or TCP port fields (if present) and the TEID in the GTP header (if present)
	<b>Default</b>	lbl-only
	<i>hashing-treatment</i> — specifies which label stack profile option to use; profiles determine the significance of the bottom-of-stack label (VC label)	
	<b>Values</b>	
	profile-1	favors better load balancing for pseudowires when the VC label distribution is contiguous
	profile-2	similar to profile-1 where the VC labels are contiguous, but provides an alternate distribution
	profile-3	all labels have equal influence in hash key generation
	<b>Default</b>	profile-1
	<b>use-ingress-port</b> — when configured, specifies that the ingress port is used by the hashing algorithm at the LSR	

## system-ip-load-balancing

<b>Syntax</b>	<b>[no] system-ip-load-balancing</b>
<b>Context</b>	config>system>load-balancing
<b>Description</b>	This command enables the use of the system IP address in the hash algorithm to add a per-system variable. This can help to guard against cases where multiple routers, in series, will end up hashing traffic to the same ECMP or LAG path. The algorithm based on the system IP address is included by default.
<b>Default</b>	system-ip-load-balancing

---

## location

<b>Syntax</b>	<b>location</b> <i>location</i> <b>no location</b>
<b>Context</b>	config>system
<b>Description</b>	This command creates a text string that identifies the system location for the device.  Only one location can be configured. If multiple locations are configured, the last one entered overwrites the previous entry.  The <b>no</b> form of the command reverts to the default value.
<b>Default</b>	n/a — no system location is configured
<b>Parameters</b>	<i>location</i> — the location as a character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains spaces, the entire string must be enclosed within double quotes.

## name

<b>Syntax</b>	<b>name</b> <i>system-name</i> <b>no name</b>
<b>Context</b>	config>system
<b>Description</b>	This command creates a system name string for the device.  For example, system-name parameter ALU-1 for the <b>name</b> command configures the device name as ALU-1.  <pre>ABC&gt;config&gt;system# name ALU-1 ALU-1&gt;config&gt;system#</pre> Only one system name can be configured. If multiple system names are configured, the last one encountered overwrites the previous entry.  The <b>no</b> form of the command reverts to the default value.
<b>Default</b>	The default system name is set to the chassis serial number which is read from the backplane EEPROM.
<b>Parameters</b>	<i>system-name</i> — the system name as a character string. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains spaces, the entire string must be enclosed within double quotes.

---

## power-feed-monitoring

<b>Syntax</b>	<b>[no] power-feed-monitoring {A   B   C}</b>
<b>Context</b>	config>system
<b>Description</b>	<p>This command suppresses power feed monitoring and alarms on the secondary input power feed of a chassis when that power feed is not in use. Use this command when monitoring and raising alarms on the unused power input is not required. Suppressing monitoring and alarms on an unused input power feed results in the following:</p> <ul style="list-style-type: none"><li>• logging of input power feed failures is suppressed</li><li>• any alarms that have been raised on an unused power feed are cleared when the <b>no power-feed-monitoring</b> command is applied to that power feed</li><li>• in the Power Feed Information output of the <b>show&gt;chassis</b> command, the status of the unused input power feed appears as “not monitored”</li><li>• for chassis that use the Status LED to indicate alarms, the Status LED will be lit green if no other alarm conditions exist; for chassis that have alarm LEDs, the critical alarm LED will be unlit if no other critical alarm conditions exist. For the 7705 SAR-Hc, the alarm LED is unlit if no other alarm condition exists.</li></ul> <p>Power feed monitoring and alarming is enabled by default.</p>
<b>Default</b>	power-feed-monitoring
<b>Parameters</b>	<p><b>A</b> — corresponds to the first input power feed</p> <p><b>B</b> — corresponds to the second input power feed</p> <p><b>C</b> — corresponds to the AC power input on the high-voltage chassis variant of the 7705 SAR-H</p>

### 6.13.2.1.3 System Alarm Commands

#### thresholds

<b>Syntax</b>	<b>thresholds</b>
<b>Context</b>	config>system
<b>Description</b>	This command enables the context to configure monitoring thresholds.

#### cflash-cap-alarm

<b>Syntax</b>	<b>cflash-cap-alarm</b> <i>cflash-id</i> <b>rising-threshold</b> <i>threshold</i> [ <b>falling-threshold</b> <i>threshold</i> ] <b>interval</b> <i>seconds</i> [ <i>rmon-event-type</i> ] [ <b>startup-alarm</b> <i>alarm-type</i> ] <b>no cflash-cap-alarm</b> <i>cflash-id</i>
<b>Context</b>	config>system>thresholds
<b>Description</b>	This command enables capacity monitoring of the compact flash specified in this command. The severity level is Alarm. Both a rising and falling threshold can be specified.  The <b>no</b> form of this command removes the configured compact flash threshold alarm.
<b>Parameters</b>	<i>cflash-id</i> — the <i>cflash-id</i> specifies the name of the cflash device to be monitored (see <a href="#">Table 15</a> for parameter descriptions and values)  <b>rising-threshold</b> <i>threshold</i> — specifies a threshold for the sampled statistic. When the current sampled value is greater than or equal to this threshold, and the value at the last sampling interval was less than this threshold, a single threshold crossing event will be generated. A single threshold crossing event will also be generated if the first sample taken is greater than or equal to this threshold and the associated <b>startup-alarm</b> is equal to <b>rising</b> or <b>either</b> .  After a rising threshold crossing event is generated, another such event will not be generated until the sampled value falls below this threshold and reaches less than or equal to the <b>falling-threshold</b> value.  The threshold values represent units of 512 bytes.  <b>Values</b> -2147483648 to 2147483647  <b>Default</b> 0  <b>falling-threshold</b> <i>threshold</i> — specifies a threshold for the sampled statistic. When the current sampled value is less than or equal to this threshold, and the value at the last sampling interval was greater than this threshold, a single threshold crossing event will be generated. A single threshold crossing event will also be generated if the first sample taken is less than or equal to this threshold and the associated <b>startup-alarm</b> is equal to <b>falling</b> or <b>either</b> .

After a falling threshold crossing event is generated, another such event will not be generated until the sampled value rises above this threshold and reaches greater than or equal to the **rising-threshold** value.

The threshold values represent units of 512 bytes.

**Values** -2147483648 to 2147483647

**Default** 0

*seconds* — specifies the polling period, in seconds, over which the data is sampled and compared with the rising and falling thresholds

**Values** 1 to 2147483647

*rmon-event-type* — specifies the type of notification action to be taken when this event occurs

**Values** **log** — an entry is made in the RMON-MIB log table for each event occurrence. This does not create a TiMOS logger entry. The RMON-MIB log table entries can be viewed using the **show>system>thresholds** CLI command.

**trap** — a TiMOS logger event is generated. The TiMOS logger utility then distributes the notification of this event to its configured log destinations, which may be CONSOLE, telnet session, memory log, cflash file, syslog, or SNMP trap destinations logs.

**both** — both an entry in the RMON-MIB logTable and a TiMOS logger event are generated

**none** — no action is taken

**Default** both

*alarm-type* — specifies the alarm that may be sent when this alarm is first created

If the first sample is greater than or equal to the rising threshold value and **startup-alarm** is equal to **rising** or **either**, a single rising threshold crossing event is generated.

If the first sample is less than or equal to the falling threshold value and **startup-alarm** is equal to **falling** or **either**, a single falling threshold crossing event is generated.

**Values** **rising, falling, either**

**Default** either

Configuration example:

```
cflash-cap-alarm cfl-A: rising-threshold 50000000 falling-
threshold 49999900 interval 120 rmon-event-type both start-alarm rising
```

## cflash-cap-warn

<b>Syntax</b>	<b>cflash-cap-warn</b> <i>cflash-id</i> <b>rising-threshold</b> <i>threshold</i> [ <b>falling-threshold</b> <i>threshold</i> ] <b>interval</b> <i>seconds</i> [ <i>rmon-event-type</i> ] [ <b>startup-alarm</b> <i>alarm-type</i> ] <b>no cflash-cap-warn</b> <i>cflash-id</i>
<b>Context</b>	config>system>thresholds
<b>Description</b>	This command enables capacity monitoring of the compact flash specified in this command. The severity level is Warning. Both a rising and falling threshold can be specified.  The <b>no</b> form of this command removes the configured compact flash threshold warning.
<b>Parameters</b>	<i>cflash-id</i> — the <i>cflash-id</i> specifies the name of the cflash device to be monitored (see <a href="#">Table 15</a> for parameter descriptions and values)  <b>rising-threshold</b> <i>threshold</i> — specifies a threshold for the sampled statistic. When the current sampled value is greater than or equal to this threshold, and the value at the last sampling interval was less than this threshold, a single threshold crossing event will be generated. A single threshold crossing event will also be generated if the first sample taken is greater than or equal to this threshold and the associated <b>startup-alarm</b> is equal to <b>rising</b> or <b>either</b> .  After a rising threshold crossing event is generated, another such event will not be generated until the sampled value falls below this threshold and reaches less than or equal to the <b>falling-threshold</b> value.  The threshold values represent units of 512 bytes.  <b>Values</b> -2147483648 to 2147483647  <b>Default</b> 0  <b>falling-threshold</b> <i>threshold</i> — specifies a threshold for the sampled statistic. When the current sampled value is less than or equal to this threshold, and the value at the last sampling interval was greater than this threshold, a single threshold crossing event will be generated. A single threshold crossing event will also be generated if the first sample taken is less than or equal to this threshold and the associated <b>startup-alarm</b> is equal to <b>falling</b> or <b>either</b> .  After a falling threshold crossing event is generated, another such event will not be generated until the sampled value rises above this threshold and reaches greater than or equal to the <b>rising-threshold</b> value.  The threshold values represent units of 512 bytes.  <b>Values</b> -2147483648 to 2147483647  <b>Default</b> 0  <i>seconds</i> — specifies the polling period over which the data is sampled and compared with the rising and falling thresholds  <b>Values</b> 1 to 2147483647

*rmon-event-type* — specifies the type of notification action to be taken when this event occurs

**Values**     **log** — an entry is made in the RMON-MIB log table for each event occurrence. This does not create a TiMOS logger entry. The RMON-MIB log table entries can be viewed using the **show>system>thresholds** CLI command.

**trap** — a TiMOS logger event is generated. The TiMOS logger utility then distributes the notification of this event to its configured log destinations, which may be CONSOLE, telnet session, memory log, cflash file, syslog, or SNMP trap destinations logs.

**both** — both an entry in the RMON-MIB logTable and a TiMOS logger event are generated

**none** — no action is taken

**Default**     both

*alarm-type* — specifies the alarm that may be sent when this alarm is first created

If the first sample is greater than or equal to the rising threshold value and **startup-alarm** is equal to **rising** or **either**, a single rising threshold crossing event is generated.

If the first sample is less than or equal to the falling threshold value and **startup-alarm** is equal to **falling** or **either**, a single falling threshold crossing event is generated.

**Values**     **rising, falling, either**

**Default**     either

Configuration example:

```
cflash-cap-warn cf1-B: rising-threshold 2000000 falling-
threshold 1999900 interval 240 rmon-event-type trap start-alarm either
```

## memory-use-alarm

**Syntax**     **memory-use-alarm rising-threshold** *threshold* [**falling-threshold** *threshold*] **interval** *seconds* [*rmon-event-type*] [**startup-alarm** *alarm-type*]  
**no memory-use-alarm**

**Context**     config>system>thresholds

**Description**     The memory thresholds are based on monitoring the TIMETRA-SYSTEM-MIB `sgiMemoryUsed` object. This object contains the amount of memory currently used by the system. The severity level is Alarm.

The **absolute** sample type method is used.

The **no** form of this command removes the configured memory threshold alarm.



- Parameters**
- rising-threshold** *threshold* — specifies a threshold for the sampled statistic. When the current sampled value is greater than or equal to this threshold, and the value at the last sampling interval was less than this threshold, a single threshold crossing event will be generated. A single threshold crossing event will also be generated if the first sample taken is greater than or equal to this threshold and the associated **startup-alarm** is equal to **rising** or **either**.
- After a rising threshold crossing event is generated, another such event will not be generated until the sampled value falls below this threshold and reaches less than or equal to the **falling-threshold** value.
- The threshold values are in bytes.
- Values** -2147483648 to 2147483647
- Default** 0
- falling-threshold** *threshold* — specifies a threshold for the sampled statistic. When the current sampled value is less than or equal to this threshold, and the value at the last sampling interval was greater than this threshold, a single threshold crossing event will be generated. A single threshold crossing event will also be generated if the first sample taken is less than or equal to this threshold and the associated **startup-alarm** is equal to **falling** or **either**.
- After a falling threshold crossing event is generated, another such event will not be generated until the sampled value rises above this threshold and reaches greater than or equal to the **rising-threshold** value.
- The threshold values are in bytes.
- Values** -2147483648 to 2147483647
- Default** 0
- seconds** — specifies the polling period over which the data is sampled and compared with the rising and falling thresholds
- Values** 1 to 2147483647
- rmon-event-type** — specifies the type of notification action to be taken when this event occurs
- Values**
- log** — an entry is made in the RMON-MIB log table for each event occurrence. This does not create a TiMOS logger entry. The RMON-MIB log table entries can be viewed using the CLI command.
  - trap** — a TiMOS logger event is generated. The TiMOS logger utility then distributes the notification of this event to its configured log destinations, which may be CONSOLE, telnet session, memory log, cflash file, syslog, or SNMP trap destinations logs.
  - both** — both an entry in the RMON-MIB logTable and a TiMOS logger event are generated
  - none** — no action is taken
- Default** both
- alarm-type** — specifies the alarm that may be sent when this alarm is first created

If the first sample is greater than or equal to the rising threshold value and **startup-alarm** is equal to **rising** or **either**, a single rising threshold crossing event is generated.

If the first sample is less than or equal to the falling threshold value and **startup-alarm** is equal to **falling** or **either**, a single falling threshold crossing event is generated.

**Values** rising, falling, either

**Default** either

Configuration example:

```
memory-use-alarm rising-threshold 50000000 falling-threshold 45999999 interval 500
rmon-event-type both start-alarm either
```

## memory-use-warn

**Syntax** **memory-use-warn rising-threshold** *threshold* [**falling-threshold** *threshold*] **interval** *seconds* [*rmon-event-type*] [**startup-alarm** *alarm-type*]  
**no memory-use-warn**

**Context** config>system>thresholds

**Description** The memory thresholds are based on monitoring the TIMETRA-SYSTEM-MIB `sgiMemoryUsed` object. This object contains the amount of memory currently used by the system. The severity level is Warning.

The **absolute** sample type method is used.

The **no** form of this command removes the configured compact flash threshold warning.

**Parameters** **rising-threshold** *threshold* — specifies a threshold for the sampled statistic. When the current sampled value is greater than or equal to this threshold, and the value at the last sampling interval was less than this threshold, a single threshold crossing event will be generated. A single threshold crossing event will also be generated if the first sample taken is greater than or equal to this threshold and the associated **startup-alarm** is equal to **rising** or **either**.

After a rising threshold crossing event is generated, another such event will not be generated until the sampled value falls below this threshold and reaches less than or equal to the **falling-threshold** value.

The threshold values are in bytes.

**Values** -2147483648 to 2147483647

**Default** 0

**falling-threshold** *threshold* — specifies a threshold for the sampled statistic. When the current sampled value is less than or equal to this threshold, and the value at the last sampling interval was greater than this threshold, a single threshold crossing event will be generated. A single threshold crossing event will also be generated if the first sample taken is less than or equal to this threshold and the associated **startup-alarm** is equal to **falling** or **either**.

After a falling threshold crossing event is generated, another such event will not be generated until the sampled value rises above this threshold and reaches greater than or equal to the **rising-threshold** value.

The threshold values are in bytes.

**Values** -2147483648 to 2147483647

**Default** 0

**seconds** — specifies the polling period over which the data is sampled and compared with the rising and falling thresholds

**Values** 1 to 2147483647

**rmon-event-type** — specifies the type of notification action to be taken when this event occurs

**Values** **log** — an entry is made in the RMON-MIB log table for each event occurrence. This does not create a TiMOS logger entry. The RMON-MIB log table entries can be viewed using the **show>system>thresholds** CLI command.

**trap** — a TiMOS logger event is generated. The TiMOS logger utility then distributes the notification of this event to its configured log destinations, which may be CONSOLE, telnet session, memory log, cflash file, syslog, or SNMP trap destinations logs.

**both** — both an entry in the RMON-MIB logTable and a TiMOS logger event are generated

**none** — no action is taken

**Default** both

**alarm-type** — specifies the alarm that may be sent when this alarm is first created

If the first sample is greater than or equal to the rising threshold value and **startup-alarm** is equal to **rising** or **either**, a single rising threshold crossing event is generated.

If the first sample is less than or equal to the falling threshold value and **startup-alarm** is equal to **falling** or **either**, a single falling threshold crossing event is generated.

**Values** **rising, falling, either**

**Default** either

Configuration example:

```
memory-use-warn rising-threshold 500000 falling-threshold 400000 interval 800 rmon-
event-type log start-alarm falling
```

---

## rmon

<b>Syntax</b>	<b>rmon</b>
<b>Context</b>	config>system>thresholds
<b>Description</b>	<p>This command enables the context to configure generic RMON alarms and events.</p> <p>Generic RMON alarms can be created on any SNMP object-ID that is valid for RMON monitoring (for example, an integer-based datatype).</p> <p>The configuration of an <b>event</b> controls the generation and notification of threshold crossing events configured with the <b>alarm</b> command.</p>

## alarm

<b>Syntax</b>	<b>alarm</b> <i>rmon-alarm-id</i> <b>variable-oid</b> <i>oid-string</i> <b>interval</b> <i>seconds</i> [ <i>sample-type</i> ] [ <b>startup-alarm</b> <i>alarm-type</i> ] [ <b>rising-event</b> <i>rmon-event-id</i> <b>rising-threshold</b> <i>threshold</i> ] [ <b>falling-event</b> <i>rmon-event-id</i> <b>falling threshold</b> <i>threshold</i> ] [ <b>owner</b> <i>owner-string</i> ] <b>no alarm</b> <i>rmon-alarm-id</i>
<b>Context</b>	config>system>thresholds>rmon
<b>Description</b>	<p>The <b>alarm</b> command configures an entry in the RMON-MIB alarm table. The <b>alarm</b> command controls the monitoring and triggering of threshold crossing events. In order for notification or logging of a threshold crossing event to occur, there must be at least one associated <b>rmon&gt;event</b> configured.</p> <p>The agent periodically takes statistical sample values from the MIB variable specified for monitoring and compares them to thresholds that have been configured with the <b>alarm</b> command. The <b>alarm</b> command configures the MIB variable to be monitored, the polling period (interval), sampling type (absolute or delta value), and rising and falling threshold parameters. If a sample has crossed a threshold value, the associated event is generated.</p> <p>Use the <b>no</b> form of this command to remove an <i>rmon-alarm-id</i> from the configuration.</p>
<b>Parameters</b>	<p><i>rmon-alarm-id</i> — a numerical identifier for the alarm being configured. The number of alarms that can be created is limited to 1200.</p> <p><b>Values</b> 1 to 65535</p> <p><b>Default</b> n/a</p> <p><i>oid-string</i> — the SNMP object identifier of the particular variable to be sampled. Only SNMP variables that resolve to an ASN.1 primitive type of integer (integer, Integer32, Counter32, Counter64, Gauge, or TimeTicks) may be sampled. The <i>oid-string</i> may be expressed using either the dotted string notation or as object name plus dotted instance identifier. For example, “1.3.6.1.2.1.2.2.1.10.184582144” or “ifInOctets.184582144”.</p>

The *oid-string* has a maximum length of 255 characters.

**Default** n/a

*seconds* — the interval in seconds specifies the polling period over which the data is sampled and compared with the rising and falling thresholds. When setting this interval value, care should be taken in the case of “delta” type sampling – the interval should be set short enough that the sampled variable is very unlikely to increase or decrease by more than  $2147483647 - 1$  during a single sampling interval. Care should also be taken not to set the interval value too low to avoid creating unnecessary processing overhead.

**Values** 1 to 2147483647

**Default** n/a

*sample-type* — specifies the method of sampling the selected variable and calculating the value to be compared against the thresholds

**Values** **absolute** — specifies that the value of the selected variable will be compared directly with the thresholds at the end of the sampling interval

**delta** — specifies that the value of the selected variable at the last sample will be subtracted from the current value, and the difference compared with the thresholds

**Default** absolute

*alarm-type* — specifies the alarm that may be sent when this alarm is first created

If the first sample is greater than or equal to the rising threshold value and **startup-alarm** is equal to **rising** or **either**, a single rising threshold crossing event is generated.

If the first sample is less than or equal to the falling threshold value and **startup-alarm** is equal to **falling** or **either**, a single falling threshold crossing event is generated.

**Values** **rising, falling, either**

**Default** either

**rising-event** *rmon-event-id* — the identifier of the **rmon>event** that specifies the action to be taken when a rising threshold crossing event occurs

If there is no corresponding event configured for the specified *rmon-event-id*, then no association exists and no action is taken.

If the *rmon-event-id* has a value of zero (0), no associated event exists.

If an *rmon-event-id* is configured, the CLI requires a **rising-threshold** to also be configured.

**Values** 0 to 65535

**Default** 0

**rising-threshold *threshold*** — specifies a threshold for the sampled statistic. When the current sampled value is greater than or equal to this threshold, and the value at the last sampling interval was less than this threshold, a single threshold crossing event will be generated. A single threshold crossing event will also be generated if the first sample taken is greater than or equal to this threshold and the associated **startup-alarm** is equal to **rising** or **either**.

After a rising threshold crossing event is generated, another such event will not be generated until the sampled value falls below this threshold and reaches less than or equal to the **falling-threshold** value.

**Values** -2147483648 to 2147483647

**Default** 0

**falling-event *rmon-event-id*** — the identifier of the **rmon>event** that specifies the action to be taken when a falling threshold crossing event occurs

If there is no corresponding event configured for the specified *rmon-event-id*, then no association exists and no action is taken.

If the *rmon-event-id* has a value of zero (0), no associated event exists.

If an *rmon-event-id* is configured, the CLI requires a **falling-threshold** to also be configured.

**Values** -2147483648 to 2147483647

**Default** 0

**falling-threshold *threshold*** — specifies a threshold for the sampled statistic. When the current sampled value is less than or equal to this threshold, and the value at the last sampling interval was greater than this threshold, a single threshold crossing event will be generated. A single threshold crossing event will also be generated if the first sample taken is less than or equal to this threshold and the associated **startup-alarm** is equal to **falling** or **either**.

After a falling threshold crossing event is generated, another such event will not be generated until the sampled value rises above this threshold and reaches greater than or equal to the **rising-threshold** value.

**Values** -2147483648 to 2147483647

**Default** 0

**owner-string** — the creator of this alarm, a string up to 80 characters in length. It defaults to "TiMOS CLI". This parameter is defined primarily to allow entries that have been created in the RMON-MIB alarm table by remote SNMP managers to be saved and reloaded in a CLI configuration file. The owner will not normally be configured by CLI users.

**Default** TiMOS CLI

Configuration example:

```
alarm 3 variable-oid ifInOctets.184582144 interval 20 sample-type delta start-alarm
either rising-event 5 rising-threshold 10000 falling-event 5 falling-threshold 9000
owner "TiMOS CLI"
```

---

## event

<b>Syntax</b>	<b>event</b> <i>rmon-event-id</i> [ <i>event-type</i> ] [ <b>description</b> <i>description-string</i> ] [ <b>owner</b> <i>owner-string</i> ] <b>no event</b> <i>rmon-event-id</i>
<b>Context</b>	config>system>thresholds>rmon
<b>Description</b>	<p>This command configures an entry in the RMON-MIB event table. The command controls the generation and notification of threshold crossing events configured with the <b>alarm</b> command. When a threshold crossing event is triggered, the <b>rmon&gt;event</b> configuration optionally specifies if an entry in the RMON-MIB log table should be created to record the occurrence of the event. It may also specify that an SNMP notification (trap) should be generated for the event. The RMON-MIB defines two notifications for threshold crossing events: Rising Alarm and Falling Alarm.</p> <p>Creating an event entry in the RMON-MIB log table does not create a corresponding entry in the TiMOS event logs. However, when the <i>event-type</i> is set to <b>trap</b>, the generation of a Rising Alarm or Falling Alarm notification creates an entry in the TiMOS event logs and that is distributed to whatever TiMOS log destinations are configured: CONSOLE, session, memory, file, syslog, or SNMP trap destination.</p> <p>The TiMOS logger message includes a rising or falling threshold crossing event indicator, the sample type (absolute or delta), the sampled value, the threshold value, the <i>rmon-alarm-id</i>, the associated <i>rmon-event-id</i>, and the sampled SNMP object identifier.</p> <p>Use the <b>no</b> form of this command to remove an <i>rmon-event-id</i> from the configuration.</p>
<b>Parameters</b>	<p><i>rmon-event-id</i> — the identifier of the RMON event</p> <p><b>Values</b> 0 to 65535</p> <p><b>Default</b> 0</p> <p><i>event-type</i> — specifies the type of notification action to be taken</p> <p><b>Values</b></p> <ul style="list-style-type: none"> <li><b>log</b> — an entry is made in the RMON-MIB log table for each event occurrence. This does not create a TiMOS logger entry. The RMON-MIB log table entries can be viewed using the <b>show&gt;system&gt;thresholds</b> CLI command.</li> <li><b>trap</b> — a TiMOS logger event is generated. The TiMOS logger utility then distributes the notification of this event to its configured log destinations, which may be CONSOLE, telnet session, memory log, cflash file, syslog, or SNMP trap destinations logs.</li> <li><b>both</b> — both an entry in the RMON-MIB logTable and a TiMOS logger event are generated</li> <li><b>none</b> — no action is taken</li> </ul> <p><b>Default</b> both</p>

*description-string* — a user-configurable string, up to 80 characters in length, that can be used to identify the purpose of this event. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

**Default** n/a

*owner-string* — the creator of this alarm, a string up to 80 characters in length. It defaults to "TiMOS CLI". This parameter is defined primarily to allow entries that have been created in the RMON-MIB alarm table by remote SNMP managers to be saved and reloaded in a CLI configuration file. The owner will not normally be configured by CLI users.

**Default** TiMOS CLI

Configuration example:

```
event 5 rmon-event-type both description "alarm testing" owner "TiMOS CLI"
```



### 6.13.2.1.4 Persistence Commands

#### persistence

<b>Syntax</b>	<b>persistence</b>
<b>Context</b>	config>system
<b>Description</b>	This command enables the context to configure persistence parameters on the system.  The persistence feature allows lease information on DHCP servers to be kept across reboots. This information can include data such as the IP address, MAC binding information, and lease length information.
<b>Default</b>	n/a

#### dhcp-server

<b>Syntax</b>	<b>dhcp-server</b>
<b>Context</b>	config>system>persistence
<b>Description</b>	This command configures DHCP server persistence parameters.

#### location

<b>Syntax</b>	<b>location <i>cflash-id</i></b> <b>no location</b>
<b>Context</b>	config>system>persistence>dhcp-server
<b>Description</b>	This command instructs the system where to write the file. The name of the file is dhcp-serv.001. On boot-up, the system scans the file systems looking for dhcp-serv.001. If the system finds the file, it loads it.  The <b>no</b> form of this command returns the system to the default.
<b>Default</b>	no location
<b>Parameters</b>	<i>cflash-id</i> — the location of the compact flash device. On all 7705 SAR systems except the 7705 SAR-18, the location is cf3:. On the 7705 SAR-18, the location is cf1:, cf2:, or cf3:.

### 6.13.2.1.5 System Time Commands

#### set-time

<b>Syntax</b>	<b>set-time</b> [ <i>date</i> ] [ <i>time</i> ]
<b>Context</b>	admin
<b>Description</b>	This command sets the local system time.  The time entered should be accurate for the time zone configured for the system. The system will convert the local time to UTC before saving to the system clock, which is always set to UTC. This command does not take into account any daylight saving offset if defined.
<b>Parameters</b>	<i>date</i> — the local date and time accurate to the minute in the YYYY/MM/DD format  <b>Values</b> YYYY is the 4-digit year MM is the 2-digit month DD is the 2-digit date  <i>time</i> — the time (accurate to the second) in the <i>hh:mm[:ss]</i> format. If no seconds value is entered, the seconds are reset to :00.  <b>Values</b> <i>hh</i> is the 2-digit hour in 24 hour format (00=midnight, 12=noon) <i>mm</i> is the 2-digit minute  <b>Default</b> 0

#### time

<b>Syntax</b>	<b>time</b>
<b>Context</b>	config>system
<b>Description</b>	This command enables the context to configure the system time zone and time synchronization parameters.

#### dst-zone

<b>Syntax</b>	[no] <b>dst-zone</b> [ <i>std-zone-name</i>   <i>non-std-zone-name</i> ]
<b>Context</b>	config>system>time
<b>Description</b>	This command configures the start and end dates and offset for summer time or daylight savings time to override system defaults or for user defined time zones.  When configured, the time is adjusted by adding the configured offset when summer time starts and subtracting the configured offset when summer time ends.

If the time zone configured is listed in [Table 24](#), then the starting and ending parameters and offset do not need to be configured with this command unless it is necessary to override the system defaults. The command returns an error if the start and ending dates and times are not available either in [Table 24](#) or entered as optional parameters in this command.

Up to five summer time zones may be configured; for example, for five successive years or for five different time zones. Configuring a sixth entry will return an error message. If no summer (daylight savings) time is supplied, it is assumed no summer time adjustment is required.

The **no** form of the command removes a configured summer (daylight savings) time entry.

**Default** n/a — no summer time is configured

**Parameters** *std-zone-name* — the standard time zone name. The standard name must be a system-defined zone in [Table 24](#). For zone names in the table that have an implicit summer time setting, for example MDT for Mountain Daylight Saving Time, the remaining *start-date*, *end-date* and *offset* parameters need to be provided unless it is necessary to override the system defaults for the time zone.

**Values** std-zone-name ADT, AKDT, CDT, CEST, EDT, EEST, MDT, PDT, WEST

*non-std-zone-name* — the non-standard time zone name. Create a user-defined name using the [zone](#) command.

**Values** 5 characters maximum

end

**Syntax** **end** *end-week end-day end-month hours-minutes*

**Context** config>system>time>dst-zone

**Description** This command configures the end of summer time settings.

**Parameters** *end-week* — specifies the starting week of the month when the summer time will end

**Values** first, second, third, fourth, last

**Default** first

*end-day* — specifies the starting day of the week when the summer time will end

**Values** sunday, monday, tuesday, wednesday, thursday, friday, saturday

**Default** sunday

*end-month* — specifies the starting month of the year when the summer time will end

**Values** january, february, march, april, may, june, july, august, september, october, november, december}

**Default** january

*hours* — specifies the hour at which the summer time will end

**Values** 0 to 24

**Default** 0

*minutes* — specifies the number of minutes, after the hours defined by the *hours* parameter, when the summer time will end

**Values** 0 to 59

**Default** 0

## offset

**Syntax** `offset offset`

**Context** `config>system>time>dst-zone`

**Description** This command specifies the number of minutes that will be added to the time when summer time takes effect. The same number of minutes will be subtracted from the time when the summer time ends.

**Parameters** *offset* — the number of minutes added to the time at the beginning of summer time and subtracted at the end of summer time, expressed as an integer

**Values** 0 to 60

**Default** 60

## start

**Syntax** `start start-week start-day start-month hours-minutes`

**Context** `config>system>time>dst-zone`

**Description** This command configures start of summer time settings.

**Parameters** *start-week* — specifies the starting week of the month when the summer time will take effect

**Values** first, second, third, fourth, last

**Default** first

*start-day* — specifies the starting day of the week when the summer time will take effect

**Values** sunday, monday, tuesday, wednesday, thursday, friday, saturday

**Default** sunday

*start-month* — the starting month of the year when the summer time will take effect

**Values**    january, february, march, april, may, june, july, august, september, october, november, december

**Default**    january

*hours* — specifies the hour at which the summer time will take effect

**Default**    0

*minutes* — specifies the number of minutes, after the hours defined by the *hours* parameter, when the summer time will take effect

**Default**    0

## gnss

**Syntax**    **gnss**

**Context**    config>system>time

**Description**    This command enables the context to create or modify **gnss** parameters for time.

**Default**    n/a

## port

**Syntax**    **port** *port-id* **time-ref-priority** *priority-value*  
**no port**

**Context**    config>system>time>gnss

**Description**    This command specifies a GNSS receiver port as a synchronous timing source. The specific GNSS receiver port is identified by *port-id* and has an assigned *priority-value*.

**Default**    no port

**Parameters**    *port-id* — identifies the GNSS receiver port in the *slot/mda/port* format

*priority-value* — specifies the priority order of the given GNSS receiver port configured as the time reference. The lower the number, the higher the priority. GNSS should be given the highest priority whenever available.

**Values**    1 to 16

---

## ntp

<b>Syntax</b>	<b>[no] ntp</b>
<b>Context</b>	config>system>time
<b>Description</b>	This command enables the context to configure Network Time Protocol (NTP) and its operation. This protocol defines a method to accurately distribute and maintain time for network elements. Furthermore, this capability allows for the synchronization of clocks between the various network elements. The <b>no</b> form of the command stops the execution of NTP and removes its configuration.
<b>Default</b>	n/a

## authentication-check

<b>Syntax</b>	<b>[no] authentication-check</b>
<b>Context</b>	config>system>time>ntp
<b>Description</b>	<p>This command provides the option to skip the rejection of NTP PDUs that do not match the authentication key ID, type, or key values.</p> <p>When authentication is configured, NTP PDUs received on an interface or the management port are authenticated on receipt and rejected if there is a mismatch in the authentication key ID, type, or key value.</p> <p>When <b>authentication-check</b> is enabled, NTP PDUs are authenticated on receipt and rejected if there is a mismatch in the authentication key ID, type, or key value. Any mismatches cause a counter to be incremented: one counter for type, one for key ID, and one for key value mismatches. These counters are visible in the <b>show&gt;system&gt;ntp</b> command output.</p> <p>The <b>no</b> form of this command allows mismatched packets to be accepted (overriding authentication); however, the counters are maintained.</p>
<b>Default</b>	authentication-check

## authentication-key

<b>Syntax</b>	<b>authentication-key</b> <i>key-id</i> <b>key</b> <i>key</i> [ <b>hash</b>   <b>hash2</b> ] <b>type</b> { <b>des</b>   <b>message-digest</b> } <b>no authentication-key</b> <i>key-id</i>
<b>Context</b>	config>system>time>ntp
<b>Description</b>	This command sets the authentication key ID, type, and key value used to authenticate NTP PDUs sent to or received from other network elements participating in the NTP protocol. For authentication to work, the authentication key ID, type, and key value must match.

Configuring the **authentication-key** with a *key-id* value that matches an existing key will override the existing entry.

Recipients of the NTP packets must have the same authentication key ID, type, and key value in order to use the data transmitted by this node.

The **no** form of the command removes the authentication key.

<b>Default</b>	n/a
<b>Parameters</b>	<p><i>key-id</i> — the authentication key identifier used by the node when transmitting or receiving NTP packets</p> <p><b>Values</b> 1 to 255</p> <p><i>key</i> — the authentication key associated with the configured key ID. The configured value is the actual value used by other network elements to authenticate the NTP packet.</p> <p><b>Values</b> any combination of ASCII characters up to 8 characters in length (unencrypted). If spaces are used in the string, enclose the entire string in quotation marks (“ ”).</p> <p><b>hash</b> — specifies that the key is entered in an encrypted form. If the <b>hash</b> or <b>hash2</b> parameter is not used, the key is assumed to be in an unencrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the <b>hash</b> or <b>hash2</b> parameter specified.</p> <p><b>hash2</b> — specifies that the key is entered in a more complex encrypted form that involves more variables than the key value alone. This means that the <b>hash2</b> encrypted key cannot be copied and pasted. If the <b>hash</b> or <b>hash2</b> parameter is not used, the key is assumed to be in an unencrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the <b>hash</b> or <b>hash2</b> parameter specified.</p> <p><b>type</b> — the authentication type, either DES or message-digest</p> <p><b>Values</b> <b>des</b> — specifies that DES authentication is used for this key. The <b>des</b> value is not supported in FIPS-140-2 mode.  <b>message-digest</b> — specifies that MD5 authentication in accordance with RFC 2104 is used for this key</p>

## broadcast

<b>Syntax</b>	<pre><b>broadcast</b> [<b>router</b> <i>router-name</i>] {<b>interface</b> <i>ip-int-name</i>} [<b>key-id</b> <i>key-id</i>] [<b>version</b> <i>version</i>] [<b>tth</b> <i>tth</i>]</pre> <pre><b>no broadcast</b> [<b>router</b> <i>router-name</i>] {<b>interface</b> <i>ip-int-name</i>}</pre>
<b>Context</b>	config>system>time>ntp

---

<b>Description</b>	<p>This command configures the node to transmit NTP broadcast packets on the specified interface. Because broadcast messages can easily be spoofed, authentication is strongly recommended.</p> <p>Broadcast server capability can also be enabled on an interface within a VPRN context. Refer to the 7705 SAR Services Guide, “VPRN NTP Commands”, for information.</p> <p>The <b>no</b> form of this command removes the interface from the configuration.</p>
<b>Default</b>	n/a
<b>Parameters</b>	<p><i>router-name</i> — the name of the router used to transmit NTP packets. Select management to use the Management port (Ethernet port on the CSM).</p> <p><b>Values</b> Base   management</p> <p><b>Default</b> Base</p> <p><i>ip-int-name</i> — the local interface on which to transmit NTP broadcast packets. If the string contains special characters (#, \$, spaces, and so on), the entire string must be enclosed within double quotes.</p> <p><b>Values</b> 32 character maximum</p> <p><i>key-id</i> — identifies the configured authentication key and authentication type used by this node to receive and transmit NTP packets from and to an NTP server and peers. If an NTP packet is received by this node, both the authentication key and authentication type must be valid; otherwise, the packet will be rejected and an event or trap will be generated. When this parameter is omitted from the configuration, packets are sent unencrypted.</p> <p><b>Values</b> 1 to 255</p> <p><i>version</i> — the NTP version number that is generated by this node. This parameter does not need to be configured when the node is in NTP client mode because all versions will be accepted.</p> <p><b>Values</b> 2 to 4</p> <p><b>Default</b> 4</p> <p><i>tvl</i> — the IP Time To Live (TTL) value</p> <p><b>Values</b> 1 to 255</p>

## broadcastclient

<b>Syntax</b>	<pre><b>broadcastclient</b> [<b>router</b> <i>router-name</i>] [<b>interface</b> <i>ip-int-name</i>] [<b>authenticate</b>] <b>no broadcastclient</b> [<b>router</b> <i>router-name</i>] [<b>interface</b> <i>ip-int-name</i>]</pre>
<b>Context</b>	config>system>time>ntp



---

<b>Description</b>	<p>This command configures an interface to receive NTP broadcast packets on a particular subnet. Because broadcast messages can easily be spoofed, authentication is strongly recommended. If <b>broadcastclient</b> is not configured, received NTP broadcast traffic will be ignored. Use the <b>show&gt;system&gt;ntp</b> command to view the state of the configuration.</p> <p>When the <b>authenticate</b> parameter is specified, the received authentication <i>key-id</i> must have been configured with the <b>authentication-key</b> command, and the key ID type and key value must also match.</p> <p>The <b>no</b> form of this command removes the interface from the configuration.</p>
<b>Default</b>	n/a
<b>Parameters</b>	<p><i>router-name</i> — the name of the router used to receive NTP packets. Select management to use the Management port (Ethernet port on the CSM)</p> <p><b>Values</b>     Base   management</p> <p><b>Default</b>     Base</p> <p><i>ip-int-name</i> — the local interface on which to receive NTP broadcast packets. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.</p> <p><b>Values</b>     32 character maximum</p> <p><b>authenticate</b> — specifies that authentication is required. If authentication is required, the authentication <i>key-id</i> received in a message must have been configured with the <b>authentication-key</b> command, and the key ID type and key value must match.</p>

## mda-timestamp

<b>Syntax</b>	[no] <b>mda-timestamp</b>
<b>Context</b>	config>system>time>ntp
<b>Description</b>	<p>This command enables more accurate timestamping for in-band NTP packets. When enabled, timestamping is performed on an adapter card by the network processor as packets ingress and egress the router. This reduces packet delay variability.</p> <p>The <b>mda-timestamp</b> command can only be set if NTP is shut down and the NTP servers are not associated with an authentication key. The command is only supported on Ethernet-based adapter cards. Enabling this command does not change the behavior of NTP over the Management port.</p> <p>The <b>no</b> form of this command returns the system to its default behavior of having NTP packets timestamped by the CSM.</p>
<b>Default</b>	no mda-timestamp

## multicast

<b>Syntax</b>	<b>multicast</b> [ <b>key-id</b> <i>key-id</i> ] [ <b>version</b> <i>version</i> ] <b>no multicast</b>
<b>Context</b>	config>system>time>ntp
<b>Description</b>	This command configures the node to transmit NTP multicast packets on the Management port. Because multicast messages can easily be spoofed, authentication is strongly recommended.  The <b>no</b> form of this command disables transmission of multicast packets on the Management port.
<b>Default</b>	n/a
<b>Parameters</b>	<i>key-id</i> — the authentication key ID used by the node to transmit NTP multicast packets. When this parameter is omitted from the configuration, packets are sent unencrypted.  <b>Values</b> 1 to 255  <i>version</i> — the NTP version number that is generated by the node. When the node is in NTP client mode, this parameter does not need to be configured because all versions will be accepted.  <b>Values</b> 2 to 4  <b>Default</b> 4

## multicastclient

<b>Syntax</b>	<b>multicastclient</b> [ <b>authenticate</b> ] <b>no multicastclient</b>
<b>Context</b>	config>system>time>ntp
<b>Description</b>	This command configures the node to receive NTP multicast messages on the Management port. If <b>multicastclient</b> is not configured, received NTP multicast traffic will be ignored. Use the <b>show&gt;system&gt;ntp</b> command to view the state of the configuration.  When the <b>authenticate</b> parameter is specified, the received authentication <i>key-id</i> must have been configured with the <b>authentication-key</b> command, and the key ID type and key value must also match.  The <b>no</b> form of this command disables the receipt of multicast messages on the Management port.
<b>Default</b>	n/a

**Parameters** **authenticate** — specifies that authentication is required. If authentication is required, the authentication *key-id* received in a message must have been configured with the **authentication-key** command, and the key ID type and key value must match.

