Alcatel-Lucent 7705

SERVICE AGGREGATION ROUTER OS | RELEASE 7.0.R4

BASIC SYSTEM CONFIGURATION GUIDE

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Preface

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 7.0 content and may contain some content that will be released in later maintenance loads. Please refer to the 7705 SAR OS 7.0.Rx Software Release Notes, part number 3HE10099000xTQZZA, for information on features supported in each load of the Release 7.0 software.

Note:

In Release 7.0, support for the following hardware has been deprecated:

- CSMv1
- 7705 SAR-F
- 8-port Ethernet Adapter card, version 1
- 16-port T1/E1 ASAP Adapter card, version 1

These components are no longer recognized in the release.

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

List of Technical Publications

The 7705 SAR OS documentation set is composed of the following guides:

- 7705 SAR OS Basic System Configuration Guide

  This guide describes basic system configurations and operations.
- 7705 SAR OS System Management Guide

  This guide describes system security and access configurations as well as event logging and accounting logs.
- 7705 SAR OS Interface Configuration Guide

  This guide describes card and port provisioning.
- 7705 SAR OS Router Configuration Guide

  This guide describes logical IP routing interfaces, filtering, and routing policies.
- 7705 SAR OS MPLS Guide

  This guide describes how to configure Multiprotocol Label Switching (MPLS), Resource Reservation Protocol for Traffic Engineering (RSVP-TE), and Label Distribution Protocol (LDP).
- 7705 SAR OS Services Guide

  This guide describes how to configure service parameters such as service access points (SAPs), service destination points (SDPs), customer information, and user services.
- 7705 SAR OS Quality of Service Guide

  This guide describes how to configure Quality of Service (QoS) policy management.

- 7705 SAR OS Routing Protocols Guide

  This guide provides an overview of dynamic routing concepts and describes how to configure them.
- 7705 SAR OS OAM and Diagnostics Guide

  This guide provides information on Operations, Administration and Maintenance (OAM) tools.

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 an Alcatel-Lucent service agreement, follow this link to contact an Alcatel-Lucent support representative and to access product manuals and documentation updates:

http://support.alcatel-lucent.com

Getting Started

In This Chapter

This chapter provides process flow information to configure basic router and system parameters, perform operational functions with directory and file management, and perform boot option tasks.

Alcatel-Lucent 7705 SAR System Configuration Process

Table 1 lists the tasks necessary to perform system and file management functions and to configure boot option files (BOF).

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: Basic Configuration Process

Area	Task	Chapter
CLI Usage	Learning the CLI structure	CLI Usage
	Basic CLI commands	Basic CLI Commands
	Configure environment commands	CLI Environment Commands
	Configure monitor commands	CLI Monitor Commands
Operational functions	Directory and file management	File System Management
Boot options	Configure boot option files (BOF)	Boot Options

Table 1: Basic Configuration Process (Continued)

Area	Task	Chapter
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

CLI Usage

In This Chapter

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

Topics in this chapter include:

CLI Structure

The Alcatel-Lucent 7705 SAR Operating System (OS) 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. At 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

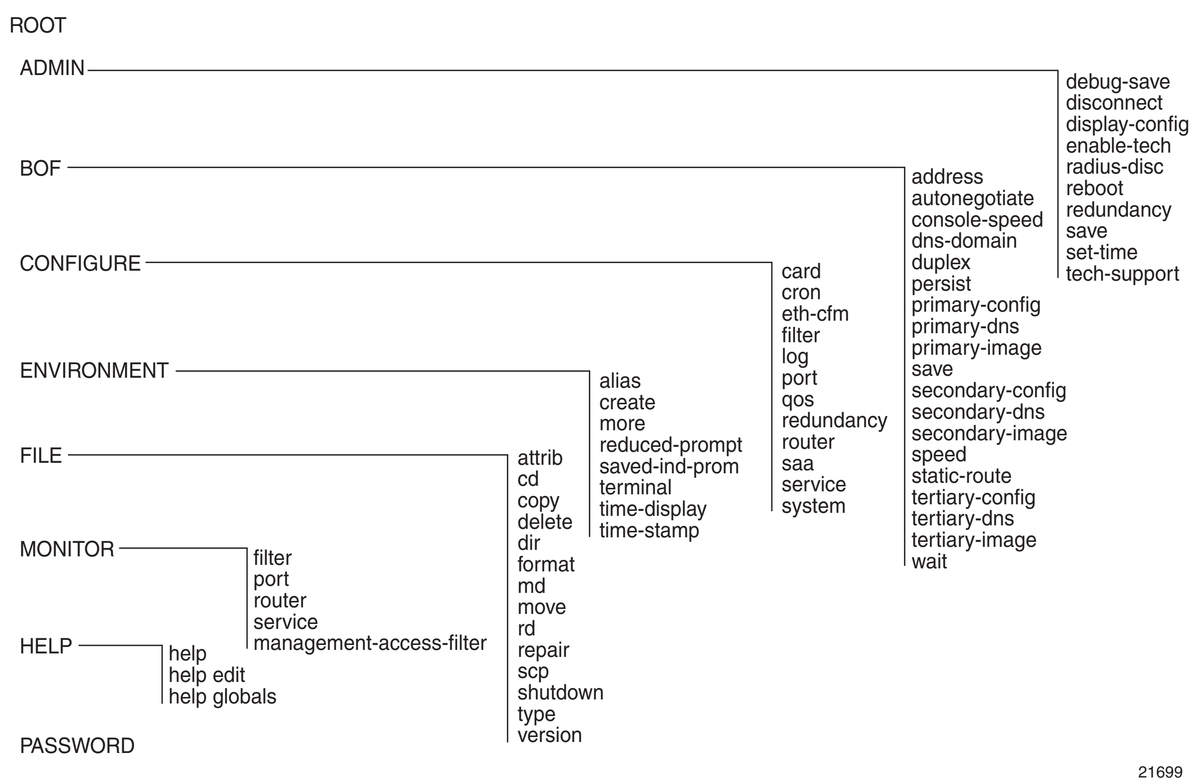
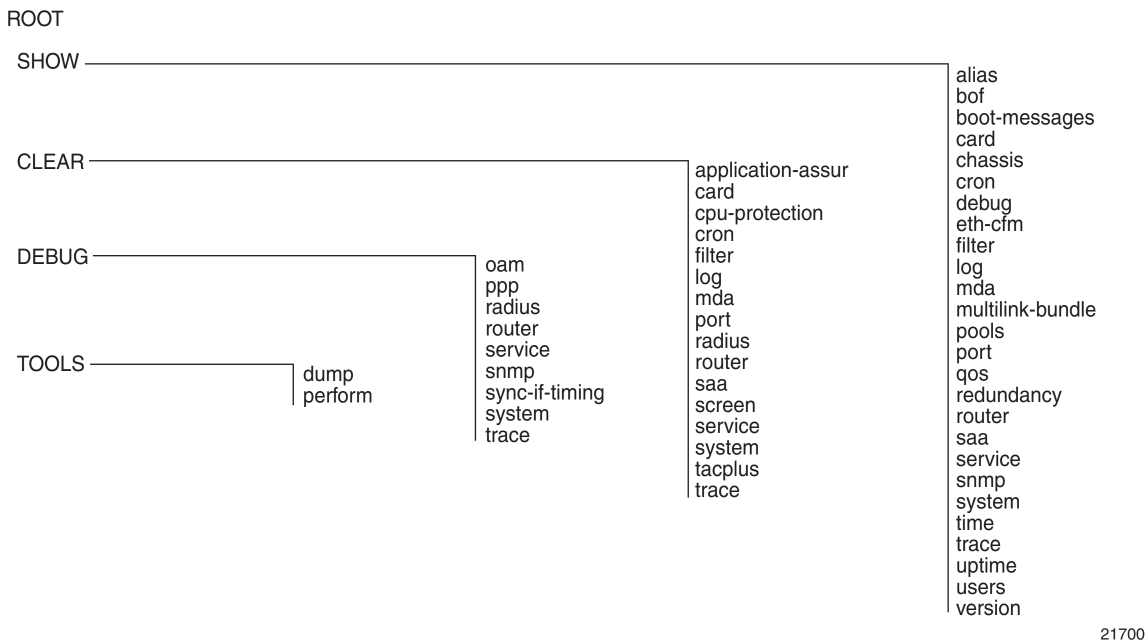


Figure 2: Operational Root Commands



Navigating in the CLI

The following sections describe additional navigational and syntax information:

- CLI Contexts
- Basic CLI Commands
- CLI Environment Commands
- CLI Monitor Commands

CLI Contexts

Use the CLI to access, configure, and manage Alcatel-Lucent 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# rooter
Error: Bad command.
```

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	Page
<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	48
clear	Clears statistics for a specified entity or clears and resets the entity	48
echo	Echoes the text that is typed in. Primary use is to display messages to the screen within an exec file.	49
exec	Executes the contents of a text file as if they were CLI commands entered at the console	49
exit	Returns the user to the previous higher context	50
exit all	Returns the user to the ROOT context	50
help	Displays help in the CLI	51
?	Displays all available options	—
history	Displays a list of the most recently entered commands	52
info	Displays the running configuration for a configuration context	53
logout	Terminates the CLI session	54

Table 2: Console Control Commands (Continued)

Command	Description	Page
mrinfo	Displays multicast information from the target multicast router. See the 7705 SAR OS OAM and Diagnostics Guide for details.	—
mstat	Traces a multicast path from a source to a receiver and displays multicast packet rate and loss information. See the 7705 SAR OS 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 OS OAM and Diagnostics Guide for details.	—
oam	Provides OAM test suite options. See the 7705 SAR OS OAM and Diagnostics Guide for details.	—
password	Changes the user CLI login password. The password can only be changed at the ROOT level.	54
ping	Verifies the reachability of a remote host	55
pwc	Displays the present or previous working context of the CLI session	57
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.	57
ssh	Opens a secure shell connection to a host	58
telnet	Telnet to a host	59
traceroute	Determines the route to a destination address	60
tree	Displays a list of all commands at the current level and all sublevels	61
write	Sends a console message to a specific user or to all users with active console sessions	61

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 line (pipe) indicates that one of the parameters within the brackets or braces is required	`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 Command Reference section but are used on the CLI; italics are used in the Command Reference section 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 within the braces is required; for example, if you select the peer parameter, you must enter the keyword "peer" (ip-address is optional)	`discovery [{peer [ip-address]} | {interface [ip-int-name]}]`
Bold	In the Command Reference section (not on the CLI), bold indicates commands and keywords that the user must enter exactly as shown	**scope** {**inclusive** | **template**}

Table 3: Command Syntax Symbols (Continued)

Symbol	Description	Example
Italic	In the Command Reference section (not on the CLI), italics indicate parameters that the user must enter a value for	**dscp** *dscp-name*
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	—

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	Page
alias	Enables the substitution of a command line by an alias	62
create	Enables or disables the use of a create parameter check	62
more	Configures whether CLI output should be displayed one screen at a time awaiting user input to continue	63
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	63
saved-ind-prompt	Saves the indicator in the prompt	64
terminal	Configures the terminal screen length for the current CLI session	64
time-display	Specifies whether time should be displayed in local time or UTC	65
time-stamp	Specifies whether a timestamp should be displayed before the prompt	65

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	Page
filter	Enables IP and MAC filter monitoring at a configurable interval until that count is reached	66
management-access-filter	Monitors commands for management access filters	69
port	Enables port traffic monitoring. The specified port(s) statistical information displays at the configured interval until the configured count is reached.	70
router	Enables virtual router instance monitoring at a configurable interval until that count is reached	72
service	Monitors commands for a particular service	80

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 *string*
command ?	Displays the command's syntax and associated keywords
command keyword ?	Lists the associated arguments for *keyword* in *command*
string<Tab> string<Space>	Completes a partial command name (auto-completion) or lists available commands that match *string*

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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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 in the `saved-ind-prompt` command in the `environment` context.

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 10.221.221.72/32
----------------------------------------------
*A:ALU-1>config>router>if#

*A:ALU-1>config>router>if# info detail
----------------------------------------------
            address 10.221.221.72/32
            no description
            no arp-timeout
            icmp
                mask-reply
                unreachables 100 10
                ttl-expired 100 10
            exit
            no ntp-broadcast
            no shutdown
            no bfd
----------------------------------------------
*A:ALU-1>config>router>if#
```

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.

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
- Pipe/Match
- Pipe/Count
- Redirection

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.

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.

The following output shows different `static-route` command syntax and an example of the command usage.

```
*A:ALU-12>config>router# static-route ?
- [no] static-route {<ip-prefix/prefix-length> | <ip-prefix> <netmask>} [metric
<metric>] [enable | disable] next-hop <ip-address> [bfd-enable]
- [no] static-route {<ip-prefix/mask> | <ip-prefix> <netmask>} [preference
<preference>] [metric <metric>] [tag <tag>] [enable | disable] indirect <ip-address>
[ldp [disallow-igp]]
- [no] static-route {<ip-prefix/mask> | <ip-prefix> <netmask>} [preference
<preference>] [metric <metric>] [tag <tag>] [enable | disable] black-hole
*A:ALU-12>config>router# static-route preference 1 10.1.0.0/16 metric
```

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><b>
Move forward one word	<Esc><f>

Table 7: Command Editing Keystrokes (Continued)

Editing Action	Keystrokes
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>

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 1.2.3.4
*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 or not 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#
```

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 ALCATEL SAR 7705
Copyright (c) 2000-2008 Alcatel-Lucent.All rights reserved.
All use subject to applicable license agreements.
Built on Wed Jan 16 01:05:13 EST 2008 by csabuild in /rel0.0/I322/panos/main
*A:ALU-1#
```

Entering Numerical Ranges

The 7705 SAR CLI allows the use of a single numerical range 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, it is possible to shut down ports 1 through 10 on MDA 1. A port is denoted by *`slot/mda/port`*, where *`slot`* identifies the IOM card slot ID (always 1), *`mda`* is the MDA number and *`port`* is the port number. To shut down ports 1 through 10 on Slot 1 and MDA 1, the command is entered as follows:

```
config port 1/1/[1..10] shutdown
```

<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
Only a single range can be specified	It is not possible to shut down ports 1 through 10 on MDA 1 and MDA 2, as the command would look like `config port 1/[1..2]/[1..10]` and requires two ranges in the command: [1..2] for the MDA and [1..10] for the port number

Ranges within quotation marks are interpreted literally	In the 7705 SAR OS CLI, enclosing a string in quotation marks (`"string"`) causes the string to be treated literally and as a single parameter. For example, several commands in the 7705 SAR OS 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 .. 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.
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.

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
[^]	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)

Table 9: Pipe/Match Characters (Continued)

String	Description
()	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 *m* and at most *n* repetitions of the term
{m}	Matches exactly *m* repetitions of the term
{m,}	Matches *m* 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 criteria 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
[:punct:]	[.,!?:...]	Punctuation
[:blank:]	[\t]	Space and Tab
[:space:]	[\t\n\r\f\v]	Blank characters

Table 10: Special Characters (Continued)

Options	Similar to	Description
\s	[\t\n\r\f\v]	Blank characters

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#
```

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”).

Basic Command Reference

Command Hierarchies

- Basic CLI Commands
- Environment Commands
- Monitor Commands
- Show Commands

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**]
— **logout**
— **mrinfo** [See 7705 SAR OS OAM and Diagnostics Guide for command description]
— **mstat** [See 7705 SAR OS OAM and Diagnostics Guide for command description]
— **mtrace** [See 7705 SAR OS OAM and Diagnostics Guide for command description]
— **oam** [See 7705 SAR OS 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*]
— **pwc** [**previous**]
— **sleep** [**seconds**]
— **ssh** *host* [**-l** *username*] [**-v** *ssh-version*] [**router** *router-instance* | **service-name** *service-name*]
— **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 milli***seconds*] [**no-dns**] [**source** *ip-address*] [**tos** *type-of-service*] [**router** *router-instance* | **service-name** *service-name*]
— **tree** [**detail**] [**flat**]
— **write** {*user* | **broadcast**} *message-string*

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**
  — **terminal**
    — **length** *lines*
    — **width** *width*
  — **time-display** {**local** | **utc**}
  — [**no**] **time-stamp**

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**
    - — **session** *ldp-id* [*ldp-id*...(up to 5 max)] [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
    - — **statistics** [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
  - — **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* [**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**]

Show Commands

show
- — **alias**

Command Descriptions

- Basic CLI Commands
- Environment Commands
- Monitor CLI Commands
- Show Commands

Basic CLI Commands

enable-admin

Syntax **enable-admin**

Context <global>

Description See the description for the **admin-password** command. If the **admin-password** is configured in the **config>system>security>password** context, then any user can enter a special administrative mode by entering the **enable-admin** 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
  138.120.141.147
-------------------------------------------------------------------------------
Number of users : 2
===============================================================================
A:ALU-1#
A:ALU-1# enable-admin
MINOR: CLI Already in admin mode.
A:ALU-1#
```

back

Syntax **back**

Context <global>

Description This command moves the context back one level of the command hierarchy. For example, if the current level is the **config router mpls** context, the **back** command moves the cursor to the **config router** context level.

clear

Syntax **clear**

Context <global>

Description This command clears statistics for a specified entity or clears and resets the entity.

Parameters **card —** reinitializes an I/O module in a specified slot

cron — clears CRON history

filter — clears IP filter counters

log — closes and reinitializes the log specified by log-id

mda — reinitializes the specified MDA in a particular slot

port — clears port statistics

radius — clears the RADIUS server state

router — clears router commands affecting the router instance in which they are entered

Values arp, authentication, bfd, forwarding-table, interface, ldp, mpls, rip

saa — clears the SAA test results

screen — clears the console or Telnet screen

service — clears service ID and statistical entities

system — clears (re-enables) a previously failed reference

tacplus — clears the TACACS+ server state

trace — clears the trace log

vrrp — clears and resets the VRRP interface and statistical entities

echo

Syntax **echo** [*text-to-echo*] [*extra-text-to-echo*] [*more-text*]

Context <global>

Description 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 **exec** command.

Parameters *text-to-echo* — specifies a text string to be echoed, up to 256 characters

extra-text-to-echo — specifies more text to be echoed, up to 256 characters

more-text — specifies more text to be echoed, up to 256 characters

exec

Syntax **exec** [**-echo**] [**-syntax**] {*filename* | **<<**[*eof-marker-string*]}

Context <global>

Description This command executes the contents of a text file as if they were CLI commands entered at the console.

Exec commands do not have **no** versions.

Related commands are:

- boot-good-exec
  Use this command to configure a URL for a CLI script to exec following a successful configuration boot.
- boot-bad-exec
  Use this command to configure a URL for a CLI script to exec following a failed configuration boot.

Parameters

-echo — echoes the contents of the **exec** file to the session screen as it executes

Default echo disabled

-syntax — 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.

Default execute file commands

filename — the text file with CLI commands to execute

<< — 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 <Ctrl-c>, "EOF<Return>" or "*eof_string*<Return>".

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.

eof-marker-string — The ASCII printable string used to indicate the end of the exec file when stdin is used as the exec file source. <Ctrl-c> and "EOF" can always be used to terminate an exec file sourced from stdin.

Default <Ctrl-c>, EOF

exit

Syntax **exit** [**all**]

Context <global>

Description 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 **exit** command only moves the cursor back one level.

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

If you navigated to the current level by entering a command string, then the **exit** command returns the cursor to the context in which the command was initially entered.

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

The **exit all** command moves the cursor all the way back to the root level.

```
ALU-1# configure
ALU-1>config# router
ALU-1>config>router# mpls
ALU-1>config>router>mpls# exit all
ALU-1#
```

Parameters **all —** exits back to the root CLI context

help

Syntax **help**
help edit
help globals
help special-characters

Context <global>

Description This command provides a brief description of the help system. The following information is displayed:

```
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:
     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

Syntax **history**

Context <global>

Description 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

Syntax **info** [**detail**]

Context <global>

Description 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
            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.

Parameters **detail —** displays all configuration parameters, including parameters at their default values

logout

Syntax **logout**

Context <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 (host bits must be 0)
ipv6-address x:x:x:x:x:x:x:x (eight 16-bit pieces)
x:x:x:x:x:x:d.d.d.d
x: [0 to FFFF]H
d: [0 to 255]D

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

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

Values 0.0.0.0 to 255.255.255.255

Default the IP address of the egress IP interface

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

Values 1 to 10000

Default 1

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

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

Syntax **pwc** [**previous**]

Context <global>

Description 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.

Parameters **previous** — displays the previous working context

sleep

Syntax **sleep** [*seconds*]

Context <global>

Description This command causes the console session to pause operation (sleep) for 1 second (default) or for the specified number of seconds.

Parameters *seconds* — specifies the number of seconds for the console session to sleep, expressed as a decimal integer

Values 1 to 100

Default 1

ssh

Syntax **ssh** *host* [**-l** *username*] [**-v** *ssh-version*] [**router** *router-instance* | **service-name** *service-name*]

Context <global>

Description This command opens a Secure Shell (SSH) session with another host.

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.

Quitting SSH while in the process of authentication is accomplished by either executing a <Ctrl-c> or "~." (tilde and dot) assuming the "~" is the default escape character for the SSH session.

Parameters *host* — 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.

For IPv6 addresses, including the "*-interface*" for the link local address is mandatory; otherwise, "*-interface*" is omitted. For example, if the *user* is alu_admin and the IPv6 *hostname* consists of FE80::9876:DEEF:154D along with the link local interface "ies1_chicago", then the full command would be (note the "-" between the *ipv6-address* and the *interface*):

ssh -l alu_admin FE80::9876:DEEF:154D-ies1_chicago

Values

[*user@*]*hostname:*	255 characters maximum
user:	user name, 32 characters maximum
hostname:	[*dns-name* | *ipv4-address* | *ipv6-address*]
dns-name:	128 characters maximum
ipv4-address:	a.b.c.d
ipv6-address:	x:x:x:x:x:x:x:x[-*interface*]
	x:x:x:x:x:x:d.d.d.d[-*interface*]
	x: [0..FFFF]H
	d: [0..255]D
	interface: interface name, 32 characters maximum, mandatory for link local addresses

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

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

Values 1, 2, or 1-2 (for SSH-1 only, SSH-2 only, or SSH-1 and SSH-2)

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

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.

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

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

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

Values 128 characters maximum

port — the TCP port number to use to Telnet to the remote host, expressed as a decimal integer

Values 1 to 65535

Default 23

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

traceroute

Syntax **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*]

Context <global>

Description The TCP/IP traceroute utility determines the route to a destination address. Note that aborting a traceroute with the <Ctrl-c> command could require issuing a second <Ctrl-c> command before the prompt is returned.

```
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#
```

Parameters *ip-address* — the IP address to trace

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

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.

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

Syntax **tree** [**detail**] [**flat**]

Context <global>

Description This command displays the command hierarchy structure from the present working context.

Parameters **detail —** includes parameter information for each command displayed in the tree output

flat — displays the command hierarchy on single lines

write

Syntax **write** {*user* | **broadcast**} *message-string*

Context <global>

Description This command sends a console message to a specific user or to all users with active console sessions.

Parameters *user* — the name of a user with an active console session to which to send a console message

Values any valid CLI username

broadcast — specifies that the *message-string* is to be sent to all users logged in to the router

message-string — 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.

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. 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"

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 a ellipsis (“…”).

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

Note that 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://128.251.10.43/./sim48/sim48-config.cfg
Saving configuration .... Completed.
A:ALU-48
```

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** *lines*

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 *lines* — the number of lines for the terminal screen length

Values 1 to 512

width

Syntax **width** *width*

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 *width* — the number of characters for the terminal screen width

Values 1 to 512

time-display

Syntax **time-display** {**local** | **utc**}

Context environment

Description This command displays timestamps in the CLI session based on local time or Coordinated Universal Time (UTC).

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.

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.

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.

Default time-display local

time-stamp

Syntax [**no**] **time-stamp**

Context environment

Description 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.

Default no time-stamp

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** *ip-filter-id* **entry** *entry-id* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

Context monitor>filter

Description 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.

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.

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 *ip-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

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

Sample Output

```
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** *entry-id* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

Context monitor>management-access-filter

Description 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.

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.

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 *entry-id* — displays information for the specified filter entry ID

Values 1 to 9999

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

ipv6

Syntax **ipv6 entry** *entry-id* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

Context monitor>management-access-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 *entry-id* — displays information for the specified filter entry ID

Values 1 to 9999

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

port

Syntax **port** *port-id* [*port-id*...(up to 5 max)] [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

Context monitor

Description This command enables port traffic monitoring. The specified port(s) statistical information is displayed at the configured interval until the configured count is reached.

The first screen displays the current statistics related to the specified port(s). 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. 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.

Sample Output

```
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
Utilisation (% of port capacity)                 0.00                        0.00
-------------------------------------------------------------------------------
At time t = 6 sec (Mode: Rate)
-------------------------------------------------------------------------------
Octets                                              0                           0
Packets                                             0                           0
Errors                                              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
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

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 session(s). 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-address[:label-space]

ip-address — a.b.c.d

label-space — [0..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 the LDP session.

Sample Output

```
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.

Sample Output

```
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

neighbor

Syntax **neighbor** *neighbor* [*neighbor*...(up to 5 max)] [**interval** *seconds*] [**repeat** *repeat*] [**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 neighbor(s). 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 *neighbor* — the IP address of the neighbor for which to display statistics. Up to 5 neighbors can be specified.

seconds — configures the interval for each display in seconds

repeat — 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** *interface-name* **vr-id** *virtual-router-id* [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

Context monitor>router>vrrp

Description This command displays statistics for a VRRP instance.

Parameters *interface-name* — 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

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

Values 3 to 60

Default 5

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

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

<table>
<tr><th>Type</th><th>Syntax</th><th>Example</th></tr>
<tr><td>port-id</td><td>slot/mda/port[.channel]</td><td>1/1/5</td></tr>
<tr><td>bridge</td><td>slot/mda/<bridge-id.branch-id></td><td>1/5/16.10</td></tr>
<tr><td>null</td><td>[port-id | bundle-id | lag-id | aps-id | mw-link-id]</td><td>port-id: 1/1/3
bundle-id: bundle-ppp-1/1.1
lag-id: lag-1
aps-id: aps-1
mw-link-id: mw-link-1</td></tr>
<tr><td>dot1q</td><td>[port-id | lag-id | aps-id | mw-link-id]:qtag1</td><td>port-id:qtag1: 1/1/3:100
lag-id: lag-1:10
aps-id: aps-1
mw-link-id: mw-link-1</td></tr>
<tr><td>qinq</td><td>[port-id | lag-id]:qtag1.qtag2</td><td>port-id:qtag1.qtag2: 1/1/3:100.30
lag-id: lag-1:10.10</td></tr>
<tr><td>atm</td><td>[port-id | aps-id][:vpi/vci | vpi | vpi1.vpi2] [1]</td><td>port-id: 1/1/1 or 1/1/1.1 (for T1/E1 channelized ports)
aps-id: aps-1
vpi/vci: 16/26
vpi: 16
vpi1.vpi2: 16.22</td></tr>
<tr><td>lag</td><td>lag-id</td><td>lag-2</td></tr>
<tr><td>frame</td><td>[port-id| aps-id]:dlci</td><td>1/1/1
aps-id: aps-1
dlci: 16</td></tr>
<tr><td>frame relay</td><td>[port-id]:dlci</td><td>1/1/1
dlci: 16</td></tr>
<tr><td>cisco-hdlc</td><td>slot/mda/port.channel</td><td>1/1/1.3</td></tr>
</table>

Table 11: SAP ID Configurations (Continued)

Type	Syntax	Example
cem	*slot/mda/port.channel*	1/1/1.3
ima-grp	*bundle-id*[:vpi/vci | vpi | vpi1.vpi2]	1/1/3.1
ipcp	*slot/mda/port.channel*	1/2/2.4
hdlc	*slot/mda/port.channel*	1/1/3.1
lag-id	lag-*id*	lag-1
mw-link-id	mw-link-*id*	mw-link-1
aps-id	aps-*group-id*[.channel]	aps-1
bundle-id	bundle-[ima | ppp]-*slot/mda.bundle-num*	bundle-ima-1/1.1
tunnel-id	tunnel-<*id*>.[private | public]:<*tag*>	tunnel-1.private:1

Note:

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

Values *sap-id*:

null	[*port-id* | *bundle-id* | *lag-id* | *aps-id* | *mw-link-id*]
dot1q	[*port-id* | *lag-id* | *aps-id* | *mw-link-id*]:*qtag1*
qinq	[*port-id* | *lag-id*]:*qtag1.qtag2*
atm	[*port-id* | *aps-id*][:vpi/vci |vpi | vpi1.vpi2]
frame	[*port-id* | *aps-id*]:*dlci*
cisco-hdlc	*slot/mda/port.channel*
cem	*slot/mda/port.channel*
ipcp	*slot/mda/port.channel*
ima-grp	*bundle-id*[:vpi/vci | vpi | vpi1.vpi2]
hdlc	*slot/mda/port.channel*
port-id	*slot/mda/port*[*.channel*]
bridge	*slot/mda/bridge-id.branch-id*
	bridge-id 1 to 16
	branch-id 1 to 32
bundle-id	bundle-*type*-*slot/mda.bundle-num*
	bundle keyword
	type ima, ppp
	bundle-num 1 to 32

aps-id	aps-*group-id*[.*channel*]	
	aps	keyword
	group-id	1 to 24
mw-link-id	mw-link-*id*	
	id	1 to 24
lag-id	lag-*id*	
	lag	keyword
	id	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	tunnel-*id*.[private | public]:*tag*	
	tunnel	keyword
	id	1 to 16 (1 is the only valid value)
	tag	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 s*lot/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. Note that a 0 qtag1 value also accepts untagged packets on the dot1q port, and that 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. Note that a 0 qtag1 or qtag 2 value also accepts untagged packets on the qinq port, and that 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.

Sample Output

```
*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
Dropped               : 0                       n/a
Off. HiPrio           : 205557                  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          : 205557                  68605598
```

```
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
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

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
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

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.

Sample Output

```
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#
```

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.

Sample Output

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

Table 13: Show Alias Output Fields

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

File System Management

In This Chapter

This chapter provides information about file system management.

Topics in this chapter include:

- The File System
- Common Configuration Tasks
- File System Command Reference

The File System

The 7705 SAR OS 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.

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 (both variants)
- 7705 SAR-F
- 7705 SAR-M (all variants)
- 7705 SAR-H (both variants)
- 7705 SAR-Hc
- 7705 SAR-W
- 7705 SAR-Wx (all variants)
- 7705 SAR-X

Note: The 7705 SAR-8, 7705 SAR-18, 7705 SAR-H, and 7705 SAR-M have removable compact flash cards.

The 7705 SAR-A, 7705 SAR-F, 7705 SAR-Hc, 7705 SAR-W, and 7705 SAR-Wx, do not have removable compact flash cards; they are shipped with an integrated 256 Mbyte flash memory device 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 OS gracefully closes any open files on the device so that it can be safely removed.

URLs

The arguments for the 7705 SAR OS 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 OS 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 14.

Table 14: URL Types and Syntax

URL Type	Syntax	Notes
local-url	[*cflash-id/*] [*file-path*]	*cflash-id* 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 supports cf3:, cf3-A:, and cf3-B:; all fixed platforms support cf3: and cf3-A:) Length: 200 characters maximum, including *cflash-id*; directory length is 99 characters maximum each
		path is the path to the directory or file
remote-url	[**ftp**://*login*:*pswd@remote-locn/*] [*file-path*]	An absolute ftp path from the root of the remote file system: Length: 247 characters maximum; directory length is 99 characters maximum each
		login is the ftp user name
		pswd is the ftp user password
		remote-locn is the remote host (hostname or IP address) Values: • *hostname*: host name of the remote location, up to 128 characters maximum • *ipv4-address*: a.b.c.d • "["*ipv6-address*"]" (address must be enclosed in square brackets) → x:x:x:x:x:x:x:x[-*interface*] → x:x:x:x:x:x:d.d.d.d[-*interface*] → x: [0..FFFF]H → d: [0..255]D → *interface:* the interface name, 32 characters maximum, mandatory for link local addresses

Table 14: URL Types and Syntax (Continued)

URL Type	Syntax	Notes
		path is the path to the directory or file
	ftp://*login***:***pswd*]**@***host***/./***path*	A relative ftp path from the user's home directory. Note the period and slash ("**./**") in this syntax, as compared to the absolute path.
tftp-url	**tftp**://*login*:*pswd@remote-locn*/*file-path*	tftp is only supported for operations on file-urls

Table 15 lists the commands that are supported both locally and remotely.

Table 15: File Command Local and Remote File System Support

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

The 7705 SAR OS accepts either forward slash ("/") or backslash ("\") characters to delimit directory and/or filenames in URLs. Similarly, the 7705 SAR OS 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 OS 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 OS SCP server.

For example, a destination directory specified as "cf3:\dir1\file1" will be transmitted to the 7705 SAR OS 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.

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.

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.

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
```

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 #
```

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
```

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\ #
```

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
```

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>`
```
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 ALCATEL-LUCENT SAR 7705
# Copyright (c) 2000-2008 Alcatel-Lucent.
# All rights reserved. All use subject to applicable license agreements.
# Built on Wed Apr 9 09:53:01 EDT 2008 by csabuild in /rel2.0/b1/R1/panos/main

# Generated WED APR 09 20:18:06 2008 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:\ #
```

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.
```

File System Command Reference

Command Hierarchy

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**]

Command Descriptions

- Configuration Commands

Configuration Commands

file

Syntax **file**

Context root

Description This command enters the context to perform file system operations.

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.

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.

attrib

Syntax **attrib** [**+r** | **-r**] *file-url*
attrib

Context file

Description This command sets or clears/resets the read-only attribute for a file in the local file system.

To list all files and their current attributes, enter **attrib** or **attrib x** where **x** is either the filename or a wildcard (*).

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:

```
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 *file-url* — the URL for the local file (see Table 14 for parameter descriptions)

+r — sets the read-only attribute on the specified file

-r — clears/resets the read-only attribute on the specified file

cd

Syntax **cd** [*file-url*]

Context file

Description This command displays or changes the current working directory in the local file system.

