



7705 Service Aggregation Router

Release 23.10.R1

System Management Guide

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1 Preface

1.1 About This Guide

This guide describes router security, SNMP features, and event and accounting logs. It covers basic tasks such as configuring management access filters that control traffic in and out of the CSM, passwords, user profiles, and security such as RADIUS, TACACS+, and SSH servers.

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 23.x content and may contain some content that will be released in later maintenance loads. Please see the 7705 SAR 23.x.Rx Software Release Notes, part number 3HE19533000xTQZZA, for information about features supported in each load of the Release 23.x software.



Note: As of Release 23.4, software support for the following hardware has been deprecated:

- 8-port Ethernet Adapter card, v2 (a8-ethv2) (3HE02776)
- 12-port Serial Data Interface card, v1 (a12-sdi) (3HE03391)
- 7705 SAR-W (3HE07349)

These components are no longer recognized in the release.

If information about any of the above components is required, please see the applicable installation guides in Release 22.10.

1.1.1 Audience

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

- CLI concepts
- system and user access and security
- SNMP
- event and accounting logs

1.1.2 Technical Support

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

[Product Support Portal](#)

2 7705 SAR System Management Configuration Process

[Table 1: Configuration Process](#) lists the tasks that are required to configure system security and access functions as well as event and accounting logs.

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

Table 1: Configuration Process

Area	Task/Description	Chapter
System security	Configure system security parameters, such as authentication, authorization, and accounting	Security
Network management	Configure SNMP elements	SNMP
Operational functions	Configure event and accounting logs	Event and Accounting Logs
Reference	List of security and telecom standards, supported protocols, and proprietary MIBs	Supported Standards and Protocols

3 Security

This chapter provides information to configure security parameters.

Topics in this chapter include:

- [Authentication, Authorization, and Accounting](#)
- [Security Controls](#)
- [RADIUS VSAs](#)
- [Other Security Features](#)
- [Configuration Notes](#)
- [Configuring Security with CLI](#)
- [Security Command Reference](#)

3.1 Authentication, Authorization, and Accounting

This chapter describes authentication, authorization, and accounting (AAA) used to monitor and control network access on the 7705 SAR. Network security is based on a multi-step process. The first step, authentication, validates a user's name and password. The second step is authorization, which allows the user to access and execute commands at various command levels based on profiles assigned to the user.

The third step, accounting, keeps track of the activity of a user who has accessed the network. The type of accounting information recorded can include a history of the commands executed, the amount of time spent in the session, the services accessed, and the data transfer size during the session. The accounting data can then be used to analyze trends, and also for billing and auditing purposes.

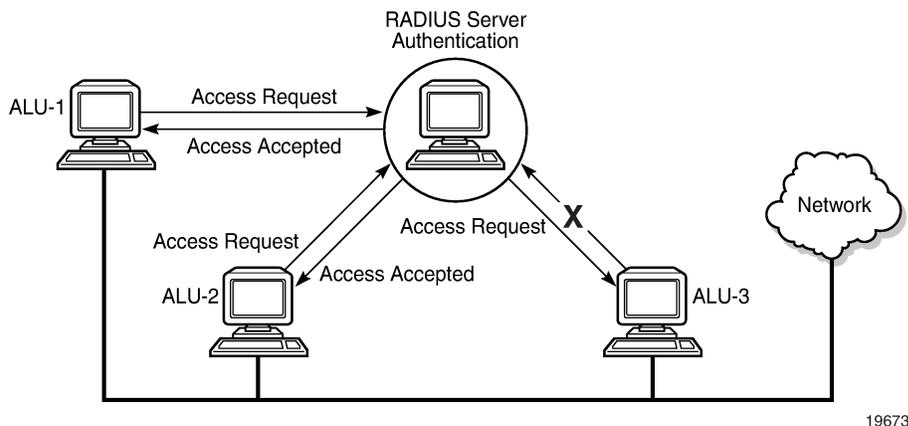
You can configure the 7705 SAR to use local, Remote Authentication Dial In User Service (RADIUS), or Terminal Access Controller Access Control System Plus (TACACS+) security to validate users who attempt to access the router by console, Telnet, SSH, SFTP, SCP, or FTP. You can select the authentication order that determines the authentication method to try first, second, and third.

The 7705 SAR supports the following security features:

- RADIUS can be used for authentication, authorization, and accounting
- TACACS+ can be used for authentication, authorization, and accounting
- local security can be implemented for authentication and authorization

[Figure 1: RADIUS Requests and Responses](#) depicts end-user access requests sent to a RADIUS server. After validating the usernames and passwords, the RADIUS server returns an access accept message to the users on ALU-1 and ALU-2. The username and password from ALU-3 could not be authenticated; therefore, access was denied.