## ntp-server

**Syntax** **ntp-server [authenticate]**  
**no ntp-server**

**Context** config>system>time>ntp

**Description** This command configures the node to assume the role of an NTP server. Unless the **ntp-server** command is used, the node will function as an NTP client only and will not distribute time to downstream network elements.

**Default** no ntp-server

**Parameters** **authenticate** — specifies that authentication is required. If authentication is required, the authentication *key-id* received in a message must have been configured with the **authentication-key** command, and the key ID, type, and key values must match. The authentication key from the received messages is used for the transmitted messages.

## peer

**Syntax** **peer ip-address [key-id key-id] [version version] [prefer]**  
**no peer ip-address**

**Context** config>system>time>ntp

**Description** This command configures symmetric active mode for an NTP peer. It is recommended that only known time servers be configured as peers and that authentication be enabled.

Successful authentication requires that both peers have the same authentication key ID, type, and key values. The key ID identifies the configured authentication key and authentication type used by this node to transmit NTP packets to an NTP peer. When an NTP packet is received by a peer, if the authentication key ID, type, and key values do not match, the packet will be rejected and an event or trap will be generated.

When configuring more than one peer, one remote system can be configured as the preferred peer. If a second peer is configured as preferred, the new entry overrides the old entry.

The **no** form of the command removes the specified peer.

**Default** n/a

<b>Parameters</b>	<p><i>ip-address</i> — the IP address of the peer that requires a peering relationship to be set up. The address can be IPv4 or IPv6.</p> <p><b>Values</b> any valid IPv4 address in the format a.b.c.d any valid IPv6 address in the format:</p> <ul style="list-style-type: none"> <li>• x:x:x:x:x:x:x (eight 16-bit pieces)</li> <li>• x:x:x:x:x:d.d.d.d</li> <li>• x: [0 to FFFF] H</li> <li>• d: [0 to 255] D</li> </ul> <p><i>key-id</i> — the authentication key ID</p> <p><b>Values</b> 1 to 255</p> <p><i>version</i> — the NTP version number that is generated by the node. When the node is in NTP client mode, this parameter does not need to be configured because all versions will be accepted.</p> <p><b>Values</b> 2 to 4</p> <p><b>Default</b> 4</p> <p><b>prefer</b> — specifies the configured peer as the preferred peer</p>
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## server

<b>Syntax</b>	<pre>server {ip-address   system-time} [key-id key-id] [version version] [prefer] no server {ip-address   system-time}</pre>
<b>Context</b>	config>system>time>ntp
<b>Description</b>	<p>This command specifies the source that is to be used as an NTP server. The source can be specified with an IPv4 address, an IPv6 address, or the <b>system-time</b> keyword.</p> <p>The NTP clock in the 7705 SAR can recover time from a local PTP or GNSS source. This is achieved by configuring the PTP clock or GNSS receiver as the internal system time. The internal system time can then be identified as the preferred source of NTP timing into the network with the <b>system-time</b> and <b>prefer</b> parameters. After PTP or GNSS has established a UTC traceable time, it will always be the source for time into NTP even if the system time goes into time holdover for any reason. When the internal PTP clock or GNSS is identified as the server for NTP, NTP will promote the internal NTP server (the 7705 SAR) to Stratum-1 level, which may affect the NTP network topology.</p> <p>Up to five NTP servers can be configured. When configuring more than one server, one remote system can be configured as the preferred server. If a second server is configured as preferred, the new entry overrides the old entry.</p> <p>The <b>no</b> form of this command removes the specified NTP server from the configuration.</p>
<b>Default</b>	n/a

<b>Parameters</b>	<p><i>ip-address</i> — the IP address of the node to be used as the NTP server to this network element</p> <p><b>Values</b> any valid IPv4 address in the format a.b.c.d any valid IPv6 address in the format:</p> <ul style="list-style-type: none"> <li>• x:x:x:x:x:x:x (eight 16-bit pieces)</li> <li>• x:x:x:x:x:d.d.d.d</li> <li>• x: [0 to FFFF] H</li> <li>• d: [0 to 255] D</li> </ul> <p><b>system-time</b> — specifies that the internal system time configured with PTP or GNSS is the time server into the NTP process. The <b>prefer</b> parameter is mandatory with this option.</p> <p><i>version</i> — the NTP version number that is expected by this node</p> <p><b>Values</b> 2 to 4</p> <p><b>Default</b> 4</p> <p><b>key-id</b> — the identifier for the configured authentication key and authentication type used by this node to transmit NTP packets to an NTP server. If an NTP packet is received by this node, the authentication key ID, type, and key values must be valid; otherwise, the packet will be rejected and an event or trap will be generated.</p> <p><b>Values</b> 1 to 255</p> <p><b>prefer</b> — specifies the configured source as the preferred source that is to be used as an NTP server</p>
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## ptp

<b>Syntax</b>	<b>ptp</b>
<b>Context</b>	config>system>time
<b>Description</b>	This command enables the context to create or modify <b>ptp</b> parameters for time.

## clock

<b>Syntax</b>	<p><b>clock</b> <i>clock-id</i> <b>time-ref-priority</b> <i>priority-value</i></p> <p><b>clock</b> <b>csm</b> <i>time-ref-priority</i> <i>priority-value</i></p> <p><b>no clock</b></p>
<b>Context</b>	config>system>time>ptp
<b>Description</b>	This command specifies the PTP (Precision Time Protocol) source as an option for recovered time for the 1pps (1 pulse per second) port. The specific PTP clock is identified by <i>clock-id</i> and has an assigned <i>priority-value</i> .

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<b>Default</b>	no clock
<b>Parameters</b>	<p><i>clock-id</i> — specifies which configured clock is being used as the time reference</p> <p><b>Values</b> 1 to 16</p> <p><i>priority-value</i> — specifies the priority order of the given clock configured as the time reference</p> <p><b>Values</b> 1 to 16</p> <p><b>csm</b> — keyword to specify the CSM as the time reference</p>

## sntp

<b>Syntax</b>	[no] sntp
<b>Context</b>	config>system>time
<b>Description</b>	<p>This command enables the context to edit the Simple Network Time Protocol (SNTP).</p> <p>SNTP can be configured in either broadcast or unicast client mode. SNTP is a compact, client-only version of the NTP. SNTP can only receive the time from SNTP/NTP servers. It cannot be used to provide time services to other systems.</p> <p>The system clock is automatically adjusted at system initialization time or when the protocol first starts up.</p> <p>When the time differential between the SNTP/NTP server and the system is more than 2.5 seconds, the time on the system is gradually adjusted.</p> <p>SNTP is created in an administratively enabled state (<b>no shutdown</b>).</p> <p>The <b>no</b> form of the command removes the SNTP instance and configuration. SNTP does not need to be administratively disabled when removing the SNTP instance and configuration.</p>
<b>Default</b>	no sntp

## broadcast-client

<b>Syntax</b>	[no] broadcast-client
<b>Context</b>	config>system>time>sntp
<b>Description</b>	<p>This command enables listening to SNTP/NTP broadcast messages on interfaces with broadcast client enabled at global device level.</p> <p>When this global parameter is configured, then the <b>ntp-broadcast</b> parameter must be configured on selected interfaces on which NTP broadcasts are transmitted.</p> <p>SNTP must be shut down prior to changing either to or from broadcast mode.</p>

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The **no** form of the command disables broadcast client mode.

**Default** no broadcast-client

## server-address

**Syntax** **server-address** *ip-address* [**version** *version-number*] [**normal** | **preferred**]  
 [**interval** *seconds*]  
**no server-address** *ip-address*

**Context** config>system>time>sntp

**Description** This command creates an SNTP server for unicast client mode.

**Parameters** *ip-address* — specifies the IP address of the SNTP server  
*version-number* — specifies the SNTP version supported by this server

**Values** 1 to 3

**Default** 3

**normal** | **preferred** — specifies the preference value for this SNTP server. When more than one time-server is configured, one server can have preference over others. The value for that server should be set to **preferred**. Only one server in the table can be a preferred server.

**Default** normal

*seconds* — specifies the frequency at which this server is queried

**Values** 64 to 1024

**Default** 64

## tod-1pps

**Syntax** **tod-1pps**

**Context** config>system>time

**Description** This command enables the context to create or modify **tod-1pps** connector parameters.

## message-type

<b>Syntax</b>	<b>message-type</b> { <b>ct</b>   <b>cm</b>   <b>irig-b002-b122</b>   <b>irig-b003-b123</b>   <b>irig-b006-b126</b>   <b>irig-b007-b127</b> } <b>no message-type</b>
<b>Context</b>	config>system>time>tod-1pps
<b>Description</b>	This command specifies the format for the Time of Day message that is transmitted out the time of day (ToD) or ToD/PPS Out port on the following: <ul style="list-style-type: none"> <li>• 7705 SAR-M</li> <li>• 7705 SAR-H</li> <li>• 7705 SAR-A</li> <li>• 7705 SAR-Ax</li> <li>• 7705 SAR-X</li> </ul> <p>On the 7705 SAR-H, the Time of Day message output is only available when the router is configured with an active IP PTP slave clock or boundary clock. For all other routers, the Time of Day message output is available when the router is configured with an active IP PTP slave clock or boundary clock or when Time of Day is recovered from an Ethernet PTP clock or integrated GNSS.</p>
<b>Default</b>	no message-type
<b>Parameters</b>	<b>ct</b> — China Telecom; not available on the 7705 SAR-H <b>cm</b> — China Mobile; not available on the 7705 SAR-H <b>irig-b002-b122</b>   <b>irig-b003-b123</b>   <b>irig-b006-b126</b>   <b>irig-b007-b127</b> — specifies IRIG-B message format; available on the 7705 SAR-H only

## output

<b>Syntax</b>	<b>[no] output</b>
<b>Context</b>	config>system>time>tod-1pps
<b>Description</b>	This command specifies whether the 1pps output is enabled. When disabled, neither the 1pps nor the RS-422 serial port is available.
<b>Default</b>	no output

## zone

<b>Syntax</b>	<b>zone</b> { <i>std-zone-name</i>   <i>non-std-zone-name</i> } [ <i>hh</i> [: <i>mm</i> ]] <b>no zone</b>
<b>Context</b>	config>system>time



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<b>Description</b>	<p>This command sets the time zone and/or time zone offset for the device.</p> <p>The 7705 SAR supports system-defined and user-defined time zones. The system-defined time zones are listed in <a href="#">Table 24</a>.</p> <p>For user-defined time zones, the zone and the UTC offset must be specified.</p> <p>The <b>no</b> form of the command reverts to the default of Coordinated Universal Time (UTC). If the time zone in use was a user-defined time zone, the time zone will be deleted. If a <a href="#">dst-zone</a> command has been configured that references the zone, the summer commands must be deleted before the zone can be reset to UTC.</p>
<b>Default</b>	zone utc - the time zone is set for Coordinated Universal Time (UTC)
<b>Parameters</b>	<p><i>std-zone-name</i> — the standard time zone name. The standard name must be a system-defined zone in <a href="#">Table 24</a>. For zone names in the table that have an implicit summer time setting, for example MDT for Mountain Daylight Saving Time, the remaining <i>start-date</i>, <i>end-date</i> and <i>offset</i> parameters need to be provided unless it is necessary to override the system defaults for the time zone.</p> <p>For system-defined time zones, a different offset cannot be specified. If a new time zone is needed with a different offset, the user must create a new time zone. Some system-defined time zones have implicit summer time settings that causes the switchover to summer time to occur automatically; in this case, configuring the <a href="#">dst-zone</a> parameter is not required.</p> <p>A user-defined time zone name is case-sensitive and can be up to 5 characters in length.</p> <p><b>Values</b> A user-defined value can be up to 5 characters or one of the following values:  GMT, BST, IST, WET, WEST, CET, CEST, EET, EEST, MSK, MSD, AST, ADT, EST, EDT, ET, CST, CDT, CT, MST, MDT, MT, PST, PDT, PT, HST, AKST, AKDT, WAST, CAST, EAST</p> <p><i>non-std-zone-name</i> — the non-standard time zone name</p> <p><b>Values</b> Up to 5 characters maximum</p> <p><i>hh [:mm]</i> — the hours and minutes offset from UTC time, expressed as integers. Some time zones do not have an offset that is an integral number of hours. In these instances, the <i>minutes-offset</i> must be specified. For example, the time zone in Pirlangimpi, Australia is UTC + 9.5 hours.</p> <p><b>Values</b> hours: -11 to 11  minutes: 0 to 59</p> <p><b>Default</b> hours: 0  minutes: 0</p>

### 6.13.2.1.6 CRON Commands

#### cron

<b>Syntax</b>	<b>cron</b>
<b>Context</b>	config>system
<b>Description</b>	This command enables the context to configure periodic and date- and time-based scheduling.

CRON can be used, for example, to schedule Service Assurance Agent (SAA) functions. CRON functions include the ability to specify scripts that need to be run and when they will be scheduled. Reboots, peer turn-ups, and SAA tests can be scheduled with CRON, as well as OAM events such as connectivity checks or troubleshooting runs.

#### schedule

<b>Syntax</b>	<b>[no] schedule</b> <i>schedule-name</i> [ <b>owner</b> <i>schedule-owner</i> ]
<b>Context</b>	config>system>cron
<b>Description</b>	This command configures a schedule name and optional schedule owner.
<b>Default</b>	no schedule
<b>Parameters</b>	<i>schedule-name</i> — the name of the schedule, up to 32 characters in length <i>schedule-owner</i> — the name of the owner, up to 32 characters in length. The owner name is an arbitrary string; it is not associated with an actual CLI user.
	<b>Default</b> "TiMOS CLI"

#### count

<b>Syntax</b>	<b>count</b> <i>number</i> <b>no count</b>
<b>Context</b>	config>system>cron>schedule
<b>Description</b>	This command configures the number of times a CRON periodic schedule is run. For example, if the <b>interval</b> is set to 600 and the <b>count</b> is set to 4, the schedule runs 4 times at 600-second intervals.
<b>Default</b>	no count

**Parameters** *number* — the number of times the schedule is run  
**Values** 1 to 65535

## day-of-month

**Syntax** **day-of-month** {*day-number* [*..day-number*] | **all**}  
**no day-of-month**

**Context** config>system>cron>schedule

**Description** This command specifies on which days of the month the schedule will execute. Multiple days of the month can be specified. If multiple days are configured, each of them will trigger the schedule. If a **day-of-month** is configured without configuring [month](#), [hour](#), and [minute](#), the schedule will not execute.

Using the **weekday** command as well as the **day-of-month** command may cause the schedule to run twice in a week. For example, if today is Monday, January 1, and **month** is set to January, **weekday** is set to Tuesday, and **day-of-month** is set to the 5th day of the month, the schedule will run on Tuesday (January 2) and on Friday (January 5).

The **no** form of this command removes the specified **day-of-month** or all **day-of-month** configurations.

**Default** no day-of-month

**Parameters** *day-number* — positive integers specify the day of the month beginning on the first of the month. Negative integers specify the day of the month beginning on the last day of the month. For example, configuring **day-of-month -5, 5** in a month that has 31 days will specify the schedule to execute on the 27th and 5th of that month.

Integer values must map to a valid day for the specified month. For example, February 30 is not a valid date.

**Values** 1 to 31, -31 to -1 (maximum 62 day-numbers)

**all** — specifies all days of the month

## end-time

**Syntax** **end-time** [*date* | *day-name*] *time*  
**no end-time**

**Context** config>system>cron>schedule

**Description** This command is used concurrently with schedule type **calendar** or **periodic**. If the schedule is configured as **calendar**, the end-time determines on which date the schedule will end. If the schedule is configured as **periodic**, the end-time determines at which interval the schedule will end.

If **no end-time** is specified, the schedule runs indefinitely.

<b>Default</b>	no end-time
<b>Parameters</b>	<p><i>date</i> — the date that the schedule will end</p> <p><b>Values</b>    yyyy/mm/dd in year/month/day number format</p> <p><i>day-name</i> — the day of the week that the schedule will end</p> <p><b>Values</b>    sunday   monday   tuesday   wednesday   thursday   friday   saturday</p> <p><i>time</i> — the time on the configured day that the schedule will end</p> <p><b>Values</b>    hh:mm in hour:minute format</p>

## hour

<b>Syntax</b>	<b>hour</b> {.. <i>hour-number</i> [.. <i>hour-number</i> ]   <b>all</b> }
	<b>no hour</b>
<b>Context</b>	config>system>cron>schedule
<b>Description</b>	<p>This command specifies at which hour the schedule will execute. Multiple hours can be specified. If multiple hours are configured, each of them will trigger the schedule. If an hour is configured without configuring <a href="#">month</a>, <a href="#">weekday</a> or <a href="#">day-of-month</a>, and <a href="#">minute</a>, the schedule will not execute.</p> <p>The <b>no</b> form of this command removes the specified hour or all configured hours.</p>
<b>Default</b>	no hour
<b>Parameters</b>	<p><i>hour-number</i> — the hour that the schedule will execute</p> <p><b>Values</b>    0 to 23 (maximum 24 <i>hour-numbers</i>)</p> <p><b>all</b> — specifies all hours</p>

## interval

<b>Syntax</b>	<b>interval</b> <i>seconds</i>
	<b>no interval</b>
<b>Context</b>	config>system>cron>schedule
<b>Description</b>	This command specifies the interval between each periodic schedule run.
<b>Default</b>	no interval
<b>Parameters</b>	<p><i>seconds</i> — the interval, in seconds, between each schedule run</p> <p><b>Values</b>    30 to 4294967295</p>

## minute

<b>Syntax</b>	<b>minute</b> { <i>minute-number</i> [ <i>..minute-number</i> ]   <b>all</b> } <b>no minute</b>
<b>Context</b>	config>system>cron>schedule
<b>Description</b>	This command specifies at which minute the schedule will execute. Multiple minutes can be specified. If multiple minutes are configured, each of them will trigger the schedule. If a minute is configured without configuring <a href="#">month</a> , <a href="#">weekday</a> or <a href="#">day-of-month</a> , and <a href="#">hour</a> , the schedule will not execute.  The <b>no</b> form of this command removes the specified minute or all configured minutes.
<b>Default</b>	no minute
<b>Parameters</b>	<i>minute-number</i> — the minute that the schedule will execute <b>Values</b> 0 to 59 (maximum 60 <i>minute-numbers</i> ) <b>all</b> — specifies all minutes

## month

<b>Syntax</b>	<b>month</b> { <i>month-number</i> [ <i>..month-number</i> ]   <i>month-name</i> [ <i>..month-name</i> ]   <b>all</b> } <b>no month</b>
<b>Context</b>	config>system>cron>schedule
<b>Description</b>	This command specifies on which month the schedule will execute. Multiple months can be specified. If multiple months are configured, each of them will trigger the schedule. If a month is configured without configuring <a href="#">weekday</a> or <a href="#">day-of-month</a> , <a href="#">hour</a> , and <a href="#">minute</a> , the schedule will not execute.  The <b>no</b> form of this command removes the specified month or all configured months.
<b>Default</b>	no month
<b>Parameters</b>	<i>month-number</i> — the month that the schedule will execute, by number <b>Values</b> 1 to 12 (maximum 12 <i>month-numbers</i> ) <i>month-name</i> — the month that the schedule will execute, by name <b>Values</b> january, february, march, april, may, june, july, august, september, october, november, december (maximum 12 <i>month-names</i> ) <b>all</b> — specifies all months

## script-policy

<b>Syntax</b>	<b>script-policy</b> <i>policy-name</i> [ <b>owner</b> <i>policy-owner</i> ] <b>no script-policy</b>
<b>Context</b>	config>system>cron>schedule
<b>Description</b>	This command specifies the script policy associated with the script to be run by the CRON schedule. The script policy must have already been created in the <b>config&gt;system&gt;script-control</b> context.
<b>Default</b>	no script-policy
<b>Parameters</b>	<i>policy-name</i> — the name of the script policy associated with the desired script <i>policy-owner</i> — the name of the owner that, combined with the script policy name, is associated with the desired script

## type

<b>Syntax</b>	<b>type</b> <i>schedule-type</i>
<b>Context</b>	config>system>cron>schedule
<b>Description</b>	This command configures how the schedule will run (periodically, on a specified date or dates, or one time only).
<b>Default</b>	periodic
<b>Parameters</b>	<i>schedule-type</i> — the type of schedule
<b>Values</b>	<p><b>periodic</b> — specifies that the schedule runs at a specified interval. The <a href="#">interval</a> value must be configured.</p> <p><b>calendar</b> — specifies that the schedule runs based on a calendar. The <a href="#">month</a>, <a href="#">weekday</a> or <a href="#">day-of-month</a>, <a href="#">hour</a>, and <a href="#">minute</a> must be configured.</p> <p><b>oneshot</b> — specifies that the schedule runs one time only, then enters a shutdown state. The <a href="#">month</a>, <a href="#">weekday</a> or <a href="#">day-of-month</a>, <a href="#">hour</a>, and <a href="#">minute</a> must be configured.</p>

## weekday

<b>Syntax</b>	<b>weekday</b> { <i>weekday-number</i> [ <i>..weekday-number</i> ]   <i>day-name</i> [ <i>..day-name</i> ]   <b>all</b> }
	<b>no weekday</b>
<b>Context</b>	config>system>cron>schedule

---

**Description** This command specifies on which days of the week the schedule will execute. Multiple days of the week can be specified. If multiple days are configured, each of them will trigger the schedule. If a weekday is configured without configuring **month**, **hour**, and **minute**, the schedule will not execute.

Using the **weekday** command as well as the **day-of-month** command may cause the schedule to run twice in a week. For example, if today is Monday, January 1, and **month** is set to January, **weekday** is set to Tuesday, and **day-of-month** is set to the 5th day of the month, the schedule will run on Tuesday (January 2) and on Friday (January 5).

The **no** form of this command removes the specified weekday or all configured weekdays.

**Default** no weekday

**Parameters** *weekday-number* — the day of the week that the schedule will execute, by number

**Values** 1 to 7 (maximum 7 *weekday-numbers*)

*day-name* — the day of the week that the schedule will execute, by name

**Values** sunday, monday, tuesday, wednesday, thursday, friday, saturday  
(maximum 7 *day-names*)

**all** — specifies all days of the week

### 6.13.2.1.7 Script Control Commands

#### script-control

<b>Syntax</b>	<b>script-control</b>
<b>Context</b>	config>system
<b>Description</b>	This command enables the context to configure CLI script parameters.

#### script

<b>Syntax</b>	<b>[no] script <i>script-name</i> [owner <i>script-owner</i>]</b>
<b>Context</b>	config>system>script-control
<b>Description</b>	<p>This command assigns a name and optional owner to a script text file that contains a list of CLI commands to be executed. The owner is an arbitrary string; it is not associated with an actual CLI user.</p> <p>Multiple owners can be associated with a script name, and each script name/owner combination is unique.</p> <p>The scripts are not authorized against the owner but can be configured to execute under a particular user context in order for authorization to be performed. Refer to the 7705 SAR System Management Guide, “CLI Script Authorization Commands”, for information.</p> <p>The <b>no</b> form of the command deletes the script name.</p>
<b>Default</b>	no script
<b>Parameters</b>	<p><i>script-name</i> — the name of the script, up to 32 characters in length</p> <p><i>script-owner</i> — the name of the script owner, up to 32 characters in length</p> <p><b>Default</b> “TiMOS CLI”</p>

#### location

<b>Syntax</b>	<b>location <i>file-url</i></b> <b>no location</b>
<b>Context</b>	config>system>script-control>script
<b>Description</b>	This command specifies the location of the script text file, either on the local compact flash or on a remote FTP server.



The **no** form of the command removes the location.

**Default** no location

**Parameters** *file-url* — the local or remote URL for the file location (see [Table 15](#) for parameter descriptions)

## script-policy

**Syntax** [**no**] **script-policy** *policy-name* [**owner** *policy-owner*]

**Context** config>system>script-control

**Description** This command configures a script policy. The script policy is assigned a name and optional owner. The owner is an arbitrary string; it is not associated with an actual CLI user.

Multiple owners can be associated with a script policy, and each script policy name/owner combination is unique.

A script policy cannot be shut down while a running history exists for that policy. The script policy must be shut down before the script file location can be changed.

**Default** no script-policy

**Parameters** *policy-name* — the name of the script policy, up to 32 characters in length  
*policy-owner* — the name of the script policy owner, up to 32 characters in length

**Default** "TiMOS CLI"

## expire-time

**Syntax** **expire-time** {*seconds* | **forever**}

**Context** config>system>script-control>script-policy

**Description** This command configures the maximum length of time to keep the run history status entry from a script run.

**Default** expire-time 3600

**Parameters** *seconds* — length of time to keep the run history status entry, in seconds

**Values** 0 to 21474836

**forever** — specifies to keep the run history status entry indefinitely

## lifetime

<b>Syntax</b>	<b>lifetime</b> { <i>seconds</i>   <b>forever</b> }
<b>Context</b>	config>system>script-control>script-policy
<b>Description</b>	This command configures the maximum length of time that a script may run.
<b>Default</b>	lifetime 3600
<b>Parameters</b>	<i>seconds</i> — the maximum length of time that a script may run, in seconds <b>Values</b> 0 to 21474836 <b>forever</b> — specifies to allow a script to run indefinitely

## max-completed

<b>Syntax</b>	<b>max-completed</b> <i>unsigned</i>
<b>Context</b>	config>system>script-control>script-policy
<b>Description</b>	This command specifies the maximum number of script run history status entries to keep.  The system maintains the script run history table, which has a maximum size of 255 entries. Entries are removed from this table when the <b>max-completed</b> or <b>expire-time</b> thresholds are crossed. If the table reaches the maximum value, no further scripts are run until older run history entries expire (due to the <b>expire-time</b> setting), or entries are manually cleared.
<b>Default</b>	max-completed 1
<b>Parameters</b>	<i>unsigned</i> — the maximum number of script run history status entries to keep <b>Values</b> 1 to 1500

## results

<b>Syntax</b>	<b>results</b> <i>file-url</i> <b>no results</b>
<b>Context</b>	config>system>script-control>script-policy
<b>Description</b>	This command specifies the location where the system stores the results of the script run, either on a local compact flash or on an FTP server.  When a script is run, the results are stored in the specified location, and a date and time suffix is added to the filename in the format <i>yyyymmdd-hhmmss.µµµµµµ.out</i> . The microseconds are padded to 6 characters with leading zeros.

The **no** form of the command removes the file location from the configuration. Scripts will not execute if there is no results file location defined.

**Default** no results

**Parameters** *file-url* — the local or remote URL for the results file location (see [Table 15](#) for parameter descriptions)

## script

**Syntax** **script** *script-name* [**owner** *script-owner*]  
**no script**

**Context** config>system>script-control>script-policy

**Description** This command associates the script defined under the **config>system>script-control** context with this script policy.

The **no** form of the command removes the script from the script policy.

**Default** no script

**Parameters** *script-name* — the name of the defined script

*script-owner* — the name of the defined script owner associated with the script name

---

### 6.13.2.1.8 System Synchronization Configuration Commands

#### sync-if-timing

<b>Syntax</b>	<b>sync-if-timing</b>
<b>Context</b>	config>system
<b>Description</b>	This command creates or edits the context to create or modify timing reference parameters.
<b>Default</b>	not enabled (The <b>ref-order</b> must be specified in order for this command to be enabled.)

#### abort

<b>Syntax</b>	<b>abort</b>
<b>Context</b>	config>system>sync-if-timing
<b>Description</b>	This command is required to discard changes that have been made to the synchronous interface timing configuration during a session.

#### begin

<b>Syntax</b>	<b>begin</b>
<b>Context</b>	config>system>sync-if-timing
<b>Description</b>	This command is required in order to enter the mode to create or edit the system synchronous interface timing configuration.

#### bits

<b>Syntax</b>	<b>bits</b>
<b>Context</b>	config>system>sync-if-timing
<b>Description</b>	This command enables the context to configure parameters for BITS timing on the 7705 SAR-18. The BITS input and output ports can be configured for T1/E1 or 2 MHz G.703 signals.

## input

<b>Syntax</b>	<b>input</b>
<b>Context</b>	config>system>sync-if-timing>bits
<b>Description</b>	This command enables the context to configure BITS input timing ports parameters on the 7705 SAR-18.

## interface-type

<b>Syntax</b>	<b>interface-type {ds1 [{esf   sf}]   e1 [{pcm30crc   pcm31crc}]   2048khz-G703}</b> <b>no interface-type</b>
<b>Context</b>	config>system>sync-if-timing>bits
<b>Description</b>	This command specifies the signal type for the BITS input and output ports. If you configure the signal type as <b>ds1</b> , the system automatically defaults to <b>esf</b> . If you configure the signal type as <b>e1</b> , the system automatically defaults to <b>pcm30crc</b> .  The <b>no</b> form of the command reverts to the default configuration.
<b>Default</b>	ds1 esf
<b>Parameters</b>	<p><b>ds1 esf</b> — specifies Extended Super Frame (ESF). ESF is a framing type used on DS1 circuits. ESF consists of 24 192-bit frames. The 193rd bit provides timing and other functions.</p> <p><b>ds1 sf</b> — specifies Super Frame (SF), also called D4 framing. SF is a common framing type used on DS1 circuits. SF consists of 12 192-bit frames. The 193rd bit provides error checking and other functions. ESF supersedes SF.</p> <p><b>e1 pcm30crc</b> — specifies PCM30CRC as the pulse code modulation (PCM) type. PCM30CRC uses PCM to separate the signal into 30 user channels with Cyclic Redundancy Check (CRC) protection.</p> <p><b>e1 pcm31crc</b> — specifies PCM31CRC as the PCM type. PCM31CRC uses PCM to separate the signal into 31 user channels with CRC protection.</p>

## output

<b>Syntax</b>	<b>output</b>
<b>Context</b>	config>system>sync-if-timing>bits
<b>Description</b>	This command enables the context to configure BITS output port parameters on the 7705 SAR-18.

## line-length

<b>Syntax</b>	<b>line-length</b> { <b>110</b>   <b>220</b>   <b>330</b>   <b>440</b>   <b>550</b>   <b>660</b> }
<b>Context</b>	config>system>sync-if-timing>bits>output
<b>Description</b>	<p>This command configures the line length, in feet, between the network element and the central clock (BITS/SSU).</p> <p>This command is only applicable when the <a href="#">interface-type</a> is DS1.</p>
<b>Default</b>	110
<b>Parameters</b>	<p><b>110</b> — specifies a line length from 0 to 110 ft</p> <p><b>220</b> — specifies a line length from 111 to 220 ft</p> <p><b>330</b> — specifies a line length from 221 to 330 ft</p> <p><b>440</b> — specifies a line length from 331 to 440 ft</p> <p><b>550</b> — specifies a line length from 441 to 550 ft</p> <p><b>660</b> — specifies a line length from 551 to 660 ft</p>

## SOURCE

<b>Syntax</b>	<b>source</b> { <b>line-ref</b>   <b>internal-clock</b> }
<b>Context</b>	config>system>sync-if-timing>bits>output
<b>Description</b>	<p>This command configures the source of the BITS output ports in the 7705 SAR-18.</p> <p>By default the source is configured as <b>internal-clock</b>, which provides a filtered signal from the output of the node's central clock. The central clock output is usually used when no BITS/SASE device is present. When an external BITS/SASE clock is present, it is often desirable to provide an unfiltered clock reference to it by configuring <b>line-ref</b>. When the <b>line-ref</b> parameter is configured, the recovered clock from ref1 or ref2 (based on configuration of the <b>ref-order</b> and <b>ql-selection</b> commands) is transmitted directly out the BITS output port without filtering.</p>
<b>Default</b>	internal-clock
<b>Parameters</b>	<p><b>line-ref</b> — BITS output timing is selected from one of the input references, without any filtering</p> <p><b>internal-clock</b> — BITS output timing is driven from the node's central clock (filtered)</p>

## ql-override

<b>Syntax</b>	<b>ql-override</b> { <b>prs</b>   <b>stu</b>   <b>st2</b>   <b>tnc</b>   <b>st3e</b>   <b>st3</b>   <b>smc</b>   <b>prc</b>   <b>ssu-a</b>   <b>ssu-b</b>   <b>sec</b>   <b>eec1</b>   <b>eec2</b> } <b>no ql-override</b>
<b>Context</b>	config>system>sync-if-timing>external config>system>sync-if-timing>bits config>system>sync-if-timing>ref1 config>system>sync-if-timing>ref2
<b>Description</b>	This command configures a static quality level value. This value overrides any dynamic quality level value received by the Synchronization Status Messaging (SSM) process.
<b>Default</b>	no ql-override (for external timing references, ql-override stu is equivalent to no ql-override)
<b>Parameters</b>	<b>prs</b> — SONET Primary Reference Source Traceable <b>stu</b> — SONET Synchronous Traceability Unknown <b>st2</b> — SONET Stratum 2 Traceable <b>tnc</b> — SONET Transit Node Clock Traceable <b>st3e</b> — SONET Stratum 3E Traceable <b>st3</b> — SONET Stratum 3 Traceable <b>smc</b> — SONET Minimum Clock Traceable <b>prc</b> — SDH Primary Reference Clock Traceable <b>ssu-a</b> — SDH Primary Level Synchronization Supply Unit Traceable <b>ssu-b</b> — SDH Second Level Synchronization Supply Unit Traceable <b>sec</b> — SDH Synchronous Equipment Clock Traceable <b>eec1</b> — Ethernet Equipment Clock Option 1 Traceable (SDH) <b>eec2</b> — Ethernet Equipment Clock Option 2 Traceable (SONET)

## ssm-bit

<b>Syntax</b>	<b>ssm-bit</b> <i>sa-bit</i>
<b>Context</b>	config>system>sync-if-timing>bits
<b>Description</b>	This command configures which Sa-bit to use for conveying Synchronization Status Messaging (SSM) information when the interface type is E1.
<b>Default</b>	Sa8
<b>Parameters</b>	<i>sa-bit</i> — specifies the Sa-bit value
<b>Values</b>	Sa4 to Sa8

---

## commit

<b>Syntax</b>	<b>commit</b>
<b>Context</b>	config>system>sync-if-timing
<b>Description</b>	This command is required in order to save the changes made to the system synchronous interface timing configuration.

## external

<b>Syntax</b>	<b>external</b>
<b>Context</b>	config>system>sync-if-timing
<b>Description</b>	This command enables the context to configure parameters for external timing via the port on the CSM. This can be used to reference external synchronization signals.

## input-interface

<b>Syntax</b>	<b>input-interface</b>
<b>Context</b>	config>system>sync-if-timing>external
<b>Description</b>	This command enables the context to configure parameters for external input timing interface via the port on the CSM.

## impedance

<b>Syntax</b>	<b>impedance {high-impedance   50-Ohm   75-Ohm}</b>
<b>Context</b>	config>system>sync-if-timing>external>input-interface
<b>Description</b>	This command configures the impedance of the external input timing port. The command is only applicable to the 7705 SAR-8 Shelf V2, 7705 SAR-H, and 7705 SAR-M.
<b>Default</b>	50-Ohm
<b>Parameters</b>	<b>high-impedance</b> — specifies a high input impedance value <b>50-Ohm</b> — specifies a 50 $\Omega$ input impedance value <b>75-Ohm</b> — specifies a 75 $\Omega$ input impedance value



## type

<b>Syntax</b>	<b>type</b> { <b>2048khz-G703</b>   <b>5mhz</b>   <b>10mhz</b> } <b>no type</b>
<b>Context</b>	config>system>sync-if-timing>external>input-interface config>system>sync-if-timing>external>output-interface
<b>Description</b>	This command configures the interface type of the external timing port.  The <b>no</b> form of the command reverts to the default.
<b>Default</b>	2048 kHz-G703
<b>Parameters</b>	<b>2048khz-G703</b> — specifies a G703 2048 kHz clock <b>5mhz</b> — specifies a 5 MHz sine clock <b>10mhz</b> — specifies a 10 MHz sine clock

## output-interface

<b>Syntax</b>	<b>output-interface</b>
<b>Context</b>	config>system>sync-if-timing>external
<b>Description</b>	This command enables the context to configure parameters for external output timing interface via the port on the CSM.
<b>Default</b>	n/a

## ql-selection

<b>Syntax</b>	<b>[no] ql-selection</b>
<b>Context</b>	config>system>sync-if-timing
<b>Description</b>	This command enables SSM encoding as a means of timing reference selection.
<b>Default</b>	no ql-selection

## ref-order

<b>Syntax</b>	<b>ref-order</b> <i>first second [third]</i> <b>no ref-order</b>
<b>Context</b>	config>system>sync-if-timing

<b>Description</b>	<p>The synchronous equipment timing subsystem can lock to three different timing reference inputs, those specified in the <a href="#">ref1</a>, <a href="#">ref2</a>, <a href="#">external</a>, and <a href="#">bits</a> command configuration. This command organizes the priority order of the timing references.</p> <p>If a reference source is disabled, then the clock from the next reference source as defined by <b>ref-order</b> is used. If the reference sources are disabled, then clocking is derived from a local oscillator.</p> <p>If a <b>sync-if-timing</b> reference is linked to a source port that is operationally down, the port will no longer be qualified as a valid reference.</p> <p>For unfiltered BITS output (T4), all reference sources are valid options, except the BITS input, which is excluded to avoid a timing loop. Because the same priority order is used for the SETG output (T0), the BITS input option must be set as the first (highest-priority) reference option.</p> <p>The <b>no</b> form of the command resets the reference order to the default values.</p>
<b>Default</b>	external, ref1 ref2
<b>Parameters</b>	<p><i>first</i> — specifies the first timing reference to use in the reference order sequence</p> <p style="padding-left: 2em;"><b>Values</b> ref1, ref2, external, bits</p> <p><i>second</i> — specifies the second timing reference to use in the reference order sequence</p> <p style="padding-left: 2em;"><b>Values</b> ref1, ref2, external, bits</p> <p><i>third</i> — specifies the third timing reference to use in the reference order sequence</p> <p style="padding-left: 2em;"><b>Values</b> ref1, ref2, external, bits</p>

## ref1

<b>Syntax</b>	<b>ref1</b>
<b>Context</b>	config>system>sync-if-timing
<b>Description</b>	This command enables the context to configure parameters for the first timing reference.

## ref2

<b>Syntax</b>	<b>ref2</b>
<b>Context</b>	config>system>sync-if-timing
<b>Description</b>	This command enables the context to configure parameters for the second timing reference.

---

## source-port

<b>Syntax</b>	<b>source-port</b> <i>port-id</i> [ <b>adaptive</b> ] <b>no source-port</b>
<b>Context</b>	config>system>sync-if-timing>ref1 config>system>sync-if-timing>ref2
<b>Description</b>	This command configures the source port for timing reference <b>ref1</b> or <b>ref2</b> .

The timing reference can either be timing extracted from the receive port (line-timed) or packetized data of a TDM PW (adaptive). If the adaptive option is not selected, the system uses line timing mode. If the line timing is from a port that becomes unavailable or the link goes down, then the reference sources are re-evaluated according to the reference order configured by the [ref-order](#) command.

Line timing is supported on T1/E1 ports of the 7705 SAR-M and 7705 SAR-A and on the T1/E1 ports of the 7705 SAR-H 4-port T1/E1 and RS-232 Combination module.

Line timing is also supported in the form of synchronous Ethernet on all RJ-45 and optical SFP Ethernet ports on the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, 7705 SAR-Wx, 7705 SAR-X, and 7705 SAR-Ax. The 7705 SAR-A supports line timing on its synchronous Ethernet-capable ports (1 to 8) when they are fixed RJ-45 or optical SFP.

In addition, line timing is supported on the following modules:

- 2-port 10GigE (Ethernet) module
- 6-port SAR-M Ethernet module
- 4-port SAR-H Fast Ethernet module

On the 7705 SAR-8 Shelf V2 or 7705 SAR-18, line timing is supported on:

- T1/E1 ports on the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card
- Ethernet SFP ports with SFPs that support synchronous Ethernet on the 8-port Ethernet Adapter card, 6-port Ethernet 10Gbps Adapter card, 8-port Gigabit Ethernet Adapter card, Packet Microwave Adapter card, 2-port 10GigE (Ethernet) Adapter card, and 10-port 1GigE/1-port 10GigE X-Adapter card (supported on the 7705 SAR-18 only)
- SONET/SDH ports on the 4-port OC3/STM1 Clear Channel Adapter card and 2-port OC3/STM1 Channelized Adapter card
- DS3/E3 ports on the 4-port DS3/E3 Adapter card

Adaptive timing is supported on the T1/E1 ports on the 7705 SAR-X, 7705 SAR-M, and 7705 SAR-A. On the 7705 SAR-8 Shelf V2 and 7705 SAR-18, adaptive timing is supported on the 16-port T1/E1 ASAP Adapter card and the 32-port T1/E1 ASAP Adapter card configured with one or more TDM PWs. Adaptive timing is also supported on the T1/E1 ports of the 4-port T1/E1 and RS-232 Combination module.



**Note:** The PW terminated on channel group 1 will be used to extract the ACR timing.

Synchronous Ethernet ports can supply a timing reference on the 7705 SAR-M, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X. Two T1/E1 ports can supply a timing reference on the 7705 SAR-X and on the 7705 SAR-M and 7705 SAR-A (variants with T1/E1 ports).

On the 7705 SAR-H and 7705 SAR-Hc, all RJ-45 Ethernet ports and SFP ports support synchronous Ethernet and can supply a timing reference to be used as a source of node synchronization. When the 4-port T1/E1 and RS-232 Combination module is installed in the 7705 SAR-H, a single T1/E1 port on the module can supply a timing reference.