Parameters *file-url* — the URL for the local file (see Table 14 for parameter descriptions)

<*none*> — displays the current working directory

.. — signifies the parent directory. This can be used in place of an actual directory name in a *directory-url*.

directory-url — the destination directory

copy

Syntax **copy** *source-file-url dest-file-url* [**force**]

Context file

Description 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.

When a file is copied to a destination with the same file name, the original file is overwritten by the new file specified in the operation. The following prompt appears if the destination file already exists:

"Overwrite destination file (y/n)?"

For example:

To copy a file named srcfile in a directory called test on cf3: in slot CSM B to a file called destfile in a directory called production on cf3: in slot CSM A, the syntax is:

```
file cf3:\ # copy cf3-B:/test/srcfile cf3-A:/production/destfile
```

To FTP a file named 121201.cfg in directory mydir stored on cf3: in slot CSM A to a network FTP server with IP address 131.12.31.79 in a directory called backup with a destination file name of 121201.cfg, the FTP syntax is:

```
copy cf3-A:/mydir/121201.cfg 131.12.31.79/backup/121201.cfg
```

Parameters *source-file-url* — the location of the source file or directory to be copied (see *file-url*)

dest-file-url — the destination of the copied file or directory (see *file-url*)

force — forces an immediate copy of the specified file(s)

file copy force executes the command without displaying a user prompt message

file-url — the local or remote URL (see Table 14 for parameter descriptions)

delete

Syntax **delete** *file-url* [**force**]

Context file

Description This command deletes the specified file.

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:

"Delete file <filename> (y/n)?"

Parameters *file-url* — the file name to delete (see Table 14 for parameter descriptions)

force — forces an immediate deletion of the specified file(s)

file delete * force deletes all the wildcard matching files without displaying a user prompt message

dir

Syntax **dir** [*file-url*] [**sort-order** {**d** | **n** | **s**}] [**reverse**]

Context file

Description 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.

Parameters *file-url* — the path or directory name (see Table 14 for parameter descriptions)

Use *file-url* with the optional wildcard (*) to reduce the number of files to list.

Default lists all files in the present working directory, sorted by name (in ascending order)

sort-order — specifies the order by which the files are sorted

Values d – sorts by date

n – sorts by filename

s – sorts by file size

reverse — sorts the files in descending order

format

Syntax **format** [*flash-id*] [**reliable**]

Context file

Description This command formats the compact flash. The compact flash must be shut down before formatting.

Parameters *flash-id* — the compact flash type

Values The 7705 SAR-8 and the 7705 SAR-18 support cf3:, cf3-A:, and cf3-B:.

In addition, the 7705 SAR-18 supports cf1:, cf1-A:, cf1-B:, cf2:, cf2-A:, and cf2-B:.

The 7705 SAR-F, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, 7705 SAR-X, 7705 SAR-M, 7705 SAR-A, and 7705 SAR-Wx support cf3: and cf3-A:.

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** *file-url*

Context file

Description This command creates a new directory in a file system.

Directories can only be created one level at a time.

Parameters *file-url* — the directory name to be created (see Table 14 for parameter descriptions)

move

Syntax **move** *old-file-url new-file-url* [**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 *old-file-url* — the file or directory to be moved (see Table 14 for parameter descriptions)

new-file-url — the new destination to place the *old-file-url* (see Table 14 for parameter descriptions)

force — forces an immediate move of the specified file(s)

file move force executes the command without displaying a user prompt message

rd

Syntax **rd** *file-url* **rf**
rd *file-url* [**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 *file-url* — the directory to be removed (see Table 14 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** [*flash-id*]

Context file

Description This command checks a compact flash device for errors and repairs any errors found.

Parameters *flash-id* — the compact flash slot ID to be shut down or enabled. When a specific *flash-id* is specified, then that drive is shut down. If no *flash-id* 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 The 7705 SAR-8 and the 7705 SAR-18 support cf3:, cf3-A:, and cf3-B:.

In addition, the 7705 SAR-18 supports cf1:, cf1-A:, cf1-B:, cf2:, cf2-A:, and cf2-B:.

The 7705 SAR-F, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, 7705 SAR-X, 7705 SAR-M, 7705 SAR-A, and 7705 SAR-Wx support cf3: and cf3-A:.

Default the current compact flash device

scp

Syntax **scp** *local-file-url destination-file-url* [**router** *router-instance*] [**force**]
scp *local-file-url destination-file-url* [**service** *service-name*] [**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 14 for parameter descriptions)

destination-file-url — the destination file:

Values *user@hostname*:*file-path* 255 characters maximum

user: the SSH user, 32 characters maximum

hostname: *dns-name* | *ipv4-address* | "["*ipv6-address* "]" (IPv6 address must be enclosed in square brackets)

dns-name: 128 characters maximum

ipv4-address: a.b.c.d

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

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

x: [0..FFFF]H

d: [0..255]D

interface: the interface name, 32 characters maximum, mandatory for link local addresses

file-path: the destination file path, 200 characters maximum, directory length is 99 characters maximum each

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

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** *flash-id*

Context file

Description This command shuts down (unmounts) the specified CSM(s).

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 **configure>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 *flash-id* — the compact flash slot ID to be shut down or enabled. If a *flash-id* is specified, the drive is shut down or enabled. If no *flash-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 The 7705 SAR-8 and the 7705 SAR-18 support cf3:, cf3-A:, and cf3-B:.

In addition, the 7705 SAR-18 supports cf1:, cf1-A:, cf1-B:, cf2:, cf2-A:, and cf2-B:.

The 7705 SAR-F, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, 7705 SAR-X, 7705 SAR-M, 7705 SAR-A, and 7705 SAR-Wx support cf3: and cf3-A:.

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 14 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 file name of the target file (see Table 14 for parameter descriptions)

check — validates the .tim file

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

Sample Output

```
A:ALU-1# file version cf3:/both.tim
TiMOS-B-0.0.R1 for ALCATEL-LUCENT 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 ALCATEL-LUCENT SAR 7705
B:Performance#
```

Boot Options

In This Chapter

This chapter provides information about configuring boot option parameters.

Topics in this chapter include:

System Initialization

Depending on the chassis, the primary copy of 7705 SAR OS 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 OS image, the bootstrap file, 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
- 7705 SAR-18
- 7705 SAR-H
- 7705 SAR-M

All other chassis have an integrated flash memory device 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.

The following is an example of console display output when the **boot.ldr** file cannot be located on **cf3**.

```
...
Alcatel-Lucent 7705 Boot ROM. Copyright 2010 Alcatel-Lucent.
All rights reserved. All use is subject to applicable license agreements.
Build: X-2.1.R1 on Tue Oct 5 16:25:56 EDT 2010 by csabuild
Version: 0x1D
Performing Data Bus Test... Passed.
Performing Local RAM Test (1st 2MB)... Passed.
COLD boot on processor #1
?Preparing for jump to RAM...
Starting bootrom RAM code...
Boot rom version is v29
CPU BIST check passed.
Testing SDRAM from 0x02200000 to 0x40000000
```

```
Testing Compact Flash ... Slot Empty
Board Serial Number is 'NS080940085'
Chassis Serial Number is 'NS000000064'
Searching for boot.ldr on local drives:
No disk in cf3
No disk in cf3
No disk in cf3
Error - file boot.ldr not found on any drive
Please insert CF containing boot.ldr. Rebooting in 5 seconds.

Rebooting...ÿ

Alcatel-Lucent 7705 Boot ROM. Copyright 2000-2010 Alcatel-Lucent.
All rights reserved. All use is subject to applicable license agreements.
Build: X-2.1.R1 on Tue Oct 5 16:25:56 EDT 2010 by csabuild
Version: 0x1D
Performing Data Bus Test... Passed.
Performing Local RAM Test (1st 2MB)... Passed.
COLD boot on processor #1
?Preparing for jump to RAM...
Starting bootrom RAM code...
Boot rom version is v29
CPU BIST check passed.
Testing SDRAM from 0x02200000 to 0x40000000
Testing Compact Flash ... OK (SMART CF)
Board Serial Number is 'NS080940085'
Chassis Serial Number is 'NS000000064'
Searching for boot.ldr on local drives:
Searching cf3 for boot.ldr...
**********************************************

Total Memory: 992MB  Chassis Type: sar8  Card Type: corona_r1
TiMOS-L-2.1.R1 boot/hops ALCATEL-LUCENT SAR 7705
Copyright (c) 2000-2010 Alcatel-Lucent.
All rights reserved. All use subject to applicable license agreements.
Built on Tue Oct 5 16:35:12 EDT 2010 by csabuild in /rel2.0/b1/R1/panos/main
```

When the bootstrap image is loaded, the BOF is read to obtain the location of the image and configuration files. The BOF must be located on the same compact flash drive as the **boot.ldr** file.

Figure 4 displays the system initialization sequence.

Figure 4: System Initialization - Part 1

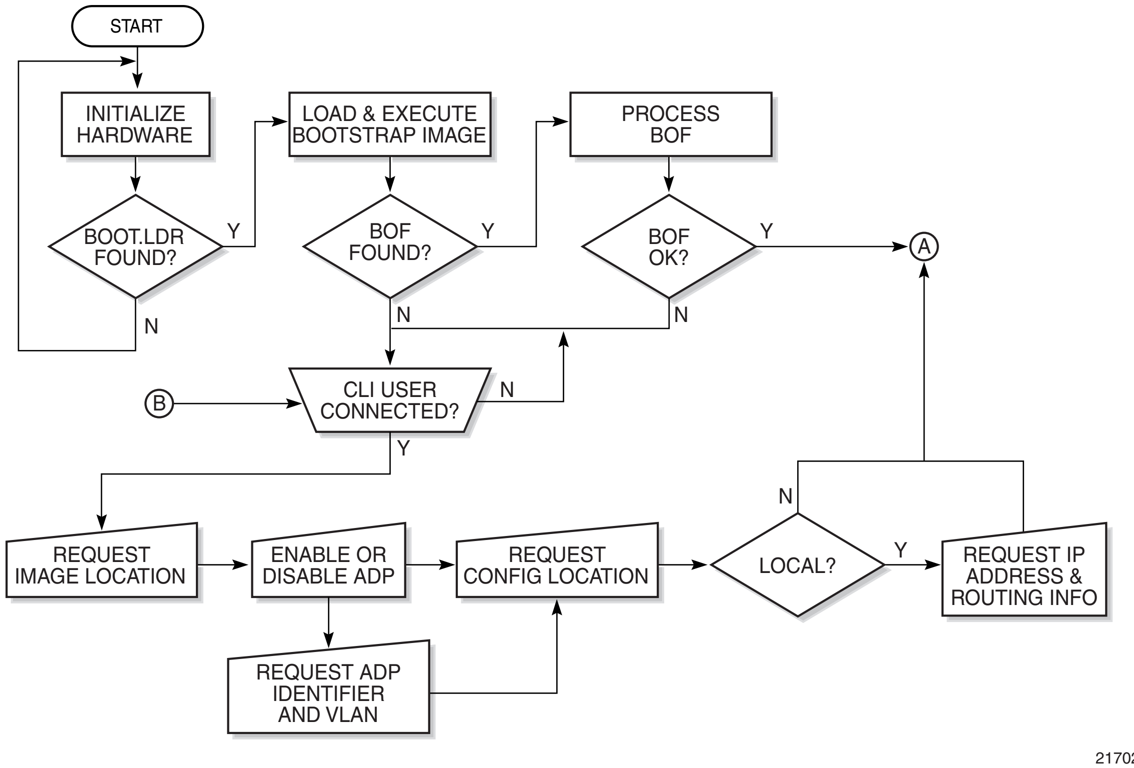
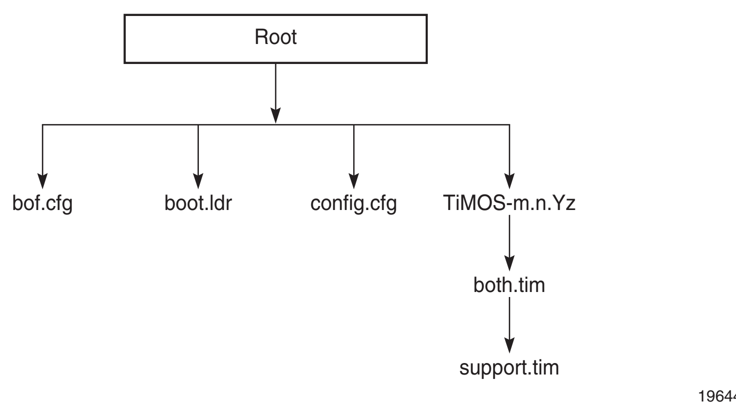


Figure 5 displays the compact flash directory structure and file names.

Figure 5: Files on the Compact Flash



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

Note: The support.tim file is included in the software bundles for the following platforms only: 7705 SAR-8, 7705 SAR-18, 7705 SAR-H, 7705 SAR-M, and 7705 SAR-X.

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 BOF cannot be found or loaded, then the system enters a console message dialog session prompting the user to enter alternate file locations and file names.

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 6 displays the boot sequence.

Figure 6: System Initialization - Part 2

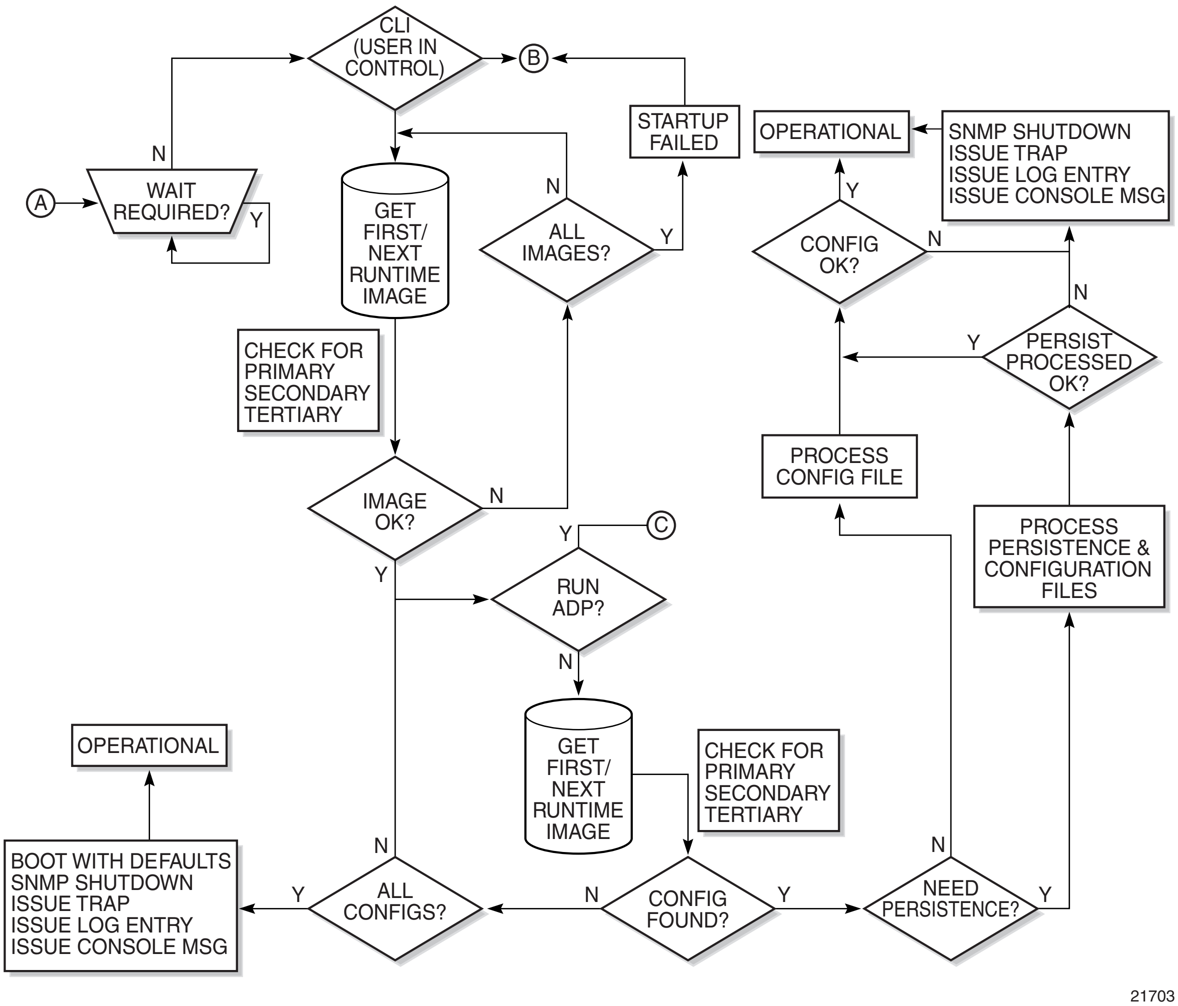
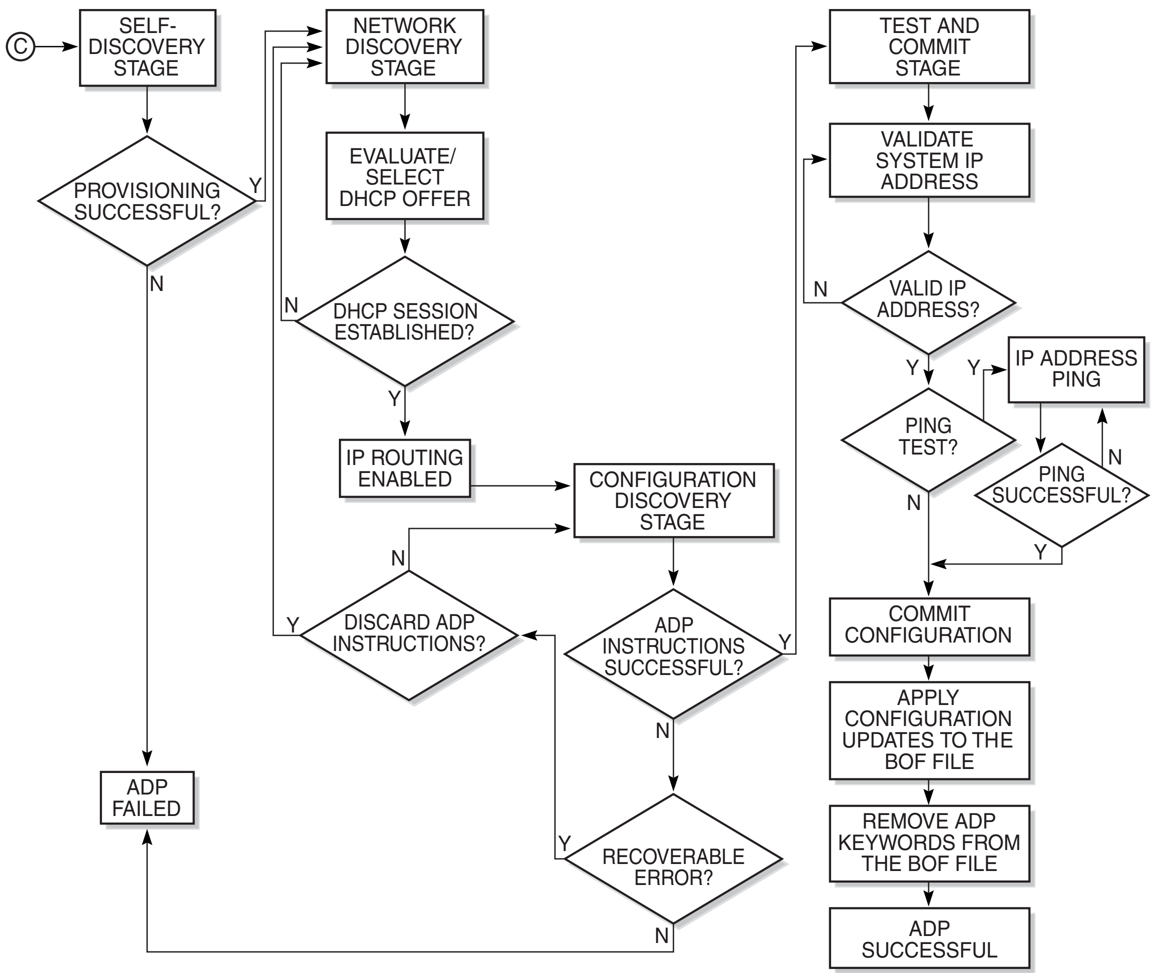


Figure 7 shows the boot sequence if Automatic Discovery Protocol (ADP) is run on the system.

Figure 7: System Initialization With ADP



The following displays an example of BOF output.

```
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
    console-speed   115200
===============================================================================
A:ALU-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, then the system becomes operational. If persistence is required, then 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.

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 on the 7705 SAR-8 (qinq is not supported on the version 1 card)
- all ports on the 8-port Ethernet Adapter card on the 7705 SAR-18 (the 7705 SAR-18 does not support the version 1 card)
- all ports on the 10-port 1GigE/1-port 10GigE X-Adapter card on the 7705 SAR-18

- all ports on the 6-port Ethernet 10Gbps Adapter card on the 7705 SAR-8 Shelf V2 with CSMv2 and the 7705 SAR-18
- all ports on the 8-port Gigabit Ethernet Adapter card
- all Ethernet ports on the 7705 SAR-F, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-M (all variants), 7705 SAR-W, 7705 SAR-Wx (all variants), 7705 SAR-X, 6-port SAR-M Ethernet module, and 4-port SAR-H Fast Ethernet module
- Ethernet ports 5 through 12 on the 7705 SAR-A variant with T1/E1 ports, and Ethernet ports 5 through 8 on the 7705 SAR-A variant without T1/E1 ports
- all DSL or GPON ports on the 7705 SAR-M (variants with module slots), when a GPON, DCM, or xDSL module is installed in the chassis (qinq is not supported)
- the DSL ports on the 7705 SAR-Wx

Caution: On the 7705 SAR-A, ADP will not run successfully if the connection to the network is made from the SFP connector on ports 1 to 4 because the default connector is RJ-45.

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

- self-discovery
- network discovery
- configuration discovery
- test and commit

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.

During the network discovery stage, the 7705 SAR sends a DHCP DISCOVER message from all operational ports. Table 16 describes the DHCP DISCOVER message options.

Table 16: DHCP DISCOVER Message Options

Option	Name	Description
chaddr	Client HW Address	The MAC address of the port
51	Lease Time	Always set to Infinite

Table 16: DHCP DISCOVER Message Options (Continued)

Option	Name	Description
60	Class Identifier	The class of 7705 SAR router: ALU-AD | SAR-8 ALU-AD | SAR-18 ALU-AD | SAR-A ALU-AD | SAR-F 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.

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 17 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 17: 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

Table 17: DHCP OFFER Message Options (Continued)

Option	Name	Description	Required
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 5620 SAM 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 18 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 18: 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

Table 18: ADP Instructions (Continued)

Keyword	Description	Format
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 100.20.2.30
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

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-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.

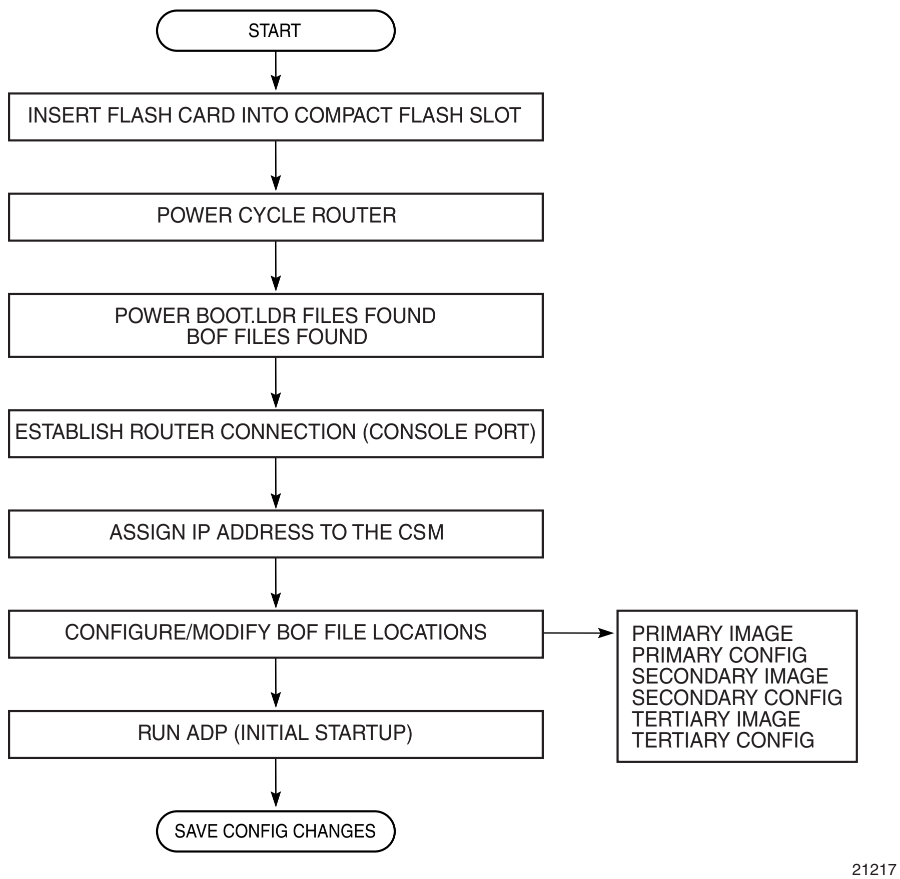
ADP runs only once on a router during initial startup if the automatic discovery is successful. The learned network interface configuration is retained in the local database. On subsequent reboots, the router uses its local database to reload its network configuration. After ADP successfully completes, 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.

Initial System Startup Process Overview

Figure 8 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 the Figure 8 does not apply.

Figure 8: System Startup Flow



Boot Loader File Protection

Alcatel-Lucent 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.

Before Upgrading

Before starting the upgrade, all 7705 SAR OS image files must be copied to the cf3: device on the system. Alcatel-Lucent 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. Alcatel-Lucent strongly recommends following this process for all 7705 SAR systems.

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** file name 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 7705 SAR OS 7.0.Rx Software Release Notes, part number 3HE10099000xTQZZA, "Standard Software Upgrade Procedure" for complete instructions.

Configuration Notes

The following describes BOF configuration 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.

Reference Sources

For information on supported IETF drafts and standards as well as standard and proprietary MIBs, refer to Standards and Protocol Support.

Configuring Boot File Options with CLI

This section provides information to configure BOF parameters with CLI.

Topics in this section include:

- BOF Configuration Overview
- Basic BOF Configuration
- Common Configuration Tasks
- Configuring BOF Parameters
- Service Management Tasks

BOF Configuration Overview

Alcatel-Lucent 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.

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
    console-speed    115200
===============================================================================
A:ALU-1#
```

Common Configuration Tasks

The following sections describe basic system tasks that must be performed.

- Searching for the BOF
- Accessing the CLI
- Accessing the Management Port on a 7705 SAR-W

For details about hardware installation and initial router connections, refer to the specific 7705 SAR hardware installation guide.

Searching for the BOF

The BOF should be on the same drive as the boot loader file. If the system cannot load or cannot find the BOF, the system checks whether the boot sequence was manually interrupted. The system prompts for a different image and configuration location.

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
```

Accessing the CLI

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).

Console Connection

To establish a console connection, you will need the following:

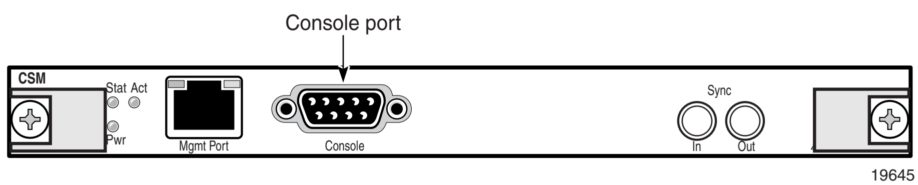
- an ASCII terminal or a PC running terminal emulation software set to the parameters shown in Table 19
- a standard serial cable with a male DB9 connector

Table 19: Console Configuration Parameter Values

Parameter	Value
Baud Rate	115 200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Figure 9 displays an example of the Console port on a 7705 SAR front panel.

Figure 9: 7705 SAR Console Port



To establish a console connection:

Step 1. Connect the terminal to the Console port on the front panel (Figure 9) 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`.

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.

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}
     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 10.10.10.103/20 active
ALU-1>bof# dns-domain ca.alcatel.com
ALU-1>bof# duplex full
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
    console-speed    115200
===============================================================================
A:ALU-1#
```

Service Management Tasks

This section describes system administration commands.

System Administration Commands

Use the following administrative commands to perform management tasks.

CLI Syntax:
```
ALU-1# admin
      display-config
      reboot [active | standby] [now]
      save [file-url] [detail] [index]
```

Viewing the Current Configuration

Use one of the following CLI commands to display the current configuration. The `detail` option displays all default values. The `index` option displays only the persistent indexes. The `info` command displays context-level information.

CLI Syntax:
```
admin# display-config [detail | index]
      info detail
```

The following displays an example of a configuration file:

```
A:ALU-1# admin display-config
# TiMOS-B-0.0.R3 both/hops ALCATEL-LUCENT SAR 7705
# Copyright (c) 2000-2008 Alcatel-Lucent.
# All rights reserved. All use subject to applicable license agreements.
# Built on Wed Jan 16 01:05:13 EST 2008 by csabuild in /rel0.0/I297/panos/main

# Generated THU JAN 17 21:21:21 2008 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 128.120.118.37 preferred
                server-address 128.120.210.200
                no shutdown
            exit
            zone EST
        exit
        thresholds
            rmon
            exit
        exit
    exit
#--------------------------------------------------
echo "System Security Configuration"
#--------------------------------------------------
    system
        security
            telnet-server
            ftp-server
            snmp
    exit
...exit all

# Finished THU JAN 17 21:57:11 2008 UTC
A:ALU-1#
```

Modifying and 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 file names 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#
```

or

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.

Deleting BOF Parameters

You can delete specific 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.

Deleting a BOF address entry is not allowed from a Telnet session.

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
```

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#
```

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

Alcatel-Lucent 7705 Boot ROM. Copyright 2000-2008
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All rights reserved. All use is subject to applicable
license agreements.

....
```

BOF Command Reference

Command Hierarchies

- Configuration Commands
- Show Commands

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**}
— **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*

Show Commands

show

— **bof** [*cflash-id* | **booted**]
— **boot-messages**

Command Descriptions

- Configuration Commands
- Show Commands

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

File Management Commands

bof

Syntax **bof**

Context <root>

Description This command creates or edits the boot option file (BOF) for the specified local storage device.

A BOF file specifies where the system searches for runtime images, configuration files, and other operational parameters during system initialization.

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**.

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.

Only one entry of the BOF configuration command statement can be saved once the statement has been found to be syntactically correct.

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.

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.

Default n/a

save

Syntax **save** [*cflash-id*]

Context bof

Description This command uses the boot option parameters currently in memory and writes them from the boot option file to the specified compact flash.

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**.

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”.

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 *flash-id* — the compact flash ID where the **bof.cfg** is to be saved

Values cf3:, cf3-A:, cf3-B:

Default cf3:

BOF Processing Control Commands

wait

Syntax **wait** *seconds*

Context bof

Description This command configures a pause, in seconds, at the start of the boot process, which allows system initialization to be interrupted at the console.

When system initialization is interrupted, the operator is allowed to manually override the parameters defined in the boot option file (BOF).