Figure 1: RADIUS Requests and Responses



3.1.1 Authentication

Authentication validates a username and password combination when a user attempts to log in.

When a user attempts to log in through the console or through Telnet, SSH, SFTP, SCP, or FTP, the 7705 SAR client sends an access request to a RADIUS, TACACS+, or local database.

Transactions between the client and a RADIUS server are authenticated through the use of a shared secret. The secret is never transmitted over the network. User passwords are sent encrypted between the client and RADIUS server, which prevents someone snooping on an insecure network to learn password information.

If the RADIUS server does not respond within a specified time, the router issues the access request to the next configured servers. Each RADIUS server must be configured identically to guarantee consistent results. Up to five RADIUS servers can be configured.

If a server is unreachable, it is not used again by the RADIUS application until 30 seconds have elapsed, to give the server time to recover from its unreachable state. After 30 seconds, the unreachable server becomes available again for the RADIUS application.

If, within the 30 seconds, the RADIUS server receives a valid response to a previously sent RADIUS packet on that unreachable server, the server immediately becomes available again.

If any RADIUS server rejects the authentication request, it sends an access reject message to the router. In this case, no access request is issued to any other RADIUS servers. However, if other authentication methods such as TACACS+ or local are configured, then these methods are attempted. If no other authentication methods are configured, or all methods reject the authentication request, then access is denied.

The user login is successful when the RADIUS server accepts the authentication request and responds to the router with an access accept message.

Implementing authentication without authorization for the 7705 SAR does not require the configuration of VSAs (vendor-specific attributes) on the RADIUS server. However, users, user access permissions, and command authorization profiles must be configured on each router.

Any combination of these authentication methods can be configured to control network access from a 7705 SAR router:

- [Local Authentication](#)
- [RADIUS Authentication](#)
- [TACACS+ Authentication](#)

3.1.1.1 Local Authentication

Local authentication uses PKI or usernames and passwords configured on the router to authenticate login attempts. The usernames and passwords are local to each router, not to user profiles.

By default, local authentication is enabled. When one or more of the other security methods are enabled, local authentication is disabled. Local authentication is restored when the other authentication methods are disabled. Local authentication is attempted if the other authentication methods fail and local is included in the authentication order password parameters.

Locally, you can configure usernames and password management information. This is referred to as local authentication. Remote security servers such as RADIUS or TACACS+ are not enabled.

3.1.1.1.1 Password Hashing

The 7705 SAR supports two algorithms for user password hashing: bcrypt, which is the default algorithm, and PBKDF2. The PBKDF2 algorithm uses the SHA-2 and SHA-3 sets of cryptographic hash functions for password hashing.

A system administrator can change the default bcrypt password hashing algorithm to the PBKDF2 algorithm using the **config>system>security>password>hashing** command.

When the password hashing algorithm is changed to PBKDF2 SHA-2 or PBKDF2 SHA-3, users must change their passwords using the **/password** command to use the new hashing algorithm. The system administrator must then perform an **admin>save** command to store the new user passwords in the system configuration file.

After a password hashing change, any user logging in to the system who did not update their password to use the new hashing algorithm will be prompted to enter their old password the next time they log in. When the password is entered successfully, the user will be prompted to enter a new password that will be hashed using the new algorithm.

3.1.1.2 RADIUS Authentication

Remote Authentication Dial-In User Service (RADIUS) is a client/server security protocol and software that enables remote access servers to communicate with a central server to authenticate dial-in users and authorize access to the requested system or service.

RADIUS allows administrators to maintain user profiles in a shared central database and provides better security, allowing a company to set up a policy that can be applied at a single administered network point.

3.1.1.2.1 RADIUS Server Selection

Up to five RADIUS servers can be configured. They can be selected to authenticate user requests in two ways, using either the direct method or the round-robin method. The default method is direct.

Direct

In direct mode, the first server, as defined by the **server-index** command, is the primary server. This server is always used first when authenticating a request.

Round-robin

In round-robin mode, the server used to authenticate a request is the next server in the list, following the last authentication request. For example, if server 1 is used to authenticate the first request, server 2 is used to authenticate the second request, and so on.

3.1.1.3 TACACS+ Authentication

Terminal Access Controller Access Control System, commonly referred to as TACACS, is an authentication protocol that allows a remote access server to forward a user's login password to an authentication server to determine whether access can be allowed to a system. TACACS is an encryption protocol and therefore less secure than the later Terminal Access Controller Access Control System Plus (TACACS+) and RADIUS protocols.

TACACS+ and RADIUS have largely replaced earlier protocols in the newer or recently updated networks. TACACS+ uses Transmission Control Protocol (TCP) and RADIUS uses the User Datagram Protocol (UDP). TACACS+ is popular as TCP is thought to be a more reliable protocol. RADIUS combines authentication and authorization. TACACS+ separates these operations.