When the 2-port 10GigE (Ethernet) module or 6-port SAR-M Ethernet module is installed in the 7705 SAR-M, the ports on the module can supply a timing reference.

The 7705 SAR-8 Shelf V2 and 7705 SAR-18 can receive one or two timing references depending on the port and card type supplying the reference. A timing reference can come from:

- a single SONET/SDH port on the 4-port OC3/STM1 Clear Channel Adapter card
- a single synchronous Ethernet port on the 8-port Ethernet Adapter card
- two DS3/E3 ports on the 4-port DS3/E3 Adapter card
- two SONET/SDH ports on the 2-port OC3/STM1 Channelized Adapter card
- two synchronous Ethernet ports on the 6-port Ethernet 10Gbps Adapter card, 8-port Gigabit Ethernet Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card (supported on the 7705 SAR-18 only), or 2-port 10GigE (Ethernet) Adapter card
- two T1/E1 ports on the 16-port T1/E1 ASAP Adapter card or 32-port T1/E1 ASAP Adapter card. References must be from different framers; the framers each have eight ports and are grouped as ports 1 to 8, 9 to 16, 17 to 24, and 25 to 32.
- two ports on the Packet Microwave Adapter card: on port 1 or 2, it could be a synchronous Ethernet or PCR-enabled port; on port 3 or 4, it could be a synchronous Ethernet (optical SFP only) or PCR-enabled port (copper-based SFP only); on ports 5 through 8, it could be a synchronous Ethernet (optical SFP only) port.

The **no** form of this command deletes the source port from the reference. An example of when the **no** form would be used is if the user wants to change the reference to a source IP interface in order to enable PTP. In this case, the user would first delete the PTP using the **no source-port** command, then configure the source IP interface using the [source-ptp-clock](#) command.

**Parameters**

*port-id* — identifies the port in the slot/mda/port format

**adaptive** — clock recovery is adaptive, rather than line-timed

---

## source-ptp-clock

<b>Syntax</b>	<b>source-ptp-clock</b> <i>clock-id</i> <b>no source-ptp-clock</b>
<b>Context</b>	config>system>sync-if-timing>ref1 config>system>sync-if-timing>ref2
<b>Description</b>	This command configures the reference source clock using the clock ID configured by the PTP <a href="#">clock</a> command.
<b>Default</b>	no source-ptp-clock
<b>Parameters</b>	<i>clock-id</i> — identifies the PTP clock to use as the reference source clock <b>Values</b> 1 to 16

## revert

<b>Syntax</b>	<b>[no] revert</b>
<b>Context</b>	config>system>sync-if-timing
<b>Description</b>	This command allows the clock to revert to a higher-priority reference if the current reference goes offline or becomes unstable. With revertive switching enabled, the highest-priority valid timing reference will be used. If a reference with a higher priority becomes valid, a reference switchover to that reference will be initiated. If a failure on the current reference occurs, the next highest reference takes over. With non-revertive switching, the active reference will always remain selected while it is valid, even if a higher-priority reference becomes available. If this reference becomes invalid, a reference switchover to a valid reference with the highest priority will be initiated. When the failed reference becomes operational, it is eligible for selection.
<b>Default</b>	no revert

### 6.13.2.1.9 LLDP System Commands

Refer to the 7705 SAR Interface Configuration Guide, “7705 SAR Interfaces”, for LLDP Ethernet port commands.

#### lldp

<b>Syntax</b>	<b>lldp</b>
<b>Context</b>	config>system
<b>Description</b>	This command enables the context to configure system-wide Link Layer Discovery Protocol (LLDP) parameters.

#### message-fast-tx

<b>Syntax</b>	<b>message-fast-tx <i>time</i></b> <b>no message-fast-tx</b>
<b>Context</b>	config>system>lldp
<b>Description</b>	<p>This command configures the interval between LLDPDU transmissions by the LLDP agent during a fast transmission period.</p> <p>The fast transmission period begins when a new neighbor is detected. During the fast transmission period, LLDPDUs are transmitted at shorter intervals than the standard <a href="#">tx-interval</a> to ensure that more than one LLDPDU is sent to the new neighbor. The first transmission occurs as soon as the new neighbor is detected. The length of the fast transmission period is determined by the number of LLDPDU transmissions (configured by the <a href="#">message-fast-tx-init</a> command) and the interval between them.</p> <p>The <b>no</b> form of the command reverts to the default value.</p>
<b>Default</b>	1
<b>Parameters</b>	<i>time</i> — specifies the interval between LLDPDU transmissions in seconds
<b>Values</b>	1 to 3600

---

## message-fast-tx-init

<b>Syntax</b>	<b>message-fast-tx-init</b> <i>count</i> <b>no message-fast-tx-init</b>
<b>Context</b>	config>system>lldp
<b>Description</b>	<p>This command configures the number of LLDPDUs to send during a fast transmission period.</p> <p>The fast transmission period begins when a new neighbor is detected. During the fast transmission period, LLDPDUs are transmitted at shorter intervals than the standard <a href="#">tx-interval</a> to ensure that more than one LLDPDU is sent to the new neighbor. The first transmission occurs as soon as the new neighbor is detected. The length of the fast transmission period is determined by the number of LLDPDU transmissions and the interval between them (configured by the <a href="#">message-fast-tx</a> command).</p> <p>The <b>no</b> form of the command reverts to the default value.</p>
<b>Default</b>	4
<b>Parameters</b>	<i>count</i> — specifies the number of LLDPDUs to send during the fast transmission period
<b>Values</b>	1 to 8

## notification-interval

<b>Syntax</b>	<b>notification-interval</b> <i>time</i> <b>no notification-interval</b>
<b>Context</b>	config>system>lldp
<b>Description</b>	<p>This command configures the minimum time between change notifications. A change notification is a trap message sent to SNMP whenever a change occurs in the database of LLDP information.</p> <p>The <b>no</b> form of the command reverts to the default value.</p>
<b>Default</b>	5
<b>Parameters</b>	<i>time</i> — specifies the minimum time, in seconds, between change notifications
<b>Values</b>	5 to 3600

---

## reinit-delay

<b>Syntax</b>	<b>reinit-delay time</b> <b>no reinit-delay</b>
<b>Context</b>	config>system>lldp
<b>Description</b>	This command configures the time before reinitializing LLDP on a port.  The <b>no</b> form of the command reverts to the default value.
<b>Default</b>	2
<b>Parameters</b>	<i>time</i> — specifies the time, in seconds, before reinitializing LLDP on a port <b>Values</b> 1 to 10

## tx-credit-max

<b>Syntax</b>	<b>tx-credit-max count</b> <b>no tx-credit-max</b>
<b>Context</b>	config>system>lldp
<b>Description</b>	This command configures the maximum number of consecutive LLDPDUs that can be transmitted at any time.  The <b>no</b> form of the command reverts to the default value.
<b>Default</b>	5
<b>Parameters</b>	<i>count</i> — specifies the maximum number of consecutive LLDPDUs transmitted <b>Values</b> 1 to 100

## tx-hold-multiplier

<b>Syntax</b>	<b>tx-hold-multiplier multiplier</b> <b>no tx-hold-multiplier</b>
<b>Context</b>	config>system>lldp
<b>Description</b>	This command configures the multiplier of the transmit interval defined by the <a href="#">tx-interval</a> command.  The transmit interval time multiplied by the <b>tx-hold-multiplier</b> is the TTL value in the LLDPDU. The TTL value determines the amount of time the receiving device retains LLDP packet information in local information databases before discarding it.



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The **no** form of the command reverts to the default value.

**Default** 4

**Parameters** *multiplier* — specifies the multiplier of the transmit interval

**Values** 2 to 10

## tx-interval

**Syntax** **tx-interval** *interval*  
**no tx-interval**

**Context** config>system>lldp

**Description** This command configures the LLDP transmit interval time.

The **no** form of the command reverts to the default value.

**Default** 30

**Parameters** *interval* — specifies the LLDP transmit interval time in seconds

**Values** 5 to 32768

### 6.13.2.1.10 System PTP Commands

#### ptp

<b>Syntax</b>	<b>ptp</b>
<b>Context</b>	config>system
<b>Description</b>	This command enables the context to create or modify PTP timing parameters.

#### clock

<b>Syntax</b>	<b>clock</b> <i>clock-id</i> [ <b>create</b> ] <b>no clock</b>
<b>Context</b>	config>system>ptp
<b>Description</b>	<p>This command creates a PTP clock, which can be set to a master, slave, boundary, or transparent clock using the <a href="#">clock-type</a> command. The <i>clock-id</i> can be a numeric value (1 to 16) or it can be the keyword <b>csm</b>.</p> <p>Use the numeric value for PTP clocks that transmit and receive PTP messages using IPv4 or IPv6 encapsulation. On the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X, only one PTP instance can be master, slave, or boundary.</p> <p>Use the <b>csm</b> keyword when the PTP clock transmits and receives PTP messages using Ethernet encapsulation. Ethernet-encapsulated PTP messages are processed on the CSM module or CSM functional block.</p> <p>The <b>no</b> form of the command deletes a PTP clock when the <i>clock-id</i> is set to a numeric value. The CSM PTP clock cannot be removed.</p>
<b>Parameters</b>	<p><i>clock-id</i> — specifies the clock ID of this PTP instance</p> <p><b>Values</b>      1 to 16 for PTP clocks that use IPv4 or IPv6 encapsulation                   <b>csm</b> for the PTP clock that uses Ethernet encapsulation</p> <p><b>create</b> — keyword required when first creating the configuration context for a <i>clock-id</i> of 1 to 16. When the context is created, you can navigate into the context without the <b>create</b> keyword. The <b>create</b> keyword is not required when the <i>clock-id</i> is <b>csm</b>.</p>

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## anno-rx-timeout

<b>Syntax</b>	<b>anno-rx-timeout</b> <i>number-of-timeouts</i> <b>no anno-rx-timeout</b>
<b>Context</b>	config>system>ptp>clock config>system>ptp>clock>ptp-port
<b>Description</b>	This command defines the number of announce timeouts that need to occur on a PTP slave port or boundary clock port in slave mode before communication messages with a master clock are deemed lost and the master clock is considered not available. One timeout in this context is equal to the announce interval in seconds, calculated using the logarithm $2^{\log-anno-interval}$ .  The <b>no</b> form of this command returns the configuration to the default value.
<b>Default</b>	3
<b>Parameters</b>	<i>number-of-timeouts</i> — specifies the number of timeouts that need to occur before communication messages to a master clock are deemed lost and the master clock is considered not available  <b>Values</b> 2 to 10

## clock-mdm

<b>Syntax</b>	<b>clock-mdm</b> <i>mdm-id</i> <b>no clock-mdm</b>
<b>Context</b>	config>system>ptp>clock
<b>Description</b>	This command configures the adapter card slot that performs the IEEE 1588v2 clock recovery. On the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, and 7705 SAR-Wx, this slot is always 1/1. On the 7705 SAR-X, this slot is always either 1/2 or 1/3.  This command is only available when the <i>clock-id</i> parameter value is 1 to 16.  The <b>no</b> form of this command clears the clock recovery adapter card.
<b>Default</b>	n/a
<b>Parameters</b>	<i>mdm-id</i> — <i>slot/mdm</i>

## clock-type

<b>Syntax</b>	<b>clock-type</b> { <b>ordinary</b> { <b>master</b>   <b>slave</b> }   <b>boundary</b>   <b>transparent-e2e</b> } <b>no clock-type</b>
<b>Context</b>	config>system>ptp>clock
<b>Description</b>	<p>This command configures the type of clock. The <b>no</b> form of the command returns the configuration to the default (ordinary slave). The clock type can only be changed when PTP is shut down.</p> <p>To enable transparent clock processing at the node level, configure a PTP clock with the <b>transparent-e2e</b> clock type. The <b>transparent-e2e</b> clock type is only available for a PTP clock that transmits and receives PTP messages using IPv4 encapsulation.</p>
<b>Default</b>	ordinary slave
<b>Parameters</b>	<p><b>ordinary master</b> — configures the clock as an ordinary PTP master</p> <p><b>ordinary slave</b> — configures the clock as an ordinary PTP slave</p> <p><b>boundary</b> — configures the clock as a boundary clock capable of functioning as both a master and slave concurrently</p> <p><b>transparent-e2e</b> — configures the clock as a transparent clock. This option is only used for a PTP clock that transmits and receives PTP messages using IPv4 encapsulation, and is only available for the following: 7705 SAR-M, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X.</p>

## domain

<b>Syntax</b>	<b>domain</b> <i>domain-value</i> <b>no domain</b>
<b>Context</b>	config>system>ptp>clock
<b>Description</b>	<p>This command defines the PTP device domain as an integer. A domain consists of one device or multiple PTP devices communicating with each other as defined by the protocol. A PTP domain defines the scope of PTP message communication, state, operations, data sets and timescale. A domain is configured because it is possible that a deployment could require two PTP instances within a single network element to be programmed with different domain values.</p> <p>The <b>no</b> form of this command returns the configuration to the default value. The default value varies depending on the configuration of the <a href="#">profile</a> command.</p>
<b>Default</b>	<p>0 when the profile is configured as <b>ieee1588-2008</b>, <b>itu-telecom-freq</b>, or <b>iec-61850-9-3-2016</b></p> <p>24 when the profile is configured as <b>g8275dot1-2014</b></p> <p>44 when the profile is configured as <b>g8275dot2-2016</b></p>

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**Parameters** *domain-value* — specifies the PTP device domain value  
**Values** 0 to 255

## dynamic-peers

**Syntax** **[no] dynamic-peers**

**Context** config>system>ptp>clock

**Description** This command allows a slave clock to connect to the master clock without the master being aware of it. Once connected, the master clock or boundary clock assigns the slave a PTP port and/or peer ID dynamically.

This command is only available when the *clock-id* parameter value is 1 to 16.

Dynamic peers are not stored in the configuration file. If a master clock with dynamic peers goes down and comes back up, the slave clocks renegotiate to it and are reassigned resources on the master clock or boundary clock.

The **no** form of this command disables dynamic peers. In this case, the user must manually program any slave peer clocks into the master clock or boundary clock in order for those clocks to accept those slaves.

**Default** no dynamic-peers

## freq-source

**Syntax** **freq-source {ptp | ssu}**  
**no freq-source**

**Context** config>system>ptp>clock

**Description** This command specifies the administrative frequency source to use for a given PTP clock. This selection influences the operational frequency source selected by the system for the given PTP clock. If PTP is only used for time of day and the node SSU is being synchronized through a better frequency source externally (for example, through the external timing input port) or through line timing (for example, through a synchronous Ethernet or T1/E1 port), SSU may be configured as the frequency source for the PTP clock. This option allows PTP to use the SSU frequency where available.

This command is only available when the *clock-id* parameter value is 1 to 16.

The **no** form of the command returns the configuration to the default setting.

**Default** ptp

- Parameters**    **ptp** — configures the PTP clock to use PTP as the frequency source  
**ssu** — configures the PTP clock to use the SSU as the frequency source

## local-priority

- Syntax**    **local-priority** *priority*  
**no local-priority**
- Context**    config>system>ptp>clock  
config>system>ptp>clock>port  
config>system>ptp>clock>ptp-port
- Description**    This command configures the local priority used to choose between PTP masters in the best master clock algorithm (BMCA). If the PTP [profile](#) is set to **ieee1588-2008** or **itu-telecom-freq**, this parameter is ignored. The priority of the port or local clock can only be configured if the PTP profile is set to **g8275dot1-2014**, **g8275dot2-2016**, or **iec-61850-9-3-2016**. The value of the highest priority is 1 and the value of the lowest priority is 255.
- The **no** form of this command returns the configuration to the default value.
- Default**    128
- Parameters**    *priority* — specifies the local priority for choosing the PTP master for the BMCA
- Values**    1 to 255

## log-anno-interval

- Syntax**    **log-anno-interval** *log-anno-interval*  
**no log-anno-interval**
- Context**    config>system>ptp>clock  
config>system>ptp>clock>ptp-port
- Description**    This command configures the announce message interval used for unicast and multicast messages.
- For unicast messages, this command defines the announce message interval that is requested during unicast negotiation to any peer. This controls the announce message rate sent from remote peers to the local node. It does not affect the announce message rate that may be sent from the local node to remote peers. Remote peers may request an announce message rate anywhere within the acceptable grant range.
- For multicast messages on PTP Ethernet ports, this command configures the message interval used for announce messages transmitted by the local node.

This value also defines the interval between executions of the BMCA within the node. In order to minimize BMCA-driven reconfigurations, the IEEE Std 1588-2008 recommends that the announce interval be consistent across the entire IEEE 1588 network.

The announce message interval cannot be changed unless PTP is shut down.

The *log-anno-interval* is calculated using the binary logarithm of the value of the interval in seconds before message reception. For example, for an announce message interval of 8 packets/s (one packet every 0.125 seconds), set this field to  $\log(\text{base}2)(0.125) = -3$ .

The **no** form of this command returns the configuration to the default value. The default value varies depending on the configuration of the [profile](#) command.

- Default** 1 (1 packet every 2 s) when the profile is configured as **ieee1588-2008**
- 1 (1 packet every 2 s) when the profile is configured as **itu-telecom-freq** for a *clock-id* of 1 to 16 (this profile does not apply when the *clock-id* is **csn**)
- 3 (8 packets/s) when the profile is configured as **g8275dot1-2014** or **g8275dot2-2016** (this profile does not apply when the *clock-id* is **csn**)
- 0 (1 packet/s) when the profile is configured as **iec-61850-9-3-2016** when the *clock-id* is **csn** (this profile does not apply when the *clock-id* is 1 to 16)

**Parameters** *log-anno-interval* — specifies the expected interval between the reception of announce messages. This parameter is specified as the logarithm to the base 2, in seconds.

**Values** -3 to 4, where -3 = 0.125 s, -2 = 0.25 s, -1 = 0.5 s, 0 = 1 s, 1 = 2 s, 2 = 4 s, 3 = 8 s, and 4 = 16 s when the *clock-id* is 1 to 16 (all profiles except for **iec-61850-9-3-2016**) or when the *clock-id* is **csn** and the profile is configured as **ieee1588-2008**, **g8275dot1-2014**, or **iec-61850-9-3-2016** (the **itu-telecom-freq** and **g8275dot2-2016** profiles do not apply when the *clock-id* is **csn**)

## network-type

- Syntax** **network-type** {**sdh** | **sonet**}
- no network-type**
- Context** config>system>ptp>clock
- Description** This command determines whether to use SDH or SONET values for encoding synchronous status messages. This command only applies to synchronous Ethernet ports and is not configurable on SONET/SDH ports. This command is only available when the *clock-id* parameter is defined as **csn**.
- Default** sdh
- Parameters** **sdh** — specifies the values used are as defined in ITU-T G.781 Option 1
- sonet** — specifies the values used are as defined in ITU-T G.781 Option 2

---

## port

<b>Syntax</b>	<b>port</b> <i>port-id</i> [ <b>create</b> ] <b>no port</b> <i>port-id</i>
<b>Context</b>	config>system>ptp>clock
<b>Description</b>	<p>This command configures PTP over Ethernet on the physical port, so that PTP messages are sent and received over the port using Ethernet encapsulation. There are two reserved multicast addresses allocated for PTP messages (see Annex F of IEEE Std 1588- 2008 and the <a href="#">address</a> command). Either address can be configured for the PTP messages sent through this port.</p> <p>The adapter card, module, or fixed platform containing the specified port cannot be deprovisioned while the port is configured for PTP. A port configured for dot1q or qinq encapsulation can be configured as the physical port for PTP over Ethernet. The encapsulation type and the Ethernet port type cannot be changed when PTP Ethernet multicast operation is configured on the port.</p> <p>This command is only available when the <i>clock-id</i> parameter is defined as <b>csn</b>.</p>
<b>Default</b>	n/a
<b>Parameters</b>	<i>port-id</i> — specifies the physical port in the format <i>slot/mda/port</i>

## address

<b>Syntax</b>	<b>address</b> { <b>01:1b:19:00:00:00</b>   <b>01:80:c2:00:00:0e</b> } <b>no address</b>
<b>Context</b>	config>system>ptp>clock>port
<b>Description</b>	<p>This command configures the MAC address to be used as the multicast destination MAC address for transmitted PTP messages. The IEEE Std 1588-2008 Annex F defines the two reserved addresses for PTP messages as:</p> <ul style="list-style-type: none"><li>• 01-1B-19-00-00-00 for all messages except peer delay messages</li><li>• 01-80-C2-00-00-0E for peer delay messages</li></ul> <p>The system will accept PTP messages received using either destination MAC address, regardless of the address configured by this command.</p> <p>The <b>no</b> form of this command returns the address to the default value.</p>
<b>Default</b>	01:1b:19:00:00:00



## log-delay-interval

<b>Syntax</b>	<b>log-delay-interval</b> <i>log-delay-interval</i> <b>no log-delay-interval</b>
<b>Context</b>	config>system>ptp>clock>port
<b>Description</b>	<p>This command configures the minimum interval between multicast Delay_Req or PDelay messages for PTP with Ethernet encapsulation. This parameter is applied on a per-port basis and does not apply to peers. PTP slave ports use this interval unless the parent port indicates a longer interval. PTP master ports advertise this interval to external slave ports as the minimum acceptable interval for Delay_Req or PDelay messages from those slave ports. The 7705 SAR supports the IEEE 1588 requirement that a port in slave mode check the logMessageInterval field of received multicast Delay_Resp or PDelay messages. If the value of the logMessageInterval field for those messages is greater than the value configured locally to generate Delay_Req or PDelay messages, the slave port must use the longer interval for generating Delay_Req or PDelay messages.</p> <p>The <i>log-delay-interval</i> is calculated using the binary logarithm of the value of the interval in seconds.</p> <p>The <i>log-delay-interval</i> is only applicable when the <i>clock-id</i> is <b>csn</b>. For PTP with IP encapsulation (<i>clock-id</i> is 1 to 16), the value configured for the <i>log-sync-interval</i> is also used as the interval for Delay_Req messages.</p> <p>The <b>no</b> form of this command returns the configuration to the default value. The default value varies depending on the configuration of the <a href="#">profile</a> command.</p>
<b>Default</b>	<p>–6 when the profile is configured as <b>ieee1588-2008</b></p> <p>–4 when the profile is configured as <b>g8275dot1-2014</b></p> <p>0 when the profile is configured as <b>iec-61850-9-3-2016</b></p>
<b>Parameters</b>	<p><i>log-delay-interval</i> — specifies the expected interval between the receipt of Delay_Req or PDelay messages</p> <p><b>Values</b> –6 to 0, where –6 is 64 packets/s, –5 is 32 packets/s, –4 is 16 packets/s, –3 is 8 packets/s, –2 is 4 packets/s, –1 is 2 packets/s, and 0 is 1 packet/s, when the profile is configured as <b>ieee1588-2008</b>, <b>g8275dot1-2014</b>, or <b>iec-61850-9-3-2016</b></p>

## log-sync-interval

<b>Syntax</b>	<b>log-sync-interval</b> <i>log-sync-interval</i> <b>no log-sync-interval</b>
<b>Context</b>	config>system>ptp>clock>port config>system>ptp>clock>ptp-port

<b>Description</b>	<p>This command configures the interval between transmission of synchronization packets for a PTP port in a master state. For PTP with IP encapsulation (<i>clock-id</i> is 1 to 16), this value is also used as the interval for Delay_Req messages for this clock.</p> <p>The <b>no</b> form of this command returns the configuration to the default value. The default value varies depending on the configuration of the <a href="#">profile</a> command.</p>
<b>Default</b>	<p>–6 when the profile is configured as <b>ieee1588-2008</b></p> <p>–6 when the profile is configured as <b>itu-telecom-freq</b> for a <i>clock-id</i> of 1 to 16 (this profile does not apply when the <i>clock-id</i> is <b>csn</b>)</p> <p>–4 when the profile is configured as <b>g8275dot1-2014</b> or <b>g8275dot2-2016</b> (this profile does not apply when the <i>clock-id</i> is <b>csn</b>)</p> <p>0 when the profile is configured as <b>iec-61850-9-3-2016</b> when the <i>clock-id</i> is <b>csn</b> (this profile does not apply when the <i>clock-id</i> is 1 to 16)</p>
<b>Parameters</b>	<p><i>log-sync-interval</i> — specifies the expected interval between the reception of synchronization messages</p> <p><b>Values</b>      –7 to –4, where –7 is 128 packets/s, –6 is 64 packets/s, –5 is 32 packets/s, and –4 is 16 packets/s, when the <i>clock-id</i> is 1 to 16 (all profiles except for <b>iec-61850-9-3-2016</b>)</p> <p>                  –6 to 0, where –6 is 64 packets/s, –5 is 32 packets/s, –4 is 16 packets/s, –3 is 8 packets/s, –2 is 4 packets/s, –1 is 2 packets/s, and 0 is 1 packet/s, when the <i>clock-id</i> is <b>csn</b> and the profile is configured as <b>ieee1588-2008</b>, <b>g8275dot1-2014</b>, or <b>iec-61850-9-3-2016</b> (the <b>itu-telecom-freq</b> and <b>g8275dot2-2016</b> profiles do not apply when the <i>clock-id</i> is <b>csn</b>)</p>

## master-only

<b>Syntax</b>	<b>master-only {true   false}</b>
<b>Context</b>	<pre>config&gt;system&gt;ptp&gt;clock&gt;port config&gt;system&gt;ptp&gt;clock&gt;ptp-port</pre>
<b>Description</b>	<p>This command prevents the local port from ever entering the slave state. This ensures that the 7705 SAR never draws synchronization from an attached external device.</p> <p>This command only applies when the <a href="#">profile</a> command is set to <b>g8275dot1-2014</b> or <b>g8275dot2-2016</b>.</p> <p>If the <b>clock-type</b> command is set to <b>ordinary slave</b>, the <b>master-only</b> value is set to <b>false</b> and cannot be changed. Similarly, if the <b>clock-type</b> command is set to <b>ordinary master</b>, the <b>master-only</b> value is set to <b>true</b> and cannot be changed.</p>
<b>Default</b>	true (when the PTP <b>clock-type</b> is set to <b>boundary</b> )

## priority1

<b>Syntax</b>	<b>priority1</b> <i>priority-value</i> <b>no priority1</b>
<b>Context</b>	config>system>ptp>clock
<b>Description</b>	<p>This command configures the first priority value of the local clock. This value is used by the BMCA to determine which clock should provide timing for the network. It is also used as the advertised value in announce messages and as the local clock value in data set comparisons.</p> <p>When the <a href="#">profile</a> command is set to <b>g8275dot1-2014</b> or <b>g8275dot2-2016</b>, the priority1 value is set to the default value of 128 and cannot be changed.</p> <p>The <b>no</b> form of the command returns the configuration to the default value.</p>
<b>Default</b>	128
<b>Parameters</b>	<p><i>priority</i> — specifies the priority1 value of the local clock</p> <p><b>Values</b> 0 to 255</p>

## priority2

<b>Syntax</b>	<b>priority2</b> <i>priority-value</i> <b>no priority2</b>
<b>Context</b>	config>system>ptp>clock
<b>Description</b>	<p>This command configures the second priority value of the local clock. This value is used by the BMCA to determine which clock should provide timing for the network. It is also used as the advertised value in announce messages and as the local clock value in data set comparisons.</p> <p>When the <a href="#">profile</a> command is set to <b>g8275dot1-2014</b> or <b>g8275dot2-2016</b> and the <a href="#">clock-type</a> is configured as <b>ordinary slave</b>, the priority2 value is set to the default value of 255 and cannot be changed.</p> <p>The <b>no</b> form of the command returns the configuration to the default value.</p>
<b>Default</b>	<p>128, when the clock type is configured as ordinary master or boundary</p> <p>255, when the clock type is configured as ordinary slave</p>
<b>Parameters</b>	<p><i>priority</i> — specifies the priority2 value of the local clock</p> <p><b>Values</b> 0 to 255 when the profile is configured as <b>ieee1588-2008</b> or <b>iec-61850-9-3-2016</b>, or when the profile is configured as <b>g8275dot1-2014</b> or <b>g8275dot2-2016</b> and the clock type is configured as <b>ordinary master</b> or <b>boundary</b></p>

## profile

<b>Syntax</b>	<b>profile</b> { <b>g8275dot1-2014</b>   <b>g8275dot2-2016</b>   <b>ieee1588-2008</b>   <b>itu-telecom-freq</b>   <b>iec-61850-9-3-2016</b> } <b>no profile</b>
<b>Context</b>	config>system>ptp>clock
<b>Description</b>	This command defines the specification rules to be used by PTP. Configuring the profile changes the BMCA and SSM/QL mappings to match the settings in the specification. The profile can only be changed when PTP is shut down. Changing the profile changes the domain to the default value of the new profile.  The <b>no</b> form of the command returns the configuration to the default setting.
<b>Default</b>	ieee1588-2008
<b>Parameters</b>	<b>g8275dot1-2014</b> — configures the PTP profile to follow the ITU G.8275.1 specification rules  <b>g8275dot2-2016</b> — configures the PTP profile to follow the ITU G.8275.2 specification rules; this option is only available when the <i>clock-id</i> parameter value is 1 to 16  <b>ieee1588-2008</b> — configures the PTP profile to follow the IEEE 1588-2008 specification rules  <b>itu-telecom-freq</b> — configures the PTP profile to follow the ITU G.8265.1 specification rules; this option is only available when the <i>clock-id</i> parameter value is 1 to 16  <b>iec-61850-9-3-2016</b> — configures the PTP profile to follow the IEC/IEEE 61850-9-3 specification rules; this option is only available when the <i>clock-id</i> parameter value is <b>csm</b>

## ptp-port

<b>Syntax</b>	<b>ptp-port</b> <i>port-id</i>
<b>Context</b>	config>system>ptp>clock
<b>Description</b>	This command configures an IEEE 1588v2 logical port in the system. It also enables the context to configure parameters for IEEE 1588v2. PTP ports are created when the clock type is set with the <a href="#">clock-type</a> command.  This command is only available when the <i>clock-id</i> parameter value is 1 to 16.  When the clock type is set to ordinary slave, one port with 2 peers is created. When the clock type is set to ordinary master, one port with 50 peers is created. When the clock type is set to boundary clock, 50 ports each with 1 peer are created.



**Note:** When the clock type is set to transparent, PTP is associated with all ports on the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, or 7705 SAR-X, rather than on individual ports, because transparent clock is a system-wide setting.

**Default** n/a

**Parameters** *port-id* — specifies the PTP port ID

**Values** 1 to 50

## peer

**Syntax** **peer** *peer-id*

**Context** config>system>ptp>clock>ptp-port

**Description** This command enables the context to configure parameters associated with remote PTP peers such as grand master clocks.

For ordinary slave clocks, 2 peers are automatically created. For ordinary master clocks, 50 peers are automatically created. For boundary clocks, 1 peer per PTP port is automatically created.

The **no** form of the command removes the IP address from the PTP peer.

**Default** n/a

**Parameters** *peer-id* — specifies the PTP peer ID

**Values** 1 to 2 (ordinary slave)  
1 to 50 (ordinary master)  
1 (boundary)

## ip-address

**Syntax** **ip-address** {*ip-address* | *ipv6-address*}  
**no ip-address**

**Context** config>system>ptp>clock>ptp-port>peer

**Description** This command configures a remote PTP peer address and enables the context to configure parameters for the remote PTP peer.

Up to two remote PTP peers may be configured on a PTP port.

The **no** form of the command removes the IP address from the PTP peer.

<b>Default</b>	n/a
<b>Parameters</b>	<i>ip-address</i> — specifies the IPv4 or IPv6 address of the remote peer
	<b>Values</b>
	<i>ip-address</i> : a.b.c.d
	<i>ipv6-address</i> : x:x:x:x:x:x:x (eight 16-bit pieces)
	x:x:x:x:x:d.d.d.d
	x: [0 to FFFF]H
	d: [0 to 255]D

## unicast-negotiate

<b>Syntax</b>	<b>[no] unicast-negotiate</b>
<b>Context</b>	config>system>ptp>clock>ptp-port
<b>Description</b>	This command specifies whether the slave clock is to initiate a unicast request to the master clock or wait for announce and synchronization messages from the master clock.  The <b>no</b> form of this command disables <b>unicast-negotiate</b> . In this case, the user must specify the slave clock information when configuring the 7705 SAR master node in order for communication between the slave clock and master clock to take place.
<b>Default</b>	unicast-negotiate

## source-interface

<b>Syntax</b>	<b>source-interface</b> <i>ip-int-name</i> <b>no source-interface</b>
<b>Context</b>	config>system>ptp>clock
<b>Description</b>	This command defines the IP interface that provides the IEEE 1588 packets to the clock recovery mechanism on the adapter card or port. The interface must be PTP-enabled.  This command only applies when the <i>clock-id</i> parameter value is 1 to 16.  If the <i>ip-int-name</i> refers to a loopback or system address, the remote peer can send packets toward any network IP interface. If the <i>ip-int-name</i> refers to an interface that is associated with a physical port or VLAN, the remote peer must send packets to ingress on that particular IP interface.
<b>Default</b>	n/a
<b>Parameters</b>	<i>ip-int-name</i> — specifies the IP interface used by the PTP slave clock

## tx-while-sync-uncertain

<b>Syntax</b>	<b>[no] tx-while-sync-uncertain</b>
<b>Context</b>	config>system>ptp>clock
<b>Description</b>	<p>This command enables or disables the transmission of Announce messages to downstream clocks if the PTP network has not yet stabilized. In some cases, it may be important for a downstream boundary clock or slave clock to know whether the PTP network has stabilized or is still “synchronization uncertain”.</p> <p>To indicate the synchronization certainty state, the synchronizationUncertain flag in the Announce message is set to TRUE if the clock is in a “synchronization uncertain” state and is set to FALSE if the clock is in a “synchronization certain” state.</p> <p>However, because the synchronizationUncertain flag is newly agreed upon in standards, most base station slave clocks do not look at this bit. Therefore, in order to ensure that the downstream clocks are aware of the state of the network, the PTP clock may be configured to transmit Announce and Sync messages only if the clock is in a “synchronization certain” state. This is done using the <b>no</b> form of this command.</p>
<b>Default</b>	tx-while-sync-uncertain

## use-node-time

<b>Syntax</b>	<b>[no] use-node-time</b>
<b>Context</b>	config>system>ptp>clock
<b>Description</b>	<p>This command determines whether the PTP clock will generate event messages based on system time.</p> <p>To enable ToD/phase distribution capability in a master or boundary clock, select <b>use-node-time</b>. This allows PTP master or boundary clocks to use the node system time from GNSS or PTP. For a 7705 SAR with an active GNSS receiver port, PTP boundary clocks in <b>use-node-time</b> mode will function similar to a grand master clock with GNSS traceability.</p> <p>This command only applies to master or boundary clocks when:</p> <ul style="list-style-type: none"> <li>the profile setting for the PTP clock is <b>ieee1588-2008</b> (default configuration), <b>g8275dot1-2014</b>, or <b>g8275dot2-2016</b> (see the <a href="#">profile</a> command for the <b>config&gt;system&gt;ptp&gt;clock</b> context)</li> <li>the <i>clock-id</i> parameter value is 1 to 16</li> </ul>
<b>Default</b>	no use-node-time
	use-node-time when the profile for the master clock is configured as <b>g8275dot1-2014</b>

## 6.13.2.2 Administration Commands

- [System Administration Commands](#)
- [High Availability \(Redundancy\) Commands](#)



### 6.13.2.2.1 System Administration Commands

#### admin

<b>Syntax</b>	<b>admin</b>
<b>Context</b>	<ROOT>
<b>Description</b>	This command enables the context to configure administrative system commands. Only authorized users can execute the commands in the <b>admin</b> context.
<b>Default</b>	n/a

#### debug-save

<b>Syntax</b>	<b>debug-save</b> <i>file-url</i>
<b>Context</b>	admin
<b>Description</b>	This command saves existing debug configuration. Debug configurations are not preserved in configuration saves.
<b>Default</b>	n/a
<b>Parameters</b>	<i>file-url</i> — the file URL location to save the debug configuration (see <a href="#">Table 15</a> for parameter descriptions)

#### disconnect

<b>Syntax</b>	<b>disconnect</b> { <b>address</b> <i>ip-address</i>   <b>username</b> <i>user-name</i>   <b>console</b>   <b>telnet</b>   <b>ftp</b>   <b>ssh</b>   <b>mct</b> }
<b>Context</b>	admin
<b>Description</b>	<p>This command disconnects a user from a console, Telnet, FTP, SSH, SFTP, or MPT craft terminal (MCT) session.</p> <p>If any of the console, Telnet, FTP, SSH, or MCT options are specified, then only the respective sessions are affected. The <b>ssh</b> keyword disconnects users connected to the node via SSH or SFTP.</p> <p>If no console, Telnet, FTP, SSH, or MCT options are specified, then all sessions from the IP address or from the specified user are disconnected.</p> <p>Any task that the user is executing is terminated. FTP files accessed by the user will not be removed. A major severity security log event is created, specifying what was terminated and by whom.</p>

<b>Default</b>	n/a — no disconnect options are configured
<b>Parameters</b>	<i>ip-address</i> — the IP address to disconnect
<b>Values</b>	<i>ip-int-name</i> : 32 characters maximum <i>ipv4-address</i> : a.b.c.d <i>ipv6-address</i> : x:x:x:x:x:x:x (eight 16-bit pieces) x:x:x:x:x:d.d.d.d x: [0..FFFF]H d: [0..255]D
	<i>user-name</i> — the name of the user
	<b>console</b> — disconnects the console session
	<b>telnet</b> — disconnects the Telnet session
	<b>ftp</b> — disconnects the FTP session
	<b>ssh</b> — disconnects the SSH or SFTP session
	<b>mct</b> — disconnects the MCT session

## display-config

<b>Syntax</b>	<b>display-config</b> [ <b>detail</b>   <b>index</b> ]
<b>Context</b>	admin
<b>Description</b>	<p>This command displays the system's running configuration.</p> <p>By default, only non-default settings are displayed.</p> <p>Specifying the <b>detail</b> option displays all default and non-default configuration parameters.</p>
<b>Parameters</b>	<b>detail</b> — displays default and non-default configuration parameters <b>index</b> — displays only persistent indexes

## reboot

<b>Syntax</b>	<b>reboot</b> [ <b>active</b>   <b>standby</b> ]   [ <b>upgrade</b> ] [ <b>now</b> ]
<b>Context</b>	admin
<b>Description</b>	<p>This command reboots the router including redundant CSMs or upgrades the boot ROMs.</p> <p>If no options are specified, the user is prompted to confirm the reboot operation. For example:</p> <pre>ALU-1&gt;admin# reboot Are you sure you want to reboot (y/n)?</pre>

If the **now** option is specified, no boot confirmation messages appear.

**Parameters**    **active** — keyword to reboot the active CSM

**Default**    active

**standby** — keyword to reboot the standby CSM

**Default**    active

**upgrade** — enables card firmware to be upgraded during chassis reboot. The 7705 SAR and the boot.ldr support functionality to perform automatic firmware upgrades on CSMs. The automatic upgrade must be enabled in the 7705 SAR Command Line Interface (CLI) when rebooting the system.

When the **upgrade** keyword is specified, a chassis flag is set for the Boot Loader (boot.ldr) and on the subsequent boot of the 7705 SAR on the chassis, any firmware images on CSMs requiring upgrading will be upgraded automatically.

If a 7705 SAR is rebooted with the “admin reboot” command (without the “upgrade” keyword), the firmware images are left intact.

Any CSMs that are installed in the chassis will be upgraded automatically. For example, if a card is inserted with down revision firmware as a result of a card hot swap with the latest OS version running, the firmware on the card will be automatically upgraded before the card is brought online.

If the card firmware is upgraded automatically, a CHASSIS “cardUpgraded” (event 2032) log event is generated. The corresponding SNMP trap for this log event is “tmnxEqCardFirmwareUpgraded”.

During any firmware upgrade, automatic or manual, it is imperative that during the upgrade procedure:

- power must NOT be switched off or interrupted
- the system must NOT be reset
- no cards are inserted or removed

Any of the above conditions may render cards inoperable requiring a return of the card for resolution.

The time required to upgrade the firmware on the cards in the chassis depends on the number of cards to be upgraded. On system reboot, the firmware upgrades can take from approximately 3 minutes (for a minimally loaded 7705 SAR) to 8 minutes (for a fully loaded 7705 SAR chassis), after which the configuration file will be loaded. The progress of the firmware upgrades can be monitored at the console. Inserting a single card requiring a firmware upgrade in a running system generally takes less than 2 minutes before the card becomes operationally up.

**now** — forces a reboot of the router immediately without an interactive confirmation

## save

<b>Syntax</b>	<b>save</b> [ <i>file-url</i> ] [ <b>detail</b> ] [ <b>index</b> ]
<b>Context</b>	admin
<b>Description</b>	This command saves the running configuration to a configuration file. For example:  <pre>ALU-1&gt;admin# save ftp://test:test@192.168.x.xx/./100.cfg Saving configuration .....Completed.</pre> <p>By default, the running configuration is saved to the primary configuration file.</p>
<b>Parameters</b>	<p><i>file-url</i> — the file URL location to save the configuration file (see <a href="#">Table 15</a> for parameter descriptions)</p> <p><b>Default</b> — the primary configuration file location</p> <p><b>detail</b> — saves both default and non-default configuration parameters</p> <p><b>Default</b> — saves non-default configuration parameters</p> <p><b>index</b> — forces a save of the persistent index file regardless of the persistent status in the BOF file. The index option can also be used to avoid an additional boot required while changing your system to use the persistence indexes.</p>

## enable-tech

<b>Syntax</b>	[no] <b>enable-tech</b>
<b>Context</b>	admin
<b>Description</b>	This command enables the shell and kernel commands.



**Note:** This command should only be used with authorized direction from the Nokia Technical Assistance Center (TAC).

## tech-support

<b>Syntax</b>	<b>tech-support</b> <i>file-url</i>
<b>Context</b>	admin
<b>Description</b>	This command creates a system core dump.