Only one **wait** command can be defined in the BOF.

Default 3

Parameters *seconds* — the time to pause at the start of the boot process, in seconds

Values 1 to 10

Console Port Configuration Commands

console-speed

Syntax **console-speed** *baud-rate*
no console-speed

Context bof

Description This command configures the console port baud rate.

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.

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

Default 115200 — console configured for 115 200 b/s operation

Parameters *baud-rate* — the console port baud rate, expressed as a decimal integer

Values 9600, 19200, 38400, 57600, 115200

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** *file-url*
no primary-config

Context bof

Description This command specifies the name and location of the primary configuration file.

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**.

If an error in the configuration file is encountered, the boot process aborts.

The **no** form of the command removes the **primary-config** configuration.

Default n/a

Parameters *file-url* — the primary configuration file location, expressed as a file URL

Values

file-url	{*local-url* | *remote-url*} (up to 180 characters)
local-url	[*cflash-id/*][*file-path*]
remote-url	[{ftp:// | tftp://} *login:pswd@remote-locn/*] [*file-path*]
cflash-id	cf3:, cf3-A:, cf3-B:

primary-image

Syntax **primary-image** *file-url*
no primary image

Context bof

Description This command specifies the primary directory location for runtime image file loading.

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.

The **no** form of the command removes the **primary-image** configuration.

Default n/a

Parameters *file-url* — the *location-url* can either be local (this CSM) or a remote FTP server

Values

file-url	{*local-url* | *remote-url*} (up to 180 characters)
local-url	[*cflash-id/*][*file-path*]
remote-url	[{ftp:// | tftp://} *login:pswd@remote-locn/*] [*file-path*]
cflash-id	cf3:, cf3-A:, cf3-B:

secondary-config

Syntax **secondary-config** *file-url*
no secondary-config

Context bof

Description This command specifies the name and location of the secondary configuration file.

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**.

If an error in the configuration file is encountered, the boot process aborts.

The **no** form of the command removes the **secondary-config** configuration.

Default n/a

Parameters *file-url* — the secondary configuration file location, expressed as a file URL

Values

file-url	{*local-url* | *remote-url*} (up to 180 characters)
local-url	[*cflash-id/*][*file-path*]
remote-url	[{ftp:// | tftp://} *login:pswd@remote-locn/*] [*file-path*]
cflash-id	cf3:, cf3-A:, cf3-B:

secondary-image

Syntax **secondary-image** *file-url*
no secondary-image

Context bof

Description This command specifies the secondary directory location for runtime image file loading.

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.

The **no** form of the command removes the **secondary-image** configuration.

Default n/a

Parameters *file-url* — the *file-url* can either be local (this CSM) or a remote FTP server

Values	*file-url*	{*local-url* | *remote-url*} (up to 180 characters)
	local-url	[*cflash-id/*][*file-path*]
	remote-url	[{ftp:// | tftp://} *login:pswd@remote-locn/*] [*file-path*]
	cflash-id	cf3:, cf3-A:, cf3-B:

tertiary-config

Syntax **tertiary-config file-***url*
no tertiary-config

Context bof

Description This command specifies the name and location of the tertiary configuration file.

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.

If an error in the configuration file is encountered, the boot process aborts.

The **no** form of the command removes the **tertiary-config** configuration.

Default n/a

Parameters *file-url* — the tertiary configuration file location, expressed as a file URL

Values	*local-url*	[*cflash-id/*][*file-path*]
	cflash-id	cf3:, cf3-A:, cf3-B:
	remote-url	[{ftp:// | tftp://} *login:pswd@remote-locn/*] [*file-path*]

tertiary-image

Syntax **tertiary-image** *file-url*
no tertiary-image

Context bof

Description This command specifies the tertiary directory location for runtime image file loading.

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.

All runtime image files (both.tim) must be located in the same directory.

The **no** form of the command removes the **tertiary-image** configuration.

Default n/a

Parameters *file-url* — the location-url can either be local (this CSM) or a remote FTP server

Values

file-url	{[*local-url* | *remote-url*} (up to 180 characters)
local-url	[*cflash-id/*][*file-path*]
remote-url	[{ftp:// | tftp://} *login:pswd@remote-locn/*] [*file-path*]
cflash-id	cf3:, cf3-A:, cf3-B:

CSM Management Configuration Commands

address

Syntax [**no**] **address** *ip-prefix/ip-prefix-length* [**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.

In previous releases, if an IPv6 address was assigned to the CSM Management port, an IPv4 address was also required on the port. As of this release, the 7705 SAR can use an IPv6 management address only, without the need to configure an IPv4 address.

For configurations with both IPv4 and IPv6 addresses, the IPv4 address can be deleted from the BOF, but only through a console session. Deleting a BOF address entry is not allowed from a Telnet or SSH session.

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, 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 OS System Management Guide for the command description.

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	*ipv4-prefix*	a.b.c.d (host bits must be 0)
	ipv4-prefix-length	0 to 30

Values	*ipv6-prefix*	x:x:x:x:x:x:x:x (eight 16-bit pieces) x:x:x:x:x:x:d.d.d.d x: [0 to FFFF]H d: [0 to 255]D

ipv6-prefix-length 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 This command enables speed and duplex autonegotiation on the CSM Management port in the running configuration and the Boot Option File (BOF).

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.

The **no** form of the command disables the autonegotiate feature on this port.

Default autonegotiate

auto-discover

Syntax [**no**] **auto-discover** [**id** *client-identifier*] [**vlan** *vlan-id*]
[**no**] **auto-discover**

Context bof

Description 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 mac, the chassis MAC address is used. If you run ADP with 802.1q encapsulation, you can specify the VLAN ID.

Parameters *client-identifier* — indicates the unique system identifier to use in the auto-discovery broadcast. If you use mac as the client identifier, the chassis MAC address is used.

Values any combination of up to 16 alphanumeric characters with no spaces

vlan-id — indicates the VLAN ID for ADP with 802.1q encapsulation

Values 0 to 4094

duplex

Syntax **duplex** {**full** | **half**}

Context bof

Description 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).

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.

Default duplex full — full duplex operation

Parameters **full —** sets the link to full duplex mode

half — sets the link to half duplex mode

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** *ip-prefix/prefix-length* **next-hop** *ip-address*

Context bof

Description This command creates a static route entry for the CSM Management port in the running configuration and the Boot Option File (BOF).

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.

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.

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.

The **no** form of the command deletes the static route.

Default n/a

Parameters *ip-prefix/prefix-length* — the destination address requiring the static route

Values	*ipv4-prefix*	a.b.c.d (host bits must be 0)
	ipv4-prefix-length	0 to 32
Values	*ipv6-prefix*	x:x:x:x:x:x:x:x (eight 16-bit pieces) x:x:x:x:x:x:d.d.d.d x: [0 to FFFF]H d: [0 to 255]D
	ipv6-prefix-length	{0 to 64 | 128}

next-hop *ip-address* **—** the next hop IP address used to reach the destination

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

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

secondary-dns

Syntax **secondary-dns** *ip-address*
no secondary-dns

Context bof

Description This command configures the secondary DNS server for DNS name resolution.

The secondary DNS server is used only if the primary DNS server does not respond.

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 secondary DNS server from the configuration.

Default no secondary-dns — no secondary DNS server is configured

Parameters *ip-address* — the IP address of the secondary DNS server

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

tertiary-dns

Syntax **tertiary-dns** *ip-address*
no tertiary-dns

Context bof

Description This command configures the tertiary DNS server for DNS name resolution.

The tertiary DNS server is used only if the primary DNS server and the secondary DNS server do not respond.

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 tertiary DNS server from the configuration.

Default no tertiary-dns — no tertiary DNS server is configured

Parameters *ip-address* — the IP address of the tertiary DNS server

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

Show Commands

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

bof

Syntax **bof** [*cflash-id* | **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 *cflash-id* — the cflash directory name. The slot name is not case-sensitive. Use uppercase or lowercase “A” or “B” for the slot name.

Values cf3:, cf3-A:, cf3-B:

booted — displays the boot option file used to boot the system

Output The following output is an example of BOF information, and Table 20 describes the fields.

Sample Output

```
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.0.0/16 next-hop xxx.xxx.xxx.x
    autonegotiate
    duplex           full
    speed            100
    wait             3
    persist          off
    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
    console-speed    115200
==============================================================================
A:ALU-1#
```

Table 20: Show BOF Output Fields

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
primary-dns	The primary DNS server for resolution of host names to IP addresses
secondary-image	The secondary location of the directory that contains the runtime images of the CSM card
secondary-config	The secondary location of the file that contains the configuration
secondary-dns	The secondary DNS server for resolution of host names to IP addresses
tertiary-image	The tertiary location of the directory that contains the runtime images of the CSM card
tertiary-config	The tertiary 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
tertiary-dns	The tertiary DNS server for resolution of host names to IP addresses
persist	on — persistent indexes between system reboots is enabled
	off — persistent indexes between system reboots is disabled
wait	The time configured for the boot to pause while waiting for console input

Table 20: Show BOF Output Fields (Continued)

Label	Description
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
console speed	The console port baud rate
dns domain	The domain name used when performing DNS address resolution

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.

Sample Output

```
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 2008 by csabuild

Total Memory: 992MB  Chassis Type: sar8  Card Type: corona_r1
TiMOS-L-2.1.R1 boot/hops ALCATEL-LUCENT SAR 7705
Copyright (c) 2000-2008 Alcatel-Lucent.
All rights reserved. All use subject to applicable license agreements.
Built on Wed Apr 9 09:36:02 EDT 2008 by csabuild in /rel2.0/b1/R1/panos/main

TiMOS BOOT LOADER
Time from clock is FRI APR 11 13:31:16 2008 UTC
Switching serial output to sync mode...
Total Memory: 992MB  Chassis Type: sar8  Card Type: corona_r1

TiMOS-B-2.1.R1 both/hops ALCATEL-LUCENT SAR 7705
Copyright (c) 2000-2008 Alcatel-Lucent.
All rights reserved. All use subject to applicable license agreements.
Built on Wed Apr 9 09:53:01 EDT 2008 by csabuild in /rel2.0/b1/R1/panos/main
```

```
   ___                  ___           ___           ___
  /\  \                /\__\         /\  \         /\  \
  \:\  \       ___    /::|  |       /::\  \       /::\  \
   \:\  \     /\__\  /:|:|  |      /:/\:\  \     /:/\ \  \
   /::\  \   _\/__/ /:/|:|__|__   /:/  \:\  \   _\:\~\ \  \
  /:/\:\__\ /\__\  /:/ |::::\__\ /:/__/ \:\__\ /\ \:\ \ \__\
 /:/  \/__/ /:/  / \/__/~~/:/  / \:\  \ /:/  / \:\ \:\ \/__/
/:/  /     /:/  /        /:/  /   \:\  /:/  /   \:\ \:\__\
\/__/      \/__/        /:/  /     \:\/:/  /     \:\/:/  /
                       /:/  /       \::/  /       \::/  /
                       \/__/         \/__/         \/__/

Time from clock is FRI APR 11 13:31:57 2008 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 comma
nd 'config>system>snmp no shutdown'.
TiMOS-B-2.1.R1 both/hops ALCATEL-LUCENT SAR 7705
Copyright (c) 2000-2008 Alcatel-Lucent.
All rights reserved. All use subject to applicable license agreements.
Built on Wed Apr 9 09:53:01 EDT 2008 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 2008 by csabuild

Total Memory: 992MB  Chassis Type: sar8  Card Type: corona_r1
TiMOS-L-2.1.R1 boot/hops ALCATEL-LUCENT SAR 7705
Copyright (c) 2000-2008 Alcatel-Lucent.
All rights reserved. All use subject to applicable license agreements.
Built on Wed Apr 9 09:36:02 EDT 2008 by csabuild in /rel2.0/b1/R1/panos/main

TiMOS BOOT LOADER
Time from clock is FRI APR 11 13:30:38 2008 UTC
Switching serial output to sync mode...

reboot
```

System Management

In This Chapter

This chapter provides information about configuring basic system management parameters.

Topics in this chapter include:

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 CLLI code, as well as time zones, Network Time Protocol (NTP), Simple Network Time Protocol (SNTP) properties, CRON, and synchronization properties.

System Information

System information components include:

- System Name
- System Contact
- System Location
- System Coordinates
- Common Language Location Identifier
- System Identifier
- PoE Power Source

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.

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.

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.

System Coordinates

The Alcatel-Lucent 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.

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 Alcatel-Lucent Chassis MIB tmnxChassisCLLICode object.

The CLLI code can be any ASCII printable text string of up to 11 characters.

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.

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 OS Interface Configuration Guide, “Card, Adapter Card, and Port 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 (variant 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 OS Interface Configuration Guide, “Card, Adapter Card, and Port Command Reference”, for more information.

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 OS software has options for local time translation as well as system clock synchronization.

System time parameters include:

- Time Zones
- NTP
- SNTP Time Synchronization
- PTP
- GNSS
- CRON

Time Zones

Setting a time zone in the 7705 SAR OS allows for times to be displayed in the local time rather than in UTC. The 7705 SAR OS 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 OS system-defined time zones are listed in Table 21, which includes both time zones with and without summer time correction.

Table 21: 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*
WET	Western Europe Time	UTC
WEST	Western Europe Summer Time	UTC +1

Table 21: System-defined Time Zones (Continued)

Acronym	Time Zone Name	UTC Offset
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 21: 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

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 7705 SAR typically acts as a Stratum-2 device because a network connection to an NTP server is required.

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 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 addressing — servers may be defined using IPv4 or IPv6 addresses
- broadcast or multicast modes — when operating in these modes, the node will receive or send using either a multicast (default 224.0.1.1) or a broadcast address. Multicast is supported on the CSM Management port. Only IPv4 addressing is supported.
- 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 node, then SNTP transitions to an operationally down state. If NTP is removed from the configuration or shut down, then SNTP resumes an operationally up state.
- NTP priority — if a higher-priority time source like GNSS or PTP is selected on the node, then NTP transitions to an operationally down state. If the higher-priority time source is disqualified or disabled, then NTP resumes an operationally up state.
- gradual clock adjustment — as several applications (such as Service Assurance Agent (SAA)) can use the clock, and if a major (128 ms or more) adjustment must be performed, the adjustment is performed by programmatically stepping the clock. If a minor (less than 128 ms) adjustment must be performed, then the adjustment is performed by either speeding up or slowing down the clock.
- in order to facilitate proper operation once the standby CSM takes over from the active CSM, it is required that the time on the secondary CSM be synchronized with the clock of the active CSM
- in order to avoid 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 squashing 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 the enhanced NTP mode is used, NTP authentication is not supported.

SNTP Time Synchronization

For synchronizing the system clock with outside time sources, the 7705 SAR OS 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.

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.

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 assured 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 are available on the following platforms:

- 7705 SAR-H with a GPS Receiver module (GPS reference only)
- 7705 SAR-Wx variants with a GPS RF port (GPS reference only)
- 7705 SAR-8 (CSMv2 only) 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.

CRON

The CRON feature supports the Service Assurance Agent (SAA) functions. CRON functionality includes the ability to specify the commands that need to be run, when they will be scheduled, including one-time-only functionality (oneshot), interval and calendar functions, as well as where to store the output of the results. In addition, CRON can specify the relationship between input, output, and schedule. Scheduled reboots, peer turn ups, and service assurance agent tests can be scheduled with CRON, as well as OAM events, such as connectivity checks or troubleshooting runs.

CRON features are saved to the configuration file on both primary and backup control modules. If a control module switchover occurs, CRON events are restored when the new configuration is loaded. If a control module switchover occurs during the execution of a CRON script, the failover behavior will be determined by the contents of the script.

CRON features run serially with at least 255 separate schedules and scripts. Each instance can support a schedule where the event is executed any number of times.

The following CRON elements are supported:

- action — parameters for a script including the maximum amount of time to keep the results from a script run, the maximum amount of time a script may run, the maximum number of script runs to store, and the location to store the results.

- schedule — the schedule function configures the type of schedule to run, including one-time-only (oneshot), periodic, or calendar-based runs. All runs are determined by month, day of month or weekday, hour, minute, and interval (seconds).
- script — the script command opens a new nodal context that contains information on a script

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.

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

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

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.

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.

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

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.

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 and 7705 SAR-18, which can be used together in a redundant-pair configuration.

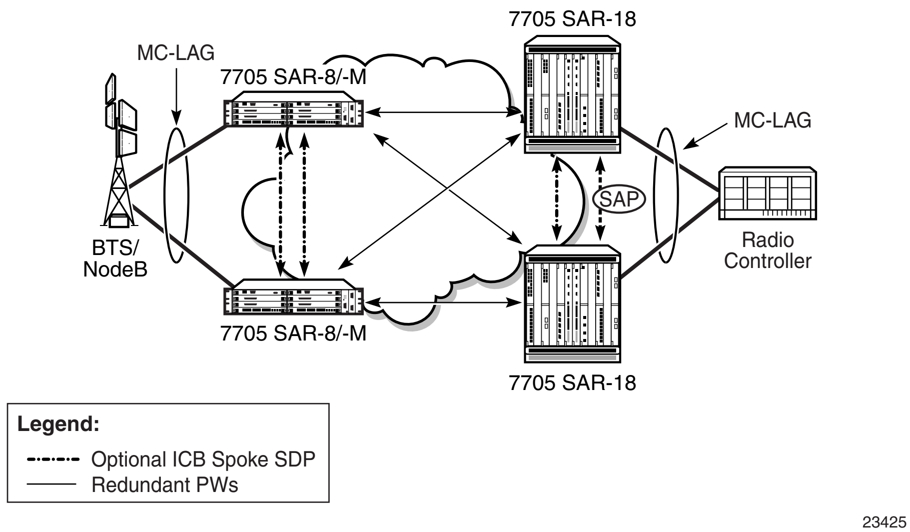
A peer is configured by specifying its IP address, to which the MCCP packets are sent. The LAG ID, system priority, and MAC address for the MC-LAG are also configured under the peer. Up to 16 MC-LAGs can be configured and they can either use the same peer or different peers up to a maximum of 4 peers.

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 10 shows an example of MC-LAG deployed at access and aggregation sites.

Figure 10: MC-LAG at Access and Aggregation Sites



ICB (Inter-Chassis Backup) 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:

- 7705 SAR-8/7705 SAR-18: 8-port Ethernet Adapter card, version 2
- 7705 SAR-8 Shelf V2 with CSMv2 only/7705 SAR-18: 6-port Ethernet 10Gbps Adapter card
- 7705 SAR-8/7705 SAR-18: 8-port Gigabit Ethernet Adapter card
- 7705 SAR-18: 10-port 1GigE/1-port 10GigE X-Adapter card
- 7705 SAR-8/7705 SAR-18: Packet Microwave Adapter card
- 6-port SAR-M Ethernet module
- 7705 SAR-M: all platform variants (the port must be in access mode and autonegotiation must be off or limited)
- 7705 SAR-X

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

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.

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.

Synchronization

Synchronization between the CSMs includes the following:

- Configuration and boot-env Synchronization
- State Database Synchronization

Configuration and boot-env Synchronization

Configuration and boot-env synchronization are supported in `admin>redundancy>synchronize` and `config>redundancy>synchronize` contexts.

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.

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#
```

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, then 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.

Note: There are two versions of the CSM available for the 7705 SAR-8: CSMv1 and the CSMv2. In the CLI, the CSMv1 is shown as csm-1g and the CSMv2 is shown as csmv2-10g. Throughout this document both versions are referred to as CSM except when it is necessary to highlight differences between them. The CSMv1 supports a maximum bandwidth of 1 Gb/s per adapter card slot. The CSMv2 supports 10/2.5/1 Gb/s in the first two adapter card slots and 2.5/1 Gb/s in the remaining four adapter card slots. Support for 2.5 Gb/s and 10 Gb/s adapter cards by the CSMv2 is only available on the 7705 SAR-8 Shelf V2.

The following output shows that the CSMv1 installed in Slot A is acting as the active CSM and the CSMv1 installed in Slot B is acting as the standby.

```
ALU-1# show card
===============================================================================
Card State
===============================================================================
Slot/  Provisioned       Equipped          Admin Operational   Num   Num Comments
Id     Type              Type              State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-sar           iom-sar           up    up                  6
A      csm-1g            csm-1g            up    up                      Active
B      csm-1g            csm-1g            up    up                      Standby
===============================================================================
...
```

The following output shows that the CSMv2 installed in Slot A is acting as the active CSM and the CSMv2 installed in Slot B is acting as the standby.