3.1.2 Authorization

The 7705 SAR supports the following authorization methods to control the actions of specific users:

- [Local Authorization](#)
- [RADIUS Authorization](#)
- [TACACS+ Authorization](#)

Authorization operates by applying a profile based on username and password configurations after network access is granted. The profiles are configured locally as well as on the RADIUS server or TACACS+ server as VSAs. See [RADIUS VSAs](#) and [TACACS+ Services and VSAs](#).

When using authorization, maintaining a user database on the router is not required. Usernames can be configured on the RADIUS server. Usernames and their associated passwords are temporary and are not saved in the configuration database when the user session terminates.

TACACS+ separates the authentication and authorization functions. RADIUS combines the authentication and authorization functions.

3.1.2.1 Local Authorization

Local authorization uses user profiles and user access information after a user is authenticated. The profiles and user access information specify the actions the user can and cannot perform.

By default, local authorization is enabled. Local authorization is disabled only when a different remote authorization method is configured (RADIUS authorization or TACACS+). Local authorization is restored when RADIUS authorization is disabled.

You must configure profile and user access information locally.

3.1.2.2 RADIUS Authorization

RADIUS authorization grants or denies access permissions for a 7705 SAR router. Permissions include the use of FTP, Telnet, SSH (SCP), SFTP, and console access. When granting Telnet, SSH (SCP), SFTP, and console access to the 7705 SAR router, authorization can be used to limit what CLI commands the user is allowed to issue and which file systems the user is allowed or denied access to.

After a user has been authenticated using RADIUS (or another method), the 7705 SAR router can be configured to perform authorization. The RADIUS server can be used to:

- download the user profile to the 7705 SAR router
- send the profile name that the node should apply to the 7705 SAR router
- control file access using VSAs (see [RADIUS VSAs](#))

Profiles consist of a suite of commands that the user is allowed or not allowed to execute. When a user issues a command, the authorization server looks at the command and the user information and compares it with the commands in the profile. If the user is authorized to issue the command, the command is executed. If the user is not authorized to issue the command, the command is not executed.

Profiles must be created on each 7705 SAR router and should be identical for consistent results. If the profile is not present, access is denied.

[Table 2: Supported Authorization Configurations](#) displays the following scenarios:

- If the user is authenticated locally (on the 7705 SAR router), local authorization is supported and remote (RADIUS) authorization cannot be performed.
- If the user is authenticated by the RADIUS server, both local authorization and remote (RADIUS) authorization are supported.
- If the user is TACACS+ authenticated, local authorization is supported and remote (RADIUS) authorization cannot be performed.

When authorization is configured and profiles are downloaded to the router from the RADIUS server, the profiles are considered temporary configurations and are not saved when the user session terminates.

Table 2: Supported Authorization Configurations

User	Local Authorization	RADIUS Authorization
7705 SAR configured user	Supported	Not Supported
RADIUS server configured user	Supported	Supported
TACACS+ server configured user	Supported	Not Supported

3.1.2.3 TACACS+ Authorization

Like RADIUS authorization, TACACS+ grants or denies access permissions for a 7705 SAR router. The TACACS+ server sends a response based on the username and password.

TACACS+ command authorization operates in the following ways:

- All users who authenticate via TACACS+ can use a single common command authorization profile that is configured locally on the router.
- Every command that a user attempts is sent to the TACACS+ server for authorization.
- The TACACS+ default template can be configured (**tacplus_default**) and vendor-specific attributes (VSAs) can be used to control file access. The **use-default-template** command must be enabled to configure all other access parameters locally. See [TACACS+ Services and VSAs](#) for more information.

To use a single common default command authorization profile to control command authorization for TACACS+ users, enable the TACACS+ default user template and configure the template to point to a valid local profile. The local profile is then used for command authorization. TACACS+ authorization must be disabled.

CLI Syntax:

```
config>system>security
tacplus
  use-default-template
  no authorization
  user-template tacplus_default
  profile user-profile-name
```

When the **tacplus authorization** command is enabled, each CLI command that the user issues is sent to the TACACS+ server for authorization. The authorization request contains the first word of the CLI command as the value for the TACACS+ command and all following words as a command argument. Quoted values are expanded so that the quotation marks are stripped off and the enclosed values are seen as one command or command argument.

3.1.3 Accounting

Accounting tracks user activity to a specific host. The 7705 SAR supports RADIUS and TACACS+ accounting.

3.1.3.1 RADIUS Accounting

When enabled, RADIUS accounting sends command line accounting from the 7705 SAR router to the RADIUS server. The router sends accounting records using UDP packets at port 1813 (decimal).