If the *file-url* is omitted, and a [ts-location](#) has previously been defined, the tech-support file will get an automatic 7705 SAR generated filename based on the system name, date, and time, and the file will be saved to the directory indicated by the configured **ts-location**.

The format of the auto-generated filename is `ts-xxxxx.yyyymmdd.hhmmUTC.dat`, where:

- `xxxxx` is the system name with any special characters expanded to avoid problems with file systems (for example, a period (“.”) is expanded to “%2E.”)
- `yyymmdd` is the date, with leading zeros on year, month, and day
- `hhmm` are the hours and minutes in UTC time (24-hour format, always 4 characters, with leading zeros on the hours and minutes)



**Note:** This command should only be used with authorized direction from the Nokia Technical Assistance Center (TAC).

**Parameters** *file-url* — the file URL location to save the binary file (see [Table 15](#) for parameter descriptions)

## ts-location

**Syntax** **ts-location** *file-url*  
**no ts-location**

**Context** `config>system>security>tech-support`

**Description** This command specifies a location for the auto-generated filename that is created if the *file-url* parameter is not used in the [tech-support](#) command. The file is automatically assigned a name and saved to the configured location only if this **ts-location** command has first been configured; otherwise, the *file-url* parameter must be configured in the **tech-support** command to provide this information.

The directory specified for the **ts-location** is not automatically created by the 7705 SAR; it must already exist.

**Parameters** *file-url* — the file URL location to save the binary file (see [Table 15](#) for parameter descriptions)

## update

**Syntax** **update boot-loader** *file-url*

**Context** `admin`

**Description** This command upgrades the boot loader file on the system. The command checks that the new **boot.ldr** is a valid image and that it is at least a minimum supported variant for the hardware platform on which it is being loaded. Once this has been verified, the command overwrites the **boot.ldr** file that is stored on the system.

---

Nokia recommends that the boot loader file on all 7705 SAR platforms be upgraded using this command. This command is mandatory on all 7705 SAR platforms that do not have a removable compact flash drive and is part of a mechanism that protects the boot loader file from accidental overwrites on these platforms.



**Warning:** The file upgrade command takes several minutes to complete. Do not reset or power down the system, or insert or remove cards or modules, while the upgrade is in progress, as this could render the system inoperable.

Refer to the latest 7705 SAR Software Release Notes, “Standard Software Upgrade Procedure” section, for complete instructions.

**Parameters** *file-url* — the file URL location to use for upgrading the **boot.ldr** file (see [Table 15](#) for parameter descriptions)

**Default** the new **boot.ldr** file location

### 6.13.2.2.2 High Availability (Redundancy) Commands

#### redundancy

<b>Syntax</b>	<b>redundancy</b>
<b>Context</b>	admin config
<b>Description</b>	This command enters the context to allow the user to perform redundancy operations.

#### force-switchover

<b>Syntax</b>	<b>force-switchover [now]</b>
<b>Context</b>	admin>redundancy
<b>Description</b>	This command forces a switchover to the standby CSM card. The primary CSM reloads its software image and becomes the secondary CSM.
<b>Parameters</b>	<b>now</b> — forces the switchover to the redundant CSM card immediately

#### switchover-exec

<b>Syntax</b>	<b>switchover-exec <i>file-url</i></b> <b>no switchover-exec</b>
<b>Context</b>	config>system
<b>Description</b>	This command specifies the location and name of the CLI script file executed following a redundancy switchover from the previously active CSM card. A switchover can happen because of a fatal failure or by manual action.  The CLI script file can contain commands for environment settings, debug settings, and other commands not maintained by the configuration redundancy.  When the <i>file-url</i> parameter is not specified, no CLI script file is executed.
<b>Default</b>	n/a
<b>Parameters</b>	<i>file-url</i> — specifies the location and name of the CLI script file (see <a href="#">Table 15</a> for parameter descriptions)

---

## synchronize

<b>Syntax</b>	<b>synchronize</b> { <b>boot-env</b>   <b>config</b> }
<b>Context</b>	admin>redundancy config>redundancy
<b>Description</b>	<p>This command performs a synchronization of the standby CSM's images and/or config files to the active CSM. Either the <b>boot-env</b> or <b>config</b> parameter must be specified.</p> <p>In the <b>admin&gt;redundancy</b> context, this command performs a manually triggered standby CSM synchronization.</p> <p>In the <b>config&gt;redundancy</b> context, this command performs an automatically triggered standby CSM synchronization.</p> <p>When the standby CSM takes over operation following a failure or reset of the active CSM, it is important to ensure that the active and standby CSMs have identical operational parameters. This includes the saved configuration and CSM images.</p> <p>The active CSM ensures that the active configuration is maintained on the standby CSM. However, to ensure smooth operation under all circumstances, runtime images and system initialization configurations must also be automatically synchronized between the active and standby CSM.</p> <p>If synchronization fails, alarms and log messages that indicate the type of error that caused the failure of the synchronization operation are generated. When the error condition ceases to exist, the alarm is cleared.</p> <p>Only files stored on the router are synchronized. If a configuration file or image is stored in a location other than on a local compact flash, the file is not synchronized (for example, storing a configuration file on an FTP server).</p>
<b>Default</b>	n/a for admin — redundancy context  enabled for config — redundancy context
<b>Parameters</b>	<b>boot-env</b> — synchronizes all files required for the boot process (loader, BOF, images, and configuration files)  <b>config</b> — synchronizes only the primary, secondary, and tertiary configuration files  <b>Default</b> config



---

## cert-sync

<b>Syntax</b>	<b>[no] cert-sync</b>
<b>Context</b>	config>redundancy
<b>Description</b>	This command automatically synchronizes the certificate/CRL/key when importing the certificate or generating the key. If a new compact flash card is inserted into the backup CSM, the system will synchronize the whole <b>cf3:/system-pki</b> directory from the active CSM.
<b>Default</b>	cert-sync

## multi-chassis

<b>Syntax</b>	<b>multi-chassis</b>
<b>Context</b>	config>redundancy
<b>Description</b>	This command enables the context to configure multi-chassis parameters.

## peer

<b>Syntax</b>	<b>[no] peer <i>ip-address</i> [create]</b>
<b>Context</b>	config>redundancy>multi-chassis
<b>Description</b>	This command configures a multi-chassis redundancy peer.
<b>Parameters</b>	<i>ip-address</i> — specifies a peer IP address. A multicast address is not allowed. <b>create</b> — keyword required when first creating the configuration context. When the context is created, you can navigate into the context without the <b>create</b> keyword.

## authentication-key

<b>Syntax</b>	<b>authentication-key [<i>authentication-key</i>   <i>hash-key</i>] [<b>hash</b>   <b>hash2</b>] <b>no authentication-key</b></b>
<b>Context</b>	config>redundancy>multi-chassis>peer
<b>Description</b>	This command configures the authentication key used between this node and the multi-chassis peer. The authentication key can be any combination of letters or numbers.
<b>Parameters</b>	<i>authentication-key</i> — specifies the authentication key. Allowed values are any string up to 20 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

*hash-key* — specifies the hash key. The key can be any combination of ASCII characters up to 33 (*hash1-key*) or 55 (*hash2-key*) characters in length (encrypted). If spaces are used in the string, the entire string must be enclosed within double quotes.

**hash** — specifies that the key is entered in an encrypted form. If the **hash** or **hash2** parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the **hash** or **hash2** parameter specified.

**hash2** — specifies that the key is entered in a more complex encrypted form that involves more variables than the key value alone. This means that a hash2 encrypted variable cannot be copied and pasted. If the **hash** or **hash2** parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the **hash** or **hash2** parameter specified.

## description

<b>Syntax</b>	<b>description</b> <i>description-string</i> <b>no description</b>
<b>Context</b>	config>redundancy>multi-chassis>peer
<b>Description</b>	This command configures a text description and associates it with a configuration context to help identify the content in a configuration file.  The <b>no</b> form of the command removes the string from the configuration.
<b>Default</b>	n/a
<b>Parameters</b>	<i>description-string</i> — specifies the text description  <b>Values</b> any string of 7-bit ASCII characters, up to 80 characters in length; the entire string must be enclosed in double quotes if it contains any special characters

## mc-firewall

<b>Syntax</b>	<b>[no] mc-firewall</b>
<b>Context</b>	config>redundancy>multi-chassis>peer
<b>Description</b>	This command enables the context to configure parameters on the multi-chassis link (MCL), which enables the multi-chassis firewall function.  The <b>no</b> form of this command administratively disables multi-chassis firewall. The <b>no mc-firewall</b> command can only be issued when multi-chassis firewall is shut down.
<b>Default</b>	n/a

## boot-timer

<b>Syntax</b>	<b>boot-timer</b> <i>interval</i> <b>no boot-timer</b>
<b>Context</b>	config>redundancy>multi-chassis>peer>mc-firewall
<b>Description</b>	This command configures a boot timer interval for the MCL. This command applies when either router reboots. It specifies how long the multi-chassis firewall protocol attempts to establish a connection between the peers before assuming a failure of the remote peer. This is different from the keepalive mechanism that is used once the peer-to-peer communication has been established. If the boot timer interval expires before a connection between the two peers is established, both multi-chassis firewall peers will return to standalone firewall operation.  The <b>no</b> form of this command resets the interval to the default value.
<b>Default</b>	300 s
<b>Parameters</b>	<i>interval</i> — the boot timer interval, in seconds <b>Values</b> 1 to 600

## encryption

<b>Syntax</b>	<b>[no] encryption</b>
<b>Context</b>	config>redundancy>multi-chassis>peer>mc-firewall
<b>Description</b>	This command enables the context to configure encryption and/or authentication algorithms to secure the multi-chassis firewall link. The <b>no</b> form of the command disables encryption.
<b>Default</b>	no encryption

## active-outbound-sa

<b>Syntax</b>	<b>active-outbound-sa</b> <i>active-outbound-sa</i> <b>no active-outbound-sa</b>
<b>Context</b>	config>redundancy>multi-chassis>peer>mc-firewall>encryption
<b>Description</b>	This command identifies the active security association (SA) to be used for encrypting packets on the multi-chassis firewall link. On egress, only the active outbound SA is used to encrypt packets. On ingress, both SAs can be used to decrypt the arriving packets; this mechanism is used for rolling over the encryption and authentication keys.  The <b>no</b> form of the command resets the parameter to its default value.
<b>Default</b>	no active-outbound-sa

---

**Parameters** *active-outbound-sa* — the index number (SPI) of the active security association  
**Values** 1 to 1023

## authen-algorithm

**Syntax** **authen-algorithm** *authen-algorithm*  
**no authen-algorithm**

**Context** config>redundancy>multi-chassis>peer>mc-firewall>encryption

**Description** This command configures the authentication algorithm for the MCL.  
 The **no** form of the command resets the parameter to its default value.

**Default** sha256

**Parameters** *authen-algorithm* — the algorithm used to authenticate the MCL  
**Values** sha256 or sha512

## encryp-algorithm

**Syntax** **encryp-algorithm** *encryp-algorithm*  
**no encryp-algorithm**

**Context** config>redundancy>multi-chassis>peer>mc-firewall>encryption

**Description** This command configures the encryption algorithm for the MCL.  
 The **no** form of the command resets the parameter to its default value.

**Default** aes128

**Parameters** *encryp-algorithm* — the algorithm used to encrypt the MCL  
**Values** aes128 or aes256

## security-association

**Syntax** **security-association spi** *spi authentication-key authentication-key encryption-key encryption-key* [**hash** | **hash2**]  
**no security-association spi** *spi*

**Context** config>redundancy>multi-chassis>peer>mc-firewall>encryption

**Description** This command creates a security association index for encryption of the MCL. The command is also used to enter the authentication and encryption key values for the security association, or to delete the security association. A security association contains the keys needed to encrypt and authenticate the link and is identified using an SPI. There can be two security association indexes under encryption. These two indexes can be used for rolling over the keys.

The **no** form of the command deletes the SPI.

**Default** no security-association spi

**Parameters** *spi* — the index for this security association

**Values** 1 to 1023

*authentication-key* — the authentication key for the security association, either in hexadecimal format (up to 128 hexadecimal nibbles) or as a hash key.

**Values** 0x0 to 0xFFFFFFFF or *hash-key*

*encryption-key* — the encryption key for the security association, either in hexadecimal format (up to 64 hexadecimal nibbles) or as a hash key

**Values** 0x0 to 0xFFFFFFFF or *hash-key*

*hash-key* — the hash key. The key can be any combination of ASCII characters up to 33 (hash1-key) or 55 (hash2-key) characters in length (encrypted). If spaces are used in the string, the entire string must be enclosed within double quotes.

**hash** — specifies that the key is entered in an encrypted form. If the **hash** parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the **hash** or **hash2** parameter specified.

**hash2** — specifies that the key is entered in a more complex encrypted form that involves more variables than the key value alone. This means that a hash2 encrypted variable cannot be copied and pasted. If the **hash2** parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the **hash** or **hash2** parameter specified.

## hold-on-neighbor-failure

**Syntax** **hold-on-neighbor-failure** *multiplier*  
**no hold-on-neighbor-failure**

**Context** config>redundancy>multi-chassis>peer>mc-firewall

**Description** This command specifies the number of keepalive intervals that the local router will wait for packets from the multi-chassis firewall peer before assuming that the remote router has failed. If the configured number of intervals is reached before the local router receives packets from the peer, both routers will return to standalone firewall operation.

---

The **no** form of this command resets the number of intervals to the default value.

**Default** 3

**Parameters** *multiplier* — the number of keepalive intervals

**Values** 2 to 25

## keep-alive-interval

**Syntax** **keep-alive-interval** *interval*  
**no keep-alive-interval**

**Context** config>redundancy>multi-chassis>peer>mc-firewall

**Description** This command sets the interval at which keepalive messages are exchanged between the two routers participating in a multi-chassis firewall. These keepalive messages are used to determine whether the remote router has failed.

The **no** form of the command resets the interval to its default value.

**Default** 10 (1 s)

**Parameters** *interval* — the time interval expressed in deciseconds

**Values** 5 to 500

## system-priority

**Syntax** **system-priority** *value*  
**no system-priority**

**Context** config>redundancy>multi-chassis>peer>mc-firewall

**Description** This command configures the system priority for the routers participating in a multi-chassis firewall. The router configured with the lowest value becomes the master. If system priority is the same for both routers, the router with the lowest system ID (chassis MAC address) becomes the master.

The **no** form of this command resets the system priority to the default value.

**Default** 0

**Parameters** *value* — the priority of the local multi-chassis firewall peer

**Values** 1 to 255

---

## mc-lag

<b>Syntax</b>	<b>[no] mc-lag</b>
<b>Context</b>	config>redundancy>multi-chassis>peer
<b>Description</b>	This command enables the context to configure multi-chassis LAG parameters.  The <b>no</b> form of this command administratively disables multi-chassis LAG. The <b>no mc-lag</b> command can only be issued only when MC-LAG is shut down.
<b>Default</b>	n/a

## hold-on-neighbor-failure

<b>Syntax</b>	<b>hold-on-neighbor-failure</b> <i>multiplier</i> <b>no hold-on-neighbor-failure</b>
<b>Context</b>	config>redundancy>multi-chassis>peer>mc-lag
<b>Description</b>	This command sets the number of keep alive intervals the standby 7705 SAR will wait for packets from the active node before assuming a redundant neighbor node failure. This delay in switchover operation is required to accommodate different factors influencing node failure detection rate, such as IGP convergence or high availability switchover times, and to prevent the standby node from take over prematurely.  The <b>no</b> form of the command sets this parameter to its default value.
<b>Default</b>	3
<b>Parameters</b>	<i>multiplier</i> — a multiplier of the keepalive interval is used to set the number of keepalive intervals that the standby node will wait for packets from the active node before assuming a redundant-neighbor node failure.  <b>Values</b> 2 to 25

## keep-alive-interval

<b>Syntax</b>	<b>keep-alive-interval</b> <i>interval</i> <b>no keep-alive-interval</b>
<b>Context</b>	config>redundancy>multi-chassis>peer>mc-lag
<b>Description</b>	This command sets the interval at which keepalive messages are exchanged between two systems participating in an MC-LAG. These keepalive messages are used to determine remote-node failure.  The <b>no</b> form of the command sets the interval to its default value.

<b>Default</b>	10 (1s)
<b>Parameters</b>	<i>interval</i> — the time interval expressed in deciseconds
<b>Values</b>	5 to 500

## lag

<b>Syntax</b>	<b>lag</b> <i>lag-id</i> <b>lACP-key</b> <i>admin-key</i> <b>system-id</b> <i>system-id</i> [ <b>remote-lag</b> <i>lag-id</i> ] <b>system-priority</b> <i>system-priority</i> <b>no lag</b> <i>lag-id</i>
<b>Context</b>	config>redundancy>multi-chassis>peer>mc-lag
<b>Description</b>	This command defines a LAG that is forming a redundant pair for MC-LAG with a LAG configured on the given peer. The same LAG group can be defined only in the scope of one peer.  The same <b>lACP-key</b> , <b>system-id</b> , and <b>system-priority</b> must be configured on both nodes of the redundant pair in order for MC-LAG to become operational. If there is a mismatch, MC-LAG remains operationally down.
<b>Default</b>	n/a
<b>Parameters</b>	<i>lag-id</i> — the LAG identifier, expressed as a decimal integer. You must specify the LAG ID. Specifying the <i>lag-id</i> allows a mismatch between <i>lag-id</i> on the redundant pair. If you have two existing nodes that already have LAG IDs that do not match, and an MC-LAG is to be created using these nodes, you must specify the correct <b>remote-lag</b> <i>lag-id</i> so that the matching MC-LAG group can be found. If no matching MC-LAG group can be found between neighbor systems, the individual LAGs will operate as usual (no MC-LAG operation is established). <b>Values</b> 1 to 32 <i>admin-key</i> — specifies a 16-bit key that needs to be configured in the same manner on both sides of the MC-LAG in order for the MC-LAG to be operationally up <b>Values</b> 1 to 65535 <i>system-id</i> — specifies a 6-bit value expressed in the same notation as a MAC address <b>Values</b> xx:xx:xx:xx:xx:xx -xx[00 to FF] <b>remote-lag</b> <i>lag-id</i> — specifies the LAG ID on the remote system <b>Values</b> 1 to 200 <i>system-priority</i> — specifies the system priority to be used in the context of the MC-LAG. The partner system will consider all ports using the same <b>lACP-key</b> , <b>system-id</b> , and <b>system-priority</b> as part of the same LAG. <b>Values</b> 1 to 65535



---

## source-address

<b>Syntax</b>	<b>source-address</b> <i>ip-address</i> <b>no source-address</b>
<b>Context</b>	config>redundancy>multi-chassis>peer
<b>Description</b>	This command specifies the source address used to communicate with the multi-chassis peer.
<b>Parameters</b>	<i>ip-address</i> — specifies the source address used to communicate with the multi-chassis peer
	<b>Values</b> a.b.c.d (no multicast address)

### 6.13.2.3 Show Commands



**Note:** The following command outputs are examples only; actual displays may differ depending on supported functionality and user configuration.

#### connections

- Syntax** `connections [address ip-address] [port port-number] [detail]`
- Context** `show>system`
- Description** This command displays UDP and TCP connection information.
- If no command line options are specified, a summary of the TCP and UDP connections displays.
- Parameters** *ip-address* — displays only the connection information for the specified IP address or interface name
- Values**
- ip-int-name:* 32 characters maximum
  - ipv4-address:* a.b.c.d
  - ipv6-address:* x:x:x:x:x:x:x:x (eight 16-bit pieces)  
x:x:x:x:x:d.d.d.d  
x: [0..FFFF]H  
d: [0..255]D
- port-number* — displays only the connection information for the specified port number
- Values** 0 to 65535
- detail** — appends TCP statistics to the display output
- Output** The following output is an example of UDP and TCP connection information, and [Table 35](#) describes the fields.

#### Output Example

```
A:ALU-1# show system connections
=====
Connections :
=====
Proto RecvQ TxmtQ Local Address State
 MSS Remote Address vRtrID

TCP 0 0 10.0.0.0.21 LISTEN
 1024 10.0.0.0.0 0
TCP 0 0 10.0.0.0.23 LISTEN
 10.0.0.0.0 0
TCP 0 0 10.0.0.0.179 LISTEN
```

```

TCP 0 0 10.0.0.0.0 0
TCP 0 0 10.0.0.xxx.51138 SYN_SENT
 10.0.0.104.179 4095
TCP 0 0 10.0.0.xxx.51139 SYN_SENT
 10.0.0.91.179 4095
TCP 0 0 10.10.10.xxx.646 LISTEN
 10.0.0.0.0 0
TCP 0 0 10.10.10.xxx.646 ESTABLISH
 10.10.10.104.49406 4095
TCP 0 0 11.1.0.1.51140 SYN_SENT
 11.1.0.2.179 4095
TCP 0 993 192.168.x.xxx.23 ESTABLISHED
 192.168.x.xx.xxxx 4095
UDP 0 0 10.0.0.0.123 ---
 10.0.0.0.0 0
UDP 0 0 10.0.0.0.646 ---
 10.0.0.0.0 0
UDP 0 0 10.0.0.0.17185 ---
 0.0.0.0.0 0
UDP 0 0 10.10.10.xxx.646 ---
 10.0.0.0.0 0
UDP 0 0 192.0.0.1.50130 ---
 192.0.0.1.17185 4095

```

-----  
 No. of Connections: 14

=====  
 A:ALU-1#

**Output Example (Detailed)**

A:ALU-1# show system connections detail

```

TCP Statistics

packets sent : 659635
data packets : 338982 (7435146 bytes)
data packet retransmitted : 73 (1368 bytes)
ack-only packets : 320548 (140960 delayed)
URG only packet : 0
window probe packet : 0
window update packet : 0
control packets : 32
packets received : 658893
acks : 338738 for (7435123 bytes)
duplicate acks : 23
ack for unsent data : 0
packets received in-sequence : 334705 (5568368 bytes)
completely duplicate packet : 2 (36 bytes)
packet with some dup. data : 0 (0 bytes)
out-of-order packets : 20 (0 bytes)
packet of data after window : 0 (0 bytes)
window probe : 0
window update packet : 3
packets received after close : 0
discarded for bad checksum : 0
discarded for bad header offset field : 0
discarded because packet too short : 0
connection request : 4

```

```

connection accept : 24
connections established (including accepts) : 27
connections closed : 26 (including 2 drops)
embryonic connections dropped : 0
segments updated rtt : 338742 (of 338747 attempts)
retransmit timeouts : 75
connections dropped by rexmit timeout : 0
persist timeouts : 0
keepalive timeouts : 26
keepalive probes sent : 0
connections dropped by keepalive : 1
pcb cache lookups failed : 0
connections dropped by bad md5 digest : 0
connections dropped by enhanced auth : 0
path mtu discovery backoff : 0
=====
A:ALU-1#

```

**Table 35 System Connections Field Descriptions**

Label	Description
Proto	The socket protocol, either TCP or UDP
RecvQ	The number of input packets received by the protocol
TxmtQ	The number of output packets sent by the application
Local Address	The local address of the socket. The socket port is separated by a period.
Remote Address	The remote address of the socket. The socket port is separated by a period.
State	Listen — the protocol state is in the listen mode
	Established — the protocol state is established
MSS	The TCP maximum segment size
vRtrID	The virtual router identifier: vRtrID 0 — listens for connections in all routing instances, including the base and management VRFs vRtrID 1 — base routing instance vRtrID 4095 — management routing instance

## cpu

<b>Syntax</b>	cpu [sample-period seconds]
<b>Context</b>	show>system
<b>Description</b>	This command displays CPU usage per task over a sample period.
<b>Parameters</b>	seconds — the number of seconds over which to sample CPU task usage
	<b>Default</b> 1
	<b>Values</b> 1 to 10
<b>Output</b>	The following output is an example of system CPU information, and <a href="#">Table 36</a> describes the fields.

**Output Example**

```
A:ALU-1# show system cpu sample-period 2
=====
CPU Utilization (Sample period: 2 seconds)
=====
```

Name	CPU Time (uSec)	CPU Usage	Capacity Usage
BFD	10,098	0.07%	0.37%
BGP	341	~0.00%	0.01%
Cards & Ports	55,154	0.39%	0.81%
DHCP Server	352	~0.00%	0.01%
ICC	7,818	0.05%	0.20%
IGMP/MLD	3,511	0.02%	0.17%
IOM	170,517	1.22%	3.47%
IP Stack	14,371	0.10%	0.23%
IS-IS	19,893	0.14%	0.99%
ISA	5,822	0.04%	0.29%
LDP	1,746	0.01%	0.08%
Logging	94	~0.00%	~0.00%
MPLS/RSVP	16,146	0.11%	0.60%
Management	12,337	0.08%	0.40%
Microwave	43	~0.00%	~0.00%
OAM	1,100	~0.00%	0.05%
OSPF	610	~0.00%	0.02%
PIM	418	~0.00%	0.02%
RIP	0	0.00%	0.00%
RTM/Policies	0	0.00%	0.00%
Redundancy	27,293	0.19%	1.05%
Security	1,858	0.01%	0.06%
Services	4,978	0.03%	0.08%
Snmp Daemon	0	0.00%	0.00%
Stats	0	0.00%	0.00%
System	247,815	1.77%	3.71%
VRRP	2,443	0.01%	0.07%
-----			
Total	13,950,560	100.00%	
Idle	13,335,735	95.59%	
Usage	614,825	4.40%	

```

Busiest Core Utilization 164,574 8.25%
=====
A:ALU-1#

```

**Table 36 System CPU Field Descriptions**

Label	Description
CPU Utilization	The total amount of CPU time
Name	The process or protocol name
CPU Time (uSec)	The CPU time that each process or protocol has used in the specified sample time
CPU Usage	The sum of CPU usage of all the processes and protocols
Capacity Usage	Displays the level at which the specified service is being utilized. When this number reaches 100%, this part of the system is busied out. There may be extra CPU cycles still left for other processes, but this service is running at capacity.  This column does not reflect the true CPU utilization value; that data is available in the CPU Usage column. This column shows the busiest task in each group, where “busiest” is defined as either actually running or blocked attempting to acquire a lock.

**cron**

- Syntax** `cron`
- Context** `show>system`
- Description** This command enters the show CRON context.

**schedule**

- Syntax** `schedule [schedule-name] [owner owner-name]`
- Context** `show>system>cron`
- Description** This command displays CRON schedule parameters.
- Parameters**
  - schedule-name* — displays information for the specified schedule name
  - owner-name* — displays information for the specified schedule owner associated with the schedule name
- Output** The following output is an example of CRON schedule information, and [Table 37](#) describes the fields.

**Output Example**

```
A:ALU-1# show system cron schedule test
=====
CRON Schedule Information
=====
Schedule : test
Schedule owner : TiMOS CLI
Description : none
Administrative status : enabled
Operational status : enabled
Script Policy : test_policy
Script Policy Owner : TiMOS CLI
Script : test_script
Script Owner : TiMOS CLI
Script source location : ftp://*****:*****@192.168.15.1/home/testlab_bgp
 /cron/test1.cfg
Script results location : ftp://*****:*****@192.168.15.1/home/testlab_bgp
 /cron/res

Schedule type : periodic
Interval : 0d 00:01:00 (60 seconds)
Repeat count : infinite
Next scheduled run : 0d 00:00:42
End time : 2018/12/17 12:00:00
Weekday : friday
Month : none
Day of month : none
Hour : none
Minute : none
Number of schedule runs : 10
Last schedule run : 2018/12/17 11:20:00
Number of schedule failures : 0
Last schedule failure : no error
Last failure time : never
=====
A:ALU-1#
```

**Table 37 CRON Schedule Field Descriptions**

Label	Description
Schedule	The name of the schedule
Schedule owner	The name of the schedule owner
Description	The description of the schedule
Administrative status	Enabled — administrative status is enabled
	Disabled — administrative status is disabled
Operational status	Enabled — operational status is enabled
	Disabled — operational status is disabled
Script Policy	The name of the script policy

**Table 37 CRON Schedule Field Descriptions (Continued)**

Label	Description
Script Policy Owner	The name of the script policy owner
Script	The name of the script
Script Owner	The name of the script owner
Script source location	The location of the scheduled script
Script results location	The location where the script results are sent
Schedule type	Periodic — displays a schedule that runs at a given interval
	Calendar — displays a schedule that runs based on a calendar
	Oneshot — displays a schedule that ran one time only
Interval	The interval between runs of an event
Repeat count	The number of times that the interval (periodic) schedule is run
Next scheduled run	The time for the next scheduled run
End time	The interval at which the schedule will end (periodic) or the date on which the schedule will end (calendar)
Weekday	The configured weekday
Month	The configured month
Day of month	The configured day of month
Hour	The configured hour
Minute	The configured minute
Number of schedule runs	The number of scheduled sessions
Last schedule run	The last scheduled session
Number of schedule failures	The number of scheduled sessions that failed to execute
Last schedule failure	The last scheduled session that failed to execute
Last failure time	The system time of the last failure



## dhcp6

- Syntax**     **dhcp6**
- Context**     show>system
- Description** This command displays system-wide DHCPv6 configuration information.
- Output**     The following output is an example of DHCPv6 configuration information, and [Table 38](#) describes the fields.

### Output Example

```
A:ALU-1# show system dhcp6
=====
DHCP6 system
=====
Global NoAddrAvail status : esm-relay server
=====
```

**Table 38**     **DHCPv6 Configuration Field Descriptions**

Label	Description
Status	The system-wide status of DHCPv6 functionality

## options

- Syntax**     **options**
- Context**     show>system>fp
- Description** This command displays information about forwarding path options.  
  
This command is only supported on the 7705 SAR-8 Shelf V2 and the 7705 SAR-18.
- Output**     The following output is an example of forwarding path information, and [Table 39](#) describes the fields.

### Output Example

```
*A:7705:Dut-C# show system fp options
=====
System Forwarding Path Option Information
=====
Option Admin State Oper State

vpls-high-scale Enabled Disabled

Reboot Required : Yes
```

```
=====
*A:7705:Dut-C#
```

**Table 39 Forwarding Path Field Descriptions**

Label	Description
Option	The name of the forwarding path option
Admin State	The administrative status of the forwarding path option
Oper State	The operational status of the forwarding path option
Reboot Required	Indicates whether a system reboot is required for the forwarding path option to become operational

information

- Syntax** information
- Context** show>system
- Description** This command displays general system information including basic system, SNMP server, last boot and DNS client information.
- Output** The following output is an example of general system information, and [Table 40](#) describes the fields.

**Output Example**

```
A:7705:Dut-A# show system information
=====
System Information
=====
System Name : A:7705:Dut-A
System Type : 7705 SAR-8 v2
Chassis Topology : Standalone
System Version : B-0.0.I323
Crypto Module Version :
 CPM: SARCM 3.0 DP: SARDCM 1.0
System Contact : Fred Information Technology
System Location : Bldg.1-floor 2-Room 201
System Coordinates : N 85 58 23, W 34 56 12
System Active Slot : A
System Up Time : 1 days, 02:03:17.62 (hr:min:sec)

SNMP Port : 161
SNMP Engine ID : 0000197f00006883ff000000
SNMP Engine Boots : 58
SNMP Max Message Size : 1500
SNMP Admin State : Enabled
SNMP Oper State : Enabled
SNMP Index Boot Status : Not Persistent
```

```

SNMP Sync State : OK

Tel/Tel6/SSH/FTP Admin : Enabled/Disabled/Enabled/Disabled
Tel/Tel6/SSH/FTP Oper : Up/Down/Up/Down

BOF Source : cf3:
Image Source : primary
Config Source : primary
Last Booted Config File: cf3:/config.cfg
Last Boot Cfg Version : FRI APR 20 16:24:27 2007 UTC
Last Boot Config Header: # TiMOS-B-5.0.R3 both/hops NOKIA 7705 SAR #
 Copyright (c) 2016 Nokia. All rights
 reserved. # All use subject to applicable license
 agreements. # Built on Wed Feb 13 19:45:00 EST 2016 by
 builder in /rel5.0/R3/panos/main # Generated TUE
 MAR 11 16:24:27 2016 UTC

Last Boot Index Version: N/A
Last Boot Index Header : # TiMOS-B-5.0.R3 both/hops NOKIA 7705 SAR #
 Copyright (c) 2016 Nokia. All rights
 reserved. # All use subject to applicable license
 agreements. # Built on Wed Feb 13 19:45:00 EST 2016 by
 builder in /rel5.0/R3/panos/main # Generated TUE
 MAR 11 16:24:27 2016 UTC

Last Saved Config : N/A
Time Last Saved : N/A
Changes Since Last Save: Yes
User Last Modified : admin
Time Last Modified : 2016/03/19 10:03:09
Max Cfg/BOF Backup Rev : 5
Cfg-OK Script : N/A
Cfg-OK Script Status : not used
Cfg-Fail Script : N/A
Cfg-Fail Script Status: not used

Microwave S/W Package : invalid

Management IP Addr : 192.168.xxx.xxx/24
Primary DNS Server : 192.168.xxx.xxx
Secondary DNS Server : N/A
Tertiary DNS Server : N/A
DNS Domain : domain.com
DNS Resolve Preference : ipv4-only
BOF Static Routes :
 To Next Hop
 192.xxx.0.0/16 192.xxx.1.1
ATM Location ID : 01:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
ATM OAM Retry Up : 2
ATM OAM Retry Down : 4
ATM OAM Loopback Period : 10

ICMP Vendor Enhancement: Disabled
Eth QinQ Untagged SAP : False
=====
A:7705:Dut-A#

```

**Table 40 System Information Field Descriptions**

Label	Description
System Name	The configured system name
System Type	The 7705 SAR chassis model
Chassis Topology	The chassis setup – always Standalone
System Version	The version of the installed software load
Crypto Module Version	The cryptographic module in the release
System Contact	A text string that describes the system contact information
System Location	A text string that describes the system location
System Coordinates	A text string that describes the system coordinates
System Active Slot	The active CSM slot
System Up Time	The time since the last boot
SNMP Port	The port number used by this node to receive SNMP request messages and to send replies
SNMP Engine ID	The SNMP engine ID to uniquely identify the SNMPv3 node
SNMP Engine Boots	The number of times that the SNMP engine has booted
SNMP Max Message Size:	The maximum SNMP packet size generated by this node
SNMP Admin State	Enabled — SNMP is administratively enabled and running
	Disabled — SNMP is administratively shut down and not running
SNMP Oper State	Enabled — SNMP is operationally enabled
	Disabled — SNMP is operationally disabled
SNMP Index Boot Status	Persistent — system indexes are saved between reboots
	Not Persistent — system indexes are not saved between reboots
Tel/Tel6/SSH/FTP Admin	The administrative state of the Telnet, Telnet IPv6, SSH, and FTP sessions
Tel/Tel6/SSH/FTP Oper	The operational state of the Telnet, Telnet IPv6, SSH, and FTP sessions
BOF Source	The location of the BOF

**Table 40 System Information Field Descriptions (Continued)**

Label	Description
Image Source	Primary — Indicates that the directory location for runtime image file was loaded from the primary source
	Secondary — Indicates that the directory location for runtime image file was loaded from the secondary source
	Tertiary — Indicates that the directory location for runtime image file was loaded from the tertiary source
Config Source	Primary — Indicates that the directory location for configuration file was loaded from the primary source
	Secondary — Indicates that the directory location for configuration file was loaded from the secondary source
	Tertiary — Indicates that the directory location for configuration file was loaded from the tertiary source
Last Booted Config File	The URL and filename of the last loaded configuration file
Last Boot Cfg Version	The date and time of the last boot
Last Boot Config Header	The header information such as image version, date built, date generated
Last Boot Index Version	The version of the persistence index file read when this CSM card was last rebooted
Last Boot Index Header	The header of the persistence index file read when this CSM card was last rebooted
Last Saved Config	The location and filename of the last saved configuration file
Time Last Saved	The date and time of the last time configuration file was saved
Changes Since Last Save	Yes — There are unsaved configuration file changes
	No — There are no unsaved configuration file changes
User Last Modified	The user name of the user who last modified the configuration file
Time Last Modified	The date and time of the last modification
Max Cfg/BOF Backup Rev	The maximum number of backup revisions maintained for a configuration file. This value also applies to the number of revisions maintained for the BOF file.

**Table 40 System Information Field Descriptions (Continued)**

Label	Description
Cfg-OK Script	URL — the location and name of the CLI script file executed following successful completion of the boot-up configuration file execution
	N/A — no CLI script file is executed
Cfg-OK Script Status	Successful/Failed — the results from the execution of the CLI script file specified in the Cfg-OK Script location
	Not used — no CLI script file was executed
Cfg-Fail Script	URL — the location and name of the CLI script file executed following a failed boot-up configuration file execution
	Not used — no CLI script file was executed
Cfg-Fail Script Status	Successful/Failed — the results from the execution of the CLI script file specified in the Cfg-Fail Script location
	Not used — no CLI script file was executed
Microwave S/W Package	N/A
Management IP Addr	The management IP address and mask
Primary DNS Server	The IP address of the primary DNS server
Secondary DNS Server	The IP address of the secondary DNS server
Tertiary DNS Server	The IP address of the tertiary DNS server
DNS Domain	The DNS domain name of the node
DNS Resolve Preference	N/A
BOF Static Routes	To — the static route destination
	Next Hop — the next hop IP address used to reach the destination
	Metric — displays the priority of this static route versus other static routes
	None — no static routes are configured
ATM Location ID	For ATM OAM loopbacks — the address of the network device referenced in the loopback request
ATM OAM Retry Up	N/A

**Table 40 System Information Field Descriptions (Continued)**

Label	Description
Atm OAM Retry Down	N/A
ATM OAM Loopback Period	N/A
ICMP Vendor Enhancement	Enabled — inserts one-way timestamp in outbound SAA ICMP ping packets
	Disabled — one-way timestamping is not performed on outbound SAA ICMP ping packets
Eth QinQ untagged SAP	True: QinQ untagged SAPs are enabled
	False: QinQ untagged SAPs are disabled

## lldp

- Syntax** `lldp neighbor`
- Context** `show>system`
- Description** This command displays neighbor information for all configured ports without having to specify each individual port ID.
- Output** The following output is an example of LLDP neighbor information, and [Table 41](#) describes the fields.

### Output Example

```
A:ALU-1# show system lldp neighbor
Link Layer Discovery Protocol (LLDP) System Information

=====
NB = nearest-bridge NTPMR = nearest-non-tpmr NC = nearest-customer
=====
Lcl Port Scope Remote Chassis ID Index Remote Port Remote Sys Name

1/5/8 NB 38:52:1A:00:DC:01 2 1/8/8, 10/100/* 7705:Dut-C
1/5/8 NTPMR BC:52:B4:2B:D0:7D 3 1/1/1, 10/100/* 7705:Dut-F
1/5/8 NC BC:52:B4:2B:D0:7D 4 1/1/1, 10/100/* 7705:Dut-F
1/5/8 NTPMR 38:52:1A:00:E0:01 5 1/4/3, 10/100/* 7705:Dut-A
1/5/8 NC 38:52:1A:00:E0:01 6 1/4/3, 10/100/* 7705:Dut-A
1/4/3 NTPMR 38:52:1A:00:E0:01 7 1/5/8, 10/100/* 7705:Dut-A
1/4/3 NC 38:52:1A:00:E0:01 8 1/5/8, 10/100/* 7705:Dut-A
1/4/3 NTPMR BC:52:B4:2B:D0:7D 9 1/1/1, 10/100/* 7705:Dut-F
1/4/3 NC BC:52:B4:2B:D0:7D 10 1/1/1, 10/100/* 7705:Dut-F
1/4/3 NB 00:25:BA:17:2A:42 15 BA 7705:Dut-B
=====
* indicates that the corresponding row element may have been truncated.
```

```
Number of neighbors : 10
A:ALU-1#
```

**Table 41 LLDP Neighbor Field Descriptions**

Label	Description
Lcl Port	The physical port ID of the local port in <i>slot/mda/port</i> format
Scope	The scope of LLDP supported: NB (nearest bridge), NTPMR (nearest non-two-port MAC relay bridge), or NC (nearest customer bridge)
Remote Chassis ID	The MAC address of the chassis containing the Ethernet port that sent the LLDPDU
Index	The LLDP remote peer index
Remote Port	The physical port ID of the remote port in <i>slot/mda/port</i> format and a port description (based on ifDescr from RFC 2863 - IF MIB) If a port-description TLV is received, displays the ifDescr object for the interface – a text string containing information about the interface If a port-description TLV is not received or the value is null, displays the ifindex for the interface (* indicates that the output has been truncated)
Remote Sys Name	The name of the remote chassis

## load-balancing-alg

**Syntax** `load-balancing-alg [detail]`

**Context** `show>system`

**Description** This command displays the system load-balancing settings.

**Parameters** `detail` — displays detailed information for load-balancing algorithms

**Output** The following output is an example of system load-balancing algorithm information, and [Table 42](#) describes the fields.



**Output Example**

```
*A: Sar18 Dut-B>show>system# load-balancing-alg
=====
System-wide Load Balancing Algorithms
=====
L4 Load Balancing : exclude-L4
LSR Load Balancing :
 Hashing Algorithm : lbl-only
 Hashing Treatment : profile-1
 Use Ingress Port : disabled
System IP Load Balancing : enabled
=====
*A: Sar18 Dut-B>show>system#
```

**Table 42 System Load-Balancing Algorithm Field Descriptions**

Label	Description
System-wide Load Balancing Algorithms	
L4 Load Balancing	The configured setting for <b>l4-load-balancing</b>
LSR Load Balancing	The configured settings for <b>lsr-load-balancing</b> , including: <ul style="list-style-type: none"> <li>• Hashing Algorithm The configured hashing algorithm: lbl-only, lbl-ip, or lbl-ip-l4-teid</li> <li>• Hashing Treatment The configured label stack profile: profile-1, profile-2, or profile-3</li> <li>• Use Ingress Port Specifies whether the ingress port at the LSR is used</li> </ul>
System IP Load Balancing	Specifies whether the system IP address is used in the load-balancing calculation

memory-pools

- Syntax**    **memory-pools**
- Context**    show>system
- Description**    This command displays system memory status.
- Output**    The following output is an example of system memory information, and [Table 43](#) describes the fields.