```
ALU-1# show card
===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-sar          iom-sar          up    up                  6
A      csmv2-10g        csmv2-10g        up    up                      Active
B      csmv2-10g        csmv2-10g        up    up                      Standby
===============================================================================
...
```

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.

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.

Administrative Tasks

This section contains information to perform administrative tasks:

- Saving Configurations
- Specifying Post-Boot Configuration Files

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.

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.

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.

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.

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.

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.

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.

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 or 10 MHz sine wave, is available from the external timing input port on each CSMv1 in the 7705 SAR-8 or directly on the following:

- 7705 SAR-F
- 7705 SAR-M (all variants)
- 7705 SAR-H
- 7705 SAR-Hc
- 7705 SAR-A (all variants)
- 7705 SAR-X

The 7705 SAR-8 CSMv2 is the same as the CSMv1 except that it 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-F, Ethernet SFP ports support synchronous Ethernet and can be used as a timing reference, or two T1/E1 ports can supply a timing reference. For T1/E1 ports, one reference must be from ports 1 to 8 and the other from ports 9 to 16.

On the 7705 SAR-M (all variants), 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. When installed on 7705 SAR-M variants with module slots, 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 (both variants), 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-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.

All DSL modules support Network Timing Reference (NTR). NTR is enabled automatically with no user-configurable commands. The GPON port on the GPON module also supports physical layer clock recovery via the downstream synchronous GPON physical layer. Both NTR and GPON physical layer timing can be used as a source of node synchronization.

The 7705 SAR-8 and 7705 SAR-18 can receive one or two timing references depending on the port and card type supplying the reference. The 7705 SAR-8 supports two timing references only if a CSMv2 is installed. On the 7705 SAR-8 or 7705 SAR-18, 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, version 2
- a single T1/E1 port on the 16-port T1/E1 ASAP Adapter card, version 1 (not supported on the 7705 SAR-18)
- 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 (not supported on the 7705 SAR-8)
  - → the 2-port 10GigE (Ethernet) Adapter card
- two T1/E1 ports on the 16-port T1/E1 ASAP Adapter card, version 2, 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 (not supported on a 7705 SAR-8 with CSMv1)

The 7705 SAR-8 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 (version 1 is not supported on the 7705 SAR-18)
- 32-port T1/E1 ASAP Adapter card
- 7705 SAR-F
- 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, version 2
- 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.

External Timing Mode

The external input and output timing ports are located on the CSM on the 7705 SAR-8 and directly on the 7705 SAR-F, 7705 SAR-H, and 7705 SAR-M (all variants). The 7705 SAR-A and 7705 SAR-X have external timing input ports 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, BITS (Building Integrated Timing System), 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 7705 SAR-8 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, 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 port 1 and port 2 are clocked by the active CSM's SSU clock.

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-F, line timing is supported on the T1/E1 ports and on Ethernet SFP ports.

On the 7705 SAR-M (variants with T1/E1 ports), line timing is supported on T1/E1 ports. Line timing is also supported on all RJ-45 Ethernet ports and SFP ports on the 7705 SAR-M (all variants).

On the 7705 SAR-X, line timing is supported on T1/E1 ports and Ethernet ports.

In addition, line timing is supported on the following modules when they are installed in chassis variants with module slots:

- GPON module
- 8-port xDSL module (NTR over ADSL2, ADSL2+, or VDSL2)
- 6-port DSL Combination module (two references are available: NTR over SHDSL and NTR over ADSL2, ADSL2+, or VDSL2)
- 2-port 10GigE (Ethernet) module
- 6-port SAR-M Ethernet module

On the 7705 SAR-H and 7705 SAR-Hc, line timing is supported on all Ethernet ports. Line timing is also supported on the T1/E1 ports of the T1/E1 ASAP and RS-232 Combination module when it is installed in the 7705 SAR-H.

On the 7705 SAR-A variant with T1/E1 ports, line timing is supported on T1/E1 ports. Line timing is also supported on all synchronous Ethernet ports on both 7705 SAR-A variants. 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-W and 7705 SAR-Wx, line timing is supported on all Ethernet RJ-45 ports and SFP ports.

On the 7705 SAR-8 and 7705 SAR-18, line timing is supported on the following adapter cards:

- 16-port T1/E1 ASAP Adapter card (version 1 is not supported on the 7705 SAR-18)
- 32-port T1/E1 ASAP Adapter card
- 8-port Ethernet Adapter card, version 2, 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 (not supported on the 7705 SAR-8)
- 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

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 (version 1 is not supported on the 7705 SAR-18)
- 32-port T1/E1 ASAP Adapter card
- 7705 SAR-F
- 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 when it is installed in the 7705 SAR-H
- 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 OS 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

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.

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.

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, version 2
- 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 OS Services Guide, “MEF 8”, for information on MEF 8.

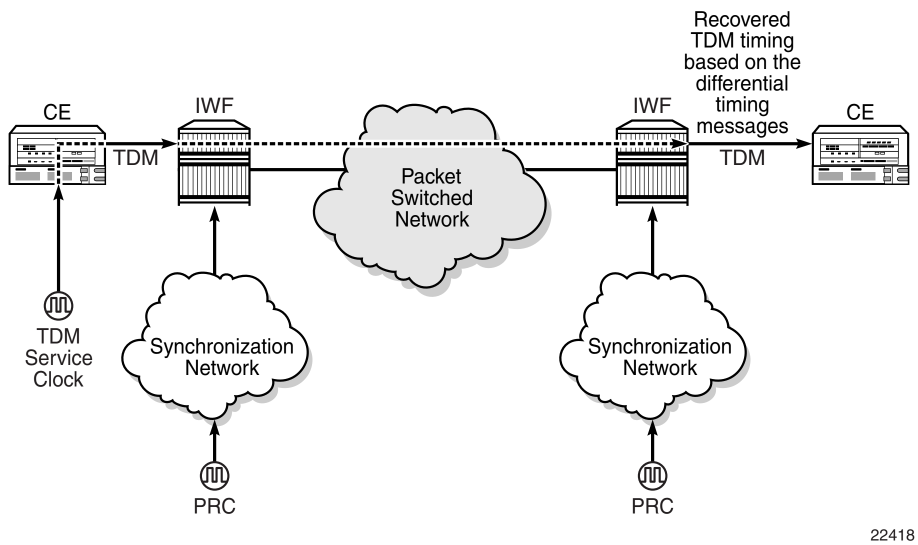
DCR is not supported on DS1 or E1 channels that have CAS signaling enabled.

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 11 shows an example of a network using DCR.

Figure 11: Differential Clock Recovery on a Network



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.

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 22 lists the supported timestamp frequencies for each platform and adapter card.

Table 22: Supported Timestamp Frequencies for DCR-timed Circuits

	Timestamp Frequency (MHz)			
	103.68	77.76	25	19.44
16-port T1/E1 ASAP Adapter card, version 2		✓ (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.

Proprietary Clock Recovery (PCR)

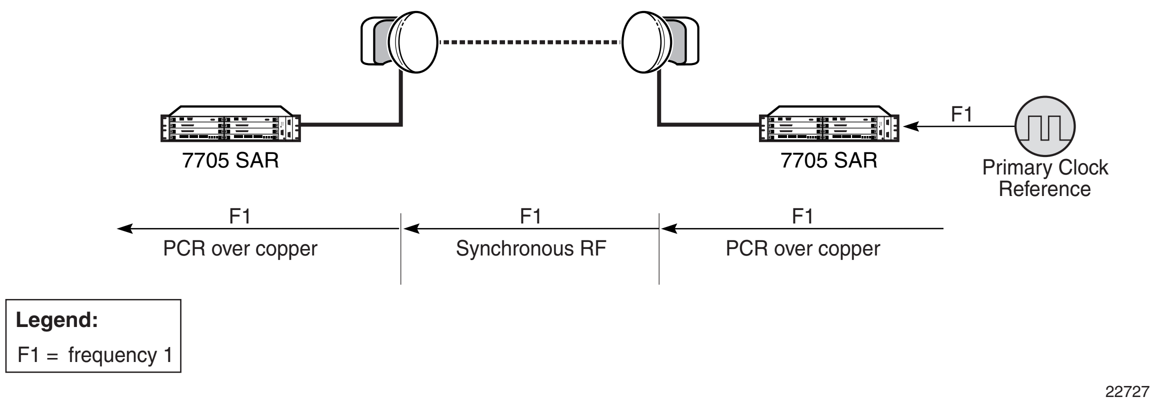
PCR is a copper synchronous Ethernet-based, timing-over-packet technology. It is supported on the Packet Microwave Adapter card on the two copper RJ-45 synchronous Ethernet 1000Base-T Microwave Awareness (MWA) ports (ports 1 and 2) and on a copper SFP Ethernet port (ports 3 and 4).

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 or 7705 SAR-18 be configured on the MPR-e radio that is connected to the 7705 SAR-8 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 12.

Figure 12: Primary Clock Recovery



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 or 7705 SAR-18 because the 7705 SAR-8 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 or 7705 SAR-18.

IEEE 1588v2 PTP

Precision Time Protocol (PTP) is a timing-over-packet protocol defined in the IEEE 1588v2 standard *1588 2008*.

PTP may 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 23 lists the types of PTP support on each fixed platform; Table 24 lists the types of PTP support on each card for the 7705 SAR-8 and the 7705 SAR-18.

Table 23: IEEE 1588v2 PTP Support per Fixed Platform

Sync Type	PTP Clock Type	7705 SAR-F	7705 SAR-A (Both Variants) 7705 SAR-H 7705 SAR-Hc 7705 SAR-M (All Variants) 7705 SAR-W 7705 SAR-Wx (All Variants) 7705 SAR-X
Freq	Ordinary Slave	Yes	Yes
	Boundary Clock	Yes	Yes
	End-to-End Transparent Clock		Yes
	Ordinary Master	Yes	Yes

Table 23: IEEE 1588v2 PTP Support per Fixed Platform (Continued)

Sync Type	PTP Clock Type	7705 SAR-F	7705 SAR-A (Both Variants) 7705 SAR-H 7705 SAR-Hc 7705 SAR-M (All Variants) 7705 SAR-W 7705 SAR-Wx (All Variants) 7705 SAR-X
Time of day/phase	Ordinary Slave		Yes
	Boundary Clock		Yes
	End-to-End Transparent Clock		Yes
	Ordinary Master		Yes [1]

Note:

1. Only supported on the 7705 SAR-H with a GPS Receiver module and 7705 SAR-Wx variants with a GPS RF port.

All of the platforms listed in Table 23 support one ordinary slave clock, ordinary master clock, or boundary clock. They also support an additional PTP clock for transparent clock functionality, except for the 7705 SAR-F. The 2-port 10GigE (Ethernet) module supports transparent clock functionality when installed in the 7705 SAR-M (variants with module slot).

Table 24: IEEE 1588v2 PTP Support per Card on the 7705 SAR-8 and 7705 SAR-18

Sync Type	PTP Clock Type	8-port Ethernet Adapter Card, Version 2	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	Yes	Yes	Yes	Yes	Yes	Yes
	Boundary Clock	Yes	Yes	Yes	Yes	Yes	Yes
	End-to-End Transparent Clock						
	Ordinary Master	Yes	Yes	Yes	Yes	Yes	Yes
Time of day/ phase	Ordinary Slave		Yes	Yes	Yes	Yes	Yes
	Boundary Clock		Yes	Yes	Yes	Yes	Yes
	End-to-End Transparent Clock						
	Ordinary Master		Yes [2]	Yes [2]	Yes [2]	Yes [2]	Yes [2]

Notes:

1. Not supported on the 7705 SAR-8.
2. Supported on chassis with an active GNSS Receiver card.

The 7705 SAR-8 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 24 support one PTP clock.

A nodal clock is equipped in each CSM on the 7705 SAR-8 and 7705 SAR-18, or directly on the fixed platforms listed in Table 23. 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.

IEEE 1588 PTP messaging for slave and master clocks is supported over module ports on the 7705 SAR-M and 7705 SAR-H, on Ethernet ports on the 7705 SAR-A, 7705 SAR-W, and 7705 SAR-Wx, and on all of the adapter cards listed in Table 24.

When a node loopback address is used as the source interface for 1588 packets, the packets can ingress and egress the module ports. Module ports do not support transparent clock, except for the 2-port 10GigE (Ethernet) module which does.

For all 7705 SAR platforms and clock types, when the node loopback address is used as the source interface for 1588 packets, the packets can ingress and egress over IES interfaces.

IP messaging between the PTP master clock and PTP slave clock over the PTP-enabled IP interface is done using IPv4 unicast mode.

Each PTP instance supports up to 128 synchronization messages per second. The default is 64 synchronization messages per second when the `profile` is set to the default of `ieee1588-2008`.

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`, and `g8275dot1-2014`. For information about the `g8275dot1-2014` profile parameter, see ITU-T G.8275.1.

If the `profile` setting for the clock is `ieee1588-2008`, 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
- 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:

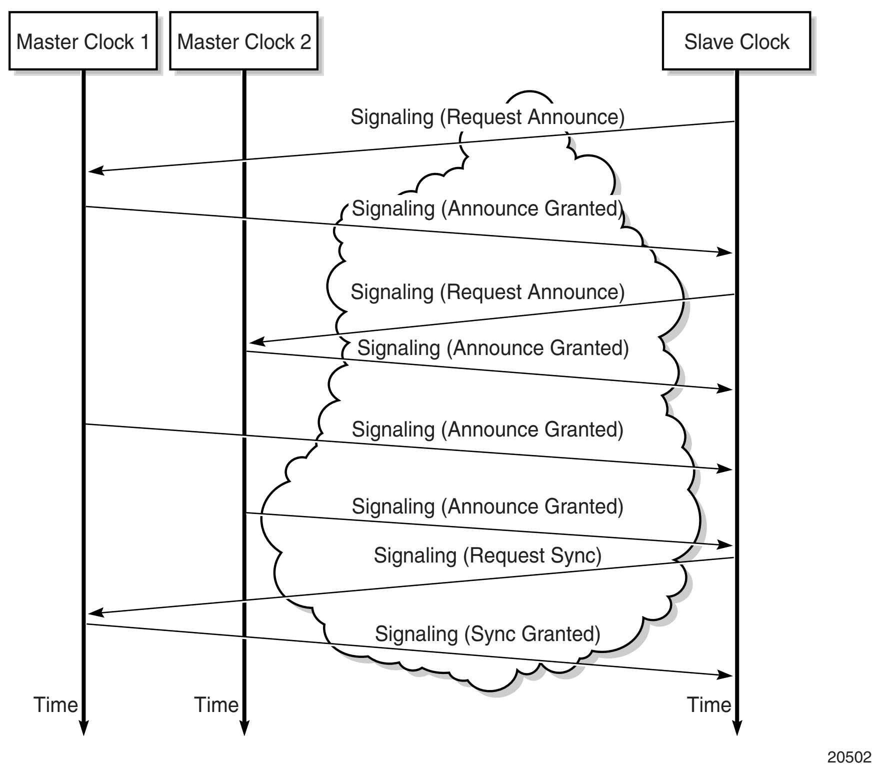
- clock class
- peer ID

If the `profile` setting for the clock is `g8275dot1-2014`, the precedence order for the best master selection algorithm is as follows:

- clock class
- clock accuracy
- PTP variance
- priority2 (user-configurable on the master clock side)
- clock identity

Figure 13 shows an example of the messaging sequence between the PTP slave clock and the two PTP master clocks.

Figure 13: Messaging Sequence Between the PTP Slave Clock and PTP Master Clocks



PTP Clock Synchronization

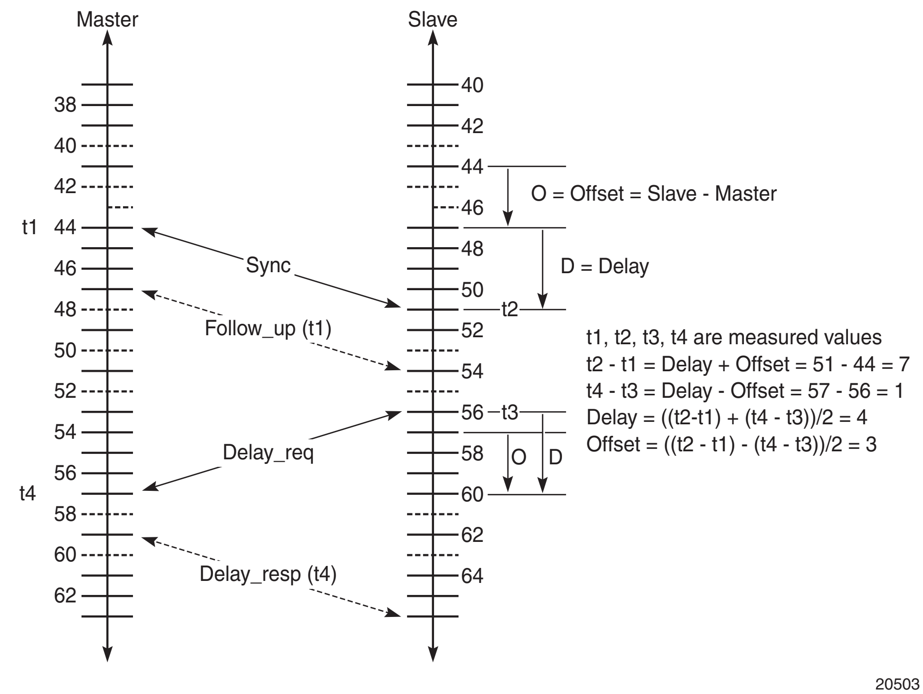
The IEEE 1588v2 standard synchronizes the frequency and time from a master clock to one or more slave clocks over a packet stream. This packet-based synchronization can be over UDP/IP or Ethernet and can be multicast or unicast. For UDP/IP, only IPv4 unicast mode with unicast negotiation is supported.

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 7705 SAR is acting as a slave or boundary clock.

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 14. This figure illustrates the offset of the slave clock referenced to the best master signal during startup.

Figure 14: PTP Slave Clock and Master Clock Synchronization Timing Computation



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.

PTP Capabilities

PTP messages are supported via IPv4 unicast with a fixed IP header size.

Table 25 describes the supported message rates for slave and master states for IP-encapsulated PTP traffic. The ordinary clock can be either in the slave or master state. The boundary clock can be in both of these states.

Table 25: Supported Rates for IP-Encapsulated PTP Messages

Supported Message	Slave State		Master State	
	Minimum Request Rate	Maximum Request Rate	Minimum Allowed Rate	Maximum Allowed Rate
Announce	1/8 s	8/s	1/16 s	8/s
Sync	16 sync/s	128 sync/s	1 sync/16 s	128 sync/s
Delay Response	16 delay/s	128 delay/s	1 delay/16 s	128 delay/s

State and statistics data for each master clock are available to assist in the detection of failures or unusual situations.

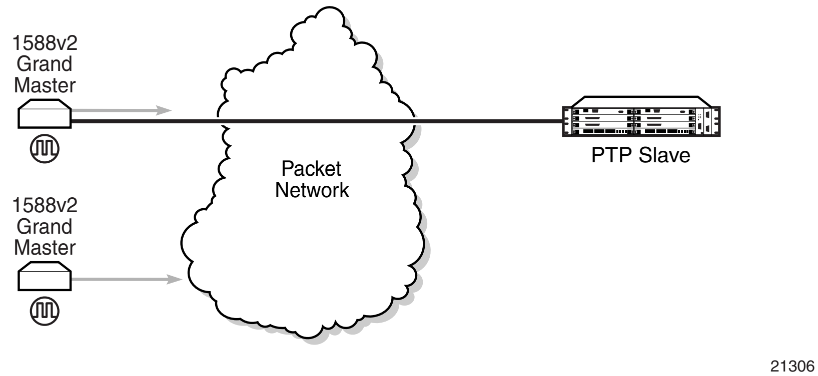
The PTP algorithm is able to recover the clock using both the upstream and downstream directions in both ordinary slave and boundary clock modes. The ability to perform bidirectional clock recovery will improve the performance of networks where the upstream and downstream load is not symmetrical.

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 15 shows a PTP ordinary slave clock network configuration.

Figure 15: Slave Clock



The PTP slave capability is implemented on the Ethernet ports of the platforms listed in Table 23 and on the cards listed in Table 24.

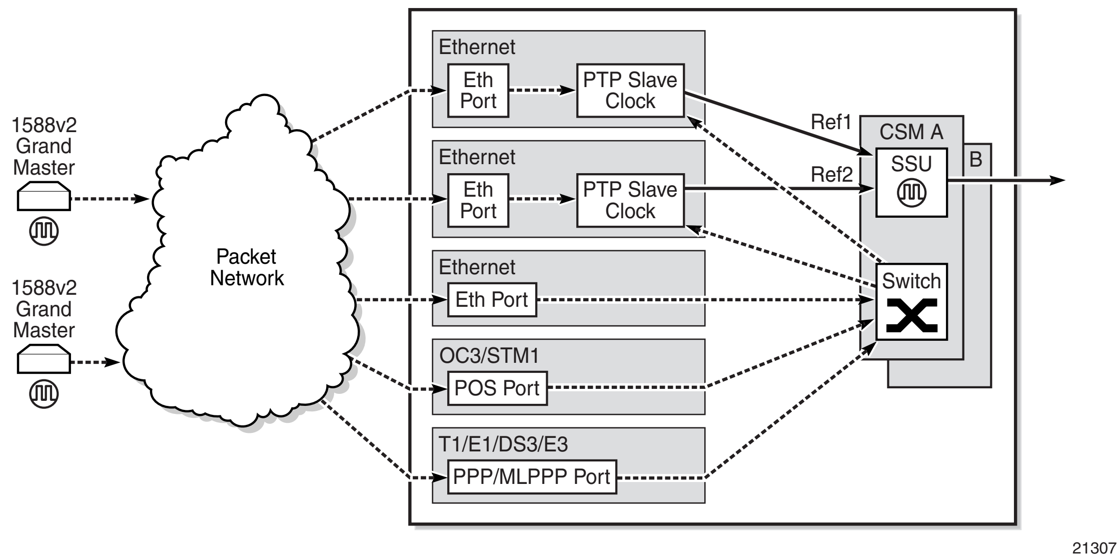
The 7705 SAR-8 can support up to six slave clocks and the 7705 SAR-18 can support up to eight slave clocks.

The 7705 SAR-F can support one slave clock. All other fixed platforms listed in Table 23 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 16 shows the operation of an ordinary PTP clock in slave mode.

Figure 16: Ordinary Slave Clock Operation



Each PTP ordinary slave clock is configured for a specific slot where the card (see Table 24) or Ethernet port (see Table 23) will perform the slave function. On the 7705 SAR-F, this slot is always 1/2. On the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 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.

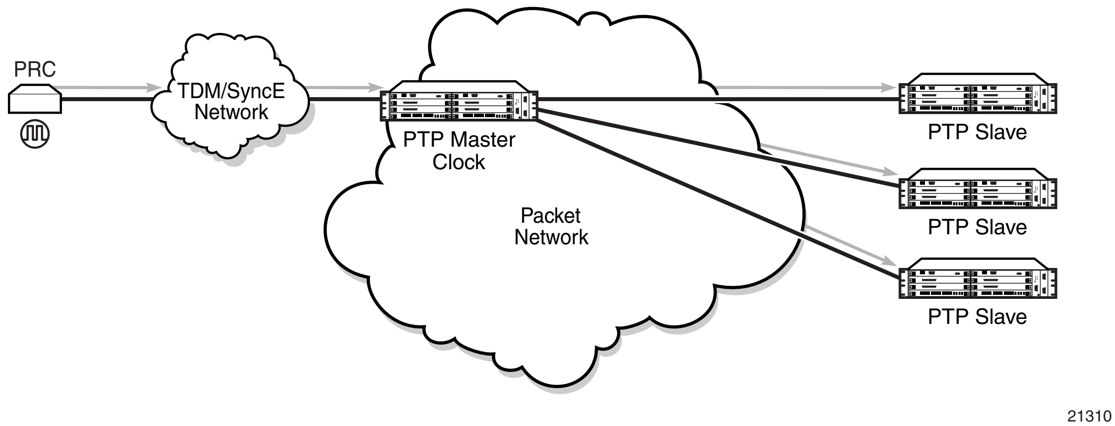
It is possible that the PTP IP packets may be routed through another Ethernet port/VLAN, OC3/STM1 or OC12/STM4 clear channel POS, OC3/STM1 or OC12/STM4 channelized MLPPP, DS3/E3 PPP, or DS1/E1 MLPPP. The PTP slave performance may be slightly worse in this case because of the extra PDV experienced through 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.

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 17 shows a PTP master clock network configuration.

Figure 17: PTP Master Clock

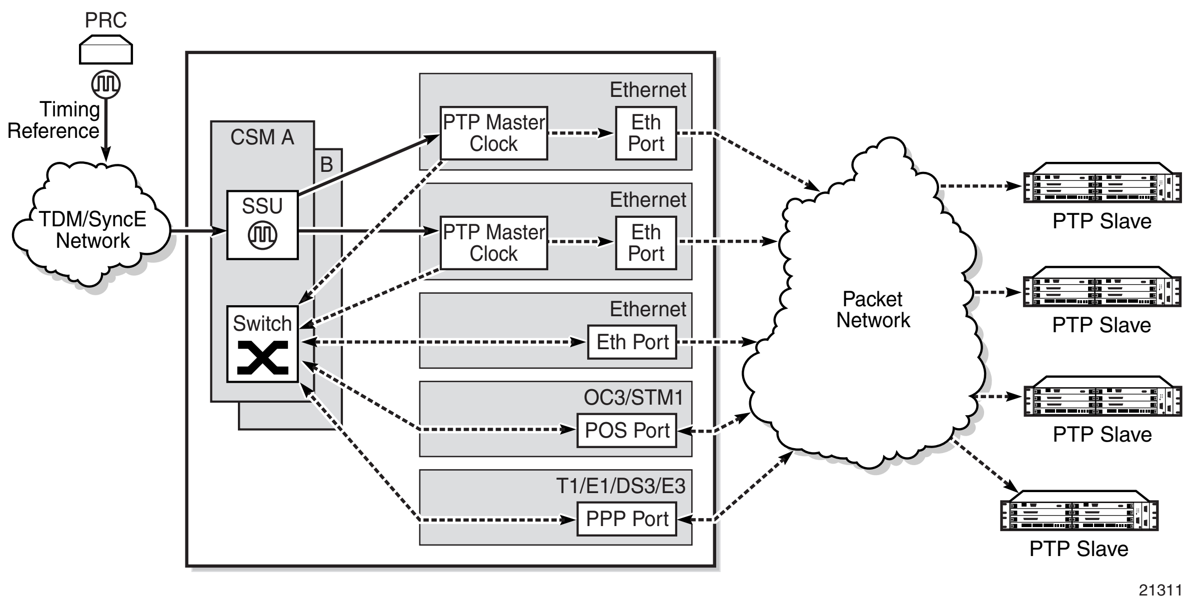


The PTP master clock capability is implemented on the Ethernet ports of the platforms listed in Table 23 and on the cards listed in Table 24.

The 7705 SAR-8 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 23 can each support one master clock.

Figure 18 shows the operation of an ordinary PTP clock in master mode.

Figure 18: Ordinary Master Clock Operation



Each PTP master clock is configured for a specific slot where the card (see Table 24) or Ethernet port (see Table 23) will perform the master function. On the 7705 SAR-F, this slot is always 1/2. On the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc,7705 SAR-A, 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.

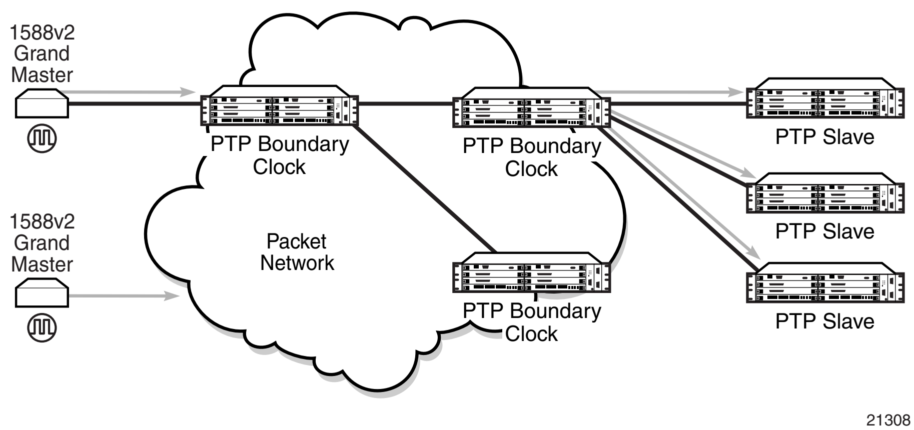
Each master clock can peer with up to 50 slaves or boundary clocks. The IP addresses of these peers can be statically configured via CLI or dynamically accepted via PTP signaling messages. A statically configured peer may displace a dynamic peer on a particular PTP port. If there are fewer than 50 peers, then that dynamic peer can signal back and be granted a different PTP-port instance.

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 19 shows the operation of a boundary clock.

Figure 19: Boundary Clock



The PTP boundary clock capability is implemented on the Ethernet ports of the platforms listed in Table 23 and on the cards listed in Table 24.

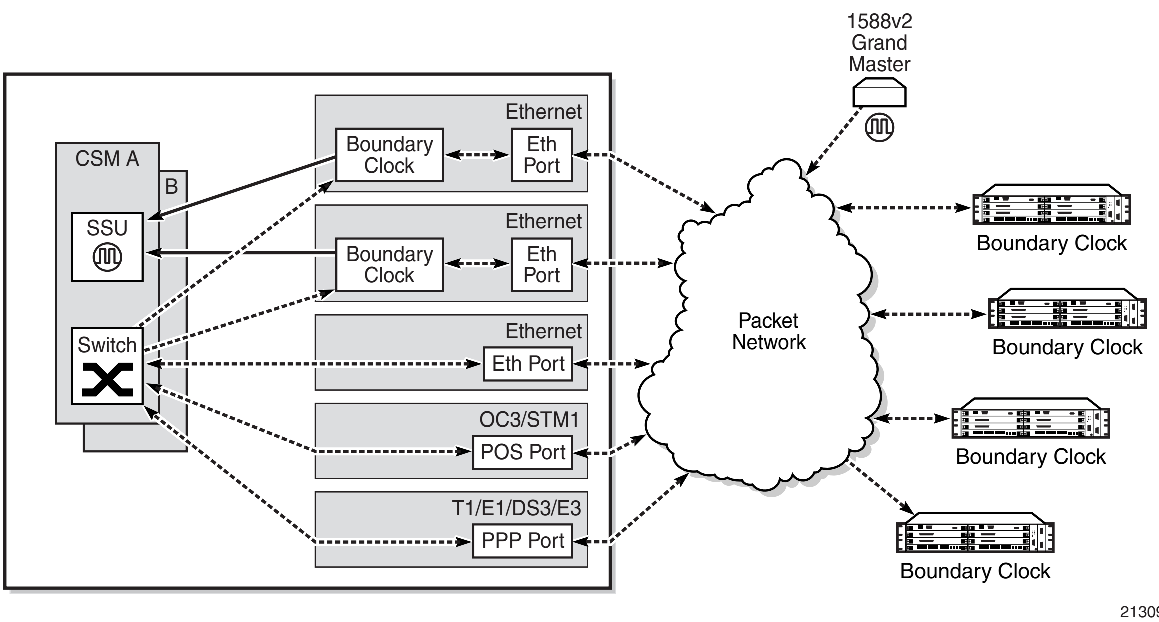
The 7705 SAR-8 can support up to six boundary clocks and the 7705 SAR-18 can support up to eight boundary clocks. The fixed platforms listed in Table 23 can each support one boundary clock.

Each PTP boundary clock is configured for a specific slot where the card (see Table 24) or Ethernet port (see Table 23) will perform the boundary clock function. On the 7705 SAR-F, this slot is always 1/2. On the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 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, then that dynamic peer can signal back and be granted a different PTP-port instance.

Figure 20 shows an example of boundary clock operation.

Figure 20: Boundary Clock Operation



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 23
- all cards listed in Table 24

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 following equipment:

- 7705 SAR-8
- 7705 SAR-18
- 7705 SAR-A
- 7705 SAR-H
- 7705 SAR-Hc
- 7705 SAR-M
- 7705 SAR-W
- 7705 SAR-Wx
- 7705 SAR-X

On the 7705 SAR-8 CSMv2, 7705 SAR-A, 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.

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.

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-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. 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.

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 23
- all cards listed in Table 24

The 7705 SAR-8 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 following equipment:

- 7705 SAR-8
- 7705 SAR-18
- 7705 SAR-A
- 7705 SAR-H
- 7705 SAR-Hc
- 7705 SAR-M
- 7705 SAR-W
- 7705 SAR-Wx
- 7705 SAR-X

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.

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 23
- 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.

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 (CSMv2 only) 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.

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 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, version 2, 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-F, 7705 SAR-M (all variants), 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A (both variants), 7705 SAR-W, 7705 SAR-Wx (all variants), 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.

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. When the 7705 SAR-H, 7705 SAR-Wx, 7705 SAR-8 (CSMv2 only), and 7705 SAR-18 are equipped to support GNSS, they can also support grand master clocks. 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 7705 SAR-F, the 8-port Ethernet Adapter card v2, and the 2-port 10GigE (Ethernet) Adapter card/module. See Table 23 and Table 24 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 PTP messages and Ethernet-encapsulated PTP messages. As well, the 7705 SAR supports the interworking of a PTP slave using IPv4-encapsulated messages with a PTP master using Ethernet-encapsulated messages.

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

The ITU-T allows either address to be used depending on customer requirements. Refer to Recommendation ITU-T G.8275.1/Y.1369.1.

When a PTP clock is configured for Ethernet encapsulation, there are two profiles available: `ieee1588-2008` or `g8275dot1-2014`. When the profile configuration is `ieee1588-2008`, 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. See ITU-T G.8275.1 for information about the `g8275dot1-2014` profile.

ITU-T G.8275.1

The 7705 SAR implements Recommendation ITU-T G.8275.1, which specifies the architecture that allows the distribution of time/phase with full timing support from the network. The Recommendation details the profile for using IEEE 1588 to distribute time in an environment where every node is either a grand master, boundary, or ordinary clock. When configured for the G.8275.1 profile, the 7705 SAR can operate as boundary clock, an ordinary master clock, or an ordinary slave clock.

When the 7705 SAR is configured for the G.8275.1 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; this parameter can be set per Ethernet port
- 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 tie-breaker 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 profile has the following characteristics.

- The default domain setting is 24; the allowed range is 24 to 43.
- Both one-step and two-step clocks are supported.
- 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.

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 delay response packets
- number of delay request packets
- number of follow-up 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

Network Timing Reference (NTR)

On the 7705 SAR-M, the 6-port DSL Combination module and 8-port xDSL module support network timing reference (NTR) clock recovery. Using NTR, a synchronized clock can be derived from the xDSL physical layer or the SHDSL interface. NTR delivers a highly accurate synchronized clock while eliminating the need for advanced synchronization hardware in the DSL modem, thereby reducing the overall cost of the network.

NTR is equivalent to physical layer synchronization and, at cell sites, is the preference for delivering frequency synchronization over a DSL network. Alternative, packet-based methods of synchronization, such as ACR and IEEE 1588v2 PTP, cannot offer the same level of accuracy as physical layer synchronization due to the inherent PDV characteristics of DSL.

On the 8-port xDSL module, a single NTR timing reference is available to signal back to the 7705 SAR-M. On the 6-port DSL Combination module, there are two DSL interfaces and therefore two separate NTR timing references available to the 7705 SAR-M: one for SHDSL and one for xDSL. On SHDSL interfaces, NTR locks the DSL symbol clock directly to the reference clock. On xDSL interfaces, NTR maps DSL frame phase difference bits information between the reference clock and the DSL free-running clock.

NTR on xDSL Interfaces

On xDSL interfaces, all CPE lines must be connected to the same LT because the clock source for all lines must be identical. While operating in VDSL2 mode, all pairs on an 8-port xDSL module must have their VDSL2 DMT signals aligned.

When NTR on xDSL is in use, a message is sent to the 7705 SAR-M indicating which pair is currently being used to derive NTR. However, once all lines are in show-time mode, NTR is carried on all lines. If there is an NTR status change from one pair to another, a status change is indicated in the CLI for the 7705 SAR-M. The status change is also visible through the 5620 SAM.

The chipset automatically selects the line with the best signal-to-noise ratio on the pilot tone. If there is a line drop, or if the signal-to-noise ratio degrades, the system automatically switches NTR to another line in show-time mode to recover clock synchronization. When NTR is locked to a particular line, the status is updated and indicated in the CLI and on the 5620 SAM.

If the line carrying NTR is taken out of show-time mode, there may be phase drift during the switchover if a phase delta difference has been missed.

NTR on SHDSL Interfaces

NTR for SHDSL is carried equally across all lines because all lines must connect back to the same LT on the same DSLAM. NTR for SHDSL operates in auto-detect mode. The 6-port DSL Combination module automatically selects an SHDSL pair that will be used to extract NTR and transmit to the SSU. The SHDSL pair is selected based on clock activity monitoring, coarse frequency monitoring, and chipset level indications on the active status of individual lines.

The auto-detect algorithm on the 6-port DSL Combination module selects an SHDSL pair used for NTR by first checking SHDSL pair 1. If pair 1 is not considered an acceptable source, the algorithm checks each pair in sequence until it finds an acceptable source or reaches SHDSL pair 4. The ID of the in-use line is displayed in CLI; however, it is not user-configurable.

When NTR on SHDSL interfaces is in use, the status is indicated to the 7705 SAR-M. The pair currently being used to derive NTR is shown in the CLI and is updated to the 5620 SAM. However, once all lines are in show-time mode, NTR is carried on all lines. If there is an NTR status change from one pair to another, a status change is indicated in the CLI for the 7705 SAR-M. The status change is also visible through the 5620 SAM.

The 6-port DSL Combination module automatically selects the SHDSL pair for NTR to use based on the selection algorithm. If there is a line drop, or if the signal-to-noise ratio degrades, the system automatically switches NTR to another line in show-time mode to recover clock synchronization. When NTR is locked to a particular line, the status is updated and indicated in the CLI and on the 5620 SAM.

If the line carrying NTR is taken out of show-time mode, there will be phase drift during the switchover and clock recovery may enter the holdover state if this was the only external timing reference available. If this happens, the 6-port DSL Combination module selects a new SHDSL line if one is available.

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), version 2
- 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-F (on Gigabit Ethernet ports)
- 7705 SAR-M (all variants) (on all Ethernet ports)
- 7705 SAR-Hc (on all Ethernet ports)
- 7705 SAR-W (on all Ethernet ports)
- 7705 SAR-Wx (all variants) (on all Ethernet ports)

- 7705 SAR-H (supported on the Gigabit Ethernet ports (ports 1 and 2) and on Ethernet ports 3 and 4 when they are configured with an SFP)
- 7705 SAR-A (both variants) (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-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-F, 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 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 when the modules are installed in the 7705 SAR-M (variants with module slot). On the 7705 SAR-8 and 7705 SAR-18:

- one reference is available on the 8-port Ethernet Adapter card, version 2
- 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 (not supported on the 7705 SAR-8)
  - → 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-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.

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 21. 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 and DSL 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).

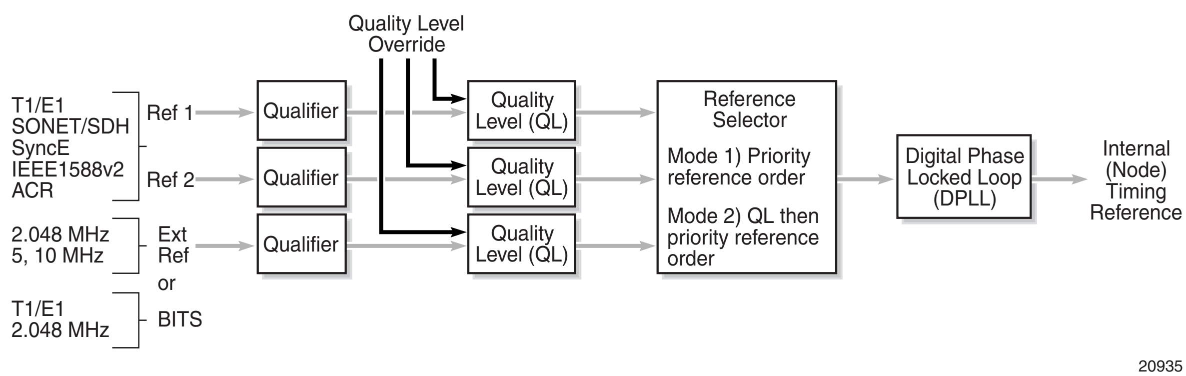
The received quality level values for the two network options based on the specific interfaces within these options are provided in the first two columns of Table 26 (for SONET, SDH, and Synchronous Ethernet interfaces) and Table 27 (for E1 and T1 interfaces). The transmitted quality level values are shown in the last two columns of Table 26 and Table 27.

- 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 21: Timing Reference Selection Based on Quality Level



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 26 and Table 27).

Table 26: 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 27: 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)
—	—	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.

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 26) 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.

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

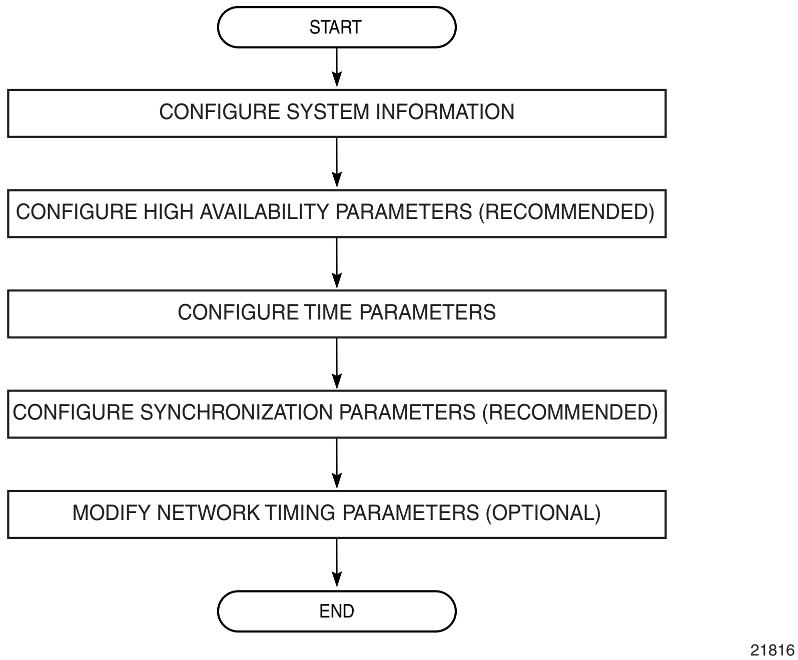
E1 signals can carry the quality level value of the timing source via one of the Sa bits (Sa4 to Sa8) in a synchronization status message, as described in G.704, section 2.3.4. Choosing which Sa bit carries the SSM is user-configurable.

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-F, 7705 SAR-M, 7705 SAR-A, and 7705 SAR-X nodes.

System Configuration Process Overview

Figure 22 displays the process to provision basic system parameters.

Figure 22: System Configuration and Implementation Flow



Configuration Notes

This section describes system configuration caveats.

- The 7705 SAR must be properly initialized and the boot loader and BOF files successfully executed in order to access the CLI.

Reference Sources

For information on supported IETF drafts and standards as well as standard and proprietary MIBs, refer to Standards and Protocol Support.

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

System Management Configuration

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.

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
            sntp
                shutdown
            exit
            zone GMT
        exit
----------------------------------------------
ALU-1>config>system#
```

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 Synchronization and Redundancy
- Configuring ATM Parameters
- Configuring Backup Copies
- Configuring System Administration Parameters
- System Timing

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

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
```

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: `alcatel>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#
```

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”`

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”
```

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
```

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"
```

```
        clli-code "abcdefg1234"
        coordinates "N 45 58 23, W 34 56 12"
. . .
        exit
----------------------------------------------
ALU-1>config>system#
```

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 12.34.56.78
```

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
- CRON

CLI Syntax:
```
config>system
time
      dst-zone zone-name
            end {first | second | third | fourth | last}
               {sunday | monday | tuesday | wednesday |
               thursday |friday | saturday} {january |
               february | march | april | may | june | july
               | august | september | october | november |
               december} hours-minutes
            offset offset
```

```
            start {first | second | third | fourth | last}
              {sunday | monday | tuesday | wednesday |
              thursday | friday |saturday} {january |
              february | march | april | may | june | july
              | august | september | october | november |
              december} hours-minutes
      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
      sntp
            broadcast-client
            server-address ip-address [version
              version-number] [normal | preferred]
              [interval seconds]
            no shutdown
      zone {std-zone-name | non-std-zone-name} [hh[:mm]]
```

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 28.