The router issues an accounting request packet for each event requiring the activity to be recorded by the RADIUS server. The RADIUS server acknowledges each accounting request by sending an accounting response after it has processed the accounting request. If no response is received in the time defined in the timeout parameter, the accounting request must be retransmitted until the configured retry count is exhausted. A trap is issued to alert the NMS (or trap receiver) that the server is unresponsive. The router issues the accounting request to the next configured RADIUS server (up to 5).

User passwords and authentication keys of any type are never transmitted as part of the accounting request.

When RADIUS accounting is enabled, the server is responsible for receiving accounting requests and returning a response to the client indicating that it has successfully received the request. Each command issued on the 7705 SAR router generates a record sent to the RADIUS server. The record identifies the user who issued the command and the timestamp.

Accounting can be configured independently from RADIUS authorization and RADIUS authentication.

3.1.3.2 TACACS+ Accounting

The 7705 SAR allows you to configure the type of accounting record packet that is to be sent to the TACACS+ server when specified events occur on the device. The accounting **record-type** parameter indicates whether TACACS+ accounting start and stop packets will be sent or just stop packets will be sent. A start packet is sent to a TACACS+ server when an authenticated user establishes a Telnet or SSH session and a stop packet is sent when the user logs out.

When a user logs in to request access to the network using Telnet or SSH, or a user enters a command for which accounting parameters are configured, or a system event occurs, such as a reboot or a configuration file reload, the 7705 SAR checks the configuration to see if TACACS+ accounting is required for the particular event.

If TACACS+ accounting is required, then, depending on the accounting record type specified, the device sends a start packet to the TACACS+ accounting server that contains information about the event.

The TACACS+ accounting server acknowledges the start packet and records information about the event. When the event ends, the device sends a stop packet. The stop packet is acknowledged by the TACACS+ accounting server.

3.2 Security Controls

You can configure the 7705 SAR to use RADIUS, TACACS+, and local authentication to validate users requesting access to the network. The order in which password authentication is processed among RADIUS, TACACS+ and local passwords can be specifically configured. For example, the authentication order can be configured to process authorization via TACACS+ first, then RADIUS for authentication and accounting. Local access can be specified next in the authentication order if the RADIUS and TACACS+ servers are not operational.

3.2.1 When a Server Does Not Respond

A trap is issued if a RADIUS server is unresponsive. An alarm is raised if RADIUS is enabled with at least one RADIUS server and no response is received to either accounting or user access requests from any server.

Periodic checks to determine if the primary server is responsive again are performed. If a server is down, it will not be contacted for 5 minutes. If a login is attempted after 5 minutes, then the server is contacted again. If a server has the health check feature enabled and is unresponsive, the server's status is checked every 30 seconds. Health check is enabled by default. When a service response is restored from at least one server, the alarm condition is cleared. Alarms are raised and cleared on the Nokia Fault Manager or other third party fault management servers.

The servers are accessed in order from lowest to highest specified index (from 1 to 5) for authentication requests until a response from a server is received. A higher indexed server is only queried if no response is received from a lower indexed server. If a response from the server is received, no other server is queried.