**Output Example**

```
A:ALU-1# show system memory-pools
```

```
=====
Memory Pools
=====
Name Max Allowed Current Size Max So Far In Use

System No limit 308,145,416 316,100,296 300,830,200
Icc 16,777,216 2,097,152 2,097,152 773,920
RTM/Policies No limit 2,097,152 2,097,152 1,027,792
OSPF No limit 1,048,576 1,048,576 437,904
MPLS/RSVP No limit 21,145,848 21,145,848 19,562,376
LDP No limit 1,048,576 1,048,576 224,848
IS-IS No limit 0 0 0
RIP No limit 0 0 0
VRRP No limit 1,048,576 1,048,576 1,144
BGP No limit 2,097,152 2,097,152 1,176,560
Services No limit 5,685,504 5,685,504 3,884,512
IOM No limit 249,068,424 249,068,424 245,119,136
SIM No limit 1,048,576 1,048,576 129,808
IP Stack No limit 4,295,184 4,295,184 3,189,048
MBUF No limit 1,048,576 1,048,576 151,520
IGMP/MLD SnpG No limit 1,048,576 1,048,576 71,192
TLS MFIB No limit 1,048,576 1,048,576 1,027,312
WEB Redirect 16,777,216 0 0 0
BFD No limit 1,048,576 1,048,576 828,448
MCPATH No limit 1,048,576 1,048,576 472

Current Total Size : 604,069,016 bytes
Total In Use : 578,436,192 bytes
Available Memory : 78,909,496 bytes
=====
*A:ALU-1#
```

**Table 43** Memory Pool Field Descriptions

Label	Description
Name	The name of the system or process
Max Allowed	Integer — the maximum allocated memory size
	No Limit — no size limit
Current Size	The current size of the memory pool
Max So Far	The largest amount of memory pool used
In Use	The current amount of the memory pool currently in use
Current Total Size	The sum of the Current Size column
Total In Use	The sum of the In Use column
Available Memory	The amount of available memory

## ntp

**Syntax** ntp [{peers | peer *peer-address* } | {servers | server *server-address*} | [all]] [detail]

**Context** show>system

**Description** This command displays NTP protocol configuration and state information.

**Parameters** **peers** — displays information about the remote systems that are configured as NTP peers  
*peer-address* — displays information about the specified NTP peer  
**servers** — displays information about sources that are configured as NTP servers  
*server-address* — displays information about the specified node that is configured as an NTP server  
**all** — displays a summary of all configured NTP peer and server information  
**detail** — displays detailed NTP configuration information

**Output** The following output is an example of NTP information, and [Table 44](#) describes the fields.

**Output Example**

```
A:Sar18 Dut-B# show system ntp
=====
NTP Status
=====
Configured : Yes Stratum : 4
Admin Status : up Oper Status : up
Server Enabled : Yes Server Authenticate : Yes
Clock Source : 135.121.107.98
Auth Check : Yes
MDA Timestamp : No
Current Date & Time: 2021/03/22 17:28:09 UTC
=====

*A:Sar18 Dut-B# show system ntp all
=====
NTP Status
=====
Configured : Yes Stratum : 4
Admin Status : up Oper Status : up
Server Enabled : Yes Server Authenticate : Yes
Clock Source : 135.121.107.98
Auth Check : Yes
MDA Timestamp : No
Current Date & Time: 2021/03/22 17:30:00 UTC
=====

NTP Active Associations
=====
State Reference ID St Type A Poll Reach Offset (ms)
Remote

```

```

chosen 138.120.210.186 3 srvr - 64 YYYYYYYY 0.124
 135.121.107.98
reject INIT - actpr n 64 0.000
 135.121.107.100
=====
=====

```

NTP Clients

```

=====
vRouter Time Last Request Rx
 Address

=====

```

\*A: Sar18 Dut-B# show system ntp detail

NTP Status

```

=====
Configured : Yes Stratum : 4
Admin Status : up Oper Status : up
Server Enabled : Yes Server Authenticate : Yes
Clock Source : 135.121.107.98
Auth Check : Yes
MDA Timestamp : No
Auth Errors : 0 Auth Errors Ignored : 0
Auth Key Id Errors : 0 Auth Key Type Errors : 0
Current Date & Time: 2021/03/22 17:34:46 UTC
=====

```

NTP Configured Broadcast/Multicast Interfaces

```

=====
vRouter Interface Address Type Auth Poll

=====

```

\*A: Sar18 Dut-B# show system ntp detail all

NTP Status

```

=====
Configured : Yes Stratum : 4
Admin Status : up Oper Status : up
Server Enabled : Yes Server Authenticate : Yes
Clock Source : 135.121.107.98
Auth Check : Yes
MDA Timestamp : No
Auth Errors : 0 Auth Errors Ignored : 0
Auth Key Id Errors : 0 Auth Key Type Errors : 0
Current Date & Time: 2021/03/22 17:36:45 UTC
=====

```

NTP Configured Broadcast/Multicast Interfaces

```

=====
vRouter Interface Address Type Auth Poll

=====

```

```

=====
NTP Active Associations
=====
State Reference ID St Type A Poll Reach Offset(ms)
 Remote

chosen 138.120.210.186 3 srvr - 64 YYYYYYYY 0.105
 135.121.107.98
reject INIT - actpr n 64 0.000
 135.121.107.100
=====
NTP Clients
=====
vRouter Time Last Request Rx
 Address

*A:Sar18 Dut-B# show system ntp peer 135.121.107.100 detail
=====
NTP Peer
=====
State Reference ID St Type A Poll Reach Offset(ms)
 Remote

reject INIT - actpr n 64 0.000
 135.121.107.100
=====

*A:7705:Dut-C# show system ntp peer 3333:50:1::4
=====
NTP Peer
=====
State Reference ID St Type A Poll Reach Offset(ms)
 Remote

outlyer 138.120.193.198 2 actpr y 8 Y.YYYYYY. -0.858
 3333:50:1::4
=====
*A:7705:Dut-C#

```

**Table 44 System NTP Field Descriptions**

Label	Description
<b>NTP Status</b>	
Configured	Indicates whether NTP is enabled: yes or no
Stratum	The stratum level of this node
Admin Status	Indicates the administrative state: up or down
Oper Status	Indicates the operational status: up or down

**Table 44 System NTP Field Descriptions (Continued)**

Label	Description
Server Enabled	Indicates whether the NTP server is enabled on this node: yes or no
Server Authenticate	Indicates whether NTP server authentication is required: yes or no
Clock Source	The IP address of the node acting as the clock source
Auth Check	Indicates whether an authentication check is required: yes or no
MDA Timestamp	Indicates whether MDA timestamping is enabled for NTP: yes or no
Current Date & Time	The current date and time
Auth Errors	Number of authentication errors
Auth Errors Ignored	Number of authentication errors ignored
Auth Key Id Errors	Number of authentication key identification errors
Auth Key Type Errors	Number of authentication key type errors
<b>NTP Configured Broadcast/Multicast Interfaces</b>	
vRouter	The router instance containing the interface
Interface	The interface configured in NTP
Address	The address used for transmitted messages
Type	The interface type: <ul style="list-style-type: none"> <li>• bcast — broadcast interface</li> <li>• mcast — multicast interface</li> <li>• bclnt — broadcast client</li> <li>• svr — server</li> <li>• actpr — active peer</li> <li>• paspr — passive peer</li> </ul>
Auth	Indicates whether authentication is in use
Poll	The current poll interval used on the interface

**Table 44 System NTP Field Descriptions (Continued)**

Label	Description
<b>NTP Active Associations</b>	
State	<p>The state of the peers acting as time servers:</p> <ul style="list-style-type: none"> <li>• <b>Reject</b> The peer is rejected and will not be used for synchronization. Rejection reasons could be that the peer is unreachable, the peer is synchronized to this local server so synchronizing with it would create a synchronization loop, or the synchronization distance is too large. This is the normal startup state.</li> <li>• <b>Invalid</b> The peer is not maintaining an accurate clock. This peer will not be used for synchronization.</li> <li>• <b>Excess</b> The peer's synchronization distance is greater than 10 other peers. This peer will not be used for synchronization.</li> <li>• <b>Outlyer</b> The peer is discarded as an outlier. This peer will not be used for synchronization.</li> <li>• <b>Candidate</b> The peer is accepted as a possible source of synchronization</li> <li>• <b>Selected</b> The peer is an acceptable source of synchronization, but its synchronization distance is greater than six other peers</li> <li>• <b>Chosen</b> The peer is chosen as the source of synchronization</li> <li>• <b>ChosenPPS</b> The peer is chosen as the source of synchronization, but the actual synchronization is occurring from a pulse-per-second (PPS) signal</li> </ul>
Remote	The IP address of the remote NTP server or peer with which this local host is exchanging NTP packets

**Table 44 System NTP Field Descriptions (Continued)**

Label	Description
Reference ID	<p>When the Stratum level is between 0 and 15, this field shows the IP address of the remote NTP server or peer with which the local server or peer is exchanging NTP packets. For reference clocks, this field shows the identification assigned to the clock, such as ".GPS." For an NTP server or peer, if the client has not yet synchronized to a server/peer, the status cannot be determined and the following codes are displayed:</p> <p>ACST — the association belongs to a unicast server</p> <p>AUTH — server authentication failed. Please wait while the association is restarted.</p> <p>AUTO — autokey sequence failed. Please wait while the association is restarted.</p> <p>BCST — the association belongs to a broadcast server</p> <p>CRPT — cryptographic authentication or identification failed. The details should be in the system log file or the cryptostats statistics file, if configured. No further messages will be sent to the server.</p> <p>DENY — access denied by remote server. No further messages will be sent to the server.</p> <p>DROP — lost peer in symmetric mode. Please wait while the association is restarted.</p> <p>RSTR — access denied due to local policy. No further messages will be sent to the server.</p> <p>INIT — the association has not yet synchronized for the first time</p> <p>INIT — the system clock has not yet synchronized for the first time</p> <p>STEP — a step change in system time has occurred, but the system clock has not yet resynchronized</p>
St	The Stratum level of this node
Type	<p>The peer type:</p> <ul style="list-style-type: none"> <li>• bcast — broadcast interface</li> <li>• mcast — multicast interface</li> <li>• bclnt — broadcast client</li> <li>• svr — server</li> <li>• actpr — active peer</li> <li>• paspr — passive peer</li> </ul>
A	Authentication
Poll	Polling interval in seconds



**Table 44 System NTP Field Descriptions (Continued)**

Label	Description
Reach	Yes — the NTP peer or server has been reached at least once in the last eight polls
	No — the NTP peer or server has not been reached at least once in the last eight polls
Offset (ms)	The difference between the local and remote UTC time, in milliseconds
<b>NTP Clients</b>	
vRouter	The router instance containing the interface
Address	The address used for the transmitted messages
Time last Request Rx	The time at which the last request was received from the client

poe

**Syntax** poe

**Context** show>system

**Description** This command shows a summary of the PoE status of each PoE capable port in the system.

**Output** The following output is an example of PoE status information, and [Table 45](#) describes the fields.

**Output Example**

```
A:# show system poe
=====
PoE Information
=====
PoE Maximum Power Budget : 83.8 watts
PoE Power Committed : 65.0 watts
PoE Power Available : 18.8 watts
PoE Power In Use : 0.0 watts

=====
PoE Port Information
=====
Interface PoE PoE Maximum Power
 Mode Detection Power In Use

1/1/5 Standard Searching 15.4 watts 0.0 watts
1/1/6 Disabled Disabled 0.0 watts 0.0 watts
1/1/7 Plus Searching 34.2 watts 0.0 watts
1/1/8 Standard Searching 15.4 watts 0.0 watts
=====
```

A:# show system poe

**Table 45 System PoE Status Field Descriptions**

Label	Description
PoE Maximum Power Budget	The maximum PoE power budget available for the system
PoE Power Committed	The total PoE power that has been configured on all POE or PoE+ ports on the system
PoE Power Available	The amount of PoE power available to be configured on additional PoE or PoE+ ports on the system
PoE Power In Use	The total PoE power currently being used by all PoE or PoE+ configured ports on the system
PoE Mode	Indicates whether the port is using standard PoE or PoE+ If the PoE function is turned off, the mode is Disabled
PoE Detection	Indicates the detection state of the PoE port
Maximum Power	The maximum PoE power available on the port
Power in Use	The amount of PoE power currently being used on the port

## ptp

**Syntax** **ptp**  
**ptp timestamp-stats**

**Context** show>system

**Description** This command displays general PTP information and PTP timestamp information.

**Parameters** **timestamp-stats** — displays port statistics for packets with timestamp updated fields

**Output** The following outputs are examples of PTP information:

- system PTP information ([Output Example, Table 46](#))
- PTP timestamp information ([Output Example, Table 47](#))

### Output Example

```
*A:# show system ptp
=====
Clk Source IP Clock-type MDA Admin PTP Clock Id Node Time-Ref-
Idx State Ref Priority
=====
csm n/a ordin/slave n/a down d665fffffe000000 - -
```

```

2 ordin/slave 1/1 up d665fffffe000002 -
=====

```

**Table 46 System PTP Field Descriptions**

Label	Description
Clk Idx	The clock identifier, either 1 to 16 or csm
Source IP	The IP address of the source interface
Clock-type	The clock type: ordin/slave, ordin/master, boundary, transparent
MDA	The adapter card slot that performs the IEEE 1588v2 clock recovery
Admin State	up – the local PTP clock is administratively enabled down – the local PTP clock is administratively disabled
PTP Clock Id	A unique 64-bit number assigned to the clock
Node Ref	Timing reference: ref1 or ref2; applicable if the clock is a source of synchronization timing for the node
Time-Ref-Priority	The priority value of the clock, used to determine which clock provides timing for the network

**Output Example**

```

A:# show system ptp timestamp-stats
=====
PTP Port Timestamp Summary
=====
Phys In/ Sync Delay Req Follow-Up
Port Out Pkt Pkt Pkt
=====
1/1/1 in 0 19529 -
 out 19558 0 19558
1/3/1 in 0 4763373 -
 out 4763374 0 4763374
=====
*A:#

```

**Table 47 System PTP Timestamp Field Descriptions**

Label	Description
Phys Port	The physical port identifier
In/Out	The direction of the packet counts
Sync Pkt	The number of ingress or egress synchronization packets

**Table 47 System PTP Timestamp Field Descriptions (Continued)**

Label	Description
Delay Req Pkt	The number of ingress or egress delay request packets
Follow-Up Pkt	The number of egress follow-up packets

## clock

**Syntax** `clock clock-id`  
`clock clock-id bmc`  
`clock clock-id detail`  
`clock clock-id standby`  
`clock clock-id statistics`  
`clock clock-id summary`  
`clock clock-id unicast`

**Context** show>system>ptp

**Description** This command displays PTP clock information.

**Parameters** *clock-id* — specifies the clock ID of this PTP instance

**Values** 1 to 16 for PTP clocks that use IPv4 encapsulation  
**csm** for a PTP clock that uses Ethernet encapsulation

**bmc** — displays information about the best master clock algorithm configured for each PTP peer. This command only applies when the *clock-id* parameter value is 1 to 16.

**detail** — displays detailed information about the specified PTP clock. This command only applies when the *clock-id* parameter value is 1 to 16.

**standby** — displays PTP information about the standby CSM. This command only applies when the *clock-id* parameter is defined as **csm**.

**statistics** — displays statistics information. This command only applies when the *clock-id* parameter is defined as **csm**.

**summary** — displays summary information. This command only applies when the *clock-id* parameter value is 1 to 16.

**unicast** — displays IP unicast negotiation information. This command only applies when the *clock-id* parameter value is 1 to 16.

**Output** The following outputs are examples of PTP clock information:

- PTP clock CSM summary information ([Output Example, Table 48](#))
- PTP clock summary information ([Output Example, Table 49](#))
- PTP clock information ([Output Example, Table 50](#))

**Output Example**

```
A:# show system# ptp clock csm
=====
IEEE 1588/PTP Clock Information
=====

Local Clock

Clock Type : ordinary,slave PTP Profile : IEEE 1588-2008
Domain : 0 Network Type : sdh
Admin State : down Oper State : down
Announce Interval : 1 pkt/2 s Announce Rx Timeout: 3 intervals
Clock Id : 4cc94ffffe737123 Clock Class : 255 (slave-only)
Clock Accuracy : unknown Clock Variance : ffff (not computed)
Clock Priority1 : 128 Clock Priority2 : 128
PTP Port State : disabled Last Changed : 10/28/2015 18:48:31
PTP Recovery State: disabled
Frequency Offset : n/a

Time Information

Timescale : Arbitrary
Current Time : 2015/11/02 15:51:44.8 (ARB)
Frequency Traceable : no
Time Traceable : no
Time Source : internal oscillator
=====
A:# show system#
```

**Table 48 System PTP Clock CSM Field Descriptions**

Label	Description
<b>Local Clock</b>	
Clock Type	The local PTP clock type, one of: ordinary master, ordinary slave, boundary, or transparent-e2e
PTP Profile	The PTP profile, one of: ieee-1588, itu-telecom-freq, g8275dot1-2014, g8275dot2-2016, or iec-61850-9-3-2016
Domain	The PTP device domain
Network Type	Indicates whether SONET or SDH values are being used for encoding synchronous status messages
Admin State	up – the local PTP clock is administratively enabled
	down – the local clock is administratively shut down and not running
Oper State	Up – the local clock is operationally enabled and running
	Down – the local clock is operationally disabled and not running

**Table 48 System PTP Clock CSM Field Descriptions (Continued)**

Label	Description
Announce Interval	The message interval used for announce messages
Announce Rx Timeout	The number of announce timeouts that need to occur on a PTP slave port or boundary clock port in slave mode before communication messages with a master clock are deemed lost and the master clock is considered not available
Clock Id	A unique 64-bit number assigned to the clock
Clock Class	The local clock class
Clock Accuracy	The local clock accuracy designation
Clock Variance	The local clock variance
Clock Priority1	The first priority value of the local clock, used by the Best Master Clock Algorithm (BMCA) to determine which clock should provide timing for the network
Clock Priority2	The second priority value of the local clock. This value is used by the BMCA to determine which clock should provide timing for the network.
PTP Port State	The PTP port state, one of: disabled, listening, slave, master, passive, or faulty
Last Changed	The time the PTP port state last changed
PTP Recovery State	The clock recovery state, one of: disabled, initial, acquiring, phase-tracking, or locked
Frequency Offset	The frequency offset of the PTP clock in parts per billion
<b>Time Information</b>	
Timescale	The PTP timescale flag sent in the 1588 Announce message
Current Time	The last date and time recovered by the PTP time recovery algorithm
Frequency Traceable	The frequency-traceable flag sent in the 1588 Announce message
Time Source	The time-source parameter sent in the 1588 Announce message

```
A:# show system ptp clock 2 summary
```

```
=====

PtpPort/Peer : 1/1
IP Address : 10.10.10.10
Static/Dynamic : Static
```

```
PTP Port State : initializing
 Rx Tx

Anno 623 0
Sync 82990 0
Follow-Up 82990 -
DelayRequest 82998 82998
DelayResponse 82998 82998
=====
```

Unicast Negotiation Summary

```

Prt/ Peer IP In/ Anno Sync Delay Anno Sync Delay
Peer Out Lease Lease Lease Rate Rate Rate
 (sec) (sec) (sec) (pkt/s) (pkt/s) (pkt/s)
=====
1/1 10.222.222.10 in 174 182 182 1 pkt/2 s 64 pkt/s 64 pkt/s
 out - - - - - -
1/2 - - - - - -
 out - - - - - -
=====
```

Best Master Clock Summary

```

Prt/ Peer IP Slave Pri1 GM GM GM Pri2 GM ClockId Step
Peer Cls Clk Clk Clk Clk Cls Acc Var Rem
=====
1/1 10.222.222.10 yes 128 6 3e3 25600 128 4041424344454637 1
1/2 - - - - - - - -
=====
```

Boundary clock case:

A:# show system ptp clock 1 summary

```

Prt/ Peer IP Slave Port Dyn/ In/ Anno Sync Delay
Peer State Stat Out Stat Out Rate Req/Resp
=====
1/1 192.253.252.10 no master sta in 7 0 0
 sta out 770 0 0
2/1 192.254.254.10 no master sta in 0 0 103052
 sta out 773 103054 103052
3/1 192.253.252.11 no master sta in 0 0 0
 sta out 0 0 0
4/1 no initia* sta in 0 0 0
 sta out 0 0 0
5/1 no initia* sta in 0 0 0
 sta out 0 0 0
6/1 no initia* sta in 0 0 0
 sta out 0 0 0
7/1 no initia* sta in 0 0 0
 sta out 0 0 0
8/1 no master sta in 0 0 0
 sta out 0 0 0
9/1 192.168.254.12 yes slave sta in 823 105272 105271
 sta out 0 0 105271
10/1 no initia* sta in 0 0 0
 sta out 0 0 0
=====
```

```

11/1 no initia* sta in 0 0 0
 sta out 0 0 0
12/1 no initia* sta in 0 0 0
 sta out 0 0 0
13/1 no initia* sta in 0 0 0
 sta out 0 0 0
14/1 no initia* sta in 0 0 0
 sta out 0 0 0
15/1 no initia* sta in 0 0 0
 sta out 0 0 0
...
50/1 no initia* sta in 0 0 0
 sta out 0 0 0

```

```

=====
Prt/ Peer IP In/ Anno Sync Delay Anno Sync Delay
Peer Out Lease Lease Lease Rate Rate Rate
 (sec) (sec) (sec) (pkt/s) (pkt/s) (pkt/s)
=====
1/1 192.253.254.8 in 166 0 0 1 pkt/2 s - -
 out 228 - - 1 pkt/2 s - -
2/1 192.254.254.9 in 1 0 0 - - -
 out 231 235 235 1 pkt/2 s 64 pkt/ s 64 pkt/s
3/1 192.253.252.11 in 1 0 0 0 - -
 out - - - - - -
4/1 - - - - - - - -
 out - - - - - -
5/1 - - - - - - - -
 out - - - - - -
6/1 - - - - - - - -
 out - - - - - -
7/1 - - - - - - - -
 out - - - - - -
8/1 - - - - - - - -
 out - - - - - -
9/1 192.168.255.11 in 102 106 106 1 pkt/2 s 64 pkt/s 64 pkt/s
 out - - - - - -
10/1 - - - - - - - -
 out - - - - - -
11/1 - - - - - - - -
 out - - - - - -
12/1 - - - - - - - -
 out - - - - - -
13/1 - - - - - - - -
 out - - - - - -
14/1 - - - - - - - -
 out - - - - - -
15/1 - - - - - - - -
 out - - - - - -
...
50/1 - - - - - - - -
 out - - - - - -

```

```

=====
Prt/ Peer IP Slave Pri1 GM GM GM Pri2 GM ClockId Step
Peer Clk Clk Clk Clk Clk Cls Acc Var Rem
=====
1/1 192.253.2.10 no 128 13 254 65535 128 002105fffe6da9b7 0

```



2/1	192.254.2.10	no	-	-	-	-	-	-	-	-
3/1	192.255.2.10		no	-	-	-	-	-	-	-
4/1		-	-	-	-	-	-	-	-	-
5/1		-	-	-	-	-	-	-	-	-
6/1		-	-	-	-	-	-	-	-	-
7/1		-	-	-	-	-	-	-	-	-
8/1		-	-	-	-	-	-	-	-	-
9/1	192.168.2.11	yes	128	6	33	25600	128	4041424344454637	0	
10/1		-	-	-	-	-	-	-	-	-
11/1		-	-	-	-	-	-	-	-	-
12/1		-	-	-	-	-	-	-	-	-
13/1		-	-	-	-	-	-	-	-	-
14/1		-	-	-	-	-	-	-	-	-
15/1		-	-	-	-	-	-	-	-	-
...										
50/1		-	-	-	-	-	-	-	-	-

**Table 49 System PTP Clock Summary Field Descriptions**

Label	Description
PtpPort/Peer Prt/Peer	The PTP port and peer ID as configured in the <b>config&gt;system&gt;ptp&gt;clock</b> context
IP Address Peer IP	The IP address of the PTP peer
Static/Dynamic Dyn/Stat	Indicates if the peer is statically configured or dynamically requested
PTP Port State Port State	The PTP port state: initializing, listening, uncalibrated, slave, master, or passive
Slave	Indicates whether the clock is in a slave state
Rx/Tx In/Out	The direction of the packet counts
Anno	The number of ingress or egress announce packets
Sync	The number of ingress or egress synchronization packets
Follow-Up	The number of ingress follow-up packets
DelayRequest	The number of ingress or egress delay request packets
DelayResponse	The number of ingress or egress delay response packets
Anno Lease	The announce time remaining in the unicast session. The peer must re-request announce before this expires or the peer communication will be canceled.

**Table 49 System PTP Clock Summary Field Descriptions (Continued)**

Label	Description
Sync Lease	The synchronization time remaining in the unicast session. The peer must re-request synchronization before this expires or the peer communication will be canceled.
Delay Lease	The delay time remaining in the unicast session. The peer must re-request delay before this expires or the peer communication will be canceled.
Anno Rate	The rate of announce packets to or from the peer
Sync Rate	The rate of synchronization packets to or from the peer
Delay Rate	The rate of delay packets to or from the peer
Pri1	The grand master clock priority1 designation
GM Clk Cls	The grand master clock class designation
GM Clk Acc	The grand master clock accuracy designation
GM Clk Var	The grand master clock scaled log variance, in decimal format
Pri2	The grand master clock priority2 designation
GM ClockId	The grand master clock identification
Step Rem	The number of boundary clocks between the peer and the grand master

**Output Example**

```
A:7705:Dut-I# show system ptp clock 2
=====
IEEE1588 PTP Clock Information
=====

Local Clock

Clock Type : ordinary,slave Admin State : up
Source Interface : system Clock MDA : 1/1
PTP Profile : g8275dot2-2016 Domain : 44
Clock ID : d665fffffe000002 Clock Class : 255
Clock Accuracy : unknown(254) Clock Variance : not computed
Clock Priority1 : 128 Clock Priority2 : 255
Clock Local-priority : 222
Use Node Time : no Dynamic Peers : not allowed
Admin Freq-source : ptp Oper Freq-source : ptp
Tx While Sync Uncert*: true Sync Certainty State : uncertain
Two-Step : unknown

Parent Clock

```

```

Parent Clock ID : 34aa99fffeea4250 Parent Port Number : 3
GM Clock Id : 702526fffea852a2 GM Clock Class : 6
GM Clock Accuracy : 100ns GM Clock Variance : 20061
GM Clock Priority1 : 128 GM Clock Priority2 : 128
Rx Sync Certainty : uncertain

Time Information

Timescale : PTP
Recovered Date/Time : 09/16/16 21:53:24 (TAI)
UTC Offset : 36
Freq Traceable : true
Time Traceable : true
Time Source : gps
=====
* indicates that the corresponding row element may have been truncated.
=====
Port/Peer Summary

PtpPort/Peer : 1/1
IP Address : 10.10.10.10
Static/Dynamic : Static
PTP Port State : initializing

 Rx Tx

Anno 623 0
Sync 82990 0
Follow-Up 82990 -
DelayRequest 82998 82998
DelayResponse 82998 82998

=====
A:7705:Dut-I#

```

**Table 50 System PTP Clock Field Descriptions**

Label	Description
<b>Local Clock</b>	
Clock Type	The local clock type
Admin State	up — the local clock is enabled and running down — the local clock is shut down and not running
Source Interface	The PTP clock source interface as configured by the <a href="#">source-interface</a> command
Clock MDA	The PTP clock-mda as configured by the <a href="#">clock-mda</a> command
PTP Profile	The PTP profile as configured by the <a href="#">profile</a> command
Domain	The local clock domain
Clock ID	The local clock identification

**Table 50 System PTP Clock Field Descriptions (Continued)**

<b>Label</b>	<b>Description</b>
Clock Class	The local clock class
Clock Accuracy	The local clock accuracy designation
Clock Variance	The local clock variance
Clock Priority1	The local clock priority1 designation
Clock Priority2	The local clock priority2 designation
Clock Local-priority	The local clock local priority designation
Use Node Time	Indicates whether the PTP clock uses the node system time as the clock source
Dynamic Peers	Indicates whether dynamic peers are enabled
Admin Freq-source	The administrative value of the frequency source
Oper Freq-source	The operational value of the frequency source
Tx While Sync Uncert*	Indicates whether Announce messages are transmitted while the clock is in a synchronization uncertain state: true or false
Sync Certainty State	Indicates the synchronization certainty state of the local clock: certain or uncertain
Two-Step	Indicates whether the local clock uses a one-step or two-step synchronization method
<b>Parent Clock</b>	
Parent Clock ID	The parent clock identification
Parent Port Number	The parent clock port number
GM Clock Id	The grand master clock ID
GM Clock Class	The grand master clock class
GM Clock Accuracy	The grand master clock accuracy designation
GM Clock Variance	The grand master clock variance
GM Clock Priority1	The grand master clock priority1 designation
GM Clock Priority2	The grand master clock priority2 designation
Rx Sync Certainty	Indicates the synchronization certainty state received from the parent clock: certain or uncertain
<b>Time Information</b>	

**Table 50 System PTP Clock Field Descriptions (Continued)**

Label	Description
Timescale	The PTP timescale flag sent in the 1588 Announce message
Recovered Date/Time	The last date and time recovered by the PTP time recovery algorithm
UTC Offset	The offset between TAI and UTC, in seconds
Freq Traceable	The frequency traceable flag sent in the 1588 Announce message
Time Traceable	The time traceable flag sent in the 1588 Announce message
Time Source	The time-source parameter sent in the 1588 Announce message
<b>Port/Peer Summary</b>	
PtpPort/Peer	The PTP port and peer ID as configured in the <b>config&gt;system&gt;ptp&gt;clock</b> context
IP Address	The IP address of the PTP peer
Static/Dynamic	Indicates if the peer is statically configured or dynamically requested
PTP Port State	The PTP port state: initializing, listening, uncalibrated, slave, master, or passive
Rx/Tx	The direction of the packet counts
Anno	The number of ingress or egress announce packets
Sync	The number of ingress or egress synchronization packets
Follow-Up	The number of ingress follow-up packets
DelayRequest	The number of ingress or egress delay request packets
DelayResponse	The number of ingress or egress delay response packets

## port

**Syntax** `port [port-id [detail]]`

**Context** `show>system>ptp>clock`

**Description** This command displays information about configured PTP Ethernet ports. This command only applies when the *clock-id* parameter is set to **csn**.

**Parameters** *port-id* — specifies the PTP port ID in the format *slot/mda/port*

## ptp-port

- Syntax** `ptp-port port-id`
- Context** `show>system>ptp>clock`
- Description** This command displays PTP port information. This command only applies when the *clock-id* parameter value is 1 to 16.
- Parameters** *port-id* — specifies the PTP port ID
- Values** 1 to 50
- Output** The following output is an example of PTP port information, and [Table 51](#) describes the fields.

### Output Example

```
A:# show system ptp clock 1 ptp-port 1
```

```
=====
PTP Port
=====
Admin State : up Number Of Peers : 2
Log-anno-interval : 1 Anno-rx-timeouts : 3
Log-sync-interval : -6 Unicast : True
Master-only : false Local-priority : 128
PTP Port State : slave
=====
```

**Table 51** System PTP Port Field Descriptions

Label	Description
Admin State	up –the port is administratively up down – the port is administratively down
Number Of Peers	The number of peers associated with this PTP port
Log-anno-interval	The expected interval between the reception of announce messages
Anno-rx-timeouts	The number of announce timeouts that need to occur before communication messages with a master clock are assumed lost and the master clock is considered not available. One timeout in this context is equal to the announce interval in seconds, calculated using the logarithm $2^{\wedge}\log\text{-anno-interval-value}$ .
Log-sync-interval	The expected interval between the reception of synchronization messages

**Table 51 System PTP Port Field Descriptions (Continued)**

Label	Description
Unicast	True — the PTP slave clock can unicast-negotiate with the PTP master clock False — the PTP slave clock cannot unicast-negotiate with the PTP master clock
Master-only	True – the local port can not enter the slave state False – the local port can enter the slave state
Local-priority	The local priority designation of the associated clock
PTP Port State	The PTP port state: initializing, listening, uncalibrated, slave, master, or passive

peer

**Syntax** peer *peer-id* [**all**] [**detail**]

**Context** show>system>ptp>clock>ptp-port

**Description** This command displays PTP peer information.

**Parameters** *peer-id* — specifies the PTP peer ID

**Values** 1 to 50

**Output** The following output is an example of detailed PTP peer information, and [Table 52](#) describes the fields.

**Output Example**

```
A:# show system ptp clock 1 ptp-port 1 peer 1 detail

=====
Slave Port/Peer
=====
Slave Port Index : 1 Slave Port State : slave
Slave Peer Index : 1 Slave Peer IP : 10.242.6.6
Forward Weight : 17 Reverse Weight : 83
Freq Recovery State : locked
=====
PTP Port
=====
Admin State : up Number Of Peers : 2
Log-anno-interval : 1 Anno-rx-timeouts : 3
Log-sync-interval : -6 Unicast : True
Master-only : false Local-priority : 128
PTP Port State : initializing
=====
```

```

=====
Peer-1
=====
IP Address : 192.222.222.10 static/dynamic : static
Current Master : true
Description : (Not Specified)
Clock Id : 001af0fffe6808a7 Port Number : 2
GM Clock Id : 4041424344454637 GM Clock Class : 6
GM Clock Accuracy : 100ns GM Clock Variance : 25600
GM Clock Priority1 : 128 GM Clock Priority2 : 128
Step Type : one-step Tx Sync Certainty : unknown
Last Rx Anno Msg : 11/10/2010 10:32:54

```

```

Unicast Info

Dir Type Rate Dur Result Time Remain

Rx Anno 1 pkt/2 s 300 granted 11/10/2010 10:31:34 142
 Sync 64 pkt/s 300 granted 11/10/2010 10:31:38 150
 DelayResp 64 pkt/s 300 granted 11/10/2010 10:31:38 150

```

```

=====
PTP 1 Statistics
=====
 Input Output

Signalling Packets 91 94
Unicast Request Announce Packets 55 15
Unicast Request Announce Timeout 0 3
Unicast Request Announce Reject 0
Unicast Request Sync Packets 0 12
Unicast Request Sync Timeout 0 0
Unicast Request Sync Reject 0
Unicast Request Delay Resp Packe* 0 12
Unicast Request Delay Resp Timeo* 0 0
Unicast Request DelayResp Reject 0
Unicast Grant Announce Packets 12 0
Unicast Grant Announce Rejected 0 55
Unicast Grant Sync Packets 12 0
Unicast Grant Sync Rejected 0 0
Unicast Grant Delay Resp Packets 12 0
Unicast Grant Delay Resp Rejected 0
Unicast Cancel Announce Packets 0 0
Unicast Cancel Sync Packets 0 0
Unicast Cancel Delay Resp Packets 0 0
Unicast Ack Cancel Announce Pack* 0 0
Unicast Ack Cancel Sync Packets 0 0
Unicast Ack Cancel Delay Resp Pa* 0 0
Anno Packets 854 0
Sync Packets 113840 0
Follow-Up Packets 113840
Delay Response Packets 113838 0
Delay Request Packets 0 113838
Out Of Order Sync Packets 1
Total UDP (port 320) Pkts 945 94
Total UDP (port 319) Pkts 227678 113838

```



```

Discard Statistics

Alternate Master Packets 0
Bad Domain Packets 0
Bad Version Packets 0
Duplicate Msg Packets 0
Step RM Greater Than 255 0
=====
* indicates that the corresponding row element may have been truncated.

=====
PTP Peer 1 Algorithm State Statistics (in seconds)
=====
Free-run : 1100
Acquiring : 120
Phase-Tracking : 560
Hold-over : 0
Locked : 0
=====

=====
PTP Peer 1 Algorithm Event Statistics
=====
Excessive Freq Error Detected : 4
Excessive Packet Loss Detected : 0
Packet Loss Spotted : 0
Excessive Phase Shift Detected : 0
High PDV Detected : 0
Sync Packet Gaps Detected : 0
=====

=====
PTP Peer-1 Clock Recovery
- Internal Digital Phase Locked Loop (DPLL) Statistics
=====
time sync delay-req phase phase
 pkt delay pkt delay error error
 stddev stddev (ns) stddev
 (ns) (ns)

11/10/2010 10:31:17 0 0 211 16
11/10/2010 10:29:17 0 0 251 7
11/10/2010 10:27:17 0 0 243 11
11/10/2010 10:25:16 0 0 170 32
11/10/2010 10:07:16 138 131 -6789 36545
~11/10/2010 10:05:16 0 0 0 0
=====
A:#

```

**Table 52 System PTP Port Peer Detailed Field Descriptions**

Label	Description
<b>Slave Port/Peer</b>	
Slave Port Index	The slave port index

**Table 52 System PTP Port Peer Detailed Field Descriptions (Continued)**

Label	Description
Slave Port State	The slave port state: initializing, listening, uncalibrated, slave, master, or passive
Slave Peer Index	The slave peer index
Slave Peer IP	The slave peer IP address
Forward Weight	A value from 0 to 100, based on the stability and reliability of the PTP packet exchange in each direction. The system will give preference to frequency synchronization from the direction with a higher weight value.
Reverse Weight	
Freq Recovery State	The frequency recovery state: disabled, initial, acquiring, phase-tracking, or locked
<b>PTP Port</b>	
Admin State	up – the port is administratively up down – the port is administratively down
Number Of Peers	The number of peers associated with this PTP port
Log-anno-interval	The expected interval between the reception of announce messages
Anno-rx-timeouts	The number of announce timeouts that need to occur before communication messages with a master clock are assumed lost and the master clock is considered not available. One timeout in this context is equal to the announce interval in seconds, calculated using the logarithm $2^{\text{log-anno-interval-value}}$ .
Log-sync-interval	The expected interval between the reception of synchronization messages
Unicast	True — the PTP slave clock can unicast-negotiate with the PTP master clock False — the PTP slave clock cannot unicast-negotiate with the PTP master clock
Master-only	True – the local port can not enter the slave state False – the local port can enter the slave state
Local-priority	The local priority designation of the associated clock
PTP Port State	The PTP port state: initializing, listening, uncalibrated, slave, master, or passive

**Table 52 System PTP Port Peer Detailed Field Descriptions (Continued)**

Label	Description
<b>Peer-1</b>	
IP Address	The peer-1 clock IP address
Current Master	True — the peer-1 clock is the current master clock False — the peer-1 clock is not the current master clock
Description	The peer-1 clock description
Clock ID	The peer-1 clock identification
Port Number	The peer-1 clock port number
GM Clock ID	The grand master clock identification
GM Clock Class	The grand master clock class designation
GM Clock Accuracy	The grand master clock accuracy designation
GM Clock Variance	The grand master clock scaled log variance in decimal format
GM Clock Priority1	The grand master clock priority1 designation
GM Clock Priority2	The grand master clock priority2 designation
Step Type	Indicates whether the peer-1 clock uses a one-step or two-step synchronization method
Tx Sync Certainty	Indicates the transmitted synchronization certainty state
Last Rx Anno Msg	The time when the last announce message was received from the peer clock
<b>Unicast Info</b>	
Dir	The direction of the unicast information: either Rx or Tx
Type	The message type: announce, synchronization, or delay response
Rate	The rate of the unicast information in packets per second
Dur	The lease duration for the session
Result	The result of the last unicast request sent to the peer for the indicated message type
Time	The time the unicast information was received
Remain	The time remaining before the lease expires

**Table 52 System PTP Port Peer Detailed Field Descriptions (Continued)**

Label	Description
<b>PTP 1 Statistics</b>	
	<p>The following input/output statistics are provided for the peer-1/peer-2 clock:</p> <ul style="list-style-type: none"> <li>• Signalling Packets</li> <li>• Unicast Request Announce Packets</li> <li>• Unicast Request Announce Timeout</li> <li>• Unicast Request Announce Reject</li> <li>• Unicast Request Sync Packets</li> <li>• Unicast Request Sync Timeout</li> <li>• Unicast Request Sync Reject</li> <li>• Unicast Request Delay Resp Packets</li> <li>• Unicast Request Delay Resp Timeout</li> <li>• Unicast Request Delay Resp Reject</li> <li>• Unicast Grant Announce Packets</li> <li>• Unicast Grant Announce Rejected</li> <li>• Unicast Grant Sync Packets</li> <li>• Unicast Grant Sync Rejected</li> <li>• Unicast Grant Delay Resp Packets</li> <li>• Unicast Grant Delay Resp Rejected</li> <li>• Unicast Cancel Announce Packets</li> <li>• Unicast Cancel Sync Packets</li> <li>• Unicast Cancel Delay Resp Packets</li> <li>• Unicast Ack Cancel Announce Packets</li> <li>• Unicast Ack Cancel Sync Packets</li> <li>• Unicast Ack Cancel Delay Resp Packets</li> <li>• Anno Packets</li> <li>• Sync Packets</li> <li>• Follow-Up Packets</li> <li>• Delay Response Packets</li> <li>• Delay Request Packets</li> <li>• Out Of Order Sync Packets</li> <li>• Total UDP (port 320) Pkts</li> <li>• Total UDP (port 319) Pkts</li> </ul>

**Table 52 System PTP Port Peer Detailed Field Descriptions (Continued)**

Label	Description
	<p>The following discard statistics are provided for the peer-1/peer-2 clock:</p> <ul style="list-style-type: none"> <li>• Alternate Master Packets</li> <li>• Bad Domain Packets</li> <li>• Bad Version Packets</li> <li>• Duplicate Msg Packets</li> <li>• Step RM Greater Than 255</li> </ul>
	<p>The following algorithm state statistics (in seconds) are provided for the peer-1/peer-2 clock:</p> <ul style="list-style-type: none"> <li>• Free-run</li> <li>• Acquiring</li> <li>• Phase-Tracking</li> <li>• Hold-over</li> <li>• Locked</li> </ul>
	<p>The following algorithm event statistics are provided for the peer-1/peer-2 clock:</p> <ul style="list-style-type: none"> <li>• Excessive Freq Error Detected</li> <li>• Excessive Packet Loss Detected</li> <li>• Packet Loss Spotted</li> <li>• Excessive Phase Shift Detected</li> <li>• High PDV Detected</li> <li>• Sync Packet Gaps Detected</li> </ul>
	<p>The following statistics are shown for the peer clock. These statistics are refreshed every 2 min; the display shows the time of the last update:</p> <ul style="list-style-type: none"> <li>• sync pkt delay stddev (ns)</li> <li>• delay-req pkt delay stddev (ns)</li> <li>• phase error (ns)</li> <li>• phase error stddev (ns)</li> </ul>

## rollback

<b>Syntax</b>	<b>rollback [rescue]</b>
<b>Context</b>	show>system
<b>Description</b>	This command displays CLI configuration rollback checkpoint file information.
<b>Parameters</b>	<b>rescue</b> — displays CLI configuration rollback rescue file information
<b>Output</b>	The following outputs are examples of rollback information and rollback rescue information, and <a href="#">Table 53</a> describes the fields.