CLI Syntax:

```
config>system>time
      zone {std-zone-name | non-std-zone-name}
                  [hh [:mm]]
```

Example:

```
config>system>time#
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 28: 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
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

Table 28: System-defined Time Zones (Continued)

Acronym	Time Zone Name	UTC Offset
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

Summer Time Conditions

The `config>system>time>dst-zone` context 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
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 28, 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 28 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
```

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#
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#
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#
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#
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#
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#
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#
```

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#
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#`
`config>system>time>sntp# server-address` *`ip-address`*
`version` *`version-number`*`] [normal | preferred] [interval` *`seconds`*`]`

Example: `config>system>time>sntp#`
`config>system>time# 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 2006/04/04 12:00 end-date 2006/10/25 12:00
            zone GMT
----------------------------------------------
ALU-1>config>system>time#
```

CRON

The CRON command supports the Service Assurance Agent (SAA) functions as well as the ability to schedule turning on and off policies to meet “Time of Day” requirements. CRON functionality includes the ability to specify the commands that need to be run, when they will be scheduled, including one-time only functionality (oneshot), interval and calendar functions, as well as where to store the output of the results. In addition, CRON can specify the relationship between input, output, and schedule. Scheduled reboots, peer turn ups, service assurance agent tests and more can all be scheduled with CRON, as well as OAM events, such as connectivity checks or troubleshooting runs.

CRON elements include:

- Action
- Schedule
- Script

CLI Syntax:

```
config>cron
     action action-name [owner action-owner]
          expire-time {seconds | forever}
          lifetime {seconds | forever}
          max-completed unsigned
          results file-url
          script script-name [owner owner-name]
          no shutdown
     schedule schedule-name [owner schedule-owner]
          action action-name [owner owner-name]
          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}
          no shutdown
          type {periodic | calendar | oneshot}
          weekday {weekday-number [..weekday-number] |
            day-name [..day-name] | all}
     script script-name [owner script-owner]
          description description-string
          location file-url
          no shutdown
```

Action

Use this command to configure the parameters for a script, including the maximum amount of time to keep the results from a script run, the maximum amount of time a script may run, the maximum number of script runs to store, and the location to store the results.

CLI Syntax:
```
config>cron
     action action-name [owner action-owner]
          expire-time {seconds | forever}
          lifetime {seconds | forever}
          max-completed unsigned
          results file-url
          script script-name [owner script-owner]
          shutdown
```

Example:
```
config>cron# action test
config>cron>action# results ftp://172.22.184.249/./sim1/
 test-results
config>cron>action# no shutdown
```

The following example shows a script named “test” receiving an action to store its results in a file called “test-results”:

```
A:ALU-1>config>cron# info
----------------------------------------------
        script "test"
            location "ftp://172.22.184.249/./sim1/test.cfg"
            no shutdown
        exit
        action "test"
            results "ftp://172.22.184.249/./sim1/test-results"
            no shutdown
        exit
```

Schedule

The schedule function configures the type of schedule to run, including one-time-only (oneshot), periodic, or calendar-based runs. All runs are determined by month, day of month or weekday, hour, minute and interval (seconds). If end-time and interval are both configured, whichever condition is reached first is applied.

CLI Syntax:
```
config>cron
     schedule schedule-name [owner schedule-owner]
          action action-name [owner owner-name]
          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}
no shutdown
type {periodic | calendar | oneshot}
weekday {weekday-number [..weekday-number] |
  day-name [..day-name] | all}
shutdown
```

Example:

```
config>cron# schedule test2
config>cron>sched# day-of-month 17
config>cron>sched# end-time 2010/09/17 12:00
config>cron>sched# minute 0 15 30 45
config>cron>sched# weekday friday
config>cron>sched# shutdown
```

The following example schedules a script named “test2” to run every 15 minutes on the 17th of each month and every Friday until noon on September 17, 2010:

```
*A:ALU-1>config>cron# info
----------------------------------------------
        schedule "test2"
            shutdown
            day-of-month 17
            minute 0 15 30 45
            weekday friday
            end-time 2010/09/17 12:00
        exit
----------------------------------------------
*A:ALU-1>config>cron#
```

Script

The `script` command opens a new nodal context which contains information on a script.

CLI Syntax:

```
config>cron
      script script-name [owner script-owner]
            description description-string
            location file-url
            shutdown
```

Example:

```
config>cron# script test
config>cron>script#
```

The following example names a script “test”:

```
A:sim1>config>cron# info
----------------------------------------------
        script "test"
            location "ftp://172.22.184.249/./sim1/test.cfg"
            no shutdown
        exit
----------------------------------------------
A:sim1>config>cron#
```

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

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
```

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#
```

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.

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

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 CLI syntax displayed below 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#
```

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#
```

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"
        clli-code "abcdefg1234"
        coordinates "N 45 58 23, W 34 56 12"
        config-backup 7
...
----------------------------------------------
ALU-1>config>system>
```

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]

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.
```

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#
```

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 ALCATEL-LUCENT SAR 7705
# Copyright (c) 2000-2010 Alcatel-Lucent.
# All rights reserved. All use subject to applicable license agreements.
# Built on Fri Sept 24 01:32:43 EDT 2010 by csabuild in /rel0.0/I270/panos/main

# Generated FRI SEPT 24 14:48:31 2010 UTC

exit all
configure
#------------------------------------------
echo "System Configuration"
#------------------------------------------
    system
        name "ALU-1"
        contact "Fred Information Technology"
        location "Bldg.1-floor 2-Room 201"
        clli-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#
```

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 Alcatel-Lucent Technical Assistance Center (TAC).

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/./1x.cfg
Writing file to ftp://test:test@192.168.x.xx/./1x.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.
```

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.

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"
        clli-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 ref1 ref2 bits
..
----------------------------------------------
ALU-1>config>system#
```

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.

```
A:ALU-1# show system information

===============================================================================
System Information
===============================================================================
System Name            : ALU-1
System Type            : 7705 SAR-8
System Version         : B-5.0.R3
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 Max Message Size  : 1500
SNMP Admin State       : Enabled
SNMP Oper State        : Enabled
SNMP Index Boot Status : Not Persistent
SNMP Sync State        : OK

Telnet/SSH/FTP Admin : Enabled/Enabled/Disabled
Telnet/SSH/FTP Oper  : Up/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-0.0.I346 both/i386 ALCATEL-LUCENT SAR 7705
                         # Copyright (c) 2000-2008 Alcatel-Lucent. # All rights
                         reserved. All use subject to applicable license
                         agreements. # Built on Tue Mar 11 01:43:47 EDT 2008 by
                         csabuild in /rel0.0/I346/panos/main # Generated TUE
```

```
                         MAR 11 20:00:37 2008 UTC
Last Boot Index Version: N/A
Last Boot Index Header : # TiMOS-B-0.0.I346 both/i386 ALCATEL-LUCENT SAR 7705
                         # Copyright (c) 2000-2008 Alcatel-Lucent. # All rights
                         reserved. All use subject to applicable license
                         agreements. # Built on Tue Mar 11 01:43:47 EDT 2008 by
                         csabuild in /rel0.0/I346/panos/main # Generated TUE
                         MAR 11 20:00:37 2008 UTC
Last Saved Config      : N/A
Time Last Saved        : N/A
Changes Since Last Save: Yes
Time Last Modified     : 2008/03/25 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

Management IP Addr     : 192.168.1.202/24
DNS Server             :
192.168.x.x
DNS Domain             :
domain.com
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
===============================================================================
A:ALU-1#
```

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 Alcatel-Lucent 7705 SAR Copyright (c) 2000-2009 Alcatel
```

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
```

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 the 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#
```

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
```

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-mda mda-id
          clock-type {ordinary [master | slave] |
            boundary | transparent-e2e}
          domain domain-value
          dynamic-peers
          priority1 priority-value
          priority2 priority-value
          profile ieee1588-20008
          profile itu-telecom-freq
          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
               [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-mda 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-mda 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
```

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:

```
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
----------------------------------------------
```

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
```

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
```

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 back 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
```

Configuring System Monitoring Thresholds

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#
```

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#
```

System Command Reference

Command Hierarchies

Configuration Commands

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**
  - — **clli-code** *clli-code*
  - — **no clli-code**
  - — **config-backup** *count*
  - — **no config-backup**
  - — **contact** *contact-name*
  - — **no contact**
  - — **coordinates** *coordinates*
  - — **no coordinates**
  - — [**no**] **identifier** *id*
  - — [**no**] **l4-load-balancing**
  - — **location** *location*
  - — **no location**
  - — **lsr-load-balancing** {**lbl-only** | **lbl-ip**}
  - — **no lsr-load-balancing**
  - — **name** *system-name*
  - — **no name**
  - — **poe-power-source** {**internal** | **external**}
  - — **no poe-power-source**
  - — [**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**)

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*

Persistence Commands

config
— **system**
— **persistence**
— **dhcp-server**
— **description** *description-string*
— **no description**
— **location** *cflash-id*
— **no location**

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*
— [**no**] **broadcastclient** [**router** *router-name*] {**interface** *ip-int-name*} [**authenticate**]
— [**no**] **mda-timestamp**
— **multicastclient** [**authenticate**]
— **no multicastclient**
— **server** {*ip-address* | *ipv6-address*} [**version** *version*] [**key-id** *key-id*] [**prefer**]
— **no server** {*ip-address* | *ipv6-address*}
— [**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**

CRON Commands

config
— [**no**] **cron**
— [**no**] **action** *action-name* [**owner** *owner-name*]
— **expire-time** {*seconds* | **forever**}
— **lifetime** {*seconds* | **forever**}
— **max-completed** *unsigned*
— [**no**] **results** *file-url*
— [**no**] **script** *script-name* [**owner** *owner-name*]
— [**no**] **shutdown**
— [**no**] **schedule** *schedule-name* [**owner** *owner-name*]
— [**no**] **action** *action-name* [**owner** *owner-name*]
— [**no**] **day-of-month** {*day-number* [..*day-number*] | **all**}
— **count** *number*
— **description** *description-string*
— **no description**
— [**no**] **end-time** [*date* | *day-name*] *time*
— [**no**] **hour** {..*hour-number* [..*hour-number*] | **all**}
— [**no**] **interval** *seconds*
— [**no**] **minute** {*minute-number* [..*minute-number*] | **all**}
— [**no**] **month** {*month-number* [..*month-number*] | *month-name* [..*month-name*] | **all**}
— [**no**] **shutdown**
— **type** *schedule-type*
— [**no**] **weekday** {*weekday-number* [..*weekday-number*] | *day-name* [..*day-name*] | **all**}
— [**no**] **script** *script-name* [**owner** *owner-name*]
— **description** *description-string*
— **no description**
— [**no**] **location** *file-url*
— [**no**] **shutdown**

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**
— **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-ptp-clock** *clock-id*
  — **no source-ptp-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-ptp-clock** *clock-id*
  — **no source-ptp-clock**
— [**no**] **revert**

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**

System PTP Commands

config
— **system**
— **ptp**
— **clock** *clock-id* [**create**]
— **no clock**
— **anno-rx-timeout** *number-of-timeouts*
— **no anno-rx-timeout**
— **clock-mda** *mda-id*
— **no clock-mda**
— **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:c2:00:00:0e**}
— **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** | **ieee1588-2008** | **itu-telecom-freq**}
— **no profile**
— **ptp-port** *port-id*
— **anno-rx-timeout** *number-of-timeouts*
— **no anno-rx-timeout**
— **log-anno-interval** *log-anno-interval*

— no **log-anno-interval**
— **log-sync-interval** *log-sync-interval*
— no **log-sync-interval**
— **peer** *peer-id*
— **description** *description-string*
— no **description**
— **ip-address** *ip-address*
— no **ip-address**
— [no] **unicast-negotiate**
— [no] **shutdown**
— **source-interface** *ip-if-name*
— no **source-interface**
— [no] **use-node-time**
— [no] **shutdown**

Administration Commands

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**]
— **synchronize** [**boot-env** | **config**]
— **tech-support** [*file-url*]
— **update** **boot-loader** *file-url*

config
— system
— security
— tech-support
— **ts-location** *file-url*
— no **ts-location**

High Availability (Redundancy) Commands

root
- **admin**
  - **redundancy**
    - **force-switchover** [**now**]
    - **synchronize** {**boot-env** | **config**}

config
- **system**
  - **switchover-exec** *file-url*
  - **no switchover-exec**
- **redundancy**
  - **synchronize** {**boot-env** | **config**}
  - **multi-chassis**
    - [**no**] **peer** *ip-address*
      - **authentication-key** [*authentication-key* | *hash-key*] [**hash** | **hash2**]
      - **no authentication-key**
      - **description** *description-string*
      - [**no**] **description**
      - [**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**

Show Commands

show
- **chassis** [**environment**] [**power-feed**]
- **cron**
  - **action** [*action-name*] [**owner** *owner-name*] **run-history** *run-state*
  - **schedule** [*schedule-name*] [**owner** *owner-name*]
  - **script** [*script-name*] [**owner** *owner-name*]
- **redundancy**
  - **multi-chassis**
    - **all**
    - **mc-lag peer** *ip-address* [**lag** *lag-id*]
    - **mc-lag** [**peer** *ip-address* [**lag** *lag-id*]] **statistics**
  - **synchronization**
- **time**
- **system**
  - **connections** [**address** *ip-address* [**interface** *interface-name*]] [**port** *port-number*] [**detail**]
  - **cpu** [**sample-period** *seconds*]

— **dhcp6**
— **information**
— **lldp neighbor**
— **memory-pools**
— **ntp**
— **poe**
— **ptp**
  — **clock** *clock-id* [**bmc**] [**detail**] [**standby**] [**statistics**] [**summary**] [**timestamp**] [**unicast**]
  — **clock** *clock-id* **port** [*port-id* [**detail**]]
  — **clock** *clock-id* **ptp-port** *port-id*
    — **peer** *peer-id* [**detail**]
— **sntp**
— **sync-if-timing**
— **thresholds**
— **time** [**detail**]
— **uptime**

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*]

Clear Commands

clear
— **cron action completed** [*action-name*] [**owner** *action-owner*]
— **screen**
— **system**
  — **ptp**
    — **clock** *clock-id* **statistics**
    — **clock csm port** *port-id* **statistics**
— **sync-if-timing** {**external** | **ref 1**| **ref2**}
— **trace log**

Command Descriptions

Configuration Commands

- Generic Commands
- System Information and General Commands
- System Alarm Commands
- Persistence Commands
- System Time Commands
- CRON Commands
- System Synchronization Configuration Commands
- LLDP System Commands
- System PTP Commands

Generic Commands

shutdown

Syntax [**no**] **shutdown**

Context config>system>time>ntp
config>system>time>sntp
config>cron>action
config>cron>schedule
config>cron>script
config>redundancy>multi-chassis>peer
config>redundancy>multi-chassis>peer>mc-lag
config>system>ptp>clock
config>system>ptp>clock>port
config>system>ptp>clock>ptp-port
config>system>sync-if-timing>external
config>system>sync-if-timing>bits>input
config>system>sync-if-timing>bits>output
config>system>sync-if-timing>ref1
config>system>sync-if-timing>ref2
config>system>lldp

Description This command administratively disables the entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics.

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.

The **no** form of this command places the entity into an administratively enabled state.

Default no shutdown

description

Syntax **description** *description-string*
no description

Context config>system>persistence>dhcp-server
config>cron>schedule
config>cron>script
config>redundancy>multi-chassis>peer
config>system>ptp>clock>ptp-port>peer

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 *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.

System Information and General Commands

atm

Syntax **atm**

Context config>system

Description This command enables the context to configure system-wide ATM parameters.

atm-location-id

Syntax **atm-location-id** *location-id*
no atm-location-id

Context config>system>atm

Description This command indicates the location ID for ATM OAM.

Refer to the 7705 SAR OS Quality of Service Guide, “ATM QoS Traffic Descriptor Profiles”, for information on ATM QoS policies and the 7705 SAR OS Services Guide, “VLL Services” for information on ATM-related service parameters.

Default no atm-location-id

Parameters *location-id* — 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.

Values 01:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00

boot-bad-exec

Syntax **boot-bad-exec** *file-url*
no boot-bad-exec

Context config>system

Description 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.

Default no boot-bad-exec

Parameters *file-url* — 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 Table 14 for parameter descriptions.)

boot-good-exec

Syntax **boot-good-exec** *file-url*
no boot-good-exec

Context config>system

Description 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 exec.

Default no boot-good-exec

Parameters *file-url* — 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 Table 14 for parameter descriptions.)

clli-code

Syntax **clli-code** *clli-code*
no clli-code

Context config>system

Description 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 *clli-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

Syntax **contact** *contact-name*
no contact

Context config>system

Description This command creates a text string that identifies the contact name for the device.

Only one contact can be configured. If multiple contacts are configured, the last one entered will overwrite the previous entry.

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

Default n/a — no contact name is configured

Parameters *contact-name* — 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

Syntax **coordinates** *coordinates*
no coordinates

Context config>system

Description This command creates a text string that identifies the system coordinates for the device location. For example, the command **coordinates** "37.390 -122.0550" is read as latitude 37.390 north and longitude 122.0550 west.

Only one set of coordinates can be configured. If multiple coordinates are configured, the last one entered overwrites the previous entry.

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

Default n/a — no coordinates are configured

Parameters *coordinates* — 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.

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 5620 SAM) 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

l4-load-balancing

Syntax [**no**] **l4-load-balancing**

Context config>system

Description 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.

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.

Default no l4-load-balancing

location

Syntax **location** *location*
no location

Context config>system

Description 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 **no** form of the command reverts to the default value.

Default n/a — no system location is configured

Parameters *location* — 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.

lsr-load-balancing

Syntax **lsr-load-balancing** {**lbl-only** | **lbl-ip**}
no lsr-load-balancing

Context config>system

Description This command configures system-wide LSR load balancing. Hashing can be enabled on the IP header at an LSR to send labeled IP packets over multiple equal-cost paths in an LDP LSP and/or over multiple links of a LAG in all types of LSPs.

When LSR load balancing is enabled, the default configuration is label-only (**lbl-only**) hashing.

Default no lsr-load-balancing

Parameters **lbl-only —** (label-only) hashing is done on the system IP address, the global IP ifindex (interface identifier), and the MPLS label stack; this is the default configuration

lbl-ip — (label-IP) hashing is done on the system IP address, the global IP ifindex (interface identifier), the MPLS label stack, and the IPv4 source and destination IP address

name

Syntax **name** *system-name*
no name

Context config>system

Description This command creates a system name string for the device.

For example, system-name parameter ALU-1 for the **name** command configures the device name as ALU-1.

```
ABC>config>system# name ALU-1
ALU-1>config>system#
```

Only one system name can be configured. If multiple system names are configured, the last one encountered overwrites the previous entry.

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

Default The default system name is set to the chassis serial number which is read from the backplane EEPROM.

Parameters *system-name* — 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.

poe-power-source

Syntax **poe-power-source {internal | external}**
no poe-power-source

Context config>system

Description This command specifies whether the internal system-level PoE power supply or an external PoE power supply is used to power the PoE-capable ports on a 7705 SAR chassis.

When the 7705 SAR-H is configured for the internal power supply, standard 15 W PoE can be enabled only on ports 5 and 6. Port 5 can also support 34 W PoE+, but in that case, port 6 cannot support PoE. When configured for the external PoE power supply, all four PoE-capable ports support a combination of standard 15 W PoE and 34 W PoE+, with a maximum power delivery of 83 W among all PoE enabled ports. Refer to the 7705 SAR-H Chassis Installation Guide, “Ethernet Ports”, for information about supported combinations and restrictions.

The following chassis types only support the internal system-level PoE power supply:

- 7705 SAR-Hc
- 7705 SAR-W
- 7705 SAR-Wx

The **no** form of this command disables the PoE power supply on the node.

Default internal

Parameters **internal —** specifies that the internal PoE power source be used for the PoE-capable ports

external — specifies that an external PoE power source be used for the PoE-capable ports

power-feed-monitoring

Syntax [**no**] **power-feed-monitoring** {**A** | **B** | **C**}

Context config>system

Description 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:

- logging of input power feed failures is suppressed
- any alarms that have been raised on an unused power feed are cleared when the **no power-feed-monitoring** command is applied to that power feed
- in the Power Feed Information output of the **show>chassis** command, the status of the unused input power feed appears as “not monitored”
- 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.

Power feed monitoring and alarming is enabled by default.

Default power-feed-monitoring

Parameters **A —** corresponds to the first input power feed

B — corresponds to the second input power feed

C — corresponds to the AC power input on the high-voltage chassis variant of the 7705 SAR-H

System Alarm Commands

alarm

Syntax **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*

Context config>system>thresholds>rmon

Description 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.

Use the **no** form of this command to remove an *rmon-alarm-id* from the configuration.

Parameters *rmon-alarm-id* — a numerical identifier for the alarm being configured. The number of alarms that can be created is limited to 1200.

Values 1 to 65535

Default n/a

oid-string — 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 *oid-string* 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”.

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", then 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 "rising-event rmon-event-id" has a value of zero (0), no associated event exists.

If a "rising event rmon-event" 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 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 falling-event has a value of zero (0), no associated event exists.

If a "falling event" 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 rising 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 the rising-threshold *threshold* value.

Values -2147483648 to 2147483647

Default 0

owner **—** the owner identifies the creator of this alarm. 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 and can be a maximum of 80 characters long.

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"
```

cflash-cap-alarm

Syntax **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*

Context config>system>thresholds

Description 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 **no** form of this command removes the configured compact flash threshold alarm.

Parameters *cflash-id* — the cflash-id specifies the name of the cflash device to be monitored

Values cf3:, cf3-A:, cf3-B:

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-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 rising threshold crossing event is generated, another such event will not be generated until the sampled value raises above this threshold and reaches greater than or equal to the rising-threshold value.

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, then 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 cf1-A: rising-threshold 50000000 falling-
threshold 49999900 interval 120 rmon-event-type both start-alarm rising
```

cflash-cap-warn

Syntax **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*

Context config>system>thresholds

Description 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 **no** form of this command removes the configured compact flash threshold warning.

Parameters *cflash-id* — the cflash-id specifies the name of the cflash device to be monitored

Values cf3:, cf3-A:, cf3-B:

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-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 rising threshold crossing event is generated, another such event will not be generated until the sampled value raises above this threshold and reaches greater than or equal to the rising-threshold value.

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, then 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
```

event

Syntax **event** *rmon-event-id [event-type]* [**description** *description-string*] [**owner** *owner-string*]
no event *rmon-event-id*

Context config>system>thresholds>rmon

Description The event command configures an entry in the RMON-MIB event table. 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 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.

Creating an event entry in the RMON-MIB log table does not create a corresponding entry in the TiMOS event logs. However, when the <event-type> is set to trap, 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.

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 RMON-alarm-id, the associated RMON-event-id and the sampled SNMP object identifier.

Use the **no** form of this command to remove an *rmon-event-id* from the configuration.

Parameters *rmon-event-id [event-type]* — the 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

description-string **—** a user-configurable string that can be used to identify the purpose of this event. This is an optional parameter and can be 80 characters long. If the string contains special characters (#, $, spaces, etc.), the entire string must be enclosed within double quotes.

Default an empty string

owner-string **—** identifies the creator of this alarm. 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 and can be a maximum of 80 characters long.

Default TiMOS CLI

Configuration example:

```
event 5 rmon-event-type both description "alarm testing" owner "TiMOS CLI"
```

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 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.

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 rising threshold crossing event is generated, another such event will not be generated until the sampled value raises above this threshold and reaches greater than or equal to the rising-threshold threshold value.

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, then 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 MemoryUsed 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 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.

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 rising threshold crossing event is generated, another such event will not be generated until the sampled value raises above this threshold and reaches greater than or equal to the rising-threshold value.

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, then 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

Syntax **rmon**

Context config>system>thresholds

Description This command creates the context to configure generic RMON alarms and events.

Generic RMON alarms can be created on any SNMP object-ID that is valid for RMON monitoring (for example, an integer-based datatype).

The configuration of an event controls the generation and notification of threshold crossing events configured with the **alarm** command.

thresholds

Syntax **thresholds**

Context config>system

Description This command enables the context to configure monitoring thresholds.

Persistence Commands

persistence

Syntax **persistence**

Context config>system

Description 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.

Default n/a

dhcp-server

Syntax **dhcp-server**

Context config>system>persistence

Description This command configures DHCP server persistence parameters.

location

Syntax **location** *cflash-id*
no location

Context config>system>persistence>dhcp-server

Description This command instructs the system where to write the file. The name of the file is dhcp-serv.001. On bootup, the system scans the file systems looking for dhcp-serv.001. If the system finds the file, it loads it.

The **no** form of this command returns the system to the default.

Default no location

Parameters *cflash-id* — the location of the compact flash device. On the 7705 SAR, the location is cf3:.

System Time Commands

set-time

Syntax **set-time** [*date*] [*time*]

Context admin

Description 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.

Parameters *date* — the local date and time accurate to the minute in the YYYY/MM/DD format

Values *YYYY* is the 4-digit year
MM is the 2-digit month
DD is the 2-digit date

time — the time (accurate to the second) in the *hh*:*mm*[:*ss*] format. If no seconds value is entered, the seconds are reset to :00.

Values *hh* is the 2-digit hour in 24 hour format (00=midnight, 12=noon)
mm is the 2-digit minute

Default 0

time

Syntax **time**

Context config>system

Description This command enables the context to configure the system time zone and time synchronization parameters.

dst-zone

Syntax [**no**] **dst-zone** [*std-zone-name* | *non-std-zone-name*]

Context config>system>time

Description 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 21, 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 21 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 21. 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 creates 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

Syntax **[no] ntp**

Context config>system>time

Description 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. Use the **no** form of the command to stop the execution of NTP and remove its configuration.

Default n/a

authentication-check

Syntax **[no] authentication-check**

Context config>system>time>ntp

Description This command provides the option to skip the rejection of NTP PDUs that do not match the authentication key ID, type or key 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 enabled, NTP PDUs are authenticated on receipt. However, mismatches cause a counter to be increased – one counter for type, one for key ID, and one for type value mismatches. These counters are visible in a show command.

The **no** form of this command allows authentication mismatches to be accepted; the counters however are maintained.

Default authentication-check — rejects authentication mismatches

authentication-key

Syntax **authentication-key** *key-id* **key** *key* [**hash** | **hash2**] **type** {**des** | **message-digest**}
no authentication-key *key-id*

Context config>system>time>ntp

Description This command sets the authentication key-id, type and key used to authenticate NTP PDUs sent to or received by other network elements participating in the NTP protocol. For authentication to work, the authentication key ID, type, and key value must match.

The **no** form of the command removes the authentication key.

Default n/a

Parameters

key-id — configures the authentication key-id that will be used by the node when transmitting or receiving Network Time Protocol packets

Entering the authentication-key command with a key-id value that matches an existing configuration key will result in overriding 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. This is an optional parameter.

Values 1 to 255

Default n/a

key — the authentication key associated with the configured key-id. The value configured in this parameter is the actual value used by other network elements to authenticate the NTP packet.

The key can be 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 (“.”).

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 then the key value alone. This means that 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.

type — determines if DES or message-digest authentication is used

This is a required parameter; either DES or message-digest must be configured.

Values **des** — specifies that DES authentication is used for this key

message-digest — specifies that MD5 authentication in accordance with RFC 2104 is used for this key

broadcastclient

Syntax [**no**] **broadcastclient** [**router** *router-name*] {**interface** *ip-int-name*} [**authenticate**]

Context config>system>time>ntp

Description When configuring NTP, the node can be configured to receive broadcast packets on a given subnet. Broadcast and multicast messages can easily be spoofed; thus, authentication is strongly recommended. If broadcast is not configured, then received NTP broadcast traffic will be ignored. Use the show command to view the state of the configuration.

The **no** form of this command removes the address from the configuration.

Parameters *router-name* — specifies the router name used to receive NTP packets

Values Base, management

Default Base

ip-int-name — specifies 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.

Values 32 character maximum

authenticate — specifies whether or not to require authentication of NTP PDUs. When enabled, NTP PDUs are authenticated upon receipt.

mda-timestamp

Syntax [**no**] **mda-timestamp**

Context config>system>time>ntp

Description 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. This command can only be set if NTP is shut down and the NTP servers are not associated with an authentication key. This command is only supported on Ethernet-based adapter cards. This command does not change the behavior of NTP over the management port.

The **no** form of this command reverts the system to its default behavior of having NTP packets timestamped by the CSM.

multicastclient

Syntax **multicastclient** [**authenticate**]
no multicastclient

Context config>system>time>ntp

Description This command configures the node to receive multicast NTP messages on the CSM Management port. If multicastclient is not configured, received NTP multicast traffic will be ignored. Use the show command to view the state of the configuration.

The **no** form of this command removes the multicast client for the specified interface from the configuration.

Parameters **authenticate —** makes authentication a requirement. If authentication is required, the authentication key-id received must have been configured in the “authentication-key” command, and that key-id’s type and key value must also match.

server

Syntax **server** {*ip address* **|** *ipv6-address*} [**version** *version*] [**key-id** *key-id*] [**prefer**]
no server {*ip-address* **|** *ipv6-address*}

Context config>system>time>ntp

Description This command is used when the node should operate in client mode with the NTP server specified in the address field of this command. Only the IP address parameter is required; the other parameters are optional. The **no** form of this command removes the server with the specified address from the configuration.

Up to five NTP servers can be configured.

Parameters *ip-address* — configures the IPv4 address of a node that acts as an NTP server to this network element.

Values a.b.c.d

ipv6-address — configures the IPv6 address of a node that acts as an NTP server to this network element.

Values x:x:x:x:x:x:x:x (eight 16-bit pieces)
x:x:x:x:x:x:d.d.d.d
x [0 — FFFF]H
d [0 — 255]D

version **—** the NTP version number that is expected by this node.

Values 2 to 4

Default 4

key-id **—** the key ID that identifies 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 value must be valid; otherwise, the packet will be rejected and an event/trap generated.

Values 1 to 255

prefer — when configuring more than one server, one remote system can be configured as the preferred server. When a second server is configured as preferred, then the new entry overrides the old entry.

ptp

Syntax **ptp**

Context config>system>time

Description This command creates the context to create or modify **ptp** parameters for time.

clock

Syntax **clock** *clock-id* **time-ref-priority** *priority-value*
clock csm time-ref-priority *priority-value*
no clock

Context config>system>time>ptp

Description 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 *clock-id* and has an assigned *priority-value*.

Default no clock

Parameters *clock-id* — specifies which configured clock is being used as the time reference

Values 1 to 16

priority-value — specifies the priority order of the given clock configured as the time reference

Values 1 to 16

csm — keyword to specify the CSM as the time reference

sntp

Syntax [**no**] **sntp**

Context config>system>time

Description This command creates the context to edit the Simple Network Time Protocol (SNTP).

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.

The system clock is automatically adjusted at system initialization time or when the protocol first starts up.

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.

SNTP is created in an administratively enabled state (**no shutdown**).

The **no** 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.

Default no sntp

broadcast-client

Syntax [**no**] **broadcast-client**

Context config>system>time>sntp

Description This command enables listening to SNTP/NTP broadcast messages on interfaces with broadcast client enabled at global device level.

When this global parameter is configured, then the **ntp-broadcast** parameter must be configured on selected interfaces on which NTP broadcasts are transmitted.

SNTP must be shut down prior to changing either to or from broadcast mode.

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

Syntax **message-type** {**ct** | **cm** | **irig-b002-b122** | **irig-b003-b123** | **irig-b006-b126** | **irig-b007-b127**}
no message-type

Context config>system>time>tod-1pps

Description This command specifies the format for the Time of Day message that is transmitted out the time of day (ToD) port on the following:

- 7705 SAR-M
- 7705 SAR-H
- 7705 SAR-A
- 7705 SAR-X

Default no message-type

Parameters **ct** — China Telecom; not available on the 7705 SAR-H

cm — China Mobile; not available on the 7705 SAR-H

irig-b002-b122 | **irig-b003-b123** | **irig-b006-b126** | **irig-b007-b127** — specifies IRIG-B message format; available on the 7705 SAR-H only

output

Syntax [**no**] **output**

Context config>system>time>tod-1pps

Description This command specifies whether the 1pps output is enabled. When disabled, neither the 1pps nor the RS-422 serial port is available.

Default no output

zone

Syntax **zone** {*std-zone-name* | *non-std-zone-name*} [*hh* [*:mm*]]
no zone

Context config>system>time

Description This command sets the time zone and/or time zone offset for the device.

The 7705 SAR supports system-defined and user-defined time zones. The system-defined time zones are listed in Table 21.

For user-defined time zones, the zone and the UTC offset must be specified.

The **no** 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 dst-zone command has been configured that references the zone, the summer commands must be deleted before the zone can be reset to UTC.

Default zone utc - the time zone is set for Coordinated Universal Time (UTC)

Parameters *std-zone-name* — the standard time zone name. The standard name must be a system-defined zone in Table 21. 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.

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 dst-zone parameter is not required.

A user-defined time zone name is case-sensitive and can be up to 5 characters in length.

Values 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

non-std-zone-name — the non-standard time zone name

Values Up to 5 characters maximum.

hh [:mm] — 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 *minutes-offset* must be specified. For example, the time zone in Pirlanngimpi, Australia is UTC + 9.5 hours.

Values hours: -11 to 11

minutes: 0 to 59

Default hours: 0

minutes: 0

CRON Commands

cron

Syntax **cron**

Context config

Description This command creates the context to create scripts, script parameters and schedules that support the Service Assurance Agent (SAA) functions.

CRON features are saved to the configuration file on both primary and backup control modules. If a control module switchover occurs, CRON events are restored when the new configuration is loaded. If a control module switchover occurs during the execution of a CRON script, the failover behavior will be determined by the contents of the script.

action

Syntax [**no**] **action** *action-name* [**owner** *owner-name*]

Context config>cron
config>cron>schedule

Description This command configures action parameters for a script.

Default n/a

Parameters *action-name* — specifies the action name

Values maximum 32 characters

owner-name — specifies the owner name

Default TiMOS CLI

expire-time

Syntax **expire-time** {*seconds* | **forever**}

Context config>cron>action

Description This command configures the maximum amount of time to keep the results from a script run.

Parameters *seconds* — specifies the maximum amount of time to keep the results from a script run

Values 1 to 21474836

Default 3600 (1 hour)

forever — specifies to keep the results from a script run forever

lifetime

Syntax **lifetime** {*seconds* | **forever**}

Context config>cron>action

Description This command configures the maximum amount of time a script may run.

Parameters *seconds* — specifies the maximum amount of time a script may run

Values 1 to 21474836

Default 3600 (1 hour)

forever — specifies to allow a script to run forever

max-completed

Syntax **max-completed** *unsigned*

Context config>cron>action

Description This command specifies the maximum number of completed sessions to keep in the event execution log. If a new event execution record exceeds the number of records specified by this command, the oldest record is deleted.

The **no** form of this command resets the value to the default.

Parameters *unsigned* — specifies the maximum number of completed sessions to keep in the event execution log

Values 0 to 255

Default 1

results

Syntax [**no**] **results** *file-url*

Context config>cron>action

Description This command specifies the location where the system writes the output of an event script's execution.

The **no** form of this command removes the file location from the configuration.

Parameters *file-url* — specifies the location where the system writes the output of an event script's execution (see Table 14 for parameter descriptions)

script

Syntax [**no**] **script** *script-name* [**owner** *owner-name*]

Context config>cron>action

Description This command creates action parameters for a script, including the maximum amount of time to keep the results from a script run, the maximum amount of time a script may run, the maximum number of script runs to store and the location to store the results.

The **no** form of this command removes the script parameters from the configuration.

Default n/a

Parameters *script-name* — connects an event to the script that will run when the event is triggered

owner-name — owner name of the schedule

Default TiMOS CLI

schedule

Syntax [**no**] **schedule** *schedule-name* [**owner** *owner-name*]

Context config>cron

Description This command configures the type of schedule to run, including one-time only (oneshot), periodic, or calendar-based runs. All runs are determined by month, day of month or weekday, hour, minute and interval (seconds).

The **no** form of the command removes the context from the configuration.

Default n/a

Parameters *schedule-name* — name of the schedule

owner-name — owner name of the schedule

count

Syntax **count** *number*

Context config>cron>schedule

Description This command configures the total number of times a CRON "interval" schedule is run. For example, if the interval is set to 600 and the count is set to 4, the schedule runs 4 times at 600 second intervals.

Parameters *number* — the number of times the schedule is run

Values 1 to 65535

Default 65535

day-of-month

Syntax [**no**] **day-of-month** *{day-number [..day-number*] | **all**}

Context config>cron>schedule

Description This command specifies which days of the month that the schedule will occur. Multiple days of the month can be specified. When multiple days are configured, each of them will cause the schedule to trigger. If a day-of-month is configured without configuring month, weekday, hour and minute, the event will not execute.

Using the **weekday** command as well as the **day-of-month** command will cause the script to run twice. For example, consider that "today" is Monday January 1. If "Tuesday January 5" is configured, the script will run on Tuesday (tomorrow) as well as January 5 (Friday).

The **no** form of this command removes the specified day-of-month from the list.

Parameters *day-number* — positive integers specify the day of the month counting from the first of the month. The negative integers specify the day of the month counting from 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 occur on the 27th and 5th of that month.

Integer values must map to a valid day for the month in question. 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 [**no**] **end-time** [*date* | *day-name*] *time*

Context config>cron>schedule

Description This command is used concurrently with type **periodic** or **calendar**. Using the type of **periodic**, end-time determines at which interval the schedule will end. Using the type of **calendar**, end-time determines on which date the schedule will end.

When **no end-time** is specified, the schedule runs forever.

Parameters *date* — specifies the date to schedule a command

Values YYYY:MM:DD in year:month:day number format

day-name — specifies the day of the week to schedule a command

Values sunday | monday | tuesday | wednesday | thursday | friday | saturday

time — specifies the time of day to schedule a command

Values hh:mm in hour:minute format

hour

Syntax [**no**] **hour** {*..hour-number* [*..hour-number*] | **all**}

Context config>cron>schedule

Description This command specifies which hour to schedule a command. Multiple hours of the day can be specified. When multiple hours are configured, each of them will cause the schedule to trigger. Day-of-month or weekday must also be specified. All days of the month or weekdays can be specified. If an hour is configured without configuring month, weekday, day-of-month, and minute, the event will not execute.

The **no** form of this command removes the specified hour from the configuration.

Parameters *hour-number* — specifies the hour to schedule a command

Values 0 to 23 (maximum 24 hour-numbers)

all — specifies all hours

interval

Syntax [**no**] **interval** *seconds*

Context config>cron>schedule

Description This command specifies the interval between runs of an event.

Parameters *seconds* — the interval, in seconds, between runs of an event

Values 30 to 4294967295

minute

Syntax [**no**] **minute** {*minute-number* [**..***minute-number*] | **all**}

Context config>cron>schedule

Description This command specifies the minute to schedule a command. Multiple minutes of the hour can be specified. When multiple minutes are configured, each of them will cause the schedule to occur. If a minute is configured, but no hour or day is configured, the event will not execute. If a minute is configured without configuring month, weekday, day-of-month, and hour, the event will not execute.

The **no** form of this command removes the specified minute from the configuration.

Parameters *minute-number* — specifies the minute to schedule a command

Values 0 to 59 (maximum 60 minute-numbers)

all — specifies all minutes

month

Syntax [**no**] **month** {*month-number* [**..***month-number*] | *month-name* [**..***month-name*] | **all**}

Context config>cron>schedule

Description This command specifies the month when the event should be executed. Multiple months can be specified. When multiple months are configured, each of them will cause the schedule to trigger. If a month is configured without configuring weekday, day-of-month, hour and minute, the event will not execute.

The **no** form of this command removes the specified month from the configuration.

Parameters *month-number* — specifies a month number

Values 1 to 12 (maximum 12 month-numbers)

month-name — specifies a month by name

Values january, february, march, april, may, june, july, august, september, october, november, december (maximum 12 month names)

all — specifies all months

type

Syntax **type** *schedule-type*

Context config>cron>schedule

Description This command specifies how the system should interpret the commands contained within the schedule node.

Parameters *schedule-type* — specifies the type of schedule for the system to interpret the commands contained within the schedule node

Values **periodic** — specifies a schedule that runs at a given interval. The interval value must be specified for this feature to run successfully.

calendar — specifies a schedule that runs based on a calendar. The values, weekday, month, day-of-month, hour, and minute, must be specified for this feature to run successfully.

oneshot — specifies a schedule that runs one time only. As soon as the first event specified in these parameters takes place and the associated event occurs, the schedule enters a shutdown state. month, weekday, day-of-month, hour and minute must be specified for this feature to run successfully.

Default periodic

weekday

Syntax [**no**] **weekday** {*weekday-number* [**..***weekday-number*] | *day-name* [**..***day-name*] | **all**}

Context config>cron>schedule

Description This command specifies which days of the week that the schedule will fire on. Multiple days of the week can be specified. When multiple days are configured, each of them will cause the schedule to occur. If a weekday is configured without configuring month, day-of-month, hour and minute, the event will not execute.

Using the **weekday** command as well as the **day-of month** command will cause the script to run twice. For example, consider that “today” is Monday January 1. If “Tuesday January 5” is configured, the script will run on Tuesday (tomorrow) as well as January 5 (Friday).

The **no** form of this command removes the specified weekday from the configuration.

Parameters *weekday-number* — specifies a weekday number

Values 1 to 7 (maximum 7 week-day-numbers)

day-name — specifies a day by name

Values sunday, monday, tuesday, wednesday, thursday, friday, saturday (maximum 7 weekday names)

all — specifies all days of the week

script

Syntax [**no**] **script** *script-name* [**owner** *owner-name*]

Context config>cron>script

Description This command configures the name associated with this script.

Parameters *script-name* — specifies the script name

owner-name — specifies the owner of the script

location

Syntax [**no**] **location** *file-url*

Context config>cron>script

Description This command configures the location of script to be scheduled.

Parameters *file-url* — specifies the location where the system writes the output of an event script’s execution (see Table 14 for parameter descriptions)

System Synchronization Configuration Commands

sync-if-timing

Syntax **sync-if-timing**

Context config>system

Description This command creates or edits the context to create or modify timing reference parameters.

Default not enabled (The **ref-order** must be specified in order for this command to be enabled.)

abort

Syntax **abort**

Context config>system>sync-if-timing

Description This command is required to discard changes that have been made to the synchronous interface timing configuration during a session.

begin

Syntax **begin**

Context config>system>sync-if-timing

Description This command is required in order to enter the mode to create or edit the system synchronous interface timing configuration.

bits

Syntax **bits**

Context config>system>sync-if-timing

Description 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

Syntax **input**

Context config>system>sync-if-timing>bits

Description This command enables the context to configure BITS input timing ports parameters on the 7705 SAR-18.

interface-type

Syntax **interface-type** {**ds1** [{**esf** | **sf**}] | **e1** [{**pcm30crc** | **pcm31crc**}] | **2048khz-G703**}
no interface-type

Context config>system>sync-if-timing>bits

Description This command specifies the signal type for the BITS input and output ports. If you configure the signal type as **ds1**, the system automatically defaults to **esf**. If you configure the signal type as **e1**, the system automatically defaults to **pcm30crc**.

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

Default ds1 esf

Parameters

ds1 esf — 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.

ds1 sf — 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.

e1 pcm30crc — 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.

e1 pcm31crc — specifies PCM31CRC as the PCM type. PCM31CRC uses PCM to separate the signal into 31 user channels with CRC protection.

output

Syntax **output**

Context config>system>sync-if-timing>bits

Description This command enables the context to configure BITS output port parameters on the 7705 SAR-18.

line-length

Syntax **line-length** {**110** | **220** | **330** | **440** | **550** | **660**}

Context config>system>sync-if-timing>bits>output

Description This command configures the line length, in feet, between the network element and the central clock (BITS/SSU).

This command is only applicable when the interface-type is DS1.

Default 110

Parameters **110** — specifies a line length from 0 to 110 ft

220 — specifies a line length from 111 to 220 ft

330 — specifies a line length from 221 to 330 ft

440 — specifies a line length from 331 to 440 ft

550 — specifies a line length from 441 to 550 ft

660 — specifies a line length from 551 to 660 ft

ql-override

Syntax **ql-override** {**prs** | **stu** | **st2** | **tnc** | **st3e** | **st3** | **smc** | **prc** | **ssu-a** | **ssu-b** | **sec** | **eec1** | **eec2**}
no ql-override

Context config>system>sync-if-timing>external
config>system>sync-if-timing>bits
config>system>sync-if-timing>ref1
config>system>sync-if-timing>ref2

Description This command configures a static quality level value. This value overrides any dynamic quality level value received by the Synchronization Status Messaging (SSM) process.

Default no ql-override

Parameters **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

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

eec1 — Ethernet Equipment Clock Option 1 Traceable (SDH)

eec2 — Ethernet Equipment Clock Option 2 Traceable (SONET)

ssm-bit

Syntax **ssm-bit** *sa-bit*

Context config>system>sync-if-timing>bits

Description This command configures which Sa-bit to use for conveying Synchronization Status Messaging (SSM) information when the interface type is E1.

Default Sa8

Parameters *sa-bit* — specifies the Sa-bit value

Values Sa4 to Sa8

commit

Syntax **commit**

Context config>system>sync-if-timing

Description This command is required in order to save the changes made to the system synchronous interface timing configuration.

external

Syntax **external**

Context config>system>sync-if-timing

Description 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

Syntax **input-interface**

Context config>system>sync-if-timing>external

Description This command enables the context to configure parameters for external input timing interface via the port on the CSM.

impedance

Syntax **impedance** {**high-impedance** | **50-Ohm** | **75-Ohm**}

Context config>system>sync-if-timing>external>input-interface

Description This command configures the impedance of the external input timing port.

Default 50-Ohm

Parameters **high-impedance** — specifies a high input impedance value

50-Ohm — specifies a 50 Ω input impedance value

75-Ohm — specifies a 75 Ω input impedance value

type

Syntax **type** {**2048khz-G703** | **5mhz** | **10mhz**}
no type

Context config>system>sync-if-timing>external>input-interface
config>system>sync-if-timing>external>output-interface

Description This command configures the interface type of the external timing port.

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

Default 2048 kHz-G703

Parameters **2048khz-G703** — specifies G703 2048 kHz clock

5mhz — specifies a 5 mHz sine clock

10mhz — specifies a 10 mHz sine clock

output-interface

Syntax **output-interface**

Context config>system>sync-if-timing>external

Description This command enables the context to configure parameters for external output timing interface via the port on the CSM.

Default n/a

ql-selection

Syntax [**no**] **ql-selection**

Context config>system>sync-if-timing

Description This command enables SSM encoding as a means of timing reference selection.

Default no ql-selection

ref-order

Syntax **ref-order** *first second [third]*
no ref-order

Context config>system>sync-if-timing

Description The synchronous equipment timing subsystem can lock to three different timing reference inputs, those specified in the ref1, ref2, and external and begin command configuration. This command organizes the priority order of the timing references.

If a reference source is disabled, then the clock from the next reference source as defined by **ref-order** is used. If the reference sources are disabled, then clocking is derived from a local oscillator.

If a **sync-if-timing** reference is linked to a source port that is operationally down, the port will no longer be qualified as a valid reference.

The **no** form of the command resets the reference order to the default values.

Default external, ref1 ref2

Parameters *first* — specifies the first timing reference to use in the reference order sequence

Values ref1, ref2, external, bits

second — specifies the second timing reference to use in the reference order sequence

Values ref1, ref2, external, bits

third — specifies the third timing reference to use in the reference order sequence

Values ref1, ref2, external, bits

ref1

Syntax **ref1**

Context config>system>sync-if-timing

Description This command enables the context to configure parameters for the first timing reference.

ref2

Syntax **ref2**

Context config>system>sync-if-timing

Description This command enables the context to configure parameters for the second timing reference.

source-port

Syntax **source-port** *port-id* [**adaptive**]
no source-port

Context config>system>sync-if-timing>ref1
config>system>sync-if-timing>ref2

Description This command configures the source port for timing reference **ref1** or **ref2**.

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.

On the 7705 SAR-F, line timing is supported on the T1/E1 ports and on Ethernet optical SFP ports.

On the 7705 SAR-M and 7705 SAR-A (variants with T1/E1 ports) and on the 7705 SAR-X, line timing is supported on T1/E1 ports. Line timing is also supported on all RJ-45 Ethernet ports and optical SFP ports on the 7705 SAR-M (all variants), 7705 SAR-Hc, 7705 SAR-W, 7705 SAR-Wx (all variants), and 7705 SAR-X. On the 7705 SAR-A (both variants), line timing is supported on all synchronous Ethernet ports. 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.

Line timing is supported on all ports of the 7705 SAR-H; it is also supported on the T1/E1 ports of the 4-port T1/E1 and RS-232 Combination module when the module is installed in the 7705 SAR-H.

In addition, line timing is supported on the following modules when they are installed in 7705 SAR-M chassis variants with module slots:

- GPON module via the synchronous downstream 8 kHz GPON physical layer
- 8-port xDSL module (NTR over ADSL2, ADSL2+, or VDSL2)
- 6-port DSL Combination module (two references are available: NTR over SHDSL and NTR over ADSL2, ADSL2+, or VDSL2)
- 2-port 10GigE (Ethernet) module
- 6-port SAR-M Ethernet module

On the 7705 SAR-8 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 (the 16-port T1/E1 ASAP Adapter card, version 1, is not supported on the 7705 SAR-18)
- Ethernet SFP ports with SFPs that support synchronous Ethernet on the 8-port Ethernet Adapter card (version 2), 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 (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-F, and the 7705 SAR-M and 7705 SAR-A (variants with T1/E1 ports). On the 7705 SAR-8 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. (The 16-port T1/E1 ASAP Adapter card, version 1, is not supported on the 7705 SAR-18.) Adaptive timing is also supported on the T1/E1 ports of the 4-port T1/E1 and RS-232 Combination module when it is installed in the 7705 SAR-H.

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-F, 7705 SAR-M (all variants), 7705 SAR-A (both variants), 7705 SAR-W, 7705 SAR-Wx (all variants), and 7705 SAR-X. Two T1/E1 ports can supply a timing reference on the 7705 SAR-X, 7705 SAR-F, and on the 7705 SAR-M and 7705 SAR-A (variants with T1/E1 ports). On the 7705 SAR-F, one reference must be from ports 1 to 8 and the other from ports 9 to 16.

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 (variants with module slot), the ports on the module can supply a timing reference.

The 7705 SAR-8 and 7705 SAR-18 can receive one or two timing references depending on the port and card type supplying the reference. The 7705 SAR-8 supports two timing references only if a CSMv2 is installed. On the 7705 SAR-8 or 7705 SAR-18, 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, version 2
- a single T1/E1 port on the 16-port T1/E1 ASAP Adapter card, version 1 (not supported on the 7705 SAR-18)
- 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 (not supported on the 7705 SAR-8), or 2-port 10GigE (Ethernet) Adapter card
- two T1/E1 ports on the 16-port T1/E1 ASAP Adapter card, version 2, 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

Syntax **source-ptp-clock** *clock-id*
no source-ptp-clock

Context config>system>sync-if-timing>ref1
config>system>sync-if-timing>ref2

Description This command configures the reference source clock using the clock ID configured by the PTP clock command.

Default no source-ptp-clock

Parameters *clock-id* — identifies the PTP clock to use as the reference source clock

Values 1 to 16

revert

Syntax [**no**] **revert**

Context config>system>sync-if-timing

Description 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.

Default no revert

LLDP System Commands

Refer to the 7705 SAR OS Interface Configuration Guide, “7705 SAR Interfaces”, for LLDP Ethernet port commands.

lldp

Syntax **lldp**

Context config>system

Description This command enables the context to configure system-wide Link Layer Discovery Protocol (LLDP) parameters.

message-fast-tx

Syntax **message-fast-tx** *time*
no message-fast-tx

Context config>system>lldp

Description This command configures the interval between LLDPDU transmissions by the LLDP agent during a fast transmission period.

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 tx-interval 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 message-fast-tx-init command) and the interval between them.

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

Default 1

Parameters *time* — specifies the interval between LLDPDU transmissions in seconds

Values 1 to 3600

message-fast-tx-init

Syntax **message-fast-tx-init** *count*
no message-fast-tx-init

Context config>system>lldp

Description This command configures the number of LLDPDUs to send during a fast transmission period.

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 tx-interval 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 message-fast-tx command).

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

Default 4

Parameters *count* — specifies the number of LLDPDUs to send during the fast transmission period

Values 1 to 8

notification-interval

Syntax **notification-interval** *time*
no notification-interval

Context config>system>lldp

Description 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.

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

Default 5

Parameters *time* — specifies the minimum time, in seconds, between change notifications

Values 5 to 3600

reinit-delay

Syntax **reinit-delay time**
no reinit-delay

Context config>system>lldp

Description This command configures the time before reinitializing LLDP on a port.

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

Default 2

Parameters *time* — specifies the time, in seconds, before reinitializing LLDP on a port

Values 1 to 10

tx-credit-max

Syntax **tx-credit-max** *count*
no tx-credit-max

Context config>system>lldp

Description This command configures the maximum number of consecutive LLDPDUs that can be transmitted at any time.

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

Default 5

Parameters *count* — specifies the maximum number of consecutive LLDPDUs transmitted

Values 1 to 100

tx-hold-multiplier

Syntax **tx-hold-multiplier** *multiplier*
no tx-hold-multiplier

Context config>system>lldp

Description This command configures the multiplier of the transmit interval defined by the tx-interval command.

The transmit interval time multiplied by the **tx-hold-multiplier** 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.

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

System PTP Commands

ptp

Syntax **ptp**

Context config>system

Description This command enables the context to create or modify PTP timing parameters.

clock

Syntax **clock** *clock-id* [**create**]
no clock

Context config>system>ptp

Description This command creates a PTP clock, which can be set to a master, slave, boundary, or transparent clock using the clock-type command. The *clock-id* can be a numeric value (1 to 16) or it can be the keyword **csm**.

Use the numeric value for PTP clocks that transmit and receive PTP messages using IPv4 encapsulation. On the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X, only one PTP instance can be master, slave, or boundary.

Use the **csm** 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.

The **no** form of the command deletes a PTP clock when the *clock-id* is set to a numeric value. The CSM PTP clock cannot be removed.

Parameters *clock-id* — specifies the clock ID of this PTP instance

Values 1 to 16 for PTP clocks that use IPv4 encapsulation

csm for the PTP clock that uses Ethernet encapsulation

create — keyword required when first creating the configuration context for a *clock-id* of 1 to 16. When the context is created, you can navigate into the context without the **create** keyword. The **create** keyword is not required when the *clock-id* is **csm**.

anno-rx-timeout

Syntax **anno-rx-timeout** *number-of-timeouts*
no anno-rx-timeout

Context config>system>ptp>clock
config>system>ptp>clock>ptp-port

Description 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 **no** form of this command returns the configuration to the default value.

Default 3

Parameters *number-of-timeouts* — 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

Values 2 to 10

clock-mda

Syntax **clock-mda** *mda-id*
no clock-mda

Context config>system>ptp>clock

Description 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-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 *clock-id* parameter value is 1 to 16.

The **no** form of this command clears the clock recovery adapter card.

Default n/a

Parameters *mda-id* — *slot/mda*

clock-type

Syntax **clock-type** {**ordinary** {**master** | **slave**} | **boundary** | **transparent-e2e**}
no clock-type

Context config>system>ptp>clock

Description This command configures the type of clock. The **no** form of the command returns the configuration to the default (ordinary slave). The clock type can only be changed when PTP is shut down.

To enable transparent clock processing at the node level, configure a PTP clock with the **transparent-e2e** clock type. The **transparent-e2e** clock type is only available for a PTP clock that transmits and receives PTP messages using IPv4 encapsulation.

Default ordinary slave

Parameters **ordinary master** — configures the clock as an ordinary PTP master

ordinary slave — configures the clock as an ordinary PTP slave

boundary — configures the clock as a boundary clock capable of functioning as both a master and slave concurrently

transparent-e2e — 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-W, 7705 SAR-Wx, and 7705 SAR-X.

domain

Syntax **domain** *domain-value*
no domain

Context config>system>ptp>clock

Description 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.

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 0 when the profile is configured as either **ieee1588-2008** or **itu-telecom-freq**

24 when the profile is configured as **g8275dot1-2014**

Parameters *domain-value* — specifies the PTP device domain value

Values 0 to 127 when the profile is configured as either **ieee1588-2008** or **itu-telecom-freq**

24 to 43 when the profile is configured as **g8275dot1-2014**

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

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**. 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; this parameter is only relevant when the PTP profile is set to **g8275dot1-2014**

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(base2) (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 either **ieee1588-2008** or **itu-telecom-freq**

–3 (8 packets /s) when the profile is configured as **g8275dot1-2014**

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 0 to 3, where 0 = 1 s, 1 = 2 s, 2 = 4 s, 3 = 8 s, when the profile is configured as either **ieee1588-2008** or **itu-telecom-freq**

–3 to 4, where –3 = 0.125 s, 4 = 16 s when the profile is configured as **g8275dot1-2014**

network-type

Syntax **network-type** {**sdh** | **sonet**}
no network-type

Context config>system>ptp>clock

Description This command configures 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 **csm**.

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

Syntax **port** *port-id* [**create**]
no port *port-id*

Context config>system>ptp>clock

Description 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 address command). Either address can be configured for the PTP messages sent through this port.

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.

This command is only available when the *clock-id* parameter is defined as **csm**.

Default n/a

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

address

Syntax **address** {**01:1b:19:00:00:00** | **01:80:c2:00:00:0e**}
no address

Context config>system>ptp>clock>port

Description 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:

- 01-1B-19-00-00-00 for all messages except peer delay messages
- 01-80-C2-00-00-0E for peer delay messages

The system will accept PTP messages received using either destination MAC address, regardless of the address configured by this command.

The **no** form of this command returns the address to the default value.

Default 01:1b:19:00:00:00

log-delay-interval

Syntax **log-delay-interval** *log-delay-interval*
no log-delay-interval

Context config>system>ptp>clock>port

Description This command configures the minimum interval between multicast Delay_Req messages. 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 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 messages. If the value of the logMessageInterval field for those messages is greater than the value configured locally to generate Delay_Req messages, then the slave port must use the longer interval for generating Delay_Req messages.

The *log-delay-interval* is calculated using the binary logarithm of the value of the interval in seconds.

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 –6 when the profile is configured as **ieee1588-2008**

–4 when the profile is configured as **g8275dot1-2014**

Parameters *log-delay-interval* — specifies the expected interval between the receipt of Delay_Req messages

Values –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, and –1 is 2 packets/s when the profile is configured as **ieee1588-2008**

–4 to 0, where –4 is 16 packets/s, when the profile is configured as **g8275dot1-2014**

log-sync-interval

Syntax **log-sync-interval** *log-sync-interval*
no log-sync-interval

Context config>system>ptp>clock>port
config>system>ptp>clock>ptp-port

Description This command configures the interval between transmission of synchronization packets for a PTP port in a master state.

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 –6 when the profile is configured as either **ieee1588-2008** or **itu-telecom-freq**

–4 when the profile is configured as **g8275dot1-2014**

Parameters *log-sync-interval* — specifies the expected interval between the reception of synchronization messages

Values –6 or –7, where –6 is 64 packets/s and –7 is 128 packets/s, when the profile is configured as either **ieee1588-2008** or **itu-telecom-freq**

–4 to 0, where –4 is 16 packets/s –3 is 8 packets/s, –2 is 4 packets/s, and –1 is 2 packets/s, when the profile is configured as **g8275dot1-2014**

master-only

Syntax **master-only** {**true** | **false**}

Context config>system>ptp>clock>port

Description 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.

This command only applies when the profile command is set to **g8275dot1-2014**.

If the **clock-type** command is set to *ordinary slave*, the **master-only** value is set to *false* and cannot be changed. Similarly, if the **clock-type** command is set to *ordinary master*, the **master-only** value is set to *true* and cannot be changed.

Default true (when the PTP **clock-type** is set to *boundary*)

priority1

Syntax **priority1** *priority-value*
no priority1

Context config>system>ptp>clock

Description 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.

When the profile command is set to **g8275dot1-2014**, the priority1 value is set to the default value of 128 and cannot be changed.

The **no** form of the command returns the configuration to the default value.

Default 128

Parameters *priority* — specifies the priority1 value of the local clock

Values 0 to 255

priority2

Syntax **priority2** *priority-value*
no priority2

Context config>system>ptp>clock

Description 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.

When the profile command is set to **g8275dot1-2014** and the clock-type is configured as o**rdinary slave**, the priority2 value is set to the default value of 255 and cannot be changed.

The **no** form of the command returns the configuration to the default value.

Default 128

Parameters *priority* — specifies the priority2 value of the local clock

Values 0 to 255 when the profile is configured as **ieee1588-2008**, or when the profile is configured as **g8275dot1-2014** and the clock type is configured as **ordinary master** or **boundary**

profile

Syntax **profile** {**g8275dot1-2014** | **ieee1588-2008** | **itu-telecom-freq**}
no profile

Context config>system>ptp>clock

Description 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 **no** form of the command returns the configuration to the default setting.

Default ieee1588-2008

Parameters **ieee1588-2008 —** configures the PTP profile to follow the IEEE 1588-2008 specification rules

itu-telecom-freq — configures the PTP profile to follow the ITU G.8265.1 specification rules; this option is only available when the *clock-id* parameter value is 1 to 16

g8275dot1-2014 — configures the PTP profile to follow the ITU G.8275.1 specification rules

ptp-port

Syntax **ptp-port** *port-id*

Context config>system>ptp>clock

Description This command configures an IEEE 1588v2 logical port in the system. It also creates the context to configure parameters for IEEE 1588v2. PTP ports are created when the clock type is set with the clock-type command.

This command is only available when the *clock-id* 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 one 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-W, 7705 SAR-Wx, or 7705 SAR-X, rather than on individual ports, as 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 50

ip-address

Syntax **ip-address** *ip-address*
no ip-address

Context config>system>ptp>clock>ptp-port>peer

Description This command configures a remote PTP peer address and provides 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.

Default n/a

Parameters *ip-address* — specifies the IP address of the remote peer

Values a.b.c.d

unicast-negotiate

Syntax [**no**] **unicast-negotiate**

Context config>system>ptp>clock>ptp-port

Description 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 **no** form of this command disables **unicast-negotiate**. 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.

Default unicast-negotiate

source-interface

Syntax **source-interface** *ip-if-name*
no source-interface

Context config>system>ptp>clock

Description 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 *clock-id* parameter value is 1 to 16.

If the *ip-if-name* refers to a loopback or system address, then the remote peer must send packets to ingress on this particular loopback or system address. If the *ip-if-name* refers to an interface that is associated with a physical port or VLAN, then the remote peer must send packets to ingress on this particular IP interface.

Default n/a

Parameters *ip-if-name* — specifies the IP interface used by the PTP slave clock

use-node-time

Syntax [**no**] **use-node-time**

Context config>system>ptp>clock

Description This command configures whether the PTP clock will generate event messages based on system time.

To enable ToD/phase distribution capability in a master or boundary clock, select **use-node-time**. 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 **use-node-time** mode will function similar to a grand master clock with GNSS traceability.

This command only applies to master or boundary clocks when:

- the profile setting for the PTP clock is **ieee1588-2008** (default configuration) or **g8275dot1-2014** (see the profile command for the **config>system>ptp>clock** context)
- the *clock-id* parameter value is 1 to 16

Default no use-node-time

use-node-time when the profile for the master clock is configured as **g8275dot1-2014**

Administration Commands

- System Administration Commands
- High Availability (Redundancy) Commands

System Administration Commands

admin

Syntax **admin**

Context <ROOT>

Description This command enables the context to configure administrative system commands. Only authorized users can execute the commands in the **admin** context.

Default n/a

debug-save

Syntax **debug-save** *file-url*

Context admin

Description This command saves existing debug configuration. Debug configurations are not preserved in configuration saves.

Default n/a

Parameters *file-url* — the file URL location to save the debug configuration (see Table 14 for parameter descriptions)

disconnect

Syntax **disconnect** {**address** *ip-address* | **username** *user-name* | **console** | **telnet** | **ftp** | **ssh** | **mct**}

Context admin

Description This command disconnects a user from a console, Telnet, FTP, SSH, SFTP, or MPT craft terminal (MCT) session.

If any of the console, Telnet, FTP, SSH, or MCT options are specified, then only the respective sessions are affected. The **ssh** keyword disconnects users connected to the node via SSH or SFTP.

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.

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.

Default n/a — no disconnect options are configured

Parameters *ip-address* **—** the IP address to disconnect

Values	*ip-int-name:*	32 characters maximum
	ipv4-address:	a.b.c.d (1.0.0.0 to 223.255.255.255)
	ipv6-address:	x:x:x:x:x:x:x:x (eight 16-bit pieces)
		x:x:x:x:x:x:d.d.d.d
		x: [0..FFFF]H
		d: [0..255]D

user-name **—** the name of the user

console — disconnects the console session

telnet — disconnects the Telnet session

ftp — disconnects the FTP session

ssh — disconnects the SSH or SFTP session

mct — disconnects the MCT session

display-config

Syntax **display-config** [**detail** | **index**]

Context admin

Description This command displays the system's running configuration.

By default, only non-default settings are displayed.

Specifying the **detail** option displays all default and non-default configuration parameters.

Parameters **detail —** displays default and non-default configuration parameters

index — displays only persistent indexes

reboot

Syntax **reboot** [**active** | **standby**] | [**upgrade**] [**now**]

Context admin

Description This command reboots the router including redundant CSMs or upgrades the boot ROMs.

If no options are specified, the user is prompted to confirm the reboot operation. For example:

```
ALU-1>admin# reboot
Are you sure you want to reboot (y/n)?
```

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

Syntax **save** [*file-url*] [**detail**] [**index**]

Context admin

Description This command saves the running configuration to a configuration file. For example:

```
ALU-1>admin# save ftp://test:test@192.168.x.xx/./100.cfg
Saving configuration .........Completed.
```

By default, the running configuration is saved to the primary configuration file.

Parameters *file-url* — the file URL location to save the configuration file (see Table 14 for parameter descriptions)

Default the primary configuration file location

detail — saves both default and non-default configuration parameters

Default saves non-default configuration parameters

index — 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.

enable-tech

Syntax [**no**] **enable-tech**

Context admin

Description This command enables the shell and kernel commands.

Note: This command should only be used with authorized direction from the Alcatel-Lucent Technical Assistance Center (TAC).

tech-support

Syntax **tech-support** *file-url*

Context admin

Description 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.”)
- yyyymmdd 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 Alcatel-Lucent Technical Assistance Center (TAC).

Parameters *file-url* — the file URL location to save the binary file (see Table 14 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 14 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.

Alcatel-Lucent 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 7705 SAR OS 7.0.Rx Software Release Notes, part number 3HE10099000xTQZZA, "Standard Software Upgrade Procedure" for complete instructions.

Parameters *file-url* — the file URL location to use for upgrading the **boot.ldr** file (see Table 14 for parameter descriptions)

Default the new **boot.ldr** file location

High Availability (Redundancy) Commands

redundancy

Syntax **redundancy**

Context admin
config

Description This command enters the context to allow the user to perform redundancy operations.

force-switchover

Syntax **force-switchover** [**now**]

Context admin>redundancy

Description This command forces a switchover to the standby CSM card. The primary CSM reloads its software image and becomes the secondary CSM.

Parameters **now —** forces the switchover to the redundant CSM card immediately

switchover-exec

Syntax **switchover-exec** *file-url*
no switchover-exec

Context config>system

Description 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 *file-url* parameter is not specified, no CLI script file is executed.

Default n/a

Parameters *file-url* — specifies the location and name of the CLI script file (see Table 14 for parameter descriptions)

synchronize

Syntax **synchronize** {**boot-env** | **config**}

Context admin>redundancy
config>redundancy

Description This command performs a synchronization of the standby CSM's images and/or config files to the active CSM. Either the **boot-env** or **config** parameter must be specified.

In the **admin>redundancy** context, this command performs a manually triggered standby CSM synchronization.

In the **config>redundancy** context, this command performs an automatically triggered standby CSM synchronization.

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.

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.

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.

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).

Default n/a for admin — redundancy context

enabled for config — redundancy context

Parameters **boot-env —** synchronizes all files required for the boot process (loader, BOF, images, and configuration files

config — synchronizes only the primary, secondary, and tertiary configuration files

Default config

multi-chassis

Syntax **multi-chassis**

Context config>redundancy

Description This command enables the context to configure multi-chassis parameters.

peer

Syntax [**no**] **peer** *ip-address* [**create**]

Context config>redundancy>multi-chassis

Description This command configures a multi-chassis redundancy peer.

Parameters *ip-address* — specifies a peer IP address. A multicast address is not allowed.

create — keyword required when first creating the configuration context. When the context is created, you can navigate into the context without the **create** keyword.

authentication-key

Syntax **authentication-key** [*authentication-key* **|** *hash-key*] [**hash | hash2**]
no authentication-key

Context config>redundancy>multi-chassis>peer

Description 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.

Parameters *authentication-key* — 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

Syntax **description** *description-string*
no description

Context config>redundancy>multi-chassis>peer

Description This command configures a text description and associates it with a configuration context to help identify the content in a configuration file.

The **no** form of the command removes the string from the configuration.

Default n/a

Parameters *description-string* — specifies the text description

Values 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-lag

Syntax [**no**] **mc-lag**

Context config>redundancy>multi-chassis>peer

Description This command enables the context to configure multi-chassis LAG parameters.

The **no** form of this command administratively disables multi-chassis LAG. The **no mc-lag** command can only be issued only when MC-LAG is shut down.

Default n/a

hold-on-neighbor-failure

Syntax **hold-on-neighbor-failure** *multiplier*
no hold-on-neighbor-failure

Context config>redundancy>multi-chassis>peer>mc-lag

Description 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 **no** form of the command sets this parameter to its default value.

Default 3

Parameters *multiplier* — 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.

Values 2 to 25

keep-alive-interval

Syntax **keep-alive-interval** *interval*
no keep-alive-interval

Context config>redundancy>multi-chassis>peer>mc-lag

Description 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 interval is set in deciseconds.

The **no** form of the command sets the interval to its default value.

Default 10 (1s)

Parameters *interval* — the time interval expressed in deciseconds

Values 5 to 500

lag

Syntax **lag** *lag-id* **lacp-key** *admin-key* **system-id** *system-id* [**remote-lag** *lag-id*] **system-priority** *system-priority*
no lag *lag-id*

Context config>redundancy>multi-chassis>peer>mc-lag

Description 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 **lacp-key**, **system-id**, and **system-priority** 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.

Default n/a

Parameters *lag-id* — the LAG identifier, expressed as a decimal integer. You must specify the LAG ID. Specifying the *lag-id* allows a mismatch between *lag-id* on the redundant pair. If you have two existing nodes which already have LAG IDs that do not match, and an MC-LAG is to be created using these nodes, then you must specify the correct **remote-lag** *lag-id* 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).

Values 1 to 32

admin-key — 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

Values 1 to 65535

system-id — specifies a 6-bit value expressed in the same notation as a MAC address

Values xx:xx:xx:xx:xx:xx -xx[00..FF]

remote-lag *lag-id* **—** specifies the LAG ID on the remote system

Values 1 to 200

system-priority — specifies the system priority to be used in the context of the MC-LAG. The partner system will consider all ports using the same **lacp-key**, **system-id**, and **system-priority** as part of the same LAG.

Values 1 to 65535

source-address

Syntax **source-address** *ip-address*
no source-address

Context config>redundancy>multi-chassis>peer

Description This command specifies the source address used to communicate with the multi-chassis peer.

Parameters *ip-address* — specifies the source address used to communicate with the multi-chassis peer

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* [**interface** *interface-name*]] [**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

Values ipv4-address: a.b.c.d (host bits must be 0)

interface-name — displays connection information only for the specified interface

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 29 describes the fields.

Sample Output

```
A:ALU-1# show system connections
===============================================================================
Connections :
===============================================================================
Proto     RecvQ     TxmtQ Local Address                               State
                          Remote Address                                 vRtrID
-------------------------------------------------------------------------------
TCP           0         0 0.0.0.0.21                                  LISTEN
                          0.0.0.0.0                                      0
TCP           0         0 0.0.0.0.23                                  LISTEN
                          0.0.0.0.0                                      0
TCP           0         0 0.0.0.0.179                                 LISTEN
                          0.0.0.0.0                                      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
                          0.0.0.0.0                                      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 0.0.0.0.123                                  ---
                      0.0.0.0.0                                        0
UDP         0       0 0.0.0.0.646                                  ---
                      0.0.0.0.0                                        0
UDP         0       0 0.0.0.0.17185                                ---
                      0.0.0.0.0                                        0
UDP         0       0 10.10.10.xxx.646                             ---
                      0.0.0.0.0                                        0
UDP         0       0 127.0.0.1.50130                              ---
                      127.0.0.1.17185                                4095
-------------------------------------------------------------------------------
No. of Connections: 14
===============================================================================
A:ALU-1#
```

Sample Detailed Output

```
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
===============================================================================
A:ALU-1#
```

Table 29: Show System Connections Output Fields

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

cpu

Syntax **cpu** [**sample-period** *seconds*]

Context show>system

Description This command displays CPU usage per task over a sample period.

Parameters *seconds* — the number of seconds over which to sample CPU task usage

Default 1

Values 1 to 10

Output The following output is an example of system CPU information, and Table 30 describes the fields.

Sample Output

```
A:ALU-1# show system cpu sample-period 2
===============================================================================
CPU Utilization (Sample period: 2 seconds)
===============================================================================
Name                                       CPU Time       CPU Usage        Capacity
                                            (uSec)                            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 30: Show System CPU Output Fields

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

Table 30: Show System CPU Output Fields (Continued)

Label	Description
Capacity Usage	Displays the level at which the specified service is being utilized. When this number hits 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>cron

Description This command enters the show CRON context.

action

Syntax **action** [*action-name*] [**owner** owner-name] **run-history** *run-state*

Context show>cron

Description This command displays cron action parameters.

Parameters *action-name* — specifies the action name

Values maximum 32 characters

owner-name — specifies the owner name

Default TiMOS CLI

run-state — specifies the state of the test to be run

Values executing, initializing, terminated

Output The following output is an example of cron action information, and Table 31 describes the fields.

Sample Output

```
*A:Redundancy# show cron action run-history terminated
===============================================================================
CRON Action Run History
===============================================================================
Action "test"
Owner "TiMOS CLI"
-------------------------------------------------------------------------------
Script Run #17
-------------------------------------------------------------------------------
Start time    : 2006/11/06 20:30:09     End time      : 2006/11/06 20:35:24
Elapsed time  : 0d 00:05:15             Lifetime      : 0d 00:00:00
State         : terminated              Run exit code : noError
Result time   : 2006/11/06 20:35:24     Keep history  : 0d 00:49:57
Error time    : never
Results file  : ftp://*:*@192.168.15.18/home/testlab_bgp/cron/_20061106-203008.
                out
Run exit      : Success
-------------------------------------------------------------------------------
Script Run #18
-------------------------------------------------------------------------------
Start time    : 2006/11/06 20:35:24     End time      : 2006/11/06 20:40:40
Elapsed time  : 0d 00:05:16             Lifetime      : 0d 00:00:00
State         : terminated              Run exit code : noError
Result time   : 2006/11/06 20:40:40     Keep history  : 0d 00:55:13
Error time    : never
Results file  : ftp://*:*@192.168.15.18/home/testlab_bgp/cron/_20061106-203523.
                out
Run exit      : Success
===============================================================================
-------------------------------------------------------------------------------
*A:Redundancy#

*A:Redundancy# show cron action run-history executing

===============================================================================
CRON Action Run History
===============================================================================
Action "test"
Owner "TiMOS CLI"
-------------------------------------------------------------------------------
Script Run #20
-------------------------------------------------------------------------------
Start time    : 2006/11/06 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/_20061106-204559.
                out
===============================================================================
-------------------------------------------------------------------------------
*A:Redundancy#
```

```
*A:Redundancy# show cron action run-history initializing

===============================================================================
CRON Action Run History
===============================================================================
Action "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:Redundancy#
```

Table 31: Show Cron Run History Output Fields

Label	Description
Action	The name of the action
Action owner	The name of the action 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

Table 31: Show Cron Run History Output Fields (Continued)

Label	Description
Script source location	The location of scheduled script
Max running allowed	The maximum number of allowed sessions
Max completed run histories	The maximum number of sessions previously run
Max lifetime allowed	The maximum amount of time the script may run
Completed run histories	The number of completed sessions
Executing run histories	The number of sessions in the process of executing
Initializing run histories	The number of sessions ready to run/queued but not executed
Max time run history saved	The maximum amount of time to keep the results from a script run
Last change	The system time a change was made to the configuration

schedule

Syntax **schedule** [*schedule-name*] [**owner** *owner-name*]

Context show>cron

Description This command displays cron schedule parameters.

Parameters *schedule-name* — displays information for the specified scheduler name

owner-name — displays information for the specified scheduler owner

Output The following output is an example of cron schedule information, and Table 32 describes the fields.

Sample Output

```
A:ALU-1>show>cron schedule test
===============================================================================
CRON Schedule Information
===============================================================================
Schedule                     : test
Schedule owner               : TiMOS CLI
Description                  : none
Administrative status        : enabled
Operational status           : enabled
Action                       : test
Action owner                 : TiMOS CLI
Script name                  : test
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
Weekday                      : none
Month                        : none
Day of month                 : none
Hour                         : none
Minute                       : none
Number of schedule runs      : 10
Last schedule run            : 2006/11/07 17:20:52
Number of schedule failures  : 0
Last schedule failure        : no error
Last failure time            : never
===============================================================================
A:ALU-1>show>cron
```

Table 32: Show Cron Schedule Output Fields

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
Action	The name of the action
Action owner	The name of the action 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 have been sent
Schedule type	Periodic — displays a schedule that ran at a given interval
	Calendar — displays a schedule that ran based on a calendar
	Oneshot — displays a schedule that ran one time only
Interval	Displays the interval between runs of an event

Table 32: Show Cron Schedule Output Fields (Continued)

Label	Description
Next scheduled run	The time for the next scheduled run
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 scheduled runs	The number of scheduled sessions
Last scheduled run	The last scheduled session
Number of scheduled failures	The number of scheduled sessions that failed to execute
Last scheduled failure	The last scheduled session that failed to execute
Last failure time	The system time of the last failure

script

Syntax **script** [*script-name*] [**owner** *owner-name*]

Context show>cron

Description This command displays cron script parameters.

Parameters *script-name* — displays information for the specified script

owner-name — displays information for the specified script owner

Output The following output is an example of cron script information, and Table 33 describes the fields.

Sample Output

```
A:ALU-1>show>cron# script
===============================================================================
CRON Script Information
===============================================================================
Script                        : test
Owner name                    : TiMOS CLI
Description                   : asd
Administrative status         : enabled
Operational status            : enabled
Script source location        : ftp://*****:******@192.168.15.1/home/testlab_bgp
```

```
                                /cron/test1.cfg
Last script error             : none
Last change                   : 2006/11/07 17:10:03
===============================================================================
A:ALU-1>show>cron#
```

Table 33: Show Cron Script Output Fields

Label	Description
Script	The name of the script
Script owner	The owner name of 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

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 34 describes the fields.

Sample Output

```
A:ALU-1>show>system# dhcp6
===============================================================================
DHCP6 system
===============================================================================
Global NoAddrsAvail status   : esm-relay server
===============================================================================
```

Table 34: Show DHCPv6 Configuration Output Fields

Label	Description
Status	The system-wide status of DHCPv6 functionality

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 35 describes the fields.

Sample Output

```
A:ALU-1# show system information
===============================================================================
System Information
===============================================================================
System Name            : ALU-1
System Type            : 7705 SAR-8
System Version         : B-0.0.I323
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 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 ALCATEL-LUCENT 7705 SAR #
                         Copyright (c) 2000-2008 Alcatel-Lucent. All rights
                         reserved. # All use subject to applicable license
                         agreements. # Built on Wed Feb 13 19:45:00 EST 2008 by
                         builder in /rel5.0/R3/panos/main # Generated TUE
                         MAR 11 16:24:27 2008 UTC
```

```
Last Boot Index Version: N/A
Last Boot Index Header : # TiMOS-B-5.0.R3 both/hops ALCATEL-LUCENT 7705 SAR #
                         Copyright (c) 2000-2008 Alcatel-Lucent. All rights
                         reserved. # All use subject to applicable license
                         agreements. # Built on Wed Feb 13 19:45:00 EST 2008 by
                         builder in /rel5.0/R3/panos/main # Generated TUE
                         MAR 11 16:24:27 2008 UTC
Last Saved Config      : N/A
Time Last Saved        : N/A
Changes Since Last Save: Yes
User Last Modified     : admin
Time Last Modified     : 2008/03/19 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     : 138.120.xxx.xxx/24
Primary DNS Server     : 138.120.xxx.xxx
Secondary DNS Server   : N/A
Tertiary DNS Server    : N/A
DNS Domain             : ca.alcatel.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

ICMP Vendor Enhancement: Disabled
===============================================================================
A:ALU-1#
```

Table 35: Show System Information Output Fields

Label	Description
System Name	The configured system name
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 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 Max Message Size:	The maximum SNMP packet size generated by this node

Table 35: Show System Information Output Fields (Continued)

Label	Description
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
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

Table 35: Show System Information Output Fields (Continued)

Label	Description
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.
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

Table 35: Show System Information Output Fields (Continued)

Label	Description
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
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

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 36 describes the fields.

Sample Output

```
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 System Name
1/1/1      NB     57:30:ff:00:00:00   1      1/1/1, 10/*     ALU-2
1/1/3      NB     57:30:ff:00:00:00   1      1/2/1, int*     ALU-2
1/1/1      NB     57:37:ff:00:00:00   1      2/1/1, 10/*     ALU-3
1/1/2      NB     57:37:ff:00:00:00   1      2/1/2, 10/*     ALU-3
1/1/3      NB     57:37:ff:00:00:00   1      2/2/1, test     ALU-3
2/1/3      NB     57:37:ff:00:00:00   1      2/2/2, int*     ALU-3
-------------------------------------------------------------------------------
Number of neighbors: 6
A:ALU-1#
```

Table 36: Show LLDP Neighbor Output Fields

Label	Description
Lcl Port	The physical port ID of the local port in *slot/mda/port* 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 local interface index (ifindex)
Remote Port	The physical port ID of the remote port in *slot/mda/port* 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 System Name	The name of the remote chassis

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 37 describes the fields.

Sample Output

```
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 37: Show Memory Pool Output Fields

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**

Context show>system

Description This command displays NTP protocol configuration and state.

Output The following output is an example of NTP information, and Table 38 describes the fields.

Sample Output

```
A:pc-40>config>system>time>ntp# show system ntp
===============================================================================
NTP Status
===============================================================================
Enabled            : Yes                Stratum             : 3
Admin Status       : up                 Oper Status         : up
Server enabled     : No                 Server keyId        : none
System Ref Id      : 192.168.15.221     Auth Check          : Yes
===============================================================================

A:pc-40>config>system>time>ntp# show system ntp all
===============================================================================
NTP Status
===============================================================================
Enabled            : Yes                Stratum             : 3
Admin Status       : up                 Oper Status         : up
Server enabled     : No                 Server keyId        : none
System Ref Id      : 192.168.15.221     Auth Check          : Yes
===============================================================================

===============================================================================
NTP Active Associations
===============================================================================
State      Remote          Reference ID   St Type   A    Poll  Reach Offset(ms)
-------------------------------------------------------------------------------
reject     192.168.15.221  192.168.14.50  2  srvr   none  64   y      0.901
chosen     192.168.15.221  192.168.14.50  2  mclnt  none  64   y      1.101
===============================================================================
A:pc-40>config>system>time>ntp#

A:pc-40>config>system>time>ntp# show system ntp detail
===============================================================================
NTP Status
===============================================================================
Enabled            : Yes                Stratum             : 3
Admin Status       : up                 Oper Status         : up
Server enabled     : No                 Server keyId        : none
System Ref Id      : 192.168.15.221     Auth Check          : Yes
Auth Errors        : 0                  Auth Errors Ignored  : 0
Auth Key Id Errors : 0                  Auth Key Type Errors : 0
===============================================================================
A:pc-40>config>system>time>ntp#

A:pc-40>config>system>time>ntp# show system ntp detail all
===============================================================================
NTP Status
===============================================================================
Enabled            : Yes                Stratum             : 3
Admin Status       : up                 Oper Status         : up
Server enabled     : No                 Server keyId        : none
System Ref Id      : 192.168.15.221     Auth Check          : Yes
MDA Timestamp      : Yes                Auth Errors Ignored  : 0
Auth Errors        : 0                  Auth Errors Ignored  : 0
Auth Key Id Errors : 0                  Auth Key Type Errors : 0
===============================================================================
```

```
===============================================================================
NTP Active Associations
===============================================================================
State      Remote          Reference ID    St  Type   A     Poll  R  Offset(ms)
-------------------------------------------------------------------------------
reject     192.168.15.221  192.168.14.50   2   srvr   none  64    y  0.901
chosen     192.168.15.221  192.168.1.160   4   mclnt  none  64    y  1.101
===============================================================================
```

Table 38: Show System NTP Output Fields

Label	Description
Enabled	NTP enabled or disabled state. Output is yes or no.
Admin Status	Administrative state. Output is up or down.
Server Enabled	The NTP server state of this node. Output is yes or no.
Stratum	The stratum level of this node
Oper Status	The operational state, either up or down.
Auth Check	Displays authentication requirement. Output is yes or no.
System Ref. ID	IP address of this node or a 4-character ASCII code showing the state
MDA Timestamp	Enhanced NTP performance using MDA timestamping. Output is yes or no.
Auth Error	Authentication errors
Auth Errors Ignored	Authentication errors ignored
Auth key ID Errors	Authentication key identification errors
Auth Key Type Errors	Authentication key type errors
Peer Status/State	The operational status of the peer
Reject	The peer is rejected and will not be used for synchronization. Rejection reasons could be the peer is unreachable, the peer is synchronized to this local server so synchronizing with it would create a sync loop, or the synchronization distance is too large. This is the normal startup state.
Invalid	The peer is not maintaining an accurate clock. This peer will not be used for synchronization.
Excess	The peer's synchronization distance is greater than ten other peers. This peer will not be used for synchronization.
Outlyer	The peer is discarded as an outlier. This peer will not be used for synchronization.
Candidate	The peer is accepted as a possible source of synchronization

Table 38: Show System NTP Output Fields (Continued)

Label	Description
Selected	The peer is an acceptable source of synchronization, but its synchronization distance is greater than six other peers
Chosen	The peer is chosen as the source of synchronization
ChosenPPS	The peer is chosen as the source of synchronization, but the actual synchronization is occurring from a pulse-per-second (PPS) signal
Remote	The ip address of the remote NTP server or peer with which this local host is exchanging NTP packets
Reference ID	When stratum is between 0 and 15, this field shows the IP address of the remote NTP server or peer with which the remote 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 displays the following codes: Peer Codes: ACST — the association belongs to any cast server AUTH — server authentication failed. Please wait while the association is restarted. AUTO — autokey sequence failed. Please wait while the association is restarted. BCST — the association belongs to a broadcast server 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. DENY — access denied by remote server. No further messages will be sent to the server. DROP — lost peer in symmetric mode. Please wait while the association is restarted. RSTR — access denied due to local policy. No further messages will be sent to the server. INIT — the association has not yet synchronized for the first time MCST — the association belongs to a manycast server NKEY — no key found. Either the key was never installed or is not trusted. RATE — rate exceeded. The server has temporarily denied access because the client exceeded the rate threshold. RMOT — the association from a remote host running ntpdc has had unauthorized attempted access STEP — a step change in system time has occurred, but the association has not yet resynchronized system codes

Table 38: Show System NTP Output Fields (Continued)

Label	Description
Reference ID (continued)	INIT — the system clock has not yet synchronized for the first time STEP — a step change in system time has occurred, but the system clock has not yet resynchronized
Auth	Authentication
Poll	Polling interval in seconds
R	Yes — the NTP peer or server has been reached at least once in the last 8 polls
	No — the NTP peer or server has not been reached at least once in the last 8 polls
Offset	The time between the local and remote UTC time, in milliseconds

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 39 describes the fields.

Sample output

```
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 39: Show System PoE Status Output Fields

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**

Context show>system

Description This command enters the show PTP context.

clock

Syntax **clock** *clock-id* [**bmc**] [**detail**] [**standby**] [**statistics**] [**summary**] [**timestamp**] [**unicast**]

Context show>system>ptp

Description This command displays PTP clock information.

Timestamp is information is not available for the 2-port 10GigE (Ethernet) module.

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.

timestamp — displays PTP packet timestamp 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 (Sample Output, Table 40)
- PTP clock summary information (Sample Output, Table 41)
- PTP clock detailed information (Sample Output, Table 42)
- PTP clock timestamp information (Sample Output, Table 43)

Sample Output

```
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 40: Show System PTP Clock CSM Output Fields

Label	Description
Local Clock	
Clock Type	The local PTP clock type, one of: ordinary master, ordinary slave, boundary, or transparent-e2e
PTP Profile	The PTP profile, as configured by the profile command, one of: ieee-1588, itu-telecom-freq, or g8275dot1-2014
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
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

Table 40: Show System PTP Clock CSM Output Fields (Continued)

Label	Description
Frequency Offset	The frequency offset of the PTP clock in parts per billion
Time Information	
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
===============================================================================
Port/Peer Summary
-------------------------------------------------------------------------------
Prt/ Peer IP        Slave Port   Dyn/ In/ Anno        Sync        Delay
Peer                      State  Stat Out                         Req/Resp
===============================================================================
1/1  10.222.222.10   yes  slave   sta in  623         82990       82988
                                  sta out 0           0           82988
1/2                  no   slave   sta in  0           0           0
                                  sta out 0           0           0
===============================================================================
===============================================================================
Unicast Negotiation Summary
-------------------------------------------------------------------------------
Prt/ Peer IP         In/ Anno   Sync   Delay  Anno       Sync       Delay
Peer                 Out Lease  Lease  Lease  Rate       Rate       Rate
===============================================================================
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                            Clk   Clk   Clk                          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                         Req/Resp
===============================================================================
```

```
1/1  200.253.252.10  no   master  sta in  7         0           0
                                  sta out 770       0           0
2/1  200.254.254.10  no   master  sta in  0         0           103052
                                  sta out 773       103054      103052
3/1  6.6.6.5         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  192.168.2.11    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  200.253.252.10  in  166    0      0      1 pkt/2 s  -          -
                     out 228    -      -      1 pkt/2 s  -          -
2/1  200.254.254.10  in  1      0      0      -          -          -
                     out 231    235    235    1 pkt/2 s  64 pkt/ s  64 pkt/s
3/1  6.6.6.5         in  1      0      0      -          -          -
                     out -      -      -      -          -          -
4/1                  -   -      -      -      -          -          -
                     out -      -      -      -          -          -
5/1                  -   -      -      -      -          -          -
                     out -      -      -      -          -          -
6/1                  -   -      -      -      -          -          -
                     out -      -      -      -          -          -
7/1                  -   -      -      -      -          -          -
                     out -      -      -      -          -          -
8/1                  -   -      -      -      -          -          -
                     out -      -      -      -          -          -
9/1  192.168.2.11    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                          Rem
                                Cls    Acc    Var
===============================================================================
1/1  200.253.252.10  no    128   13     254    65535  128  002105fffe6da9b7 0
2/1  200.254.254.10  no    -     -      -      -      -    -                -
3/1  6.6.6.5         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 41: Show System PTP Clock Summary Output Fields

Label	Description
Prt/Peer	The PTP port and peer ID as configured in the config system ptp clock context
Peer IP	The IP address of the PTP peer
Slave	Indicates whether or not the clock is in a slave state
Port State	The PTP port state: initializing, listening, uncalibrated, slave, master, or passive
Dyn/Stat	Indicates if the peer is statically configured or dynamically requested
In/Out	The direction of the packet counts
Anno	The number of ingress or egress announce packets

Table 41: Show System PTP Clock Summary Output Fields (Continued)

Label	Description
Sync	The number of ingress or egress synchronization packets
Delay: Req/Resp	The number of ingress or egress delay request or 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.
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

Sample Output

```
A:# show system ptp clock 1 detail

===============================================================================
IEEE1588 PTP Clock Information
===============================================================================
-------------------------------------------------------------------------------
Local Clock
-------------------------------------------------------------------------------
Clock Type           : boundary         Admin State          : up
Source I/F           : ptp loop         Clock MDA            : 1/1
PTP Profile          : ieee1588-2008    Dynamic Peers        : not allowed
Admin Freq-source    : ssu              Oper Freq-source     : ptp
Clock ID             : 0025bafffed119b7 Clock Class          : 255
Clock Accuracy       : unknown(254)     Clock Variance       : not computed
```

```
Clock Priority1       : 128              Clock Priority2      : 128
Domain                : 0                Two-Step             : unknown
Use Node Time         : no
-------------------------------------------------------------------------------
Parent Clock
-------------------------------------------------------------------------------
Parent Clock ID       : 001af0fffe6808a7 Parent 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
-------------------------------------------------------------------------------
Time Information
-------------------------------------------------------------------------------
Timescale             : PTP
Recovered Date/Time   : 01/03/70 22.03.54 (TAI)
UTC Offset            : 35
Freq Traceable        : true
Time Traceable        : true
Time Source           : gps
leap59                : false
leap61                : false
===============================================================================
===============================================================================
Port/Peer Summary
-------------------------------------------------------------------------------
Prt/ Peer IP        Slave Port   Dyn/ In/ Anno        Sync        Delay
Peer                      State  Stat Out                         Req/Resp
===============================================================================
1/1                  no   disabl* sta in  0           0           0
                                  sta out 0           0           0
1/2                  no   disabl* sta in  0           0           0
                                  sta out 0           0           0
===============================================================================
```

Table 42: Show System PTP Clock Detail Output Fields

Label	Description
Local Clock	
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 I/F	The PTP clock source interface as configured by the source-interface command
Clock MDA	The PTP clock-mda as configured by the clock-mda command
PTP Profile	The PTP profile as configured by the profile command
Dynamic Peers	Indicates whether or not dynamic peers are enabled
Admin Freq-source	The administrative value of the frequency source

Table 42: Show System PTP Clock Detail Output Fields (Continued)

Label	Description
Oper Freq-source	The operational value of the frequency source
Clock ID	The local clock identification
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
Domain	The local clock domain
Two-Step	Indicates whether the local clock uses a one-step or two-step synchronization method
Use Node Time	Indicates whether or not the PTP clock uses the node system time as the clock source
Parent Clock	
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
Time Information	
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

Table 42: Show System PTP Clock Detail Output Fields (Continued)

Label	Description
leap59	Indicates whether or not the current UTC minute has 59 seconds
leap61	Indicates whether or not the current UTC minute has 61 seconds
Port/Peer Summary	
Prt/Peer	The PTP port and peer ID as configured in the `config>system>ptp>clock` context
Peer IP	The IP address of the PTP peer
Slave	Indicates whether or not the clock is in a slave state
Port State	The PTP port state: initializing, listening, uncalibrated, slave, master, or passive
Dyn/Stat	Indicates whether the peer is statically configured or dynamically configured
In/Out	The direction of the packet count
Anno	The number of ingress or egress announce packets
Sync	The number of ingress or egress synchronization packets
Delay Req/Resp	The number of ingress or egress delay request or delay response packets

Sample Output

```
A:# show system ptp clock 2 timestamp
===============================================================================
 Timestamp Correction Summary
-------------------------------------------------------------------------------
Phys   In/   Sync           Delay Req
Port   Out   Pkt            Pkt
===============================================================================
1/1/1    in  132941544       0
         out 0               132901419
1/1/2    in  216682263       0
         out 0               10465790
1/1/3    in  0               0
         out 0               0
1/1/4    in  0               0
         out 0               0
1/1/5    in  0               0
         out 0               0
1/1/6    in  0               0
         out 0               0
1/1/7    in  0               0
         out 0               0
1/1/8    in  0               0
         out 0               0
1/1/9    in  0               0
```

```
        out 0              0
1/1/10  in  0              0
        out 0              0
1/1/11  in  0              0
        out 0              0
1/1/12  in  0              0
        out 0              0
```

Table 43: Show System PTP Clock Timestamp Output Fields

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
Delay Req Pkt	The number of ingress or egress delay request 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 **csm**.

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 44 describes the fields.

Sample Output

```
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
PTP Port State       : slave
===============================================================================
```

Table 44: Show System PTP Port Output Fields

Label	Description
Admin State	up — The SNTP server is administratively up
	down — The SNTP server 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^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
PTP Port State	The PTP port state: initializing, listening, uncalibrated, slave, master, or passive

peer

Syntax **peer** *peer-id* [**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 45 describes the fields.

Sample Output

```
A:# show system ptp clock 1 ptp-port 1 peer 1 detail

===============================================================================
Peer-1
===============================================================================
IP Address           : 10.222.222.10    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
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 Peer-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
Delay Response Packets                          113838                 0
Delay Request Packets                                0            113838
Follow-Up Packets                                    0
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
===============================================================================
                             sync   delay-req       phase        phase
                        pkt delay   pkt delay       error        error
                           stddev      stddev                   stddev
time                         (ns)        (ns)        (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
```

Table 45: Show System PTP Port Peer Detail Output Fields

Label	Description
Peer-1	
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	Whether the peer-1 clock uses a one-step or two-step synchronization method
Last Rx Anno Msg	The time when the last announce message was received from the peer clock
Unicast Info	
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 45: Show System PTP Port Peer Detail Output Fields (Continued)

Label	Description
PTP Peer-1/Peer-2 Statistics	
	The following input/output statistics are provided for the peer-1/ peer-2 clock: • Signalling Packets • Unicast Request Announce Packets • Unicast Request Announce Timeout • Unicast Request Announce Reject • Unicast Request Sync Packets • Unicast Request Sync Timeout • Unicast Request Sync Reject • Unicast Request Delay Resp Packets • Unicast Request Delay Resp Timeout • Unicast Request Delay Resp Reject • Unicast Grant Announce Packets • Unicast Grant Announce Rejected • Unicast Grant Sync Packets • Unicast Grant Sync Rejected • Unicast Grant Delay Resp Packets • Unicast Grant Delay Resp Rejected • Unicast Cancel Announce Packets • Unicast Cancel Sync Packets • Unicast Cancel Delay Resp Packets • Unicast Ack Cancel Announce Packets • Unicast Ack Cancel Sync Packets • Unicast Ack Cancel Delay Resp Packets • Anno Packets • Sync Packets • Delay Response Packets • Delay Request Packets • Follow-Up Packets • Out Of Order Sync Packets • Total UDP (port 320) Pkts • Total UDP (port 319) Pkts

Table 45: Show System PTP Port Peer Detail Output Fields (Continued)

Label	Description
	The following discard statistics are provided for the peer-1/ peer-2 clock: • Alternate Master Packets • Bad Domain Packets • Bad Version Packets • Duplicate Msg Packets • Step RM Greater Than 255
	The following algorithm state statistics (in seconds) are provided for the peer-1/peer-2 clock: • Free-run • Acquiring • Phase-Tracking • Hold-over • Locked
	The following algorithm event statistics are provided for the peer-1/peer-2 clock: • Excessive Freq Error Detected • Excessive Packet Loss Detected • Packet Loss Spotted • Excessive Phase Shift Detected • High PDV Detected • Sync Packet Gaps Detected
	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: • sync pkt delay stddev (ns) • delay-req pkt delay stddev (ns) • phase error (ns) • phase error stddev (ns)

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 46 describes the fields.

Sample Output

```
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 46: Show System SNTP Output Fields

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
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

Table 46: Show System SNTP Output Fields (Continued)

Label	Description
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 47 describes the fields.