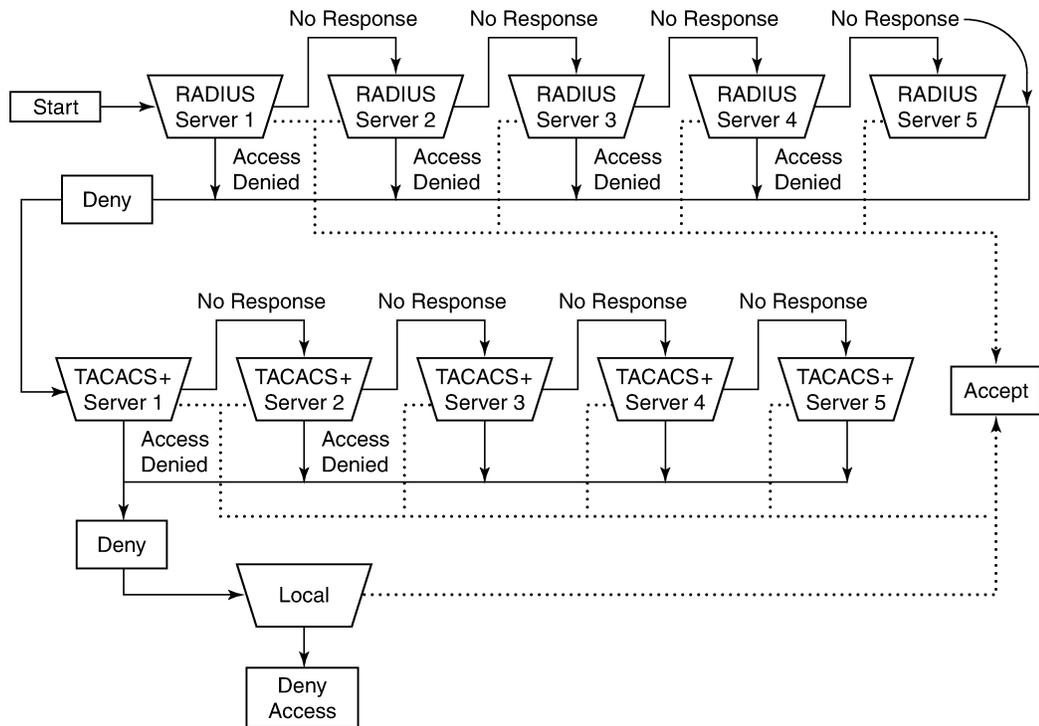
3.2.2 Access Request Flow

In [Figure 2: Security Flow](#), the authentication process is defined in the `config>system>security>password` context. The authentication order is determined by specifying the sequence in which password authentication is attempted among RADIUS, TACACS+, and local servers.

This example uses the authentication order of RADIUS, then TACACS+, and finally, local. An access request is sent to RADIUS server 1. One of two scenarios can occur. If there is no response from the server, the request is passed to the next RADIUS server with the next lowest index (RADIUS server 2) and so on, until the last RADIUS server is attempted (RADIUS server 5). If server 5 does not respond, the request is passed to the TACACS+ server 1. If there is no response from that server, the request is passed to the next TACACS+ server with the next lowest index (TACACS+ server 2) and so on.

If a request is sent to an active RADIUS server and the username and password are not recognized, access is denied and passed on to the next authentication option, in this case, the TACACS+ server. The process continues until the request is either accepted, denied, or each server is queried. Finally, if the request is denied by the active TACACS+ server, the local parameters are checked for username and password verification. This is the last chance for the access request to be accepted.

Figure 2: Security Flow



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3.3 RADIUS VSAs

The 7705 SAR software supports the configuration of Nokia-specific RADIUS attributes. These attributes are known as vendor-specific attributes (VSAs), which are defined in RFC 2138. VSAs must be configured when RADIUS authorization is enabled. It is up to the vendor to specify the format of their VSA. The attribute-specific field is dependent on the vendor's definition of that attribute. The Nokia-defined attributes are encapsulated in a RADIUS vendor-specific attribute with the vendor ID field set to 6527.

"PE-Record" should be added as a new standard attribute in the standard RADIUS dictionary file.

Nokia supports the following RADIUS VSAs :

- **Timetra-Access <ftp> <console> <both>** — this is a mandatory command that must be configured. This command specifies whether the user has FTP or console (serial port, Telnet, SSH) access.
- **Timetra-Profile <profile-name>** — when configuring this VSA for a user, it is assumed that the user profiles are configured on the local 7705 SAR router and the following applies for local and remote authentication.
 - The **authentication-order** parameters configured on the router must include the **local** keyword.
 - The username may or may not be configured on the 7705 SAR router.
 - The user must be authenticated by the RADIUS server.
 - Up to eight valid profiles can exist on the router for a user. The sequence in which the profiles are specified is relevant. The most explicit matching criteria must be ordered first. The process stops when the first complete match is found.

If all the preceding conditions are not met, access to the router is denied and a failed login event/trap is written to the security log.

- **Timetra-Default-Action <permit-all | deny-all | none>** — this is a mandatory command that must be configured even if the **Timetra-Cmd** VSA is not used. This command specifies the default action when the user has entered a command and no entry configured in the **Timetra-Cmd** VSA for the user resulted in a match condition.
- **Timetra-Cmd <match-string>** — configures a command or command subtree as the scope for the match condition

The command and all subordinate commands in subordinate command levels are specified.

Commands should be configured from most specific to least specific. The 7705 SAR exits on the first match; subordinate levels cannot be modified with subsequent action commands. Subordinate level VSAs must be entered before this entry to be effective.

All commands at and below the hierarchy level of the matched command are subject to the **Timetra-Action** VSA. Multiple match-strings can be entered in a single **Timetra-Cmd** VSA. Match strings must be semicolon (;) separated (maximum string length is 254 characters).

One or more **Timetra-Cmd** VSAs can be entered followed by a single **Timetra-Action** VSA.

- **Timetra-Action <deny | permit>** — causes the permit or deny action to be applied to all match strings specified since the last **Timetra-Action** VSA
- **Timetra-Home-Directory <home-directory string>** — specifies the home directory that applies for the FTP and CLI user. If this VSA is not configured, the home directory is compact flash slot 1 (*cf3*: on all platforms).