### Rollback Output Example

```
*A:7705:Dut-C# show system rollback
=====
Rollback Information
=====
Rollback Location : ftp://*:*@xxx.xxx.xx//device_logs/Dut-C-Rollback
Max Local Rollback Files : 10
Max Remote Rollback Files : 10
Save
 Last Rollback Save Result : Successful
 Last Save Completion Time : 2017/01/25 22:42:47 UTC
Revert
 In Progress : No
 Last Revert Initiated User : N/A
 Last Revert Checkpoint File: N/A
 Last Revert Result : None
 Last Revert Initiated Time : N/A
 Last Revert Completion Time: N/A
Delete
 Last Rollback Delete Result: None
=====
Rollback Files
=====
Idx Suffix Creation Time Release User
 Comment

latest .rb 2017/01/25 22:42:45 UTC B-8.0.B1-R4 admin
 L3_SPOKE_SETUP
1 .rb.1 2017/01/25 22:33:58 UTC B-8.0.B1-R4 admin
2 .rb.2 2017/01/25 22:25:46 UTC B-8.0.B1-R4 admin
 L3_SPOKE_SETUP
3 .rb.3 2017/01/25 19:49:30 UTC B-8.0.B1-R4 admin
4 .rb.4 2017/01/25 19:44:42 UTC B-8.0.B1-R4 admin
 L3_SPOKE_SETUP
5 .rb.5 2017/01/25 19:14:51 UTC B-8.0.B1-R4 admin
 Firewall with NGE rollback
6 .rb.6 2017/01/25 19:04:16 UTC B-8.0.B1-R4 admin
 initial

No. of Rollback Files: 7
=====
*A:7705:Dut-C#
```

```
*A:~# show system rollback rescue
=====
Rollback Rescue Information
=====
Rollback Rescue Location : cf3:/rescue
 Rescue file saved : Yes
Save
 Last Save Result : Successful
 Last Save Completion Time : 2017/02/24 17:54:57 UTC
Revert
 In Progress : No
 Last Revert Initiated User : admin
 Last Revert Result : Successful
 Last Revert Initiated Time : 2017/02/24 17:55:09 UTC
 Last Revert Completion Time: 2017/02/24 17:55:09 UTC
Delete
 Last Delete Result : None
*A:~#
```

**Rollback Rescue Output Example**

```
*A:~# show system rollback rescue
=====
Rollback Rescue Information
=====
Rollback Rescue Location : cf3:/rescue
 Rescue file saved : Yes
Save
 Last Save Result : Successful
 Last Save Completion Time : 2017/02/24 17:54:57 UTC
Revert
 In Progress : No
 Last Revert Initiated User : admin
 Last Revert Result : Successful
 Last Revert Initiated Time : 2017/02/24 17:55:09 UTC
 Last Revert Completion Time: 2017/02/24 17:55:09 UTC
Delete
 Last Delete Result : None
*A:~#
```

**Table 53 System Rollback Field Descriptions**

Label	Description
<b>Rollback Information</b>	
Rollback Location	The location where rollback checkpoint files will be saved
Max Local Rollback Files	The maximum number of rollback checkpoint files that will be saved to a local server
Max Remote Rollback Files	The maximum number of rollback checkpoint files that will be saved to a remote server
<b>Save</b>	

**Table 53 System Rollback Field Descriptions (Continued)**

Label	Description
Last Rollback Save Result	The status of the last rollback checkpoint save
Last Save Completion Time	The date and time the last rollback checkpoint file save operation was completed
<b>Revert</b>	
In Progress	Indicates if a system rollback reversion is in progress
Last Revert Initiated User	The username of the person who initiated the last system rollback reversion
Last Revert Checkpoint File	The location of the last rollback checkpoint file
Last Revert Result	The result of the last system rollback reversion
Last Revert Initiated Time	The date and time when the last rollback was initiated
Last Revert Completion Time	The date and time when the last rollback was completed
<b>Delete</b>	
Last Rollback Delete Result	The status of the last rollback checkpoint file deletion
<b>Rollback Files</b>	
Idx	The rollback checkpoint file ID
Suffix	The rollback checkpoint file suffix
Comment	User comments about the rollback checkpoint file
Creation Time	The date and time when the file was created
Release	The software load that the checkpoint file was created in
User	The user who created the file
<b>Rollback Rescue Information</b>	
Rollback Rescue Location	The location where rollback rescue files will be saved
Rescue file saved	The maximum number of rollback rescue files that will be saved to a local server



**Table 53 System Rollback Field Descriptions (Continued)**

Label	Description
Save	
Last Save Result	The status of the last rollback checkpoint save
Last Save Completion Time	The date and time the last rollback rescue file save operation was completed
Revert	
In Progress	Indicates if a system rollback reversion is in progress
Last Revert Initiated User	The username of the person who initiated the last system rollback reversion
Last Revert Result	The result of the last system rollback reversion
Last Revert Initiated Time	The date and time when the last rollback was initiated
Last Revert Completion Time	The date and time when the last rollback was completed
Delete	
Last Delete Result	The status of the last rollback rescue file deletion

### script-control

**Syntax** `script-control`

**Context** `show>system`

**Description** This command enables the context to display script information.

### script

**Syntax** `script [script-name] [owner script-owner]`

**Context** `show>system>script-control`

**Description** This command displays script parameters.

**Parameters** *script-name* — displays information for the specified script name  
*script-owner* — displays information for the specified script owner associated with the script name

**Output** The following output is an example of script information, and [Table 54](#) describes the fields.

**Output Example**

```

A:ALU-1# show system script-control script
=====
Script Information
=====
Script : test
Owner name : TiMOS CLI
Description : asd
Administrative status : enabled
Operational status : enabled
Script source location : ftp://*****:*****@192.168.100.1/home/testlab_bgp
 /test1.cfg
Last script error : none
Last change : 2017/01/07 17:10:03
=====
A:ALU-1#

```

**Table 54** Script Field Descriptions

Label	Description
Script	The name of the script
Owner name	The name of the script owner
Description	The description of the script
Administrative status	Enabled — administrative status is enabled Disabled — administrative status is disabled
Operational status	Enabled — operational status is enabled Disabled — operational status is disabled
Script source location	The location of the scheduled script
Last script error	The system time of the last error
Last change	The system time of the last change to the script configuration

**script-policy**

**Syntax** **script-policy** *policy-name* [**owner** *policy-owner*]  
**script-policy run-history** [*run-state*]

**Context** show>system>script-control

**Description** This command displays script policy information.

**Parameters** *policy-name* — displays information for the specified script policy name

*policy-owner* — displays information for the specified script policy owner associated with the script policy name

*run-state* — displays information for script policies in the specified state

**Values**      executing, initializing, terminated

**Output**      The following output is an example of script policy information, and [Table 55](#) describes the fields.

### Output Example

```
A:ALU-1# show system script-control script-policy "test_policy"
=====
Script-policy Information
=====
Script-policy : test_policy
Script-policy Owner : TiMOS CLI
Administrative status : enabled
Operational status : enabled
Script : test_script
Script owner : TiMOS CLI
Script source location : ftp://*****:*****@192.168.100.1/home/testlab_bgp
 /test1.cfg
Script results location : ftp://*****:*****@192.168.15.1/home/testlab_bgp
 /cron/res
Max running allowed : 1
Max completed run histories : 4
Max lifetime allowed : 0d 01:00:00 (3600 seconds)
Completed run histories : 1
Executing run histories : 0
Initializing run histories : 0
Max time run history saved : 0d 02:00:00 (7200 seconds)
Script start error : N/A
Last change : 2018/07/03 18:02:36
Max row expire time : never
Last application : event-script
Last auth. user account : not-specified
=====
Script Run History Status Information

No script run history entries
=====
A:ALU-1#

A:ALU-1# show system script-control script-policy run-history terminated
=====
Script-policy Run History
=====
Script policy "test"
Owner "TiMOS CLI"

Script Run #17

Start time : 2017/11/06 20:30:09 End time : 2017/11/06 20:35:24
Elapsed time : 0d 00:05:15 Lifetime : 0d 00:00:00
State : terminated Run exit code : noError
```

```

Result time : 2017/11/06 20:35:24 Keep history : 0d 00:49:57
Error time : never
Results file : ftp://*:*@192.168.15.18/home/testlab_bgp/cron/_20171106-203008.
out
Run exit : Success

Script Run #18

Start time : 2017/11/06 20:35:24 End time : 2017/11/06 20:40:40
Elapsed time : 0d 00:05:16 Lifetime : 0d 00:00:00
State : terminated Run exit code : noError
Result time : 2017/11/06 20:40:40 Keep history : 0d 00:55:13
Error time : never
Results file : ftp://*:*@192.168.15.18/home/testlab_bgp/cron/_20171106-203523.
out
Run exit : Success

A:ALU-1#

A:ALU-1# show system script-control script-policy run-history executing
=====
Script-policy Run History
=====
Script policy "test"
Owner "TiMOS CLI"

Script Run #20

Start time : 2017/11/06 20:46:00 End time : never
Elapsed time : 0d 00:00:56 Lifetime : 0d 00:59:04
State : executing Run exit code : noError
Result time : never Keep history : 0d 01:00:00
Error time : never
Results file : ftp://*:*@192.168.15.18/home/testlab_bgp/cron/_20171106-204559.
out
=====
A:ALU-1# show system script-control script-policy run-history initializing
=====
Script-policy Run History
=====
Script policy "test"
Owner "TiMOS CLI"

Script Run #21

Start time : never End time : never
Elapsed time : 0d 00:00:00 Lifetime : 0d 01:00:00
State : initializing Run exit code : noError
Result time : never Keep history : 0d 01:00:00
Error time : never
Results file : none

Script Run #22

Start time : never End time : never
Elapsed time : 0d 00:00:00 Lifetime : 0d 01:00:00
State : initializing Run exit code : noError
Result time : never Keep history : 0d 01:00:00

```

```

Error time : never
Results file : none

Script Run #23

Start time : never End time : never
Elapsed time : 0d 00:00:00 Lifetime : 0d 01:00:00
State : initializing Run exit code : noError
Result time : never Keep history : 0d 01:00:00
Error time : never
Results file : none
=====
A:ALU-1#

```

**Table 55 Script Policy Field Descriptions**

Label	Description
Script-policy	The name of the script policy
Script-policy Owner	The name of the script policy owner
Administrative status	Enabled — administrative status is enabled Disabled — administrative status is disabled
Operational status	Enabled — operational status is enabled Disabled — operational status is disabled
Script	The name of the script
Script owner	The name of the script owner
Script source location	The location of the scheduled script
Script results location	The location where the script results are sent
Max running allowed	The maximum number of allowed script runs
Max completed run histories	The maximum number of run history status entries that can be kept
Max lifetime allowed	The maximum length of time that the script may run
Completed run histories	The number of completed script runs
Executing run histories	The number of script runs in the process of executing
Initializing run histories	The number of scripts queued to run but not executed

**Table 55 Script Policy Field Descriptions (Continued)**

Label	Description
Max time run history saved	The maximum length of time to keep the run history status entry
Script start error	Indicates if any errors occurred when starting the script
Last change	The system time of the last change made to the script policy configuration
Max row expire time	The length of time that an entry (row) in the smLaunchTable (in the Script MIB) is kept and available to launch an associated script before it is deleted. Entries are deleted if there are no associated scripts in the run history. On the 7705 SAR, this timer cannot be set; therefore, the status is always Never (the row is never deleted).
Last application	The last application that triggered the script run
Last auth. user account	The last user account that the script was executed under in order for authorization to be performed
<b>Script Run History Status Information</b>	
Script Run #	Indicates the <i>n</i> th time that the script is being run
Start time	The time that the script run started
End time	The time that the script run ended
Elapsed time	The length of time between start and end of the script run
Lifetime	The maximum length of time that the script may run
State	The state of the script: executing, initializing, or terminated
Run exit code	The code generated at the end of the script run (for example, noError)
Result time	The time that the script results were generated
Keep history	The length of time to keep the script run history status entry
Error time	The time during the script run at which an error occurred
Results file	The location where the script results are stored
Run exit	Indicates whether the run completed successfully

## sntp

- Syntax**     **sntp**
- Context**    show>system
- Description** This command displays SNTP protocol configuration and state.
- Output**     The following output is an example of SNTP information, and [Table 56](#) describes the fields.

### Output Example

```
A:ALU-1# show system sntp

=====
SNTP Status
=====
Admin Status : up Oper Status : up Mode : unicast
=====

=====
SNTP
Servers
=====
SNTP Server Version Preference Interval

10.10.20.253 3 Preferred 64
=====
A:ALU-1#
```

**Table 56**     **System SNTP Field Descriptions**

Label	Description
Admin Status	up — the SNTP server is administratively up
	down — the SNTP server is administratively down
Oper Status	up — the SNTP server is operationally up
	down — the SNTP server is operationally down
Mode	broadcast — the SNTP server has broadcast client mode enabled
	unicast — the SNTP server has unicast client mode enabled
SNTP Server	The SNTP server address for SNTP unicast client mode
Version	The SNTP version number, expressed as an integer

**Table 56 System SNMP Field Descriptions (Continued)**

Label	Description
Preference	Normal — when more than one time server is configured, one server can be configured to have preference over another
	Preferred — indicates that this server has preference over another
Interval	The frequency, in seconds, that the server is queried

## thresholds

- Syntax** `thresholds`
- Context** `show>system`
- Description** This command display system monitoring thresholds.
- Output** The following output is an example of system monitoring thresholds information, and [Table 57](#) describes the fields.

### Output Example

```
A:ALU-48# show system thresholds
=====
Threshold Alarms
=====
Variable: tmtxCpmFlashUsed.1.11.1
Alarm Id : 1 Last Value : 835
Rising Event Id : 1 Threshold : 5000
Falling Event Id : 2 Threshold : 2500
Sample Interval : 2748341* SampleType : absolute
Startup Alarm : either Owner : TiMOS CLI

Variable: tmtxCpmFlashUsed.1.11.1
Alarm Id : 2 Last Value : 835
Rising Event Id : 3 Threshold : 10000
Falling Event Id : 4 Threshold : 5000
Sample Interval : 27483 SampleType : absolute
Startup Alarm : rising Owner : TiMOS CLI

Variable: sgiMemoryUsed.0
Alarm Id : 3 Last Value : 42841056
Rising Event Id : 5 Threshold : 4000
Falling Event Id : 6 Threshold : 2000
Sample Interval : 2147836 SampleType : absolute
Startup Alarm : either Owner : TiMOS CLI

=====
* indicates that the corresponding row element may have been truncated.
=====
Threshold Events
```



```

=====
Description: TiMOS CLI - cflash capacity alarm rising event
Event Id : 1 Last Sent : 10/31/2006 08:47:59
Action Type : both Owner : TiMOS CLI

Description: TiMOS CLI - cflash capacity alarm falling event
Event Id : 2 Last Sent : 10/31/2006 08:48:00
Action Type : both Owner : TiMOS CLI

Description: TiMOS CLI - cflash capacity warning rising event
Event Id : 3 Last Sent : 10/31/2006 08:47:59
Action Type : both Owner : TiMOS CLI

Description: TiMOS CLI - cflash capacity warning falling event
Event Id : 4 Last Sent : 10/31/2006 08:47:59
Action Type : both Owner : TiMOS CLI

Description: TiMOS CLI - memory usage alarm rising event
Event Id : 5 Last Sent : 10/31/2006 08:48:00
Action Type : both Owner : TiMOS CLI

Description: TiMOS CLI - memory usage alarm falling event
Event Id : 6 Last Sent : 10/31/2006 08:47:59
Action Type : both Owner : TiMOS CLI

=====

=====
Threshold Events Log
=====
Description : TiMOS CLI - cflash capacity alarm falling eve
 nt : value=835, <=2500 : alarm-index 1, event
 -index 2 alarm-variable OID tmnxCpmFlashUsed.
 1.11.1
Event Id : 2 Time Sent : 10/31/2006 08:48:00

Description : TiMOS CLI - memory usage alarm rising event :
 value=42841056, >=4000 : alarm-index 3, even
 t-index 5 alarm-variable OID sgiMemoryUsed.0
Event Id : 5 Time Sent : 10/31/2006 08:48:00

=====
A:ALU-48#

```

**Table 57 System Threshold Field Descriptions**

Label	Description
Variable	The variable OID
Alarm Id	The numerical identifier for the alarm
Last Value	The last threshold value
Rising Event Id	The identifier of the RMON rising event
Threshold	The identifier of the RMON rising threshold

**Table 57 System Threshold Field Descriptions (Continued)**

Label	Description
Falling Event Id	The identifier of the RMON falling event
Threshold	The identifier of the RMON falling threshold
Sample Interval	The polling interval, in seconds, over which the data is sampled and compared with the rising and falling thresholds
Sample Type	The method of sampling the selected variable and calculating the value to be compared against the thresholds
Startup Alarm	The alarm that may be sent when this alarm is first created
Owner	The owner of this alarm
Description	The event cause
Event Id	The identifier of the threshold event
Last Sent	The date and time the alarm was sent
Action Type	<p>log — an entry is made in the RMON-MIB log table for each event occurrence. This does not create a TiMOS logger entry. The RMON-MIB log table entries can be viewed using the <b>show&gt;system&gt;thresholds</b> CLI command.</p> <p>trap — a TiMOS logger event is generated. The TiMOS logger utility then distributes the notification of this event to its configured log destinations which may be CONSOLE, telnet session, memory log, cflash file, syslog, or SNMP trap destinations logs.</p> <p>both — both an entry in the RMON-MIB logTable and a TiMOS logger event are generated</p> <p>none — no action is taken</p>
Owner	The owner of the event

## time

**Syntax** `time [detail]`

**Context** `show>system`

**Description** This command displays the system time and zone configuration parameters.

**Output** The following outputs are examples of time information:

- 7705 SAR-8 Shelf V2, 7705 SAR-18 ([Output Example, Table 58](#))
- 7705 SAR chassis where GNSS and PTP are used as sources of system time ([Detailed Output Example, Table 59](#))

**Output Example**

```
A:ALU-1# show system time
=====
Date & Time
=====
Current Date & Time : 2014/08/13 20:47:23 DST Active : no
Current Zone : UTC Offset from UTC : 0:00

Non-DST Zone : UTC Offset from UTC : 0:00
Zone type : standard

DST Zone : PDT Offset from Non-DST : 0:60
Starts : first sunday in april 02:00
Ends : last sunday in october 02:00
=====
```

**Table 58 System Time Field Descriptions (7705 SAR-8 Shelf V2, 7705 SAR-18)**

Label	Description
Current Date & Time	The system date and time using the current time zone
DST Active	Yes — Daylight Savings Time is currently in effect
	No — Daylight Savings Time is not currently in effect
Current Zone	The zone name for the current zone
Non-DST Zone	The zone name for the non-DST zone
DST Zone	The zone name for the DST zone
Zone type	Non-standard — the zone is user-defined
	Standard — the zone is system-defined
Offset from UTC	The number of hours and minutes added to universal time for the current zone and non-DST zone, including the DST offset for a DST zone
Offset from Non-DST	The number of hours (always 0) and minutes (0 to 60) added to the time at the beginning of Daylight Saving Time and subtracted at the end of Daylight Saving Time
Starts	The date and time Daylight Saving Time begins
Ends	The date and time Daylight Saving Time ends

**Detailed Output Example**

```

A:ALU-1# show system time detail
=====
Date & Time
=====
Current Date & Time : 2014/08/13 20:47:23 DST Active : no
Current Zone : UTC Offset from UTC : 0:00

Non-DST Zone : UTC Offset from UTC : 0:00
Zone type : standard

DST Zone : PDT Offset from Non-DST : 0:60
Starts : first sunday in april 02:00
Ends : last sunday in october 02:00
=====
Time References
=====
Selected Ref : gps 1/3/1 Selection Time : 08/13/2014 20:23:19

time-ref-prior*: 1 Selected : true
Ref Type : gps Qualified : true
Ref Id : 1/3/1 Leap Sec Sched : notScheduled
Delta Sec : 0 Leap Sec Upd Time: n/a
Delta Ns : 0

time-ref-prior*: 2 Selected : false
Ref Type : ptp Qualified : false
Ref Id : clock 1 Leap Sec Sched : notScheduled
Delta Sec : 0 Leap Sec Upd Time: n/a
Delta Ns : 0

* indicates that the corresponding row element may have been truncated
=====
Time Of Day - 1 Pulse Per Second Port
=====
Output : no shutdown Message Type : none

Format : IRIG-B
Modulation : 0 = Digital Modulation : 1 = Amplitude Modulated
Freq/Resolution: 0 = No Carrier Freq/Resolution: 2 = 1 kHz/1 ms
Coded Expressi*: unknown Coded Expressi*:unknown
=====
* indicates that the corresponding row element may have been truncated

```

**Table 59 System Time Field Descriptions (GNSS and PTP Time Source)**

Label	Description
Current Date & Time	The system date and time using the current time zone
DST Active	Yes — Daylight Savings Time is currently in effect
	No — Daylight Savings Time is not currently in effect

**Table 59 System Time Field Descriptions (GNSS and PTP Time Source) (Continued)**

Label	Description
Current Zone	The zone name for the current zone
Non-DST Zone	The zone name for the non-DST zone
DST Zone	The zone name for the DST zone
Zone type	Non-standard — the zone is user-defined
	Standard — the zone is system-defined
Offset from UTC	The number of hours and minutes added to universal time for the current zone and non-DST zone, including the DST offset for a DST zone
Offset from Non-DST	The number of hours (always 0) and minutes (0 to 60) added to the time at the beginning of Daylight Saving Time and subtracted at the end of Daylight Saving Time
Starts	The date and time Daylight Saving Time begins
Ends	The date and time Daylight Saving Time ends
<b>Time References</b>	
Selected Ref	The type and identifier of the current system time reference source
Selection Time	The date and time when the current system time reference source was selected to update the system time
time-ref-priority	The priority value of the time reference. A lower numeric value represents a higher priority. The time-ref-priority value must be present when the time reference is created.
Ref Type	The type of system time reference: GNSS or PTP
Ref Id	The unique identifier for the type of system time reference
Delta Sec	The time difference between this reference and the currently selected time reference in seconds. If this time reference is not qualified, the value will be 0.
Delta Ns	The time difference between this reference and the currently selected time reference in nanoseconds. If this time reference is not qualified, the value will be 0.
Selected	true — the source is being used to update system time
	false — the source is not being used to update system time

**Table 59 System Time Field Descriptions (GNSS and PTP Time Source) (Continued)**

Label	Description
Qualified	true — the time reference is providing time updates
	false — the time reference is not providing time updates
Leap Sec Sched	Indicates whether there is a scheduled leap second
Leap Sec Upd Time	The UTC time when the scheduled leap second adjustment will occur. If a leap second is not scheduled, the value will be 0.
<b>Time of Day - 1 Pulse Per Second Port</b>	
Output	The state of the output: shutdown or no shutdown
Message Type	The type of message: ct, cm, or none
Format	The format of the time of day output
Modulation	The modulation type of the time of day output
Freq/Resolution	The frequency (in kHz) and resolution (in milliseconds) of the time of day output
Coded Expression	The coded expression of the time of day output

## time

**Syntax** time

**Context** show

**Description** This command displays the current day, date, time and time zone.

The time is displayed either in the local time zone or in UTC depending on the setting of the root level **time-display** command for the console session.

**Output** The following output is an example of time information.

### Output Example

```
A:ALU-1# show time
Tue Mar 25 12:17:15 GMT 2008
A:ALU-1#
```

-----

## redundancy

- Syntax** `redundancy`
- Context** `show`
- Description** This command enables the context to show redundancy information.

## multi-chassis

- Syntax** `multi-chassis`
- Context** `show>redundancy`
- Description** This command enables the context to show multi-chassis redundancy information.

## all

- Syntax** `all`
- Context** `show>redundancy>multi-chassis`
- Description** This command displays summary multi-chassis redundancy status information.
- Output** The following output is an example of general chassis information, and [Table 60](#) describes the fields.

### Output Example

```
A:7705:Dut-D>config>redundancy>multi-chassis# show redundancy multi-chassis all
=====
Multi-Chassis Peers
=====
Peer IP Src IP Auth Peer Admin MC-Ring Oper MC-EP Adm
 MCS Admin MCS Oper MCS State MC-LAG Adm MC-LAG Oper

10.10.10.3 10.10.10.4 None Enabled unknown --
 -- -- -- Enabled Enabled
=====
```

**Table 60 Multi-Chassis Field Descriptions**

Label	Description
Peer IP	Displays the multi-chassis redundancy peer IP address
Src IP	Displays the source IP address used to communicate with the multi-chassis peer

**Table 60 Multi-Chassis Field Descriptions (Continued)**

Label	Description
Auth	If configured, displays the authentication key used between this node and the multi-chassis peer
Peer Admin	Displays whether the multi-chassis peer is enabled or disabled
MC-Ring Oper	Displays whether multi-chassis ring functionality is enabled or disabled. Not Applicable.
MC-EP Adm	Displays whether the multi-chassis endpoint is enabled or disabled (not applicable)
MCS Admin	Displays the multi-chassis synchronization is enabled or disabled (not applicable)
MCS Oper	Displays whether multi-chassis synchronization functionality is enabled or disabled (not applicable)
MCS State	Displays the multi-chassis synchronization state (not applicable)
MC-LAG Adm	Displays whether MC-LAG is enabled or disabled
MC-LAG Oper	Displays whether MC-LAG functionality is enabled or disabled

## mc-firewall

**Syntax** **mc-firewall peer** [*ip-address*]  
**mc-firewall peer** [*ip-address*] **statistics**  
**mc-firewall statistics**

**Context** show>redundancy>multi-chassis

**Description** This command displays multi-chassis firewall information.

**Parameters** *ip-address* — shows information for the peer with the specified IP address  
**statistics** — shows either multi-chassis firewall statistics for the specified peer or multi-chassis firewall global statistics when no peer is specified

**Output** The following output is an example of multi-chassis firewall information, and [Table 61](#) describes the fields.

### Output Example

```
*A: Sar8 Dut-A>show>redundancy>multi-chassis# mc-firewall peer
=====
Multi-Chassis MC-Firewall
=====
Peer Addr : 10.0.0.1 Peer Name :
```



```

Admin State : down Oper State : down
Source Addr : 0.0.0.0 Election Role : -
Policy Sync : - Session DB Sync : -
System Id : d6:64:ff:00:00:00 Sys Priority : 0
Keep Alive Intvl : 10 Hold on Nbr Fail : 3
Boot Timer : 300
Encryption : disabled Active Out Spi : -
Auth Algorithm : - Encr Algorithm : -
Sec Assoc Spi : - Sec Assoc Spi : -
Last update : 06/27/2019 18:53:35 Last State chg : 06/27/2019 18:53:35

```

Number of Entries 1

```
*A:~>show>redundancy>multi-chassis# mc-firewall peer 50.0.0.1
```

Multi-Chassis MC-Firewall

```

Peer Addr : 50.0.0.1 Peer Name :
Admin State : up Oper State : up
Source Addr : 0.0.0.0 Election Role : Master
Policy Sync : Yes Session DB Sync : Yes
System Id : 84:db:fc:cb:ce:8d Sys Priority : 1
Keep Alive Intvl : 10 Hold on Nbr Fail : 3
Boot Timer : 300
Encryption : enabled Active Out Spi : 1
Auth Algorithm : sha256 Encr Algorithm : aes128
Sec Assoc Spi : 1 Sec Assoc Spi : -
Last update : 08/19/2019 19:56:58 Last State chg : 08/19/2019 19:43:10

```

```
*A:~>show>redundancy>multi-chassis#
```

```
*A:~>show>redundancy>multi-chassis# mc-firewall peer 10.0.0.1 statistics
```

Multi-Chassis MC-Firewall Statistics

```

Peer Addr : 10.0.0.1

Packets Rx : 0
Packets Rx Keepalive : 0
Packets Rx Peer Config : 0
Packets Rx Peer Data : 0
Packets Dropped Rx Peer Data : 0
Packets Dropped State Disabled : 0
Packets Dropped Packets Too Short : 0
Packets Dropped Tlv Invalid Size : 0
Packets Dropped Out of Seq : 0
Packets Dropped Unknown Tlv : 0
Packets Dropped MD5 : 0
Packets Tx : 0
Packets Tx Keepalive : 0
Packets Tx Peer Config : 0
Packets Tx Peer Data : 0
Packets Tx Failed : 0
Packets Dropped No Peer : 0

```

```
*A:~>show>redundancy>multi-chassis#
```

```

*A:~# Sar8 Dut-A>show>redundancy>multi-chassis# mc-firewall statistics
=====
Multi-Chassis Firewall Global Statistics
=====
Packets Rx : 0
Packets Rx Keepalive : 0
Packets Rx Peer Config : 0
Packets Rx Peer Data : 0
Packets Dropped Keep-Alive Task : 0
Packets Dropped Peer Data : 0
Packets Dropped Too Short : 0
Packets Dropped Verify Failed : 0
Packets Dropped Tlv Invalid Size : 0
Packets Dropped Out Of Seq : 0
Packets Dropped Unknown Tlv : 0
Packets Dropped MD5 : 0
Packets Dropped Unknown Peer : 0
Packets Dropped MC Firewall No Peer : 0
Packets Tx : 0
Packets Tx Keepalive : 0
Packets Tx Peer Config : 0
Packets Tx Peer Data : 0
Packets Tx Failed : 0
=====
*A:~# Sar8 Dut-A>show>redundancy>multi-chassis#

```

**Table 61 Multi-Chassis Firewall Field Descriptions**

Label	Description
<b>Multi-Chassis MC-Firewall</b>	
Peer Addr	The IP address of the multi-chassis firewall peer
Peer Name	The name of the multi-chassis firewall peer
Admin State	The administrative state of the multi-chassis firewall on this system
Oper State	The operational state of the multi-chassis firewall on this system
Source Addr	The source address of the multi-chassis firewall on this system
Election Role	The elected role of the multi-chassis firewall on this system, either master or slave
Policy Sync	Indicates whether security policy synchronization has occurred on the multi-chassis firewall on this system
Session DB Sync	Indicates whether security session database synchronization has occurred on the multi-chassis firewall on this system
System Id	The system ID of the multi-chassis firewall on this system
Sys Priority	The system priority of the multi-chassis firewall on this system

**Table 61 Multi-Chassis Firewall Field Descriptions (Continued)**

Label	Description
Keep Alive Intvl	The time interval between keepalive messages exchanged between peers
Hold on Nbr Fail	Indicates how many keepalive intervals a router will wait for packets from its neighbor before declaring communication failure
Boot Timer	The configured boot timer interval
Encryption	Indicates whether encryption is enabled on the multi-chassis link (MCL)
Active Out spi	The index number of the active outbound security association
Auth Algorithm	The configured authentication algorithm, either sha256 or sha512
Encr Algorithm	The configured encryption algorithm, either aes128 or aes256
Sec Assoc Spi	The security parameter index for the security association
Last update	The date and time of the last update for the multi-chassis firewall on this system
Last State chg	The date and time of the last state change for the multi-chassis firewall on this system
<b>Multi-Chassis MC-Firewall Statistics</b>	
Peer Addr	The IP address of the multi-chassis firewall peer
Packets Rx	The number of packets received from the peer
Packets Rx Keepalive	The number of multi-chassis firewall keepalive packets received from the peer
Packets Rx Peer Config	The number of multi-chassis firewall configuration packets received from the peer
Packets Rx Peer Data	The number of data packets received from the peer
Packets Dropped Rx Peer Data	The number of data packets received from the peer that were dropped on this system
Packets Dropped State Disabled	The number of packets that were dropped because this system was administratively disabled
Packets Dropped Packets Too Short	The number of packets dropped because the packet was too short
Packets Dropped Tlv Invalid Size	The number of packets that were dropped because the packet was an invalid size

**Table 61 Multi-Chassis Firewall Field Descriptions (Continued)**

Label	Description
Packets Dropped Out Of Seq	The number of packets that were dropped because the packets were out of sequence
Packets Dropped Unknown Tlv	The number of packets that were dropped because the packet contained an unknown TLV
Packets Dropped MD5	The number of packets that were dropped because the packet failed MD5 authentication
Packets Tx	The number of packets transmitted from this system to the peer
Packets Tx Keepalive	The number of keepalive packets transmitted from this system to the peer
Packets Tx Peer Config	The number of configured packets transmitted from this system to the peer
Packets Tx Peer Data	The number of data packets transmitted from this system to the peer
Packets Tx Failed	The number of packets that failed to be transmitted from this system to the peer
Packets Dropped No Peer	The number of packets dropped because there is no peer
<b>Multi-Chassis Firewall Global Statistics</b>	
Packets Rx	The number of packets received by the system
Packets Rx Keepalive	The number of keepalive packets received by the system
Packets Rx Peer Config	The number of multi-chassis firewall configuration packets received from the peer
Packets Rx Peer Data	The number of data packets received from the peer
Packets Dropped Keep-Alive Task	The number of packets dropped by the multi-chassis firewall receiving task
Packets Dropped Peer Data	The number of data packets dropped by this system
Packets Dropped Too Short	The number of packets dropped because they were too short
Packets Dropped Verify Failed	The number of packets dropped because they could not be verified
Packets Dropped Tlv Invalid Size	The number of packets that were dropped because the packet was an invalid size

**Table 61 Multi-Chassis Firewall Field Descriptions (Continued)**

Label	Description
Packets Dropped Out of Seq	The number of packets that were dropped because the packets were out of sequence
Packets Dropped Unknown Tlv	The number of packets that were dropped because the packet contained an unknown TLV
Packets Dropped MD5	The number of packets that were dropped because the packet failed MD5 authentication
Packets Dropped Unknown Peer	The number of packets dropped because the multi-chassis firewall peer is unknown
Packets Dropped MC Firewall No Peer	The number of packets dropped because there is no multi-chassis firewall peer
Packets Tx	The number of packets transmitted
Packets Tx Keepalive	The number of keepalive packets transmitted
Packets Tx Peer Config	The number of configured packets transmitted from this system to the peer
Packets Tx Peer Data	The number of data packets transmitted from this system to the peer
Packets Tx Failed	The number of packets that failed to be transmitted

## mc-lag

**Syntax** `mc-lag peer ip-address [lag lag-id]`  
`mc-lag [peer ip-address [lag lag-id]] statistics`

**Context** show>redundancy>multi-chassis

**Description** This command displays multi-chassis LAG information.

**Parameters** *ip-address* — shows information for the peer with the specified IP address  
*lag-id* — shows information for the specified LAG identifier

**Values** 1 to 32

**statistics** — shows statistics for the specified LAG identifier

**Output** The following output is an example of MC-LAG information, and [Table 62](#) describes the fields.

**Output Example**

```

A:ALU-1>show>redundancy>multi-chassis# mc-lag peer 10.10.10.4
=====
Multi-Chassis MC-Lag Peer 10.10.10.4
=====
Last State chg : 01/28/2013 12:52:21
Admin State : Up
KeepAlive : 10 deci-seconds
Oper State : Up
Hold On Ngbr Failure : 3

Lag Id Lacp Remote System Id Sys Last State Changed
 Key Lag Id

1 2 1 11:11:11:11:11:11 3 01/28/2013 12:52:38

Number of LAGs : 1
=====
A:ALU-1>show>redundancy>multi-chassis#

A:ALU-1>show>redundancy>multi-chassis# mc-lag peer 10.10.10.4 statistics
=====
Multi-Chassis Statistics, Peer 10.10.10.4
=====
Packets Rx : 287
Packets Rx Keepalive : 279
Packets Rx Config : 2
Packets Rx Peer Config : 35
Packets Rx State : 5
Packets Dropped State Disabled : 0
Packets Dropped Packets Too Short : 0
Packets Dropped Tlv Invalid Size : 0
Packets Dropped Tlv Invalid LagId : 0
Packets Dropped Out of Seq : 0
Packets Dropped Unknown Tlv : 0
Packets Dropped MD5 : 0
Packets Tx : 322
Packets Tx Keepalive : 281
Packets Tx Peer Config : 35
Packets Tx Failed : 0
=====
A:ALU-1>show>redundancy>multi-chassis#

A:ALU-1>show>redundancy>multi-chassis# mc-lag peer 10.10.10.4 lag 1 statistics
=====
Multi-Chassis Statistics, Peer 10.10.10.4 Lag 1
=====
Packets Rx Config : 2
Packets Rx State : 5
Packets Tx Config : 1
Packets Tx State : 5
Packets Tx Failed : 0
=====
A:ALU-1>show>redundancy>multi-chassis#

```

**Table 62 MC-LAG Field Descriptions**

Label	Description
Last State chg	Displays date and time of the last state change for the MC-LAG peer
Admin State	Displays the administrative state of the MC-LAG peer
KeepAlive	Displays the time interval between keepalive messages exchanged between peers
Oper State	Displays the operational state of the MC-LAG peer
Hold On Ngr Failure	Displays how many keep alive intervals the standby 7705 SAR will wait for packets from the active node before assuming a redundant neighbor node failure
Lag Id	Displays the LAG identifier, expressed as a decimal integer
Lacp Key	Displays the 16-bit Lacp key
Remote system Id	Displays the LAG identifier of the remote system, expressed as a decimal integer
<b>Multi-Chassis Statistics</b>	
Packets Rx	Displays the number of MC-LAG packets received from the peer
Packets Rx Keepalive	Displays the number of MC-LAG keepalive packets received from the peer
Packets Rx Config	Displays the number of MC-LAG configured packets received from the peer
Packets Rx Peer Config	Displays the number of MC-LAG packets configured by the peer
Packets Rx State	Displays the number of received MC-LAG "lag" state packets received from the peer
Packets Dropped State Disabled	Displays the number of packets that were dropped because the peer was administratively disabled
Packets Dropped Packets Too Short	Displays the number of packets that were dropped because the packet was too short
Packets Dropped Tlv Invalid Size	Displays the number of packets that were dropped because the packet size was invalid
Packets Dropped Tlv Invalid LagId	Displays the number of packets that were dropped because the packet referred to an invalid or non-multi-chassis LAG
Packets Dropped Out of Seq	Displays the number of packets that were dropped because the packet was out of sequence

**Table 62 MC-LAG Field Descriptions (Continued)**

Label	Description
Packets Dropped Unknown Tlv	Displays the number of packets that were dropped because the packet contained an unknown TLV
Packets Dropped MD5	Displays the number of packets that were dropped because the packet failed MD5 authentication
Packets Tx	Displays the number of packets transmitted from this system to the peer
Packets Tx Keepalive	Displays the number of keepalive packets transmitted from this system to the peer
Packets Tx Peer Config	Displays the number of configured packets transmitted from this system to the peer
Packets Tx Failed	Displays the number of packets that failed to be transmitted from this system to the peer

## synchronization

- Syntax** `synchronization`
- Context** `show>redundancy`
- Description** This command displays redundancy synchronization times.
- Output** The following output is an example of redundancy synchronization information, and [Table 63](#) describes the fields.

### Output Example

```
A:ALU-1>show>redundancy# synchronization
=====
Synchronization Information
=====
Standby Status : disabled
Last Standby Failure : N/A
Standby Up Time : N/A
Failover Time : N/A
Failover Reason : N/A
Boot/Config Sync Mode : None
Boot/Config Sync Status : No synchronization
Last Config File Sync Time : Never
Last Boot Env Sync Time : Never
=====
A:ALU-1>show>redundancy#
```



**Table 63 Synchronization Field Descriptions**

Label	Description
Standby Status	Displays the status of the standby CSM
Last Standby Failure	Displays the timestamp of the last standby failure
Standby Up Time	Displays the length of time the standby CSM has been up
Failover Time	Displays the timestamp when the last redundancy failover occurred causing a switchover from active to standby CSM. If there is no redundant CSM card in this system or no failover has occurred since the system last booted, the value will be 0.
Failover Reason	Displays a text string giving an explanation of the cause of the last redundancy failover. If no failover has occurred, an empty string displays.
Boot/Config Sync Mode	Displays the type of synchronization operation to perform between the primary and secondary CSMs after a change has been made to the configuration files or the boot environment information contained in the boot options file (BOF).
Boot/Config Sync Status	Displays the results of the last synchronization operation between the primary and secondary CSMs
Last Config File Sync Time	Displays the timestamp of the last successful synchronization of the configuration files
Last Boot Env Sync Time	Displays the timestamp of the last successful synchronization of the boot environment files

## uptime

**Syntax** `uptime`

**Context** `show`

**Description** This command displays the time since the system started.

**Output** The following output is an example of system uptime information, and [Table 64](#) describes the fields.

### Output Example

```
A:ALU-1# show uptime
System Up Time : 11 days, 18:32:02.22 (hr:min:sec)
A:ALU-1#
```

**Table 64 System Uptime Field Descriptions**

Label	Description
System Up Time	The length of time the system has been up in days, hr:min:sec format

## sync-if-timing

- Syntax** `sync-if-timing`
- Context** `show>system`
- Description** This command displays synchronous interface timing operational information.
- Output** The following output is an example of synchronous interface timing information, and [Table 65](#) describes the fields.