Sample Output

```
A:ALU-48# show system thresholds
================================================================
Threshold Alarms
================================================================
Variable: tmnxCpmFlashUsed.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: tmnxCpmFlashUsed.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 47: Show System Threshold Output Fields

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
Falling Event Id	The identifier of the RMON falling event
Threshold	The identifier of the RMON falling threshold

Table 47: Show System Threshold Output Fields (Continued)

Label	Description
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	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
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, 7705 SAR-18, 7705 SAR-F (Sample Output, Table 48)
- 7705 SAR chassis where GNSS and PTP are used as sources of system time (Detailed Sample Output, Table 49)

Sample Output

```
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 48: Show System Time Output Fields (SAR-8/18/F)

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 Sample Output

```
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 49: Show System Time Output Field (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 49: Show System Time Output Field (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
Time References	
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
Qualified	true — the time reference is providing time updates
	false — the time reference is not providing time updates

Table 49: Show System Time Output Field (GNSS and PTP Time Source) (Continued)

Label	Description
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.
Time of Day - 1 Pulse Per Second Port	
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.

Sample Output

```
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 50 describes the fields.

Sample Output

```
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 50: Show Multi-Chassis Output Fields

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
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)

Table 50: Show Multi-Chassis Output Fields (Continued)

Label	Description
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-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 51 describes the fields.

Sample Output

```
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                  Oper State           : Up
KeepAlive       : 10 deci-seconds     Hold On Ngbr Failure : 3
-------------------------------------------------------------------------------
Lag Id Lacp   Remote System Id          Sys   Last State Changed
       Key    Lag Id                    Prio
-------------------------------------------------------------------------------
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 51: Show MC-LAG Output Fields

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 Ngbr 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

Table 51: Show MC-LAG Output Fields (Continued)

Label	Description
Remote system Id	Displays the LAG identifier of the remote system, expressed as a decimal integer
Multi-Chassis Statistics	
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
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 52 describes the fields.

Sample Output

```
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 52: Show Synchronization Output Fields

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).

Table 52: Show Synchronization Output Fields (Continued)

Label	Description
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 53 describes the fields.

Sample Output

```
A:ALU-1# show uptime
System Up Time         : 11 days, 18:32:02.22 (hr:min:sec)
A:ALU-1#
```

Table 53: System Uptime Output Fields

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 54 describes the fields.

Note: Some of the fields in the following output apply to the 7705 SAR-18 only.

Sample Output

```
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 54: Show Sync-If-Timing Output Fields

Label	Description
System Status CSM A	The present status of the synchronous timing equipment subsystem (SETS): • Not Present • Master Freerun • Master Holdover • Master Locked • Slave • Acquiring
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
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 or not the ref1 or ref2 timing reference is qualified for use by the synchronous timing subsystem
Selected for Use	Whether or not the ref1 or ref2 timing reference is presently selected

Table 54: Show Sync-If-Timing Output Fields (Continued)

Label	Description
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 or not the BITS 1 or BITS 2 reference is qualified for use by the synchronous timing subsystem
Selected For Use	Whether or not 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** [**environment** | **power-feed**]

Context show

Description This command displays general chassis status information.

Parameters **environment** — displays chassis environmental status information

Default Display all chassis information.

power-feed — displays chassis power feed status information

Default Display all chassis information.

Output The following output is an example of general chassis information, and Table 55 describes the fields.

Sample Output

```
A:ALU-1# show chassis
===============================================================================
Chassis Information
===============================================================================
    Name                              : ALU-1
    Type                              : 7705 SAR-8
    Location                          :
    Coordinates                       :
    CLLI code                         :
    Number of slots                   : 3
    Number of ports                   : 88
    Critical LED state                : Off
    Major LED state                   : Off
    Minor LED state                   : Off
    Over Temperature state            : OK
    Base MAC address                  : 00:1a:f0:67:fc:a6

Hardware Data
    Part number                       : 3HE02773AAAA0101
    CLEI code                         : ipmjj10gra
    Serial number                     : NS000000094
    Manufacture date                  : 11262007
    Manufacturing string              : Backplane SEEP
    Manufacturing deviations          :
    Time of last boot                 : 2008/04/11 09:32:06
    Current alarm state               : alarm active
-------------------------------------------------------------------------------
Environment Information
    Module
      Status                          : ok
      Type                            : fan-v1

    Fan Information
      # of on-board fans              : 8
      Status                          : up
      Speed                           : full speed
```

```
    External Alarms Interface
       ---------------------------------------------
        Input  Pin  Event           State
       ---------------------------------------------
        IN-1   1    Major         : ok
        IN-2   2    Major         : ok
        IN-3   11   Major         : ok
        IN-4   12   Minor         : ok
       ---------------------------------------------

Hardware Data
    Part number                  : 3HE02777AAAA01
    CLEI code                    :
    Serial number                : NS073840018
    Manufacture date             :
    Manufacturing string         :
    Manufacturing deviations     :
    Time of last boot            : 2008/04/11 09:32:07
    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                     : not monitored
===============================================================================
A:ALU-1#

A:7705-3>config# show chassis environment
===============================================================================
Chassis Information
===============================================================================
Environment Information
    Module
      Status                     : ok
      Type                       : fan-v1

    Fan Information
      # of on-board fans         : 8
      Status                     : up
      Speed                      : full speed

    External Alarms Interface
       ---------------------------------------------
        Input  Pin  Event           State
       ---------------------------------------------
        IN-1   1    Major         : ok
        IN-2   2    Major         : ok
        IN-3   11   Major         : ok
        IN-4   12   Minor         : ok
       ---------------------------------------------
```

```
Hardware Data
    Part number                 : 3HE02777AAAA01
    CLEI code                   :
    Serial number               : NS073840018
    Manufacture date            :
    Manufacturing string        :
    Manufacturing deviations    :
    Time of last boot           : 2008/04/11 09:32:07
    Current alarm state         : alarm cleared
===============================================================================
A:7705>
```

Table 55: Show Chassis Output Fields

Label	Description
Name	The system name for the router
Type	The router series model number
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.
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
Part number	The CSM part number

Table 55: Show Chassis Output Fields (Continued)

Label	Description
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 string	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
Environment Information	
Status	Current status of the fan module
Type	Version of the fan module
# of on-board fans	The total number of fans installed in this chassis
Status	Current status of the fans
Speed	Half speed — the fans are operating at half speed
	Full speed — the fans are operating at full speed
External Alarms Interface	
Input	External alarm input number
Pin	Port connector pin number for the alarm input
Event	Severity level of events reported by this input: • Critical: critical log event, trap and critical alarm/relay LED illuminated • Major: major log event, trap and major alarm/relay LED illuminated • Minor: minor log event, trap and minor alarm/relay LED illuminated • Warning: warning log, event, trap, no alarm/relay illuminated • Indeterminate: indeterminate log event trap, no alarm/relay illuminated • Suppressed: no log events, traps or alarm/relays illuminated
State	State of alarm event
Hardware data	Hardware information for fan module

Table 55: Show Chassis Output Fields (Continued)

Label	Description
Power Feed Information	
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

Debug Commands

sync-if-timing

Syntax **sync-if-timing**

Context debug

Description This command enables the context to debug synchronous interface timing references.

force-reference

Syntax **force-reference** {**external** | **ref1** | **ref2**}
no force-reference

Context debug>sync-if-timing

Description 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 back 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.

Parameters **ref1** — forces the clock to use the first timing reference

ref2 — forces the clock to use the second timing reference

external — forces the clock to use the third timing reference

system

Syntax [**no**] **system**

Context debug

Description This command displays system debug information.

http-connections

Syntax **http-connections** [*host-ip-address/mask*]
no http-connections

Context debug>system

Description This command displays HTTP connections debug information.

Parameters *host-ip-address/mask* — displays information for the specified host IP address and mask

ntp

Syntax **ntp router** *router-name* **interface** *ip-int-name*
no ntp

Context debug>system

Description This command enables and configures debugging for NTP.

The **no** form of the command disables debugging for NTP.

Parameters *router-name* — specifies the route name, either base or management

Default base

ip-int-name — 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

Syntax **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*]

Context debug

Description This command enables debugging for a LAG.

The **no** form of the command disables debugging for a LAG.

Parameters *lag-id* — specifies the LAG identifier, expressed as a decimal integer

Values 1 to 32

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

all — 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

Clear Commands

clock

Syntax **clock** *clock-id* **statistics**
clock csm port *port-id* **statistics**

Context clear>system>ptp

Description This command clears 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

port-id — specifies a PTP Ethernet port in the format *slot/mda/port*

statistics — clears statistics on the PTP clock or Ethernet port

cron

Syntax **cron action completed** [*action-name*] [**owner** *action-owner*]

Context clear

Description This command clears completed CRON action run history entries.

Parameters *action-name* — specifies the action name

Values maximum 32 characters

action-owner — specifies the owner name

Default TiMOS CLI

screen

Syntax **screen**

Context clear

Description This command allows an operator to clear the Telnet or console screen.

sync-if-timing

Syntax **sync-if-timing** {**external** | **ref1** | **ref2**}

Context clear>system

Description 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.

Parameters **external —** clears the third timing reference

ref1 — clears the first timing reference

ref2 — clears the second timing reference

trace

Syntax **trace log**

Context clear

Description This command allows an operator to clear the trace log.

List of Acronyms

Table 56: Acronyms

Acronym	Expansion
2G	second generation wireless telephone technology
3DES	triple DES (data encryption standard)
3G	third generation mobile telephone technology
5620 SAM	5620 Service Aware Manager
6VPE	IPv6 on Virtual Private Edge Router
7705 SAR	7705 Service Aggregation Router
7710 SR	7710 Service Router
7750 SR	7750 Service Router
9500 MPR	9500 microwave packet radio
ABR	area border router available bit rate
AC	alternating current attachment circuit
ACK	acknowledge
ACL	access control list
ACR	adaptive clock recovery
ADM	add/drop multiplexer
ADP	automatic discovery protocol
AES	advanced encryption standard
AFI	authority and format identifier
AIS	alarm indication signal

Table 56: Acronyms (Continued)

Acronym	Expansion
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
B3ZS	bipolar with three-zero substitution
Batt A	battery A
B-bit	beginning bit (first packet of a fragment)
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
BITS	building integrated timing supply
BMCA	best master clock algorithm

Table 56: Acronyms (Continued)

Acronym	Expansion
BMU	broadcast, multicast, and unknown traffic Traffic that is not unicast. Any nature of multipoint traffic: • broadcast (that is, all 1s as the destination IP to represent all destinations within the subnet) • 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 • 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)
BOF	boot options file
BPDU	bridge protocol data unit
BRAS	Broadband Remote Access Server
BSC	Base Station Controller
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	continuity check control channel
CCM	continuity check message
CE	circuit emulation customer edge
CEM	circuit emulation

Table 56: Acronyms (Continued)

Acronym	Expansion
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
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.
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
CSNP	complete sequence number PDU
CSPF	constrained shortest path first
C-TAG	customer VLAN tag

Table 56: Acronyms (Continued)

Acronym	Expansion
CV	connection verification customer VLAN (tag)
CW	control word
CWDM	coarse wavelength-division multiplexing
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
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
DNS	domain name server
DNU	do not use
DoS	denial of service

Table 56: Acronyms (Continued)

Acronym	Expansion
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
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
EGP	exterior gateway protocol
EIA/TIA-232	Electronic Industries Alliance/Telecommunications Industry Association Standard 232 (also known as RS-232)

Table 56: Acronyms (Continued)

Acronym	Expansion
EIR	excess information rate
EJBCA	Enterprise Java Bean Certificate Authority
eLER	egress label edge router
E&M	ear and mouth earth and magneto exchange and multiplexer
eMBMS	evolved MBMS
EPC	evolved packet core
Epipe	Ethernet VLL
EPL	Ethernet private line
EPON	Ethernet Passive Optical Network
EPS	equipment protection switching
ERO	explicit route object
ESD	electrostatic discharge
ESMC	Ethernet synchronization message channel
ESN	extended sequence number
ESP	encapsulating security payload
ETE	end-to-end
ETH-CFM	Ethernet connectivity fault management (IEEE 802.1ag)
EVDO	evolution - data optimized
EVPL	Ethernet virtual private link
EXP bits	experimental bits (currently known as TC)
FC	forwarding class
FCS	frame check sequence
FD	frequency diversity
FDB	forwarding database
FDL	facilities data link

Table 56: Acronyms (Continued)

Acronym	Expansion
FEAC	far-end alarm and control
FEC	forwarding equivalence class
FECN	forward explicit congestion notification
FeGW	far-end gateway
FF	fixed filter
FFD	fast fault detection
FIB	forwarding information base
FIFO	first in, first out
FNG	fault notification generator
FOM	figure of merit
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
GPS	Global Positioning System
GRE	generic routing encapsulation

Table 56: Acronyms (Continued)

Acronym	Expansion
GRT	global routing table
GSM	Global System for Mobile Communications (2G)
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
Hpipe	HDLC VLL
H-QoS	hierarchical quality of service
HSB	hot standby
HSDPA	high-speed downlink packet access
HSPA	high-speed packet access
HVPLS	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
IEEE	Institute of Electrical and Electronics Engineers
IEEE 1588v2	Institute of Electrical and Electronics Engineers standard 1588-2008
IES	Internet Enhanced Service

Table 56: Acronyms (Continued)

Acronym	Expansion
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
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
IPoATM	IP over ATM
IPS	intrusion prevention system
IPSec	Internet Protocol security
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

Table 56: Acronyms (Continued)

Acronym	Expansion
lbf-in	pound force inch
LBM	loopback message
LBO	line buildout
LBR	loopback reply
LCP	link control protocol
LDP	label distribution protocol
LER	label edge router
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)
LSR	label switch router link-state request
LSU	link-state update
LT	linktrace
LTE	long term evolution line termination equipment

Table 56: Acronyms (Continued)

Acronym	Expansion
LTM	linktrace message
LTN	LSP ID to NHLFE
LTR	link trace reply
MA	maintenance association
MAC	media access control
MA-ID	maintenance association identifier
MBB	make-before-break
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
MDDB	multidrop data bridge
MDL	maintenance data link
ME	maintenance entity
MED	multi-exit discriminator
MEF	Metro Ethernet Forum
MEG	maintenance entity group

Table 56: Acronyms (Continued)

Acronym	Expansion
MEG-ID	maintenance entity group identifier
MEN	Metro Ethernet network
MEP	maintenance association end point
MFC	multi-field classification
MHF	MIP half function
MIB	management information base
MI-IS-IS	multi-instance IS-IS
MIR	minimum information rate
MLD	multicast listener discovery
MLPPP	multilink point-to-point protocol
MP	merge point multilink protocol
MP-BGP	multiprotocol border gateway protocol
MPLS	multiprotocol label switching
MPLSCP	multiprotocol label switching control protocol
MPP	MPT protection protocol
MPR	see 9500 MPR
MPR-e	microwave packet radio-standalone mode
MPT	microwave packet transport
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)

Table 56: Acronyms (Continued)

Acronym	Expansion
MRRU	maximum received reconstructed unit
MRU	maximum receive unit
MSDU	MAC Service Data Unit
MSO	multi-system operator
MS-PW	multi-segment pseudowire
MTIE	maximum time interval error
MTSO	mobile trunk switching office
MTU	maximum transmission unit multi-tenant unit
M-VPLS	management virtual private line service
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
NGE	network group encryption
NHLFE	next hop label forwarding entry
NHOP	next-hop
NLOS	non-line-of-sight
NLPID	network level protocol identifier
NLRI	network layer reachability information

Table 56: Acronyms (Continued)

Acronym	Expansion
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)
NSAP	network service access point
NSP	native service processing
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
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

Table 56: Acronyms (Continued)

Acronym	Expansion
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
PADI	PPPoE active discovery initiation
PADR	PPPoE active discovery request
PAE	port authentication entities
PBO	packet byte offset
PBR	policy-based routing
PBX	private branch exchange
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
PHY	physical layer
PIC	prefix independent convergence
PID	protocol ID

Table 56: Acronyms (Continued)

Acronym	Expansion
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
PoE	power over Ethernet
PoE+	power over Ethernet plus
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
PSE	power sourcing equipment
PSK	pre-shared key
PSN	packet switched network
PSNP	partial sequence number PDU
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

Table 56: Acronyms (Continued)

Acronym	Expansion
PWE	pseudowire emulation
PWE3	pseudowire emulation edge-to-edge
Q.922	ITU-T Q-series Specification 922
QL	quality level
QoS	quality of service
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
RRO	record route object
RS-232	Recommended Standard 232 (also known as EIA/TIA-232)
RSA	Rivest, Shamir, and Adleman (authors of the RSA encryption algorithm)
RSHG	residential split horizon group
RSTP	rapid spanning tree protocol

Table 56: Acronyms (Continued)

Acronym	Expansion
RSVP-TE	resource reservation protocol - traffic engineering
RT	receive/transmit
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
SAA	service assurance agent
SAFI	subsequent address family identifier
SAP	service access point
SAR-8	7705 Service Aggregation Router – 8-slot chassis
SAR-18	7705 Service Aggregation Router – 18-slot chassis
SAR-A	7705 Service Aggregation Router – two variants: • passively cooled chassis with 12 Ethernet ports and 8 T1/E1 ports • passively cooled chassis with 12 Ethernet ports and no T1/E1 ports
SAR-F	7705 Service Aggregation Router – fixed form-factor chassis
SAR-H	7705 Service Aggregation Router – temperature- and EMC-hardened to the following specifications: IEEE 1613 and IEC 61850-3
SAR-Hc	7705 Service Aggregation Router – compact version of 7705 SAR-H

Table 56: Acronyms (Continued)

Acronym	Expansion
SAR-M	7705 Service Aggregation Router – four variants: • actively cooled chassis with 16 T1/E1 ports, 7 Ethernet ports, and 1 hot-insertable module slot • actively cooled chassis with 0 T1/E1 ports, 7 Ethernet ports, and 1 hot-insertable module slot • passively cooled chassis with 16 T1/E1 ports, 7 Ethernet ports, and 0 module slots • passively cooled chassis with 0 T1/E1 ports, 7 Ethernet ports, and 0 module slots
SAR-O	7705 Service Aggregation Router passive CWDM device – three variants: • 2-wavelength CWDM dual-fiber • 4-wavelength CWDM dual-fiber • 8-wavelength CWDM single-fiber Each variant has different models that are used to add and drop different wavelengths
SAR-W	7705 Service Aggregation Router – passively cooled, universal AC and DC powered unit, equipped with five Gigabit Ethernet ports (three SFP ports and two RJ-45 Power over Ethernet (PoE) ports)

Table 56: Acronyms (Continued)

Acronym	Expansion
SAR-Wx	7705 Service Aggregation Router – passively cooled, universal AC powered unit; there are six variants: • a unit that is equipped with an AC power input connector, five Gigabit Ethernet data ports (three SFP ports and two RJ-45 Ethernet ports), and an RJ-45 alarm input connector • a unit that is equipped with an AC power input connector, five Gigabit Ethernet data ports (three SFP ports and two RJ-45 Ethernet ports), a GPS receiver, and an RJ-45 alarm input connector • a unit that is equipped with an AC power input connector, five Gigabit Ethernet data ports (three SFP ports, one RJ-45 Ethernet port, and one RJ-45 PoE+ port), and an RJ-45 alarm input connector • a unit that is equipped with an AC power input connector, five Gigabit Ethernet data ports (three SFP ports, one RJ-45 Ethernet port, and one RJ-45 PoE+ port), a GPS receiver, and an RJ-45 alarm input connector • a unit that is equipped with an AC power input connector, four Gigabit Ethernet data ports (three SFP ports and one RJ-45 port), one RJ-45 4-pair xDSL port, and an RJ-45 alarm input connector • a unit that is equipped with an AC power input connector, four Gigabit Ethernet data ports (three SFP ports and one RJ-45 port), one RJ-45 4-pair xDSL port, a GPS receiver, and an RJ-45 alarm input connector
SAR-X	7705 Service Aggregation Router – fan-cooled, rack-mountable, IP20 design, available in two variants: • AC-powered variant with a single-feed AC input that can be connected to a 100 to 240 VAC, 50/60 Hz power source • DC-powered variant with a dual-feed DC input that can be connected to a +24/-48/-60 VDC power source
SAToP	structure-agnostic TDM over packet
SCADA	surveillance, control and data acquisition

Table 56: Acronyms (Continued)

Acronym	Expansion
SC-APS	single-chassis automatic protection switching
SCP	secure copy
SD	signal degrade space diversity
SDH	synchronous digital hierarchy
SDI	serial data interface
SDP	service destination point
SE	shared explicit
SeGW	secure gateway
SF	signal fail
SFP	small form-factor pluggable (transceiver)
SFTP	SSH file transfer protocol
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

Table 56: Acronyms (Continued)

Acronym	Expansion
SPF	shortest path first
SPI	security parameter index
SPT	shortest path tree
SR	service router (includes 7710 SR, 7750 SR)
SRLG	shared risk link group
SSH	secure shell
SSM	source-specific multicast synchronization status messaging
SSU	system synchronization unit
S-TAG	service VLAN tag
STM1	synchronous transport module, level 1
STP	spanning tree protocol
SVC	switched virtual circuit
SYN	synchronize
TACACS+	Terminal Access Controller Access-Control System Plus
TC	traffic class (formerly known as EXP bits)
TCP	transmission control protocol
TDEV	time deviation
TDM	time division multiplexing
TE	traffic engineering
TEID	tunnel endpoint identifier
TFTP	trivial file transfer protocol
T-LDP	targeted LDP
TLS	transport layer security
TLV	type length value
TM	traffic management

Table 56: Acronyms (Continued)

Acronym	Expansion
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
TRAIM	time-receiver autonomous integrity monitoring
TTL	time to live
TTLS	tunneled transport layer security
TTM	tunnel table manager
TWAMP	two-way active measurement protocol
U-APS	unidirectional automatic protection switching
UBR	unspecified bit rate
UDP	user datagram protocol
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
VC	virtual circuit
VCC	virtual channel connection
VCCV	virtual circuit connectivity verification
VCI	virtual circuit identifier
VID	VLAN ID

Table 56: Acronyms (Continued)

Acronym	Expansion
VLAN	virtual LAN
VLL	virtual leased line
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
VSO	vendor-specific option
VT	virtual trunk
WCDMA	wideband code division multiple access (transmission protocol used in UMTS networks)
WRED	weighted random early discard
WTR	wait to restore
X.21	ITU-T X-series Recommendation 21
XRO	exclude route object

Standards and Protocol Support

This chapter lists the 7705 SAR compliance with EMC, environmental, and safety standards, telecom standards, and supported protocols:

Table 57: EMC Industrial Standards Compliance

Standard	Title	Platform								
		SAR-X	SAR-A	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	✓[1]			✓[2]	✓[1]	✓[4]	✓[4]		
IEEE 1613.1-2013	IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Transmission and Distribution Facilities	✓[5]			✓[6]	✓[3]	✓[7]	✓[7]		
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: 2006	Electromagnetic Compatibility – Part 4: Emission and Immunity of the Signalling and Telecommunications Apparatus	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 62236-4:2008	Electromagnetic Compatibility – Part 4: Emission and Immunity of the Signalling and Telecommunications Apparatus	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-6-2:2005	Generic standards – Immunity for industrial environments	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-6-4:2006	Generic standards – Emissions standard for industrial environments	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC TS 61000-6-5	Immunity for power station and substation environments	✓			✓	✓	✓	✓		
IEC 61850-3	Communication networks and systems for power utility automation - Part 3: General requirements	✓			✓	✓	✓	✓		
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 w/ Optics interfaces only)

3. Zone B; Performance Class 1
4. Performance Class 2
5. Zone A; Performance Class 1
6. Zone A; Performance Class 1 (Class 2 w/Optics interfaces only)
7. Zone A; Performance Class 2

Table 58: EMC Regulatory and Customer Standards Compliance

Standard	Title	Platform								
		SAR-X	SAR-A	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	✓	✓[1]	✓[1]	✓[1]	✓[1]	✓	✓[1]	✓	✓
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)	✓	✓[1]	✓[1]	✓[1]	✓[1]	✓	✓[1]	✓	✓
IEC 61000-3-3	Limits for voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current <16A	✓	✓[1]	✓[1]	✓[1]	✓[1]	✓	✓[1]	✓	✓
ITU-T K.20 (DC Ports)	Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents	✓	✓	✓	✓	✓	✓	✓		

Table 58: EMC Regulatory and Customer Standards Compliance (Continued)

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
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)	✓	✓	✓	✓	✓	✓	✓	✓	
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 22	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[3]	✓[3]
FCC Part 15, Subpart B	Radio Frequency devices- Unintentional Radiators (Radiated & Conducted Emissions)	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[3]	✓[3]
ICES-003	Information Technology Equipment (ITE) — Limits and methods of measurement	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[3]	✓[3]
EN 55022	Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[3]	✓[3]
CISPR 22	Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[3]	✓[3]
KC Notice Emission (KN22) and Immunity (KN24) (South Korea)	EMS standard: NRRA notice	✓	✓	✓	✓	✓	✓	✓		

Notes:

1. With external AC/DC power supply
2. Class A

3. Class B

Table 59: Environmental Standards Compliance

Standard	Title	Platform								
		SAR-X	SAR-A	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	✓[1]			✓[1]	✓[1]	✓	✓		
IEC 61850-3	Communication networks and systems for power utility automation - Part 3: General requirements	✓[2]			✓[2]	✓[2]	✓[2]	✓[2]		
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)	✓	✓	✓	✓	✓	✓	✓	✓	✓
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 v2.1.2, Class 1.2	Specification of environmental tests; Storage	✓	✓	✓	✓	✓	✓	✓	✓	✓
ETSI EN 300 019-2-2 V2.1.2, class 2.3	Specification of environmental tests; Transportation	✓	✓	✓	✓	✓	✓	✓	✓	✓
ETSI EN 300 019-2-3 V2.2.2, class 3.2	Specification of environmental tests; Stationary use at weatherprotected locations	✓	✓	✓	✓	✓	✓	✓		
ETSI EN 300 019-2-4 v2.2.2 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)	✓[3]	✓[3]	✓[3]	✓[3]		✓[3]	✓[3]	✓[4]	✓[4]

Table 59: Environmental Standards Compliance (Continued)

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
"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 [5]	✓		✓	✓		✓	✓		
Telcordia GR-950-CORE	Generic Requirements for ONU Closures and ONU Systems								✓	✓

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 60: Safety Standards Compliance

Standard	Title	Platform								
		SAR-X	SAR-A	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	✓	✓	✓	✓	✓	✓	✓	✓	✓
AS/NZS 60950-1	Information technology equipment - Safety - Part 1: General 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)	✓	✓	✓	✓	✓	✓	✓	✓	✓
FDA CDRH 21-CFR 1040	PART 1040 Performance Standards for Light-Emitting Products	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 60: Safety Standards Compliance (Continued)

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
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)	✓[1]	✓[2]	✓[1]	✓[1]	✓[1]	✓[2]	✓[2]	✓[3]	✓[3]

Notes:

1. IP20
2. IP40
3. IP65

Table 61: Telecom Interface Compliance

Standard	Title	Platform								
		SAR-X	SAR-A	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				✓	✓				

Table 61: Telecom Interface Compliance (Continued)

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
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				✓	✓				
ITU-T V.11 / X.27 (RS422)	Electrical characteristics for balanced double current interchange circuits operating at data signalling rates up to 10 Mbit/s				✓	✓				
ITU-T X.21 (RS422)	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 62: Directives, Regional Approvals and Certifications Compliance

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
EU Directive 2004/108/ EC EMC	Electromagnetic Compatibility (EMC)	✓	✓	✓	✓	✓	✓	✓	✓	✓
EU Directive 2006/95/ EC LVD	Low Voltage Directive (LVD)	✓	✓	✓	✓	✓	✓	✓	✓	✓
EU Directive 2012/19/ EU WEEE	Waste Electrical and Electronic Equipment (WEEE)	✓	✓	✓	✓	✓	✓	✓	✓	✓
EU Directive 2011/65/ EU RoHS2	Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS2)	✓	✓	✓	✓	✓	✓	✓	✓	✓
CE Mark		✓	✓	✓	✓	✓	✓	✓	✓	✓
CRoHS Logo; Ministry of Information Industry order No.39		✓	✓	✓	✓	✓	✓	✓	✓	✓
China (MII NAL) Network Access License			✓	✓	✓	✓	✓		✓	
South Korea (KC Mark)		✓	✓	✓	✓	✓	✓	✓		
Australia (RCM Mark)		✓	✓	✓	✓	✓	✓	✓	✓	✓
TL9000 certified		✓	✓	✓	✓	✓	✓	✓	✓	✓
ISO 14001 certified		✓	✓	✓	✓	✓	✓	✓	✓	✓
ISO 9001:2008 certified		✓	✓	✓	✓	✓	✓	✓	✓	✓

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 C37.94-2002—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.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

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 MDS

RFC 2439—BGP Route Flap Dampening

RFC 2547bis—BGP/MPLS VPNs

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)

RFC 4486—Subcodes for BGP Cease Notification Message

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

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

DSL Modules

ITU-T G.991.2 Annex A, B, F and ITU-T G.991.2 Amendment 2 Annex G—SHDSL standards compliance

ITU-T G.991.2 Appendix F and G—Support for up to 5696 Kb/s per pair

ITU-T G.992.1 (ADSL)

ITU-T G.992.3 (G.dmt.bis), Annex A, B, J, M

ITU-T G.992.3 Annex K.2 (ADSL2)

ITU-T G.992.5, Annex A, B, J, M

ITU-T G.992.5 Annex K (ADSL2+)

ITU-T G.993.2 Amendment 1—Seamless Rate Adaptation

ITU-T G.993.2 Annex A and Annex B—xDSL Standards Compliance (ADSL2/2+ and VDSL2)

ITU-T G.993.2 Annex K.3—Supported Transport Protocol Specific Transmission Convergence functions

ITU G.994.1 (2/07) Amendment 1 and 2—G.hs Handshake

ITU-T G.998.2—SHDSL 4-pair EFM bonding

ITU-T G.998.4 G.inp—Physical layer retransmission

ITU-T Y.1564 Ethernet service activation test methodology

RFC 2684—IEEE 802.2 LLC/SNAP bridged encapsulation while operating in ATM bonded mode

TR-060—SHDSL rate and reach

TR112 (U-R2 Deutsche Telekom AG) Version 7.0 and report of Self-Test-Result (ATU-T Register#3)

ECMP

RFC 2992—Analysis of an Equal-Cost Multi-Path Algorithm

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

IETF draft-nourse-scep-21.txt—Cisco Systems' Simple Certificate Enrollment Protocol

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