- **Timetra-Restrict-To-Home <true | false>** — specifies if user access is limited to their home directory (and directories and files subordinate to their home directory). If this VSA is not configured, the user is allowed to access the entire file system.
- **Timetra-Save-When-Restricted <true | false>** — when this VSA is set to true, the user can execute configuration save operations (for example, **admin save**) via the CLI when **Timetra-Restrict-To-Home** is set to true.
- **Timetra-Exec-File <login-exec-string>** — specifies the login exec file that is executed when the user login is successful. If this VSA is not configured, no login exec file is applied.

If no VSAs are configured for a user, the following applies:

- The **password authentication-order** command on the 7705 SAR router must include **local**.
- The username must be configured on the 7705 SAR router.
- The user must be successfully authenticated by the RADIUS server.
- A valid profile must exist on the 7705 SAR router for this user.

If all the preceding conditions are not met, access to the 7705 SAR router is denied and a failed login event/trap is written to the security log.

For receiving data from the RADIUS server, the following are supported:

- Juniper (vendor-id 4874) attributes 4 (Primary DNS server) and 5 (Secondary DNS server)
- Redback (vendor-id 2352) attributes 1 (Primary DNS) and 2 (Secondary DNS)
- sending authentication requests: (from the DSL Forum) (vendor-id 3561), attributes 1 (Circuit ID) and 2 (Remote ID)

3.3.1 RADIUS Configuration for File Access Control Using VSAs

File access control can be configured in one of the following ways depending on the file access requirements of users:

- locally with no VSAs (see [Configuring Users](#) for information about configuring user access parameters locally)
- with VSAs



Note: File access is denied when the **restricted-to-home** command is configured unless the **home-directory** command is configured and the directory has been created by an administrator.

The following example shows a RADIUS server configuration using VSAs and per-user home directories; in this configuration:

- the administrator has created the home directory for each user
- all file access is controlled with VSAs, which is the most flexible way to grant different file access to each user
- the RADIUS default template is not used for file access
- each user has a home directory
- the administrator can restrict file access to the home directory of the user and allow users to save the configuration based on the VSA value

RADIUS server configuration – user1 has no file access and cannot save the configuration:

```
user1
# Timetra-Home-Directory is not defined
Timetra-Restrict-To-Home = true,
Timetra-Save-When-Restricted = false
```

RADIUS server configuration – user2 has home directory access but cannot save the configuration:

```
user2
Timetra-Home-Directory = "cf3:\user2",
Timetra-Restrict-To-Home = true,
Timetra-Save-When-Restricted = false
```

RADIUS server configuration – user3 has home directory access and can save the configuration:

```
user3
Timetra-Home-Directory = "cf3:\user3",
Timetra-Restrict-To-Home = true,
Timetra-Save-When-Restricted = true
```

RADIUS server configuration – user4 has access to all files and can save the configuration:

```
user4
# Timetra-Home-Directory is not defined
Timetra-Restrict-To-Home = false
# Timetra-Save-When-Restricted is not defined
```

3.4 TACACS+ Services and VSAs

The 7705 SAR supports the "nokia-user" service with several VSAs. Administrators can optionally configure the service and VSAs for each user on a TACACS+ server instead of configuring access locally.

As part of TACACS+ services and VSAs, the router:

- requests "nokia-user" service VSAs after authentication whether **authorization** is enabled or disabled, because this command configures per-command authorization
- uses the values from the TACACS+ default template when a VSA is not present
- discards invalid VSA values and authentication fails
- ignores unknown VSAs and authentication succeeds

The administrator must ensure that the **use-default-template** command is enabled so that users can be authenticated. If the default template (**tacplus_default**) is not enabled, no login access (FTP or console) will be granted because that access can only be configured via the default template (not through VSAs).

The following table describes the supported services and VSAs.

Table 3: TACACS+ VSAs

Service Name	VSA Name	Description	Values
nokia-user	home-directory	Home directory for the user	A string up to 200 characters
nokia-user	restricted-to-home	Limits user access to their home directory	true – prevents the user from accessing files outside their home directory false – allows the user to access all files on the system
nokia-user	save-when-restricted	Saves configurations when the user is restricted to home	true – allows all configuration save operations (for example, admin save) via the CLI even if restricted-to-home is enabled false – prevents the user from performing any configuration save operations outside of their home directory when restricted-to-home is enabled

3.4.1 TACACS+ Configuration for File Access Control Using VSAs

File access control can be configured in one of the following ways depending on the file access requirements of users:

- locally with no VSAs (see [Configuring Users](#) for information about configuring user access parameters locally)
- locally using the TACACS+ default template (**tacplus_default**) and some VSAs that are different for each user
- using the file access VSAs to control file access and the TACACS+ default template for other user access controls



Note: File access is denied when the **restricted-to-home** command is configured unless the **home-directory** command is configured and the directory has been created by an administrator.