**Note:** Some of the fields in the following output apply to the 7705 SAR-18 only.

### Output Example

```
A:ALU-1# show system sync-if-timing
=====
System Interface Timing Operational Info
=====
System Interface Timing Operational Info
=====
System Status CSM A : Master Locked
 Reference Input Mode : Non-revertive
 Quality Level Selection : Disabled

Reference Order : bits ref1 ref2

Reference Input 1
 Admin Status : down
 Configured Quality Level : none
 Rx Quality Level : unknown
 Qualified For Use : No
 Not Qualified Due To : disabled
 Selected For Use : No
 Not Selected Due To : disabled

Reference Input 2
 Admin Status : down
 Configured Quality Level : none
 Rx Quality Level : unknown
 Qualified For Use : No
 Not Qualified Due To : disabled
 Selected For Use : No
 Not Selected Due To : disabled
```

```

Reference BITS 1
 Admin Status : up
 Configured Quality Level : stu
 Rx Quality Level : unknown
 Qualified For Use : Yes
 Selected For Use : Yes
 Interface Type : DS1
 Framing : ESF
 Line Coding : B8ZS
 Output Admin Status : up
 Output Reference Selected : none
 Tx Quality Level :

Reference BITS 2
 Admin Status : up
 Configured Quality Level : stu
 Rx Quality Level : unknown
 Qualified For Use : No
 Not Qualified Due To : LOS
 Selected For Use : No
 Not Selected Due To : not qualified
 Interface Type : DS1
 Framing : ESF
 Line Coding : B8ZS
 Output Admin Status : up
 Output Reference Selected : none
 Tx Quality Level :

```

=====

A:ALU-1#

**Table 65 Sync-If-Timing Field Descriptions**

Label	Description
System Status CSM A	The present status of the synchronous timing equipment subsystem (SETS): <ul style="list-style-type: none"> <li>• Not Present</li> <li>• Master Freerun</li> <li>• Master Holdover</li> <li>• Master Locked</li> <li>• Slave</li> <li>• Acquiring</li> </ul>
Reference Input Mode	Revertive — a revalidated or a newly validated reference source that has a higher priority than the currently selected reference has reverted to the new reference source Non-revertive — the clock cannot revert to a higher priority clock if the current clock goes offline
Quality Level Selection	Whether Quality Level Selection is enabled or disabled

**Table 65 Sync-If-Timing Field Descriptions (Continued)**

Label	Description
Reference Order	bits, ref1, ref2 — the priority order of the timing references
Reference Input 1, 2	The reference 1 and reference 2 input parameters
Admin Status	down — the ref1 or ref2 configuration is administratively shut down
	up — the ref1 or ref2 configuration is administratively enabled
Configured Quality Level	Synchronization Status Messaging quality level value manually configured on port for ref1 or ref2
Rx Quality Level	Synchronization Status Messaging quality level value received on port for ref1 or ref2
Qualified for Use	Whether the ref1 or ref2 timing reference is qualified for use by the synchronous timing subsystem
Selected for Use	Whether the ref1 or ref2 timing reference is presently selected
Not Selected Due To	If the ref1 or ref2 timing reference is not selected, the reason why
Not Qualified Due To	If the ref1 or ref2 timing reference is not qualified, the reason why
Source Port	None — no source port is configured or in use as a ref1 or ref2 timing reference
	card/slot/port — the source port of the ref1 or ref2 timing reference
Reference BITS 1, 2	The reference 1 and reference 2 BITS parameters, applicable to the 7705 SAR-18 only
Admin Status	down — the BITS 1 or BITS 2 configuration is administratively shut down
	up — the BITS 1 or BITS 2 configuration is administratively enabled
Configured Quality Level	Synchronization Status Messaging quality level value manually configured on port for BITS 1 or BITS 2
Rx Quality Level	Synchronization Status Messaging quality level value received on port for BITS 1 or BITS 2
Qualified For Use	Whether the BITS 1 or BITS 2 reference is qualified for use by the synchronous timing subsystem

**Table 65 Sync-If-Timing Field Descriptions (Continued)**

Label	Description
Selected For Use	Whether the BITS 1 or BITS 2 reference is presently selected
Not Qualified Due To	If the BITS 1 or BITS 2 reference is not qualified, the reason why
Not Selected Due To	If the BITS 1 or BITS 2 reference is not selected, the reason why
Interface Type	The interface type for the BITS port
Framing	The framing type used by the BITS port
Line Coding	The line coding type used by the BITS port
Output Admin Status	The administrative status of the BITS output port
Output Reference Selected	The type of output reference selected by the BITS port
Tx Quality Level	The Synchronization Status Messaging quality level value transmitted on the BITS port

## chassis

**Syntax** **chassis [detail]**  
**chassis [environment | power-feed]**

**Context** show

**Description** This command displays a summary of general chassis status information.

**Parameters** **detail** — displays detailed information about the physical chassis  
**environment** — displays chassis environmental status information  
**power-feed** — displays chassis power feed status information

**Output** The following output is an example of general chassis information, and [Table 66](#) describes the fields.

### Output Example

```
*A: Sar18 Dut-B# show chassis
=====
System Information
=====
Name : Sar18 Dut-B
Type : 7705 SAR-18
Chassis Topology : Standalone
```

```

Location : (Not Specified)
Coordinates : (Not Specified)
CLLI code :
Number of slots : 3
Oper number of slots : 3
Number of ports : 64
Critical LED state : Off
Major LED state : Off
Minor LED state : Off
Over Temperature state : OK
Base MAC address : d6:65:ff:00:00:00
=====
Chassis Summary
=====
Chassis Role Status

1 Standalone up
=====
*A: Sar18 Dut-B#

```

**Table 66 Chassis Field Descriptions**

Label	Description
<b>System Information</b>	
Name	The system name for the router
Type	The router series model number
Chassis Topology	The chassis setup; the value is always Standalone
Location	The system location for the device
Coordinates	A user-configurable string that indicates the global navigation satellite system (GNSS) coordinates for the location of the chassis. For example: N 45 58 23, W 34 56 12 N37 37' 00 latitude, W122 22' 00 longitude N36 × 39.246' W121 × 40.121'
CLLI Code	The Common Language Location Identifier (CLLI) that uniquely identifies the geographic location of places and certain functional categories of equipment unique to the telecommunications industry
Number of slots	The number of slots in the chassis for the IOM and the CSMs, including the built-in CSMs on the fixed platforms. The IOM is a virtual slot (designated as slot 1), as it is actually a module on the CSM and does not get installed separately.

**Table 66 Chassis Field Descriptions (Continued)**

Label	Description
Oper number of slots	The number of slots currently operating; the value is always the same as the Number of slots value
Number of ports	The total number of ports currently installed in this chassis. This count does not include the CSM Management ports that are used for management access.
Critical LED state	The current state of the Critical LED in this chassis
Major LED state	The current state of the Major LED in this chassis
Minor LED state	The current state of the Minor LED in this chassis
Over Temperature state	Indicates whether there is an over-temperature condition
Base MAC address	The base chassis Ethernet MAC address
<b>Chassis Summary</b>	
Chassis	The chassis number
Role	The role of the chassis in the chassis setup; the value is always Standalone
Status	Current status of the chassis

The following output is an example of detailed chassis information, and [Table 67](#) describes the fields.

**Output Example**

```
*A:Sar18 Dut-B# show chassis detail
=====
System Information
=====
Name : Sar18 Dut-B
Type : 7705 SAR-18
Chassis Topology : Standalone
Location : (Not Specified)
Coordinates : (Not Specified)
CLLI code :
Number of slots : 3
Oper number of slots : 3
Number of ports : 64
Critical LED state : Off
Major LED state : Off
Minor LED state : Off
Over Temperature state : OK
Base MAC address : d6:65:ff:00:00:00
=====
```

## Chassis 1 Detail

```

=====
Chassis Status : up
Chassis Role : Standalone
Hardware Data
 Part number : Sim Part#
 CLEI code : Sim CLEI
 Serial number : dut-b_a
 Manufacture date : 01012003
 Manufacturing variant : ch1: 1471 ch2: 1491
 Time of last boot : 2018/09/10 19:36:37
 Current alarm state : alarm cleared

Environment Information
 Fan Information
 Number of fans : 8
 Status : up
 Speed : normal
 Hardware Data
 Part number : Sim Part#
 CLEI code : Sim CLEI
 Serial number : fan-0
 Manufacture date : 01012003
 Manufacturing variant : ch1: 1471 ch2: 1491
 Time of last boot : N/A
 Current alarm state : alarm cleared
 Alarm Module
 Status : ok
 Type : alarm-v1
 External Alarms Interface

 Input Pin Event State

 IN-1 1 Critical : ok
 IN-2 2 Major : ok
 IN-3 11 Major : ok
 IN-4 12 Minor : ok

 Hardware Data
 Part number : Sim Part#
 CLEI code : Sim CLEI
 Serial number : alm-mod-0
 Manufacture date : 01012003
 Manufacturing variant : ch1: 1471 ch2: 1491
 Time of last boot : 2018/09/10 19:36:38
 Current alarm state : alarm cleared

Power Feed Information
 Number of power feeds : 2
 Input power feed : A
 Type : dc
 Status : up
 Input power feed : B
 Type : dc
 Status : up
=====
*A: Sar18 Dut-B#

```



**Table 67 Chassis Detail Field Descriptions**

Label	Description
<b>System Information</b>	
Name	The system name for the router
Type	The router series model number
Chassis Topology	The chassis setup; the value is always Standalone
Location	The system location for the device
Coordinates	A user-configurable string that indicates the global navigation satellite system (GNSS) coordinates for the location of the chassis. For example: N 45 58 23, W 34 56 12 N37 37' 00 latitude, W122 22' 00 longitude N36 × 39.246' W121 × 40.121'
CLLI Code	The Common Language Location Identifier (CLLI) that uniquely identifies the geographic location of places and certain functional categories of equipment unique to the telecommunications industry
Number of slots	The number of slots in the chassis for the IOM and the CSMs, including the built-in CSMs on the fixed platforms. The IOM is a virtual slot (designated as slot 1), as it is actually a module on the CSM and does not get installed separately.
Oper number of slots	The number of slots currently operating; the value is always the same as the Number of slots value
Number of ports	The total number of ports currently installed in this chassis. This count does not include the CSM Management ports that are used for management access.
Critical LED state	The current state of the Critical LED in this chassis
Major LED state	The current state of the Major LED in this chassis
Minor LED state	The current state of the Minor LED in this chassis
Over Temperature state	Indicates whether there is an over-temperature condition
Base MAC address	The base chassis Ethernet MAC address
<b>Chassis 1 Detail</b>	
Chassis Status	The current status of the chassis

**Table 67 Chassis Detail Field Descriptions (Continued)**

Label	Description
Chassis Role	The role of the chassis in the chassis setup; the value is always Standalone
Hardware Data	Hardware information about the chassis
Part number	The CSM part number
CLEI code	The code used to identify the router
Serial number	The CSM part number; not user-modifiable
Manufacture date	The chassis manufacture date; not user-modifiable
Manufacturing variant	Factory-inputted manufacturing text string; not user-modifiable
Time of last boot	The date and time the most recent boot occurred
Current alarm state	Displays the alarm conditions for the specific board
<b>Environment Information</b>	
Fan information	
Number of fans	The total number of fans installed in this chassis
Status	Current status of the fans
Speed	The fan speed
Hardware Data	Hardware information for fan module
Part number	The CSM part number
CLEI code	The code used to identify the router
Serial number	The CSM part number; not user-modifiable
Manufacture date	The chassis manufacture date; not user-modifiable
Manufacturing variant	Factory-inputted manufacturing text string; not user-modifiable
Time of last boot	The date and time the most recent boot occurred
Current alarm state	Displays the alarm conditions for the specific board
Alarm Module	
Status	Status of the alarm module
Type	Version of the alarm module
<b>External Alarms Interface</b>	
Input	External alarm input number

**Table 67 Chassis Detail Field Descriptions (Continued)**

Label	Description
Pin	Port connector pin number for the alarm input
Event	Severity level of events reported by this input: <ul style="list-style-type: none"> <li>• Critical: critical log event, trap and critical alarm/relay LED illuminated</li> <li>• Major: major log event, trap and major alarm/relay LED illuminated</li> <li>• Minor: minor log event, trap and minor alarm/relay LED illuminated</li> <li>• Warning: warning log, event, trap, no alarm/relay illuminated</li> <li>• Indeterminate: indeterminate log event trap, no alarm/relay illuminated</li> <li>• Suppressed: no log events, traps or alarm/relays illuminated</li> </ul>
Hardware Data	Hardware information for alarm module
<b>Power Feed Information</b>	
Number of power feeds	The number of power feeds installed in the chassis
Input power feed - Type	The type of power feed — ac power or dc power
Input power feed - Status	Up — the specified power supply is up
	Critical failure — the specified power supply has failed
	Not equipped — the specified power supply is not present
	Unknown — the software system cannot determine the type of power feed for the specified power supply
	Not monitored — the specified power supply is not monitored

The following output is an example of chassis environment information, and [Table 68](#) describes the fields.

**Output Example**

```
*A: Sar18 Dut-B# show chassis environment
=====
Chassis 1 Detail
=====
Environment Information
 Fan Information
 Number of fans : 8
 Status : up
```

```

Speed : normal
Hardware Data
Part number : Sim Part#
CLEI code : Sim CLEI
Serial number : fan-0
Manufacture date : 01012003
Manufacturing variant : ch1: 1471 ch2: 1491
Time of last boot : N/A
Current alarm state : alarm cleared
Alarm Module
Status : ok
Type : alarm-v1
External Alarms Interface

Input Pin Event State

IN-1 1 Critical : ok
IN-2 2 Major : ok
IN-3 11 Major : ok
IN-4 12 Minor : ok

Hardware Data
Part number : Sim Part#
CLEI code : Sim CLEI
Serial number : alm-mod-0
Manufacture date : 01012003
Manufacturing variant : ch1: 1471 ch2: 1491
Time of last boot : 2018/09/10 19:36:38
Current alarm state : alarm cleared
=====
*A: Sar18 Dut-B#

```

**Table 68 Chassis Environment Field Descriptions**

Label	Description
<b>Environment Information</b>	
Fan information	
Number of fans	The total number of fans installed in this chassis
Status	Current status of the fans
Speed	The fan speed
Hardware Data	Hardware information for fan module
Part number	The CSM part number
CLEI code	The code used to identify the router
Serial number	The CSM part number; not user-modifiable
Manufacture date	The chassis manufacture date; not user-modifiable
Manufacturing variant	Factory-inputted manufacturing text string; not user-modifiable

**Table 68 Chassis Environment Field Descriptions (Continued)**

Label	Description
Time of last boot	The date and time the most recent boot occurred
Current alarm state	Displays the alarm conditions for the specific board
<b>Alarm Module</b>	
Status	Status of the alarm module
Type	Version of the alarm module
<b>External Alarms Interface</b>	
Input	External alarm input number
Pin	Port connector pin number for the alarm input
Event	Severity level of events reported by this input: <ul style="list-style-type: none"> <li>• Critical: critical log event, trap and critical alarm/relay LED illuminated</li> <li>• Major: major log event, trap and major alarm/relay LED illuminated</li> <li>• Minor: minor log event, trap and minor alarm/relay LED illuminated</li> <li>• Warning: warning log, event, trap, no alarm/relay illuminated</li> <li>• Indeterminate: indeterminate log event trap, no alarm/relay illuminated</li> <li>• Suppressed: no log events, traps or alarm/relays illuminated</li> </ul>
State	State of alarm event
Hardware data	Hardware information for alarm module

The following output is an example of chassis power feed information, and [Table 69](#) describes the fields.

**Output Example**

```
*A:Sar18 Dut-B# show chassis power-feed
=====
System Information
=====
Name : Sar18 Dut-B
Type : 7705 SAR-18
Chassis Topology : Standalone
Location : (Not Specified)
Coordinates : (Not Specified)
CLLI code :
Number of slots : 3
```

```

Oper number of slots : 3
Number of ports : 64
Critical LED state : Off
Major LED state : Off
Minor LED state : Off
Over Temperature state : OK
Base MAC address : d6:65:ff:00:00:00
=====
Chassis 1 Detail
=====
Chassis Status : up
Chassis Role : Standalone
Hardware Data
 Part number : Sim Part#
 CLEI code : Sim CLEI
 Serial number : dut-b_a
 Manufacture date : 01012003
 Manufacturing variant : ch1: 1471 ch2: 1491
 Time of last boot : 2018/09/10 19:36:37
 Current alarm state : alarm cleared

Power Feed Information
 Number of power feeds : 2
 Input power feed : A
 Type : dc
 Status : up
 Input power feed : B
 Type : dc
 Status : up
=====
*A: Sar18 Dut-B# show chassis power-feed

```

**Table 69 Chassis Power Feed Field Descriptions**

Label	Description
<b>System Information</b>	
Name	The system name for the router
Type	The router series model number
Chassis Topology	The chassis setup; the value is always Standalone
Location	The system location for the device
Coordinates	A user-configurable string that indicates the global navigation satellite system (GNSS) coordinates for the location of the chassis. For example: N 45 58 23, W 34 56 12 N37 37' 00 latitude, W122 22' 00 longitude N36 × 39.246' W121 × 40.121'

**Table 69 Chassis Power Feed Field Descriptions (Continued)**

Label	Description
CLLI Code	The Common Language Location Identifier (CLLI) that uniquely identifies the geographic location of places and certain functional categories of equipment unique to the telecommunications industry
Number of slots	The number of slots in the chassis for the IOM and the CSMs, including the built-in CSMs on the fixed platforms. The IOM is a virtual slot (designated as slot 1), as it is actually a module on the CSM and does not get installed separately.
Oper number of slots	The number of slots currently operating; the value is always the same as the Number of slots value
Number of ports	The total number of ports currently installed in this chassis. This count does not include the CSM Management ports that are used for management access.
Critical LED state	The current state of the Critical LED in this chassis
Major LED state	The current state of the Major LED in this chassis
Minor LED state	The current state of the Minor LED in this chassis
Over Temperature state	Indicates whether there is an over-temperature condition
Base MAC address	The base chassis Ethernet MAC address
<b>Chassis 1 Detail</b>	
Chassis Status	Current status of the chassis
Chassis Role	The role of the chassis in the chassis setup; the value is always Standalone
Hardware Data	Hardware information about the chassis
Part number	The CSM part number
CLEI code	The code used to identify the router
Serial number	The CSM part number; not user-modifiable
Manufacture date	The chassis manufacture date; not user-modifiable
Manufacturing variant	Factory-inputted manufacturing text string; not user-modifiable
Time of last boot	The date and time the most recent boot occurred
Current alarm state	Displays the alarm conditions for the specific board

**Table 69 Chassis Power Feed Field Descriptions (Continued)**

Label	Description
<b>Power Feed Information</b>	
Number of power feeds	The number of power feeds
Input power feed - Type	The type of power feed — ac power or dc power
Input power feed - Status	Up — the specified power supply is up
	Critical failure — the specified power supply has failed
	Not equipped — the specified power supply is not present
	Unknown — the software system cannot determine the type of power feed for the specified power supply
	Not monitored — the specified power supply is not monitored



---

## 6.13.2.4 Clear Commands

### screen

<b>Syntax</b>	<b>screen</b>
<b>Context</b>	clear
<b>Description</b>	This command allows an operator to clear the Telnet or console screen.

### ptp

<b>Syntax</b>	<b>ptp</b>
<b>Context</b>	clear>system
<b>Description</b>	This command enables the context to clear Precision Timing Protocol (PTP) information.

### clock

<b>Syntax</b>	<b>clock <i>clock-id</i> statistics</b> <b>clock csm port <i>port-id</i> statistics</b>
<b>Context</b>	clear>system>ptp
<b>Description</b>	This command clears PTP clock information.
<b>Parameters</b>	<i>clock-id</i> — specifies the clock ID of this PTP instance <b>Values</b> 1 to 16 for PTP clocks that use IPv4 encapsulation <b>csm</b> for a PTP clock that uses Ethernet encapsulation <i>port-id</i> — specifies a PTP Ethernet port in the format <i>slot/mda/port</i> <b>statistics</b> — clears statistics on the PTP clock or Ethernet port

### script-control

<b>Syntax</b>	<b>script-control</b>
<b>Context</b>	clear>system
<b>Description</b>	This command enables the context to clear script information.

---

## script-policy

<b>Syntax</b>	<b>script-policy</b>
<b>Context</b>	clear>system>script-control
<b>Description</b>	This command enables the context to clear script policy information.

## completed

<b>Syntax</b>	<b>completed</b> [ <i>policy-name</i> ] [ <b>owner</b> <i>policy-owner</i> ]
<b>Context</b>	clear>system>script-control>script-policy
<b>Description</b>	This command clears completed script run history entries.
<b>Parameters</b>	<i>policy-name</i> — specifies to only clear history entries for the specified script policy <i>owner-name</i> — specifies to only clear history entries for script policies with the specified owner

## sync-if-timing

<b>Syntax</b>	<b>sync-if-timing</b> { <b>external</b>   <b>ref1</b>   <b>ref2</b> }
<b>Context</b>	clear>system
<b>Description</b>	This command allows an operator to individually clear (re-enable) a previously failed reference. As long as the reference is one of the valid options, this command is always executed. An inherent behavior enables the revertive mode which causes a re-evaluation of all available references.
<b>Parameters</b>	<b>external</b> — clears the third timing reference <b>ref1</b> — clears the first timing reference <b>ref2</b> — clears the second timing reference

## trace

<b>Syntax</b>	<b>trace log</b>
<b>Context</b>	clear
<b>Description</b>	This command allows an operator to clear the trace log.

## 6.13.2.5 Debug Commands

### sync-if-timing

<b>Syntax</b>	<b>sync-if-timing</b>
<b>Context</b>	debug
<b>Description</b>	This command enables the context to debug synchronous interface timing references.

### force-reference

<b>Syntax</b>	<b>force-reference {external   ref1   ref2}</b> <b>no force-reference</b>
<b>Context</b>	debug>sync-if-timing
<b>Description</b>	This command allows an operator to force the system synchronous timing output to use a specific reference.



**Note:** This command should be used for testing and debugging purposes only. Once the system timing reference input has been forced, it will not revert to another reference at any time. The state of this command is not persistent between system boots.

When the **debug force-reference** command is executed, the current system synchronous timing output is immediately referenced from the specified reference input. If the specified input is not available (shutdown), or in a disqualified state, the timing output will enter the holdover state based on the previous input reference.

<b>Parameters</b>	<b>ref1</b> — forces the clock to use the first timing reference
	<b>ref2</b> — forces the clock to use the second timing reference
	<b>external</b> — forces the clock to use the third timing reference

### system

<b>Syntax</b>	<b>[no] system</b>
<b>Context</b>	debug
<b>Description</b>	This command displays system debug information.

## http-connections

<b>Syntax</b>	<b>http-connections</b> [ <i>host-ip-address/mask</i> ] <b>no http-connections</b>
<b>Context</b>	debug>system
<b>Description</b>	This command displays HTTP connections debug information.
<b>Parameters</b>	<i>host-ip-address/mask</i> — displays information for the specified host IP address and mask

## ntp

<b>Syntax</b>	<b>ntp router</b> <i>router-name</i> <b>interface</b> <i>ip-int-name</i> <b>no ntp</b>
<b>Context</b>	debug>system
<b>Description</b>	This command enables and configures debugging for NTP.  The <b>no</b> form of the command disables debugging for NTP.
<b>Parameters</b>	<i>router-name</i> — specifies the route name, either base or management  <b>Default</b> base  <i>ip-int-name</i> — maximum 32 characters; must begin with a letter. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

## lag

<b>Syntax</b>	<b>lag</b> [ <i>lag-id lag-id</i> [ <i>port port-id</i> ]] [ <b>all</b> ] <b>lag</b> [ <i>lag-id lag-id</i> [ <i>port port-id</i> ]] [ <b>sm</b> ] [ <b>pkt</b> ] [ <b>cfg</b> ] [ <b>red</b> ] [ <b>iom-upd</b> ] [ <b>port-state</b> ] [ <b>timers</b> ] [ <b>sel-logic</b> ] [ <b>mc</b> ] [ <b>mc-pkt</b> ] <b>no lag</b> [ <i>lag-id lag-id</i> ]
<b>Context</b>	debug
<b>Description</b>	This command enables debugging for a LAG.  The <b>no</b> form of the command disables debugging for a LAG.
<b>Parameters</b>	<i>lag-id</i> — specifies the LAG identifier, expressed as a decimal integer  <b>Values</b> 1 to 32  <i>port-id</i> — specifies the physical port ID in the <i>slot/mda/port</i> format <b>all</b> — traces all LAG and LACP parameters

- 
- sm** — traces the LACP state machine
  - pkt** — traces LACP packets
  - cfg** — traces the LAG configuration
  - red** — traces the LAG high availability
  - iom-upd** — traces LAG IOM updates
  - port-state** — traces LAG port state transitions
  - timers** — traces LAG timers
  - sel-logic** — traces LACP selection logic
  - mc** — traces multi-chassis parameters
  - mc-pkt** — traces received MC-LAG control packets with valid authentication



## 7 List of Acronyms

**Table 70** Acronyms

Acronym	Expansion
2G	second generation wireless telephone technology
3DES	triple DES (data encryption standard)
3G	third generation mobile telephone technology
6VPE	IPv6 on Virtual Private Edge Router
7705 SAR	7705 Service Aggregation Router
7750 SR	7750 Service Router
8 PSK	eight phase shift keying
16 QAM	16-state quadrature amplitude modulation
32 QAM	32-state quadrature amplitude modulation
64 QAM	64-state quadrature amplitude modulation
128 QAM	128-state quadrature amplitude modulation
256 QAM	256-state quadrature amplitude modulation
ABR	area border router available bit rate
AC	alternating current attachment circuit
ACK	acknowledge
ACL	access control list
ACR	adaptive clock recovery
AD	auto-discovery
ADM	add/drop multiplexer
ADP	automatic discovery protocol
AES	advanced encryption standard
AFI	authority and format identifier
AIGP	accumulated IGP
AIS	alarm indication signal

**Table 70 Acronyms (Continued)**

Acronym	Expansion
ALG	application level gateway
ANSI	American National Standards Institute
Apipe	ATM VLL
APS	automatic protection switching
ARP	address resolution protocol
A/S	active/standby
AS	autonomous system
ASAP	any service, any port
ASBR	autonomous system boundary router
ASM	any-source multicast autonomous system message
ASN	autonomous system number
ATM	asynchronous transfer mode
ATM PVC	ATM permanent virtual circuit
AU	administrative unit
AUG	administrative unit group
B3ZS	bipolar with three-zero substitution
Batt A	battery A
B-bit	beginning bit (first packet of a fragment)
BBE	background block errors
Bc	committed burst size
Be	excess burst size
BECN	backward explicit congestion notification
Bellcore	Bell Communications Research
BFD	bidirectional forwarding detection
BGP	border gateway protocol
BGP-LS	border gateway protocol link state
BGP-LU	border gateway protocol labeled unicast



**Table 70 Acronyms (Continued)**

Acronym	Expansion
BITS	building integrated timing supply
BMCA	best master clock algorithm
BMU	<p>broadcast, multicast, and unknown traffic</p> <p>Traffic that is not unicast. Any nature of multipoint traffic:</p> <ul style="list-style-type: none"> <li>• broadcast (that is, all 1s as the destination IP to represent all destinations within the subnet)</li> <li>• multicast (that is, traffic typically identified by the destination address, uses special destination address); for IP, the destination must be 224.0.0.0 to 239.255.255.255</li> <li>• unknown (that is, the destination is typically a valid unicast address but the destination port/interface is not yet known; therefore, traffic needs to be forwarded to all destinations; unknown traffic is treated as broadcast)</li> </ul>
BNM	bandwidth notification message
BOF	boot options file
BoS	bottom of stack
BPDU	bridge protocol data unit
BRAS	Broadband Remote Access Server
BSC	Base Station Controller
BSM	bootstrap message
BSR	bootstrap router
BSTA	Broadband Service Termination Architecture
BTS	base transceiver station
CA	certificate authority
CAS	channel associated signaling
CBN	common bonding networks
CBS	committed buffer space
CC	<p>continuity check</p> <p>control channel</p>
CCM	continuity check message
CCTV	closed-circuit television

**Table 70 Acronyms (Continued)**

Acronym	Expansion
CE	circuit emulation customer edge
CEM	circuit emulation
CES	circuit emulation services
CESoPSN	circuit emulation services over packet switched network
CFM	connectivity fault management
cHDLC	Cisco high-level data link control protocol
CIDR	classless inter-domain routing
CIR	committed information rate
CLI	command line interface
CLP	cell loss priority
CMP	certificate management protocol
C-multicast	customer multicast
CoS	class of service
CPE	customer premises equipment
Cpipe	circuit emulation (or TDM) VLL
CPM	Control and Processing Module (CPM is used instead of CSM when referring to CSM filtering to align with CLI syntax used with other SR products). CSM management ports are referred to as CPM management ports in the CLI.
CPROTO	C prototype
CPU	central processing unit
C/R	command/response
CRC	cyclic redundancy check
CRC-32	32-bit cyclic redundancy check
CRL	certificate revocation list
CRON	a time-based scheduling service (from chronos = time)
CRP	candidate RP
CSM	Control and Switching Module

**Table 70 Acronyms (Continued)**

Acronym	Expansion
CSNP	complete sequence number PDU
CSPF	constrained shortest path first
C-TAG	customer VLAN tag
CV	connection verification customer VLAN (tag)
CW	control word
CWDM	coarse wavelength-division multiplexing
DA/FAN	distribution automation and field area network
DC	direct current
DC-C	DC return - common
DCE	data communications equipment
DC-I	DC return - isolated
DCO	digitally controlled oscillator
DCR	differential clock recovery
DDoS	distributed DoS
DE	discard eligibility
DER	distinguished encoding rules
DES	data encryption standard
DF	do not fragment designated forwarder
DH	Diffie-Hellman
DHB	decimal, hexadecimal, or binary
DHCP	dynamic host configuration protocol
DHCPv6	dynamic host configuration protocol for IPv6
DIS	designated intermediate system
DLCI	data link connection identifier
DLCMI	data link connection management interface
DM	delay measurement

**Table 70 Acronyms (Continued)**

Acronym	Expansion
DNS	domain name server
DNU	do not use
DoS	denial of service
dot1p	IEEE 802.1p bits, in Ethernet or VLAN ingress packet headers, used to map traffic to up to eight forwarding classes
dot1q	IEEE 802.1q encapsulation for Ethernet interfaces
DPD	dead peer detection
DPI	deep packet inspection
DPLL	digital phase locked loop
DR	designated router
DSA	digital signal algorithm
DSCP	differentiated services code point
DSL	digital subscriber line
DSLAM	digital subscriber line access multiplexer
DTE	data termination equipment
DU	downstream unsolicited
DUID	DHCP unique identifier
DUS	do not use for synchronization
DV	delay variation
DVMRP	distance vector multicast routing protocol
e911	enhanced 911 service
EAP	Extensible Authentication Protocol
EAPOL	EAP over LAN
E-bit	ending bit (last packet of a fragment)
E-BSR	elected BSR
ECMP	equal cost multipath
EE	end entity
EFM	Ethernet in the first mile

**Table 70 Acronyms (Continued)**

Acronym	Expansion
EGP	exterior gateway protocol
EIA/TIA-232	Electronic Industries Alliance/Telecommunications Industry Association Standard 232 (also known as <a href="#">RS-232</a> )
EIR	excess information rate
EJBCA	Enterprise Java Bean Certificate Authority
E-LAN	Ethernet local area network
E-Line	Ethernet virtual private line
EL	entropy label
eLER	egress label edge router
ELI	entropy label indicator
E&M	ear and mouth earth and magneto exchange and multiplexer
eMBMS	evolved MBMS
EOP	end of packet
EPC	evolved packet core
EPD	early packet discard
Epipes	Ethernet VLL
EPL	Ethernet private line
EPON	Ethernet Passive Optical Network
EPS	equipment protection switching
ERO	explicit route object
ES	Ethernet segment errored seconds
ESD	electrostatic discharge
ESI	Ethernet segment identifier
ESMC	Ethernet synchronization message channel
ESN	extended sequence number
ESP	encapsulating security payload

**Table 70 Acronyms (Continued)**

Acronym	Expansion
ESPI	encapsulating security payload identifier
ETE	end-to-end
ETH-BN	Ethernet bandwidth notification
ETH-CFM	Ethernet connectivity fault management (IEEE 802.1ag)
EVC	Ethernet virtual connection
EVDO	evolution - data optimized
EVI	EVPN instance
EVPL	Ethernet virtual private link
EVPN	Ethernet virtual private network
EXP bits	experimental bits (currently known as <a href="#">TC</a> )
FC	forwarding class
FCS	frame check sequence
FD	frequency diversity
FDB	forwarding database
FDL	facilities data link
FEAC	far-end alarm and control
FEC	forwarding equivalence class
FECN	forward explicit congestion notification
FeGW	far-end gateway
FEP	front-end processor
FF	fixed filter
FFD	fast fault detection
FIB	forwarding information base
FIFO	first in, first out
FIPS-140-2	Federal Information Processing Standard publication 140-2
FNG	fault notification generator
FOM	figure of merit

**Table 70 Acronyms (Continued)**

Acronym	Expansion
Fpipe	frame relay VLL
FQDN	fully qualified domain name
FR	frame relay
FRG bit	fragmentation bit
FRR	fast reroute
FTN	FEC-to-NHLFE
FTP	file transfer protocol
FXO	foreign exchange office
FXS	foreign exchange subscriber
GFP	generic framing procedure
GigE	Gigabit Ethernet
GLONASS	Global Navigation Satellite System (Russia)
GNSS	global navigation satellite system (generic)
GPON	Gigabit Passive Optical Network
GPRS	general packet radio service
GPS	Global Positioning System
GRE	generic routing encapsulation
GRT	global routing table
GSM	Global System for Mobile Communications (2G)
GTP-U	GPRS tunneling protocol user plane
GW	gateway
HA	high availability
HCM	high capacity multiplexing
HDB3	high density bipolar of order 3
HDLC	high-level data link control protocol
HEC	header error control
HMAC	hash message authentication code

**Table 70 Acronyms (Continued)**

Acronym	Expansion
Hpipe	HDLC VLL
H-QoS	hierarchical quality of service
HSB	hot standby
HSDPA	high-speed downlink packet access
HSPA	high-speed packet access
H-VPLS	hierarchical virtual private line service
IANA	internet assigned numbers authority
IBN	isolated bonding networks
ICB	inter-chassis backup
ICMP	Internet control message protocol
ICMPv6	Internet control message protocol for IPv6
ICP	IMA control protocol cells
IDS	intrusion detection system
IDU	indoor unit
IED	intelligent end device
IEEE	Institute of Electrical and Electronics Engineers
IEEE 1588v2	Institute of Electrical and Electronics Engineers standard 1588-2008
IES	Internet Enhanced Service
IETF	Internet Engineering Task Force
IGMP	Internet group management protocol
IGP	interior gateway protocol
IID	instance ID
IKE	Internet key exchange
iLER	ingress label edge router
ILM	incoming label map
IMA	inverse multiplexing over ATM
IMET-IR	inclusive multicast Ethernet tag—ingress replication



**Table 70 Acronyms (Continued)**

Acronym	Expansion
INVARP	inverse address resolution protocol
IOM	input/output module
IP	Internet Protocol
IPCP	Internet Protocol Control Protocol
IPIP	IP in IP
Ipipe	IP interworking VLL
I-PMSI	inclusive PMSI
IPoATM	IP over ATM
IPS	intrusion prevention system
IPSec	Internet Protocol security
IR	ingress replication
IRB	integrated routing and bridging
ISA	integrated services adapter
ISAKMP	Internet security association and key management protocol
IS-IS	Intermediate System-to-Intermediate System
IS-IS-TE	IS-IS-traffic engineering (extensions)
ISO	International Organization for Standardization
IW	interworking
JP	join prune
KG	key group
LB	loopback
lbf-in	pound force inch
LBM	loopback message
LBO	line buildout
LBR	loopback reply
LCP	link control protocol
LDP	label distribution protocol

**Table 70 Acronyms (Continued)**

Acronym	Expansion
LER	label edge router
LFA	loop-free alternate
LFIB	label forwarding information base
LIB	label information base
LLDP	link layer discovery protocol
LLDPDU	link layer discovery protocol data unit
LLF	link loss forwarding
LLID	loopback location ID
LM	loss measurement
LMI	local management interface
LOS	line-of-sight loss of signal
LSA	link-state advertisement
LSDB	link-state database
LSP	label switched path link-state PDU (for IS-IS)
LSPA	LSP attributes
LSR	label switch router link-state request
LSU	link-state update
LT	linktrace
LTE	long term evolution line termination equipment
LTM	linktrace message
LTN	LSP ID to NHLFE
LTR	link trace reply
MA	maintenance association
MAC	media access control
MA-ID	maintenance association identifier

**Table 70 Acronyms (Continued)**

Acronym	Expansion
MBB	make-before-break
MBGP	multicast BGP multiprotocol BGP multiprotocol extensions for BGP
MBMS	multimedia broadcast multicast service
MBS	maximum buffer space maximum burst size media buffer space
MBSP	mobile backhaul service provider
MCAC	multicast connection admission control
MC-APS	multi-chassis automatic protection switching
MC-MLPPP	multi-class multilink point-to-point protocol
MCS	multicast server multi-chassis synchronization
MCT	MPT craft terminal
MD	maintenance domain
MD5	message digest version 5 (algorithm)
MDA	media dependent adapter
MDDDB	multidrop data bridge
MDL	maintenance data link
MDT	multicast distribution tree
ME	maintenance entity
MED	multi-exit discriminator
MEF	Metro Ethernet Forum
MEG	maintenance entity group
MEG-ID	maintenance entity group identifier
MEN	Metro Ethernet network
MEP	maintenance association end point
MFC	multi-field classification

**Table 70 Acronyms (Continued)**

Acronym	Expansion
MHD	multi-homed device
MHF	MIP half function
MHN	multi-homed network
MIB	management information base
MI-IS-IS	multi-instance IS-IS
MIR	minimum information rate
MLD	multicast listener discovery
mLDP	multicast LDP
MLPPP	multilink point-to-point protocol
mLSP	multicast LSP
MoFRR	multicast-only fast reroute
MP	merge point multilink protocol multipoint
MP-BGP	multiprotocol border gateway protocol
MPLS	multiprotocol label switching
MPLSCP	multiprotocol label switching control protocol
MPP	MPT protection protocol
MPR	see <a href="#">Wavence</a>
MPR-e	Microwave Packet Radio (standalone mode)
MPT-HC V2/9558HC	Microwave Packet Transport, High Capacity version 2
MPT-HLC	Microwave Packet Transport, High-Capacity Long-Haul Cubic (ANSI)
MPT-HQAM	Microwave Packet Transport, High Capacity (MPT-HC-QAM) or Extended Power (MPT-XP-QAM) with 512/1024 QAM
MPT-MC	Microwave Packet Transport, Medium Capacity
MPT-XP	Microwave Packet Transport, High Capacity (very high power version of MPT-HC V2/9558HC)
MRAI	minimum route advertisement interval

**Table 70 Acronyms (Continued)**

Acronym	Expansion
MRRU	maximum received reconstructed unit
MRU	maximum receive unit
MSDP	Multicast Source Discovery Protocol
MSDU	MAC Service Data Unit
MSO	multi-system operator
MS-PW	multi-segment pseudowire
MSS	maximum segment size Microwave Service Switch
MTIE	maximum time interval error
MTSO	mobile trunk switching office
MTU	maximum transmission unit multi-tenant unit
M-VPLS	management virtual private line service
MVPN	multicast VPN
MVR	multicast VPLS registration
MW	microwave
MWA	microwave awareness
N·m	newton meter
NAT	network address translation
NAT-T	network address translation traversal
NBMA	non-broadcast multiple access (network)
ND	neighbor discovery
NE	network element
NET	network entity title
NFM-P	Network Functions Manager - Packet (formerly 5620 SAM)
NGE	network group encryption
NG-MVPN	next generation MVPN
NH	next hop

**Table 70 Acronyms (Continued)**

Acronym	Expansion
NHLFE	next hop label forwarding entry
NHOP	next-hop
NLOS	non-line-of-sight
NLPID	network level protocol identifier
NLRI	network layer reachability information
NNHOP	next next-hop
NNI	network-to-network interface
Node B	similar to BTS but used in 3G networks — term is used in UMTS (3G systems) while BTS is used in GSM (2G systems)
NOC	network operations center
NPAT	network port address translation
NRC-F	Network Resource Controller - Flow
NRC-P	Network Resource Controller - Packet
NRC-T	Network Resource Controller - Transport
NRC-X	Network Resource Controller - Cross Domain
NSAP	network service access point
NSD	Network Services Director
NSP	native service processing Network Services Platform
NSSA	not-so-stubby area
NTP	network time protocol
NTR	network timing reference
OADM	optical add/drop multiplexer
OAM	operations, administration, and maintenance
OAMPDU	OAM protocol data units
OC3	optical carrier level 3
OCSP	online certificate status protocol
ODU	outdoor unit

**Table 70 Acronyms (Continued)**

Acronym	Expansion
OIF	outgoing interface
OLT	optical line termination
OMC	optical management console
ONT	optical network terminal
OOB	out-of-band
OPX	off premises extension
ORF	outbound route filtering
OS	operating system
OSI	Open Systems Interconnection (reference model)
OSINLCP	OSI Network Layer Control Protocol
OSPF	open shortest path first
OSPF-TE	OSPF-traffic engineering (extensions)
OSS	operations support system
OSSP	organization specific slow protocol
OTP	one time password
OWAMP	one-way active measurement protocol
P2MP	point to multipoint
PADI	PPPoE active discovery initiation
PADR	PPPoE active discovery request
PAE	port authentication entities
PSB	path state block
PBO	packet byte offset
PBR	policy-based routing
PBX	private branch exchange
PCAP	packet capture
PCC	Path Computation Element Client
PCE	Path Computation Element