Note: If the home directory in the server configuration file (`tac_plus.conf`) is in quotation marks, you must add a backslash (\) to escape the backslash (\); otherwise, the TACACS+ server will reject the setting and fail to start. For example:

- **home-directory = cf3:\user1**

- **home-directory = "cf3:\user1"**

The following example shows a TACACS+ server configuration using VSAs for the per-user home directories and a locally configured default template for other access commands; in this configuration:

- the administrator has created the home directory for each user
- the home directory is configured with a VSA
- other file access controls are configured in the TACACS+ default template
- each user has a home directory with restricted file access
- each user can save the configuration

TACACS+ server configuration

```
user = user1 {
  service = nokia-user {
    home-directory = cf3:\user1
  }
}

user = user2 {
  service = nokia-user {
    home-directory = cf3:\user2
  }
}

user = user3 {
  service = nokia-user {
    home-directory = cf3:\user3
  }
}
```

CLI configuration

```
A:node-2>config>system>security>user-template# info
-----
                restricted-to-home
                save-when-restricted
-----
```

The following example shows a TACACS+ server configuration using VSAs and per-user home directories; in this configuration:

- the administrator has created the home directory for each user
- all file access is controlled with VSAs, which is the most flexible way to grant different file access to each user
- the TACACS+ default template is not used for access
- each user has a home directory
- the administrator can restrict file access to the home directory of the user and allow users to save the configuration based on the VSA value

TACACS+ server configuration – user1 has no file access and cannot save the configuration:

```
user = user1 {
  service = nokia-user {
    # home-directory is not defined
  }
}
```

```
        restricted-to-home = true
        save-when-restricted = false
    }
}
```

TACACS+ server configuration – user2 has home directory access but cannot save the configuration:

```
user = user2 {
    service = nokia-user {
        home-directory = cf3:\user2
        restricted-to-home = true
        save-when-restricted = false
    }
}
```

TACACS+ server configuration – user3 has home directory access and can save the configuration:

```
user = user3 {
    service = nokia-user {
        home-directory = cf3:\user3
        restricted-to-home = true
        save-when-restricted = true
    }
}
```

TACACS+ server configuration – user4 has access to all files and can save the configuration:

```
user = user4 {
    service = nokia-user {
        # home-directory is not defined
        restricted-to-home = false
        # save-when-restricted is not defined
    }
}
```

3.5 Other Security Features

This section contains information about the following topics:

- [Secure Shell \(SSH\)](#)
- [CSM Filters and CSM Security](#)
- [Exponential Login Backoff](#)
- [File Access Controls](#)
- [Encryption](#)
- [802.1x Network Access Control](#)
- [TCP Enhanced Authentication and Keychain Authentication](#)

3.5.1 Secure Shell (SSH)

Secure Shell (SSH) is a protocol that provides a secure, encrypted Telnet-like connection to a router.

A connection is always initiated by the client (the user). Authentication takes place by one of the configured authentication methods (local, RADIUS, or TACACS+). With authentication and encryption, SSH allows for a secure connection over an insecure network.

The 7705 SAR supports Secure Shell version 2 (SSHv2). SSHv2 uses host keys to authenticate systems and is considered a more secure, efficient, and portable version of SSH.

SSH runs on top of a transport layer (like TCP or IP), and provides authentication and encryption capabilities. SSH supports remote login to another computer over a network, remote command execution, and file relocation from one host to another.

The 7705 SAR has a global SSH server process to support inbound SSH, SFTP, and SCP sessions initiated by external SSH or SCP client applications. The SSH server supports SSHv2. This server process is separate from the SSH and SCP client commands on the 7705 SAR, which initiate outbound SSH and SCP sessions.

Inbound SSH, Telnet, and FTP sessions are counted separately and it is possible to set the limit for each session type individually with the **config>system>login-control** command. However, there is a maximum of 50 sessions for SSH and Telnet together. SCP and SFTP sessions are counted as SSH sessions.

When the SSH server is enabled, an SSH security key is generated. Unless the **preserve-key** command is enabled, the key is only valid until either the node is restarted or the SSH server is stopped and restarted. The key size is non-configurable and is set to 2048 for SSHv2 RSA and to 1024 for SSHv2 DSA. Only SSHv2 RSA is supported in FIPS-140-2 mode. When the server is enabled, all inbound SSH, SCP, and SFTP sessions are accepted provided the session is properly authenticated.

When the global SSH server process is disabled, no inbound SSH, SCP, or SFTP sessions are accepted.