**Table 70 Acronyms (Continued)**

Acronym	Expansion
PCEP	Path Computation Element Protocol
PCM	pulse code modulation
PCP	priority code point
PCR	proprietary clock recovery
PDU	power distribution unit protocol data units
PDV	packet delay variation
PDVT	packet delay variation tolerance
PE	provider edge router
PEAPv0	protected extensible authentication protocol version 0
PEM	privacy enhanced mail
PFoE	power feed over Ethernet
PFS	perfect forward secrecy
PHB	per-hop behavior
PHP	penultimate hop popping
PHY	physical layer
PIC	prefix independent convergence
PID	protocol ID
PIM SSM	protocol independent multicast—source-specific multicast
PIR	peak information rate
PKCS	public key cryptography standards
PKI	public key infrastructure
PLAR	private line automatic ringdown
PLCP	Physical Layer Convergence Protocol
PLR	point of local repair
PLSP	path LSP
PMSI	P-multicast service interface
P-multicast	provider multicast



**Table 70 Acronyms (Continued)**

Acronym	Expansion
PoE	power over Ethernet
PoE+	power over Ethernet plus
POH	path overhead
POI	purge originator identification
PoP	point of presence
POS	packet over SONET
PPP	point-to-point protocol
PPPoE	point-to-point protocol over Ethernet
PPS	pulses per second
PRC	primary reference clock
PRS	primary reference source
PRTC	primary reference time clock
PSE	power sourcing equipment
PSK	pre-shared key
PSN	packet switched network
PSNP	partial sequence number PDU
PTA	PMSI tunnel attribute
PTM	packet transfer mode
PTP	performance transparency protocol precision time protocol
PuTTY	an open-source terminal emulator, serial console, and network file transfer application
PVC	permanent virtual circuit
PVCC	permanent virtual channel connection
PW	pseudowire
PWE	pseudowire emulation
PWE3	pseudowire emulation edge-to-edge
Q.922	ITU-T Q-series Specification 922

**Table 70 Acronyms (Continued)**

Acronym	Expansion
QL	quality level
QoS	quality of service
QPSK	quadrature phase shift keying
RADIUS	Remote Authentication Dial In User Service
RAN	Radio Access Network
RBS	robbed bit signaling
RD	route distinguisher
RDI	remote defect indication
RED	random early discard
RESV	reservation
RIB	routing information base
RIP	routing information protocol
RJ-45	registered jack 45
RMON	remote network monitoring
RNC	Radio Network Controller
RP	rendezvous point
RPF RTM	reverse path forwarding RTM
RPS	radio protection switching
RPT	rendezvous-point tree
RR	route reflector
RRO	record route object
RS-232	Recommended Standard 232 (also known as <a href="#">EIA/TIA-232</a> )
RSA	Rivest, Shamir, and Adleman (authors of the RSA encryption algorithm)
RSHG	residential split horizon group
RSTP	rapid spanning tree protocol
RSVP-TE	resource reservation protocol - traffic engineering
RT	receive/transmit

**Table 70 Acronyms (Continued)**

Acronym	Expansion
RTC	route target constraint
RTM	routing table manager
RTN	battery return
RTP	real-time protocol
R&TTE	Radio and Telecommunications Terminal Equipment
RTU	remote terminal unit
RU	rack unit
r-VPLS	routed virtual private LAN service
SA	security association source-active
SAA	service assurance agent
SAFI	subsequent address family identifier
SAP	service access point
SAToP	structure-agnostic TDM over packet
SCADA	surveillance, control and data acquisition
SC-APS	single-chassis automatic protection switching
SCP	secure copy
SCTP	Stream Control Transmission Protocol
SD	signal degrade space diversity
SDH	synchronous digital hierarchy
SDI	serial data interface
SDN	software defined network
SDP	service destination point
SE	shared explicit
SeGW	secure gateway
SES	severely errored seconds
SETS	synchronous equipment timing source

**Table 70 Acronyms (Continued)**

Acronym	Expansion
SF	signal fail
SFP	small form-factor pluggable (transceiver)
SFTP	SSH file transfer protocol
(S,G)	(source, group)
SGT	self-generated traffic
SHA-1	secure hash algorithm
SHG	split horizon group
SIR	sustained information rate
SLA	Service Level Agreement
SLARP	serial line address resolution protocol
SLID	subscriber location identifier of a GPON module
SLM	synthetic loss measurement
SNMP	Simple Network Management Protocol
SNPA	subnetwork point of attachment
SNR	signal to noise ratio
SNTP	simple network time protocol
SONET	synchronous optical networking
S-PE	switching provider edge router
SPF	shortest path first
SPI	security parameter index
S-PMSI	selective PMSI
SPT	shortest path tree
SR	service router (7750 SR) segment routing
SRLG	shared risk link group
SRP	stateful request parameter
SRRP	subscriber routed redundancy protocol
SR-ISIS	segment routing IS-IS

**Table 70 Acronyms (Continued)**

Acronym	Expansion
SR-OSPF	segment routing OSPF
SR-TE	segment routing traffic engineering
SSH	secure shell
SSM	source-specific multicast synchronization status messaging
SSU	system synchronization unit
S-TAG	service VLAN tag
STM	synchronous transport module
STM1	synchronous transport module, level 1
STP	spanning tree protocol
STS	synchronous transport signal
SVC	switched virtual circuit
SVEC	synchronization vector
SYN	synchronize
TACACS+	Terminal Access Controller Access-Control System Plus
TC	traffic class (formerly known as <a href="#">EXP bits</a> )
TCP	transmission control protocol
TDA	transmit diversity antenna
TDEV	time deviation
TDM	time division multiplexing
TE	traffic engineering
TEDB	traffic engineering database
TEID	tunnel endpoint identifier
TEP	tunnel endpoint
TFTP	trivial file transfer protocol
T-LDP	targeted LDP
TLS	transport layer security
TLV	type length value

**Table 70 Acronyms (Continued)**

Acronym	Expansion
TM	traffic management
ToD	time of day
ToS	type of service
T-PE	terminating provider edge router
TPID	tag protocol identifier
TPIF	IEEE C37.94 teleprotection interface
TPMR	two-port MAC relay
TPS	transmission protection switching
TSoP	Transparent SDH/SONET over Packet
TTL	time to live
TTLS	tunneled transport layer security
TTM	tunnel table manager
TU	tributary unit
TUG	tributary unit group
TWAMP	two-way active measurement protocol
U-APS	unidirectional automatic protection switching
UAS	unavailable seconds
UBR	unspecified bit rate
UDP	user datagram protocol
UFD	unidirectional forwarding detection
UMH	upstream multicast hop
UMTS	Universal Mobile Telecommunications System (3G)
UNI	user-to-network interface
uRPF	unicast reverse path forwarding
V.11	ITU-T V-series Recommendation 11
V.24	ITU-T V-series Recommendation 24
V.35	ITU-T V-series Recommendation 35

**Table 70 Acronyms (Continued)**

Acronym	Expansion
VC	virtual circuit
VCB	voice conference bridge
VCC	virtual channel connection
VCCV	virtual circuit connectivity verification
VCI	virtual circuit identifier
VID	VLAN ID
VLAN	virtual LAN
VLL	virtual leased line
VM	virtual machine
VoIP	voice over IP
Vp	peak voltage
VP	virtual path
VPC	virtual path connection
VPI	virtual path identifier
VPLS	virtual private LAN service
VPN	virtual private network
VPRN	virtual private routed network
VRF	virtual routing and forwarding table
VRRP	virtual router redundancy protocol
VSE	vendor-specific extension
VSI	virtual switch instance
VSO	vendor-specific option
VT	virtual trunk virtual tributary
VTG	virtual tributary group
Wavence	formerly 9500 MPR (Microwave Packet Radio)
WCDMA	wideband code division multiple access (transmission protocol used in UMTS networks)

**Table 70 Acronyms (Continued)**

Acronym	Expansion
WRED	weighted random early discard
WTR	wait to restore
X.21	ITU-T X-series Recommendation 21
XOR	exclusive-OR
XRO	exclude route object



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## 8 Standards and Protocol Support

This chapter lists the 7705 SAR compliance with EMC, environmental, and safety standards, telecom standards, and supported protocols:

- [EMC Industrial Standards Compliance](#)
- [EMC Regulatory and Customer Standards Compliance](#)
- [Environmental Standards Compliance](#)
- [Safety Standards Compliance](#)
- [Telecom Interface Compliance](#)
- [Directives, Regional Approvals and Certifications Compliance](#)
- [Security Standards](#)
- [Telecom Standards](#)
- [Protocol Support](#)
- [Proprietary MIBs](#)

**Table 71 EMC Industrial Standards Compliance**

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IEEE 1613:2009 + A1:2011	IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Electric Power Substations	✓ <sup>1</sup>		✓ <sup>3</sup>		✓ <sup>2</sup>	✓ <sup>1</sup>	✓ <sup>3</sup>	✓ <sup>3</sup>		
IEEE 1613.1-2013	IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Transmission and Distribution Facilities	✓ <sup>4</sup>		✓ <sup>7</sup>		✓ <sup>5</sup>	✓ <sup>6</sup>	✓ <sup>7</sup>	✓ <sup>7</sup>		
IEEE Std C37.90	IEEE Standard for relays and relay systems associated with Electric Power Apparatus	✓		✓		✓	✓	✓	✓		
IEEE Std C37.90.1	Surge Withstand Capability (SWC) Tests	✓		✓		✓	✓	✓	✓		
IEEE Std C37.90.2	Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers	✓		✓		✓	✓	✓	✓		
IEEE Std C37.90.3	IEEE Standard Electrostatic Discharge Tests for Protective Relays	✓		✓		✓	✓	✓	✓		
EN 50121-4	Electromagnetic Compatibility – Part 4: Emission and Immunity of the Signalling and Telecommunications Apparatus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 62236-4	Electromagnetic Compatibility – Part 4: Emission and Immunity of the Signalling and Telecommunications Apparatus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-6-2	Generic standards – Immunity for industrial environments	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-6-4	Generic standards – Emissions standard for industrial environments	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-6-5	Generic standards – immunity for equipment used in power station and substation environment	✓		✓		✓	✓	✓	✓		
IEC 61850-3	Communication networks and systems for power utility automation - Part 3: General requirements	✓		✓		✓	✓ <sup>8</sup>	✓	✓		
IEC/AS 60870.2.1	Telecontrol equipment and systems. Operating conditions. Power supply and electromagnetic compatibility	✓		✓		✓	✓	✓	✓		

**Notes:**

1. Performance Class 1
2. Performance Class 1 (Class 2 with Optics interfaces only)
3. Performance Class 2
4. Zone A; Performance Class 1
5. Zone A; Performance Class 1 (Class 2 with Optics interfaces only)
6. Zone B; Performance Class 1
7. Zone A; Performance Class 2
8. With the exception of DC surges

**Table 72 EMC Regulatory and Customer Standards Compliance**

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IEC 61000-4-2	Electrostatic discharge immunity test	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-3	Radiated electromagnetic field immunity test	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-4	Electrical fast transient/burst immunity test	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-5	Surge immunity test	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-6	Immunity to conducted disturbances	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-8	Power frequency magnetic field immunity test	✓		✓		✓	✓	✓	✓		
IEC 61000-4-9	Pulse Magnetic field immunity test	✓		✓		✓	✓	✓	✓		
IEC 61000-4-10	Damped Oscillatory Magnetic Field	✓		✓		✓	✓	✓	✓		
IEC 61000-4-11	Voltage dips, short interruptions and voltage variations immunity tests	✓	✓ <sup>1</sup>	✓ <sup>1</sup>	✓ <sup>1</sup>	✓ <sup>1</sup>	✓ <sup>1</sup>	✓	✓ <sup>1</sup>	✓	✓
IEC 61000-4-12	Oscillatory wave immunity test	✓		✓		✓	✓	✓	✓		
IEC 61000-4-16	Conducted immunity 0 Hz - 150 kHz	✓		✓		✓	✓	✓	✓		
IEC 61000-4-17	Ripple on d.c. input power port immunity test	✓		✓		✓	✓	✓	✓		
IEC 61000-4-18	Damped oscillatory wave immunity test	✓		✓		✓	✓	✓	✓		
IEC 61000-4-29	Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests	✓		✓		✓	✓	✓	✓		
IEC 61000-3-2	Limits for harmonic current emissions (equipment input current <16A per phase)	✓	✓ <sup>1</sup>	✓ <sup>1</sup>	✓ <sup>1</sup>	✓ <sup>1</sup>	✓ <sup>1</sup>	✓	✓ <sup>1</sup>	✓	✓

**Table 72 EMC Regulatory and Customer Standards Compliance (Continued)**

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IEC 61000-3-3	Limits for voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current <16A	✓	✓ <sup>1</sup>	✓ <sup>1</sup>	✓ <sup>1</sup>	✓ <sup>1</sup>	✓ <sup>1</sup>	✓	✓ <sup>1</sup>	✓	✓
ITU-T K.20 (DC Ports)	Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents	✓	✓	✓	✓	✓	✓	✓	✓		
ITU-T K.44	Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents - Basic Recommendation									✓	✓
ETSI 300 132-2	Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 2: Operated by -48 V direct current (dc)	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ETSI 300 132-3	Power supply interface at the input to telecommunications equipment; Part 3: Operated by rectified current source, alternating current source or direct current source up to 400V	✓	✓ <sup>1</sup>	✓ <sup>1</sup>	✓ <sup>1</sup>			✓	✓ <sup>1</sup>	✓	✓
EN 300 386	Telecommunication network equipment; ElectroMagnetic Compatibility (EMC)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ES 201 468	Electromagnetic compatibility and Radio spectrum Matters (ERM); Additional ElectroMagnetic Compatibility (EMC) requirements and resistibility requirements for telecommunications equipment for enhanced availability of service in specific applications	✓		✓	✓	✓	✓				✓
EN 55024	Information technology equipment - Immunity characteristics - Limits and methods of measurements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Telcordia GR-1089-CORE	EMC and Electrical Safety - Generic Criteria for Network Telecommunications Equipment	✓	✓	✓	✓	✓	✓	✓	✓		
AS/NZS CISPR 32	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>3</sup>	✓ <sup>3</sup>
FCC Part 15, Subpart B	Radio Frequency devices- Unintentional Radiators (Radiated & Conducted Emissions)	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>3</sup>	✓ <sup>3</sup>

**Table 72 EMC Regulatory and Customer Standards Compliance (Continued)**

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
ICES-003	Information Technology Equipment (ITE) — Limits and methods of measurement	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>3</sup>	✓ <sup>3</sup>
EN 55032	Electromagnetic compatibility of multimedia equipment – Emission requirements	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>
CISPR 32	Electromagnetic compatibility of multimedia equipment – Emission requirements	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>
GS7 EMC	Electromagnetic Standard Compatibility (BT standard)	✓		✓	✓	✓	✓	✓			✓
KC Notice Emission (KN32) and Immunity (KN35) (South Korea)	EMS standard: NRRRA notice	✓	✓	✓	✓	✓	✓	✓	✓		

**Notes:**

1. With external AC/DC power supply
2. Class A
3. Class B

**Table 73 Environmental Standards Compliance**

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IEEE 1613:2009 + A1:2011	Environmental and Testing Requirements for Communications Networking Devices	✓ <sup>1</sup>		✓		✓ <sup>1</sup>	✓ <sup>1</sup>	✓	✓		
IEC 61850-3	Communication networks and systems for power utility automation - Part 3: General requirements	✓ <sup>2</sup>		✓ <sup>2</sup>		✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>		
IEC 60068-2-1	Environmental testing – Part 2-1: Tests – Test A: Cold	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 60068-2-2	Environmental testing - Part 2-2: Tests - Test B: Dry heat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 60068-2-30	Environmental testing - Part 2: Tests. Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

**Table 73 Environmental Standards Compliance (Continued)**

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IEC 60255-21-2	Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section Two: Shock and bump tests	✓		✓		✓	✓	✓	✓		
ETSI 300 753 Class 3.2	Acoustic noise emitted by telecommunications equipment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Telcordia GR-63-CORE	NEBS Requirements: Physical Protection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ETSI EN 300 019-2-1 Class 1.2	Specification of environmental tests; Storage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ETSI EN 300 019-2-2 Class 2.3	Specification of environmental tests; Transportation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ETSI EN 300 019-2-3 Class 3.2	Specification of environmental tests; Stationary use at weatherprotected locations	✓	✓	✓	✓	✓	✓	✓	✓		
ETSI EN 300 019-2-4 Class T4.1	Specification of environmental tests; Stationary use at non-weatherprotected locations									✓	✓
Telcordia GR-3108-CORE	Generic Requirements for Network Equipment in the Outside Plant (OSP)	✓ <sup>3</sup>	✓ <sup>3</sup>	✓ <sup>3</sup>	✓ <sup>3</sup>	✓ <sup>3</sup>		✓ <sup>3</sup>	✓ <sup>3</sup>	✓ <sup>4</sup>	✓ <sup>4</sup>
Telcordia GR-950-CORE	Generic Requirements for ONU Closures and ONU Systems									✓	✓
"GR-3108 Class 3 Section 6.2 IEC 60068-2-52 - Severity 3 MIL-STD-810G Method 509.5 EN 60721-3-3 Class 3C4 EN 60068-2-11: Salt Mist EN 50155 Class ST4"	Conformal Coating <sup>5</sup>	✓			✓	✓		✓	✓		

**Notes:**

1. Forced air system; uses fans
2. Normal environmental conditions as per IEC 61850-3 ed.2
3. Class 2
4. Class 4
5. Conformal coating is available as an orderable option

**Table 74 Safety Standards Compliance**

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
UL/CSA 60950-1	Information technology equipment - Safety - Part 1: General requirements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC/EN 60950-1	Information technology equipment - Safety - Part 1: General requirements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UL/CSA 62368-1	Audio/video, information and communication technology equipment - Part 1: Safety requirements		✓	✓	✓	✓	✓				✓
IEC/EN 62368-1	Audio/video, information and communication technology equipment - Part 1: Safety requirements		✓	✓	✓	✓	✓				✓
AS/NZS 60950-1	Information technology equipment - Safety - Part 1: General requirements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AS/NZS 62368-1	Audio/video, information and communication technology equipment, Part 1: Safety requirements		✓		✓	✓	✓				✓
IEC/EN 60825-1 and 2	Safety of laser products - Part 1: Equipment classification and requirements Part 2: Safety of optical fibre communication systems (OFCS)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UL/CSA 60950-22	Information Technology Equipment - Safety - Part 22: Equipment to be Installed Outdoors									✓	✓
CSA–C22.2 No.94	Special Purpose Enclosures									✓	✓
UL50	Enclosures for Electrical Equipment, Non-Environmental Consideration									✓	✓
IEC/EN 60950-22	Information technology equipment. Equipment to be installed Outdoors.									✓	✓
IEC 60529	Degrees of Protection Provided by Enclosures (IP Code)	✓ <sup>1</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>1</sup>	✓ <sup>1</sup>	✓ <sup>1</sup>	✓ <sup>2</sup>	✓ <sup>2</sup>	✓ <sup>3</sup>	✓ <sup>3</sup>

**Notes:**

1. IP20
2. IP40
3. IP65

**Table 75 Telecom Interface Compliance**

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IC CS-03 Issue 9	Compliance Specification for Terminal Equipment, Terminal Systems, Network Protection Devices, Connection Arrangements and Hearing Aids Compatibility	✓	✓		✓	✓	✓	✓			
ACTA TIA-968-B	Telecommunications - Telephone Terminal Equipment - Technical Requirements for Connection of Terminal Equipment to the Telephone Network	✓	✓		✓	✓	✓	✓			
AS/ACIF S016 (Australia)	Requirements for Customer Equipment for connection to hierarchical digital interfaces	✓	✓		✓	✓	✓	✓			
ATIS-06000403	Network and Customer Installation Interfaces- DS1 Electrical Interfaces	✓	✓		✓	✓	✓	✓			
ANSI/TIA/EIA-422-B (RS422)	Electrical Characteristics for balanced voltage digital interfaces circuits					✓	✓				
ITU-T G.825	The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)					✓	✓				
ITU-T G.703	Physical/electrical characteristics of hierarchical digital interfaces	✓	✓		✓	✓	✓	✓			
ITU-T G.712 (E&M)	Transmission performance characteristics of pulse code modulation channels					✓	✓				
ITU-T G.957	Optical interfaces for equipments and systems relating to the synchronous digital hierarchy					✓	✓				
ITU-T V.24 (RS232)	List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)					✓	✓	✓	✓		
ITU-T V.28 (V35)	Electrical characteristics for unbalanced double-current interchange circuits					✓	✓				
ITU-T V.36 (V35)	Modems for synchronous data transmission using 60-108 kHz group band circuits					✓	✓				



**Table 75 Telecom Interface Compliance (Continued)**

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
ITU-T V.11 / X.27 (RS-422)	Electrical characteristics for balanced double current interchange circuits operating at data signalling rates up to 10 Mbit/s					✓	✓				
ITU-T X.21 (RS-422)	Interface between Data Terminal Equipment and Data Circuit-terminating Equipment for synchronous operation on public data networks					✓	✓				
IEEE 802.3at (POE)	Data Terminal Equipment Power via the Media Dependent Interfaces Enhancements				✓			✓	✓	✓	✓

**Table 76 Directives, Regional Approvals and Certifications Compliance**

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
EU Directive 2014/30/ EU (EMC)	Electromagnetic Compatibility (EMC)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EU Directive 2014/35/ EU (LVD)	Low Voltage Directive (LVD)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EU Directive 2012/19/ EU (WEEE)	Waste Electrical and Electronic Equipment (WEEE)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EU Directive 2011/65/ EU (RoHS)	EU Directive 2011/65/EU Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment (Recast) Directive (including Commission Delegated Directive (EU) 2015/863)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CE Mark		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CRoHS Logo; Ministry of Information Industry order No.39		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
China (MII NAL) Network Access License			✓		✓	✓	✓	✓		✓	

**Table 76** Directives, Regional Approvals and Certifications Compliance (Continued)

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
South Korea (KC Mark)		✓	✓	✓	✓	✓	✓	✓	✓		
Australia (RCM Mark)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Japan (VCCI Mark)		✓	✓	✓	✓	✓	✓	✓			
NEBS Level 3		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TL9000 certified		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ISO 14001 certified		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ISO 9001 certified		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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## Security Standards

FIPS 140-2—Federal Information Processing Standard publication 140-2, Security Requirements for Cryptographic Modules

## Telecom Standards

ANSI/TIA/EIA-232-C—Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange

IEEE 802.1ad—IEEE Standard for Local and Metropolitan Area Networks---Virtual Bridged Local Area Networks

IEEE 802.1ag—Service Layer OAM

IEEE 802.1p/q—VLAN Tagging

IEEE 802.3—10BaseT

IEEE 802.3ab—1000BaseT

IEEE 802.3ah—Ethernet OAM

IEEE 802.3u—100BaseTX

IEEE 802.3x —Flow Control

IEEE 802.3z—1000BaseSX/LX

IEEE 802.3-2008—Revised base standard

IEEE 802.1AX-2008—Link Aggregation Task Force (transferred from IEEE 802.3ad)

IEEE C37.94-2017—N Times 64 Kilobit Per Second Optical Fiber Interfaces Between Teleprotection and Multiplexer Equipment

ITU-T G.704—Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels

ITU-T G.707—Network node interface for the Synchronous Digital Hierarchy (SDH)

ITU-T G.826—End-to-end error performance parameters and objectives for international, constant bit-rate digital paths and connections

ITU-T G.8032 — Ethernet Ring Protection Switching

ITU-T G.984.1—Gigabit-capable passive optical networks (GPON): general characteristics

ITU-T Y.1564—Ethernet service activation test methodology

ITU-T Y.1731—OAM functions and mechanisms for Ethernet-based networks

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## Protocol Support

### ATM

- AF-PHY-0086.001—Inverse Multiplexing for ATM (IMA)
- af-tm-0121.000—Traffic Management Specification Version 4.1, March 1999
- GR-1113-CORE—Bellcore, Asynchronous Transfer Mode (ATM) and ATM Adaptation Layer (AAL) Protocols Generic Requirements, Issue 1, July 1994
- GR-1248-CORE—Generic Requirements for Operations of ATM Network Elements (NEs). Issue 3 June 1996
- ITU-T Recommendation I.432.1—B-ISDN user-network interface - Physical layer specification: General characteristics
- ITU-T Recommendation I.610—B-ISDN Operation and Maintenance Principles and Functions version 11/95
- RFC 2514—Definitions of Textual Conventions and OBJECT\_IDENTITIES for ATM Management, February 1999
- RFC 2515—Definition of Managed Objects for ATM Management, February 1999
- RFC 2684—Multiprotocol Encapsulation over ATM Adaptation Layer 5

### BFD

- draft-ietf-bfd-mib-00.txt—Bidirectional Forwarding Detection Management Information Base
- draft-ietf-bfd-base-o5.txt—Bidirectional Forwarding Detection
- draft-ietf-bfd-v4v6-1hop-06.txt—BFD IPv4 and IPv6 (Single Hop)
- draft-ietf-bfd-multihop-06.txt—BFD for Multi-hop Paths

### BGP

- RFC 1397—BGP Default Route Advertisement
- RFC 1997—BGP Communities Attribute
- RFC 2385—Protection of BGP Sessions via the TCP MD5 Signature Option
- RFC 2439—BGP Route Flap Dampening
- RFC 2545—Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing
- RFC 2918—Route Refresh Capability for BGP-4
- RFC 3107—Carrying Label Information in BGP-4
- RFC 3392—Capabilities Advertisement with BGP-4
- RFC 4271—BGP-4 (previously RFC 1771)
- RFC 4360—BGP Extended Communities Attribute
- RFC 4364—BGP/MPLS IP Virtual Private Networks (VPNs) (previously RFC 2574bis BGP/MPLS VPNs)
- RFC 4456—BGP Route Reflection: Alternative to Full-mesh IBGP (previously RFC 1966 and RFC 2796)

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RFC 4486—Subcodes for BGP Cease Notification Message  
RFC 4684—Constrained Route Distribution for Border Gateway Protocol/  
MultiProtocol Label Switching (BGP/MPLS) Internet Protocol (IP) Virtual  
Private Networks (VPNs)  
RFC 4724—Graceful Restart Mechanism for BGP - GR Helper  
RFC 4760—Multi-protocol Extensions for BGP (previously RFC 2858)  
RFC 4893—BGP Support for Four-octet AS Number Space  
RFC 6513—Multicast in MPLS/BGP IP VPNs  
RFC 6514—BGP Encodings and Procedures for Multicast in MPLS/BGP IP VPNs  
draft-ietf-idr-add-paths-04.txt—Advertisement of Multiple Paths in BGP  
draft-ietf-idr-add-paths-guidelines-00.txt—Best Practices for Advertisement of  
Multiple Paths in BGP

### **DHCP/DHCPv6**

RFC 1534—Interoperation between DHCP and BOOTP  
RFC 2131—Dynamic Host Configuration Protocol (REV)  
RFC 2132—DHCP Options and BOOTP Vendor Extensions  
RFC 3046—DHCP Relay Agent Information Option (Option 82)  
RFC 3315—Dynamic Host Configuration Protocol for IPv6  
RFC 3736—Stateless Dynamic Host Configuration Protocol (DHCP) Service for IPv6

### **Differentiated Services**

RFC 2474—Definition of the DS Field in the IPv4 and IPv6 Headers  
RFC 2597—Assured Forwarding PHB Group  
RFC 2598—An Expedited Forwarding PHB  
RFC 3140—Per-Hop Behavior Identification Codes

### **Digital Data Network Management**

V.35  
RS-232 (also known as EIA/TIA-232)  
X.21

### **ECMP**

RFC 2992—Analysis of an Equal-Cost Multi-Path Algorithm

### **Ethernet VPN (EVPN)**

RFC 7432—BGP MPLS-Based Ethernet VPN  
draft-ietf-bess-evpn-vpls-seamless-integ—(PBB-)EVPN Seamless Integration with  
(PBB-)VPLS  
draft-ietf-bess-evpn-vpws—Virtual Private Wire Service support in Ethernet VPN

**Frame Relay**

ANSI T1.617 Annex D—Signalling Specification For Frame Relay Bearer Service  
ITU-T Q.922 Annex A—Digital Subscriber Signalling System No. 1 (DSS1) data link layer - ISDN data link layer specification for frame mode bearer services  
FRF.1.2—PVC User-to-Network Interface (UNI) Implementation Agreement  
FRF.12—Frame Relay Fragmentation Implementation Agreement  
RFC 2427—Multiprotocol Interconnect over Frame Relay

**GRE**

RFC 2784—Generic Routing Encapsulation (GRE)

**IPSec**

ITU-T X.690 (2002)—ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)  
PKCS #12 Personal Information Exchange Syntax Standard  
RFC 2315—PKCS #7: Cryptographic Message Syntax  
RFC 2409—The Internet Key Exchange (IKE)  
RFC 2986—PKCS #10: Certification Request Syntax Specification  
RFC 3706—A Traffic-Based Method of Detecting Dead Internet Key Exchange (IKE) Peers  
RFC 3947—Negotiation of NAT-Traversal in the IKE  
RFC 3948—UDP Encapsulation of IPsec ESP Packets  
RFC 4301—Security Architecture for the Internet Protocol  
RFC 4303—IP Encapsulating Security Payload (ESP)  
RFC 4210—Internet X.509 Public Key Infrastructure Certificate Management Protocol (CMP)  
RFC 4211—Internet X.509 Public Key Infrastructure Certificate Request Message Format (CRMF)  
RFC 4945—The Internet IP Security PKI Profile of IKEv1/ISAKMP, IKEv2, and PKIX  
RFC 5280—Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile  
RFC 5996—Internet Key Exchange Protocol Version 2 (IKEv2)  
RFC 7383—Internet Key Exchange Protocol Version 2 (IKEv2) Message Fragmentation

**IPv6**

RFC 2460—Internet Protocol, Version 6 (IPv6) Specification  
RFC 2462—IPv6 Stateless Address Autoconfiguration  
RFC 2464—Transmission of IPv6 Packets over Ethernet Networks

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RFC 3587—IPv6 Global Unicast Address Format  
RFC 3595—Textual Conventions for IPv6 Flow Label  
RFC 4007—IPv6 Scoped Address Architecture  
RFC 4193—Unique Local IPv6 Unicast Addresses  
RFC 4291—IPv6 Addressing Architecture  
RFC 4443—Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 Specification  
RFC 4649—DHCPv6 Relay Agent Remote-ID Option  
RFC 4861—Neighbor Discovery for IP version 6 (IPv6)  
RFC 5095—Deprecation of Type 0 Routing Headers in IPv6  
RFC 5952—A Recommendation for IPv6 Address Text Representation

**IS-IS**

RFC 1142—OSI IS-IS Intra-domain Routing Protocol (ISO 10589)  
RFC 1195—Use of OSI IS-IS for routing in TCP/IP & dual environments  
RFC 2763—Dynamic Hostname Exchange for IS-IS  
RFC 2966—Domain-wide Prefix Distribution with Two-Level IS-IS  
RFC 2973—IS-IS Mesh Groups  
RFC 3373—Three-Way Handshake for Intermediate System to Intermediate System (IS-IS) Point-to-Point Adjacencies  
RFC 3567—Intermediate System to Intermediate System (IS-IS) Cryptographic Authentication  
RFC 3719—Recommendations for Interoperable Networks using IS-IS  
RFC 3784—Intermediate System to Intermediate System (IS-IS) Extensions for Traffic Engineering (TE)  
RFC 3787—Recommendations for Interoperable IP Networks  
RFC 4205 for Shared Risk Link Group (SRLG) TLV  
RFC 4971—Intermediate System to Intermediate System (IS-IS) Extensions for Advertising Router Information  
RFC 5304—IS-IS Cryptographic Authentication  
RFC 5305—IS-IS Extensions for Traffic Engineering  
RFC 5308—Routing IPv6 with IS-IS  
RFC 5309—Point-to-Point Operation over LAN in Link State Routing Protocols  
RFC 5310—IS-IS Generic Cryptographic Authentication  
RFC 6232—Purge Originator Identification TLV for IS-IS

**LDP**

- RFC 5036—LDP Specification
- RFC 5283—LDP Extension for Inter-Area Label Switched Paths
- RFC 5350—IANA Considerations for the IPv4 and IPv6 Router Alert Options
- RFC 5443—LDP IGP Synchronization
- RFC 5561—LDP Capabilities
- RFC 6388—Label Distribution Protocol Extensions for Point-to-Multipoint and Multipoint-to-Multipoint Label Switched Paths
- RFC 6512—Using Multipoint LDP When the Backbone Has No Route to the Root
- RFC 6829—Label Switched Path (LSP) Ping for Pseudowire Forwarding Equivalence Classes (FECs) Advertised over IPv6
- RFC 7552—Updates to LDP for IPv6
- draft-ietf-mpls-ldp-ip-pw-capability—Controlling State Advertisements Of Non-negotiated LDP Applications
- draft-ietf-mpls-oam-ipv6-rao—IPv6 Router Alert Option for MPLS OAM
- draft-pdutta-mpls-ldp-adj-capability-00—LDP Adjacency Capabilities
- draft-pdutta-mpls-ldp-v2-00—LDP Version 2
- draft-pdutta-mpls-mldp-up-redundancy-00.txt—Upstream LSR Redundancy for Multi-point LDP Tunnels

**LDP and IP FRR**

- RFC 5286—Basic Specification for IP Fast Reroute: Loop-Free Alternates
- RFC 7490—Remote Loop-Free Alternate (LFA) Fast Reroute (FRR)

**MPLS**

- RFC 3031—MPLS Architecture
- RFC 3032—MPLS Label Stack Encoding
- RFC 3815—Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)
- RFC 6790—The Use of Entropy Labels in MPLS Forwarding

**MPLS – OAM**

- RFC 4379—Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures
- RFC 6424—Mechanism for Performing Label Switched Path Ping (LSP Ping) over MPLS Tunnels



**Multicast**

- RFC 3956—Embedding the Rendezvous Point (RP) Address in an IPv6 Multicast Address
- RFC 3973—Protocol Independent Multicast - Dense Mode (PIM-DM): Protocol Specification (Revised)
- RFC 4610—Anycast-RP Using Protocol Independent Multicast (PIM), which is similar to RFC 3446—Anycast Rendezvous Point (RP) mechanism using Protocol Independent Multicast (PIM) and Multicast Source Discovery Protocol (MSDP)
- RFC 6514—BGP Encodings and Procedures for Multicast in MPLS/IP VPNs
- cisco-ipmulticast/pim-autorp-spec—Auto-RP: Automatic discovery of Group-to-RP mappings for IP multicast, which is similar to RFC 5059—Bootstrap Router (BSR) Mechanism for Protocol Independent Multicast (PIM)
- draft-ietf-l2vpn-vpls-pim-snooping-07—Protocol Independent Multicast (PIM) over Virtual Private LAN Service (VPLS)
- draft-ietf-mboned-msdp-deploy-nn.txt—Multicast Source Discovery Protocol (MSDP) Deployment Scenarios

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- ITU-T X.721—Information technology- OSI-Structure of Management Information
- ITU-T X.734—Information technology- OSI-Systems Management: Event Report Management Function
- M.3100/3120—Equipment and Connection Models
- RFC 1157—SNMPv1
- RFC 1850—OSPF-MIB
- RFC 1907—SNMPv2-MIB
- RFC 2011—IP-MIB
- RFC 2012—TCP-MIB
- RFC 2013—UDP-MIB
- RFC 2030—Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI
- RFC 2096—IP-FORWARD-MIB
- RFC 2138—RADIUS
- RFC 2206—RSVP-MIB
- RFC 2571—SNMP-FRAMEWORKMIB
- RFC 2572—SNMP-MPD-MIB
- RFC 2573—SNMP-TARGET-&-NOTIFICATION-MIB
- RFC 2574—SNMP-USER-BASED-SMMIB
- RFC 2575—SNMP-VIEW-BASED ACM-MIB

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RFC 2576—SNMP-COMMUNITY-MIB  
RFC 2588—SONET-MIB  
RFC 2665—EtherLike-MIB  
RFC 2819—RMON-MIB  
RFC 2863—IF-MIB  
RFC 2864—INVERTED-STACK-MIB  
RFC 3014—NOTIFICATION-LOG MIB  
RFC 3164—The BSD Syslog Protocol  
RFC 3273—HCRMON-MIB  
RFC 3411—An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks  
RFC 3412—Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)  
RFC 3413—Simple Network Management Protocol (SNMP) Applications  
RFC 3414—User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)  
RFC 3418—SNMP MIB  
RFC 3954—Cisco Systems NetFlow Services Export Version 9  
RFC 5101—Specification of the IP Flow Information Export (IPFIX) Protocol for the Exchange of IP Traffic Flow Information  
RFC 5102—Information Model for IP Flow Information Export  
draft-ietf-disman-alarm-mib-04.txt  
draft-ietf-mpls-ldp-mib-07.txt  
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draft-ietf-mpls-te-mib-04.txt  
TMF 509/613—Network Connectivity Model

**OSPF**

RFC 1765—OSPF Database Overflow  
RFC 2328—OSPF Version 2  
RFC 2370—Opaque LSA Support  
RFC 2740—OSPF for IPv6  
RFC 3101—OSPF NSSA Option  
RFC 3137—OSPF Stub Router Advertisement  
RFC 3509—Alternative Implementations of OSPF Area Border Routers  
RFC 3623—Graceful OSPF Restart (support for Helper mode)  
RFC 3630—Traffic Engineering (TE) Extensions to OSPF

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RFC 4203 for Shared Risk Link Group (SRLG) sub-TLV  
RFC 4577—OSPF as the Provider/Customer Edge Protocol for BGP/MPLS IP  
Virtual Private Networks (VPNs) (support for basic OSPF at PE-CE links)  
RFC 4915—Multi-Topology (MT) Routing in OSPF  
RFC 4970—Extensions to OSPF for Advertising Optional Router Capabilities  
RFC 5185—OSPF Multi-Area Adjacency

**OSPFv3**

RFC 4552—Authentication/Confidentiality for OSPFv3

**PPP**

RFC 1332—PPP Internet Protocol Control Protocol (IPCP)  
RFC 1570—PPP LCP Extensions  
RFC 1619—PPP over SONET/SDH  
RFC 1661—The Point-to-Point Protocol (PPP)  
RFC 1662—PPP in HDLC-like Framing  
RFC 1989—PPP Link Quality Monitoring  
RFC 1990—The PPP Multilink Protocol (MP)  
RFC 2686—The Multi-Class Extension to Multi-Link PPP

**Pseudowires**

Metro Ethernet Forum—Implementation Agreement for the Emulation of PDH  
Circuits over Metro Ethernet Networks  
RFC 3550—RTP: A Transport Protocol for Real-Time Applications  
RFC 3985—Pseudo Wire Emulation Edge-to-Edge (PWE3) Architecture  
RFC 4385—Pseudowire Emulation Edge-to-Edge (PWE3) Control Word for Use  
over an MPLS PSN  
RFC 4446—IANA Allocation for PWE3  
RFC 4447—Pseudowire Setup and Maintenance Using the Label Distribution  
Protocol (LDP)  
RFC 4448—Encapsulation Methods for Transport of Ethernet over MPLS Networks  
RFC 4553—Structure-Agnostic Time Division Multiplexing (TDM) over Packet  
(SAToP)  
RFC 4717—Encapsulation Methods for Transport of Asynchronous Transfer Mode  
(ATM) over MPLS Networks  
RFC 4618—Encapsulation Methods for Transport of PPP/High-Level Data Link  
Control (HDLC) over MPLS Networks  
RFC 4619—Encapsulation Methods for Transport of Frame Relay over Multiprotocol  
Label Switching (MPLS) Networks

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RFC 4816—Pseudowire Emulation Edge-to-Edge (PWE3) Asynchronous Transfer Mode (ATM) Transparent Cell Transport Service

RFC 5085—Pseudowire Virtual Circuit Connectivity Verification (VCCV): A Control Channel for Pseudowires

RFC 5086—Structure-Aware Time Division Multiplexed (TDM) Circuit Emulation Service over Packet Switched Network (CESoPSN)

draft-ietf-pwe3-redundancy-02.txt—Pseudowire (PW) Redundancy

**RIP**

RFC 1058—Routing Information Protocol

RFC 2453—RIP Version 2

**RADIUS**

RFC 2865—Remote Authentication Dial In User Service

RFC 2866—RADIUS Accounting

**RSVP-TE and FRR**

RFC 2430—A Provider Architecture for DiffServ & TE

RFC 2702—Requirements for Traffic Engineering over MPLS

RFC 2747—RSVP Cryptographic Authentication

RFC 2961—RSVP Refresh Overhead Reduction Extensions

RFC 3097—RSVP Cryptographic Authentication - Updated Message Type Value

RFC 3209—Extensions to RSVP for LSP Tunnels

RFC 3210—Applicability Statement for Extensions to RSVP for LSP Tunnels

RFC 3477—Signalling Unnumbered Links in Resource ReSerVation Protocol - Traffic Engineering (RSVP-TE)

RFC 4090—Fast Reroute Extensions to RSVP-TE for LSP Tunnels

RFC 5440—Path Computation Element (PCE) Communication Protocol (PCEP)

draft-ietf-pce-stateful-pce—PCEP Extensions for Stateful PCE

draft-ietf-pce-segment-routing—PCEP Extensions for Segment Routing

draft-alvarez-pce-path-profiles—PCE Path Profiles

**Segment Routing (SR)**

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draft-gredler-idr-bgp-ls-segment-routing-ext-03—BGP Link-State extensions for Segment Routing

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### **SONET/SDH**

GR-253-CORE—SONET Transport Systems: Common Generic Criteria. Issue 3, September 2000

ITU-T Recommendation G.841—Telecommunication Standardization Section of ITU, Types and Characteristics of SDH Networks Protection Architecture, issued in October 1998 and as augmented by Corrigendum1 issued in July 2002

### **SSH**

RFC 4253—The Secure Shell (SSH) Transport Layer Protocol

draft-ietf-secsh-architecture.txt—SSH Protocol Architecture

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