When using SCP to copy files from an external device to the file system, the 7705 SAR SCP server will accept either forward slash (/) or backslash (\) characters to delimit directory and filenames. Similarly, the 7705 SAR SCP client application can use either slash or backslash characters, but not all SCP clients treat backslash characters as equivalent to slash characters. In particular, UNIX systems will often interpret the backslash character as an "escape" character, which does not get transmitted to the 7705 SAR SCP server. For example, a destination directory specified as "cf3:\dir1\file1" will be transmitted to the 7705 SAR SCP server as "cf3:dir1file1", where the backslash escape characters are stripped by the SCP client

system before transmission. On systems where the client treats the backslash like an “escape” character, a double backslash (\\) or the forward slash (/) can typically be used to properly delimit directories and the filename.

The 7705 SAR support for SSH, SCP, and SFTP is the same for both IPv4 and IPv6 addressing, including support for:

- SSHv2
- in-band and out-of-band management of the 7705 SAR
- key management and authentication types
- encryption types
- simultaneous IPv4 and IPv6 SSH/SCP/SFTP sessions

The 7705 SAR supports configurable lists for the following: cipher, key exchange (KEX) algorithms, and message authentication code (MAC) algorithms. These lists can be configured for an SSH client or an SSH server and are used to negotiate the best compatible cipher, KEX, or MAC algorithm between the client and server. The lists are created and managed under the **config>system>security>ssh** context. The client list is used when the 7705 SAR is acting as an SSH client and the server list is used when the 7705 SAR is acting as an SSH server.

3.5.1.1 Multichannel SSH

The 7705 SAR supports up to five channels within a single SSH connection, up to a maximum of 15 channels per system. SSH channels can be used when an SSH connection has authenticated a user and a channel is opened for configuration while another channel is required to retrieve state information, such as collecting configurations or show command output. The primary connection authenticates the user through public key authentication (PKI) or keyboard authentication. After the primary connection is authenticated, applications can open multiple channels (sessions) to the server with the same connection.

Opening a new channel inside an existing authenticated SSH connection reduces the additional time and memory requirements for establishing a new SSH session. Reducing the time and memory needed is useful when, for example, multiple RPCs from different network managers to the same device are executed at the same time.



Note: Multiple channels are only supported for SSH and some applications that use SSH as transport. Multiple channels are not supported for SFTP or SCP.

3.5.1.2 SSH Session Closing Behavior

The SSH connection closes automatically when the last channel (session) opened in the connection is closed.

SSH keepalive intervals are disabled on the 7705 SAR, which results in the following:

- the 7705 SAR SSH server does not close the session when the client SSH keepalive intervals time out
- the client SSH keepalive intervals cannot be used to keep the connection to the 7705 SAR server open

3.5.1.3 SSH PKI Authentication

The SSH server supports public key authentication (also known as PKI) if the server has been previously configured to know the client's public key.

Using public key authentication can be more secure than the existing username and password method for the following reasons.

- A user will typically reuse the same password with multiple servers. If the password is compromised, the user must reconfigure the password on all affected servers.
- A password is not transmitted between the client and server using PKI. Instead, the sensitive information (the private key) is kept on the client. Therefore, the password is less likely to be compromised.

The 7705 SAR supports server-side SSHv2 public key authentication but does not include a key-generation utility.

Support for PKI should be configured at the system level where one or more public keys may be bound to a username. This configuration will not affect any other system security or login functions.

PKI has preference over password authentication. PKI is supported using local authentication. PKI authentication is not supported on TACACS+ or RADIUS.

3.5.1.3.1 User Public Key Generation

Before SSH can be used with PKI, a public/private key pair must be generated. This is typically supported by the SSH client software. For example, PuTTY supports a utility called PuTTYGen that will generate key pairs.

The 7705 SAR currently supports Rivest, Shamir, and Adleman (RSA) and Elliptic Curve Digital Signature Algorithm (ECDSA) user public keys. The RSA public key is supported up to 4096 bits and the ECDSA public key is supported up to NIST P-521.

If the client is using PuTTY, they first generate a key pair using PuTTYGen. The user sets the key type to SSH-2 RSA and sets the number of bits to be used for the key. The user can also configure a passphrase that is used to store the key locally in encrypted form. If the passphrase is configured, it acts as a password for the private key and the user must enter the passphrase to use the private key. If a passphrase is not used, the key is stored in plaintext locally.

Next, the public key must be configured for the user on the 7705 SAR with the command **config>system>security>user>public-keys**. The user can program the public key using the CLI or SNMP.

3.5.1.4 SSH Cipher Lists

The 7705 SAR supports configurable cipher client and cipher server lists that are used to negotiate the best compatible cipher between the SSH client and SSH server. Each list contains ciphers and their corresponding index values, where a lower index has a higher preference in the SSH negotiation. The list is ordered by preference from highest to lowest. When the client and server exchange their cipher lists, the first cipher in the client list that is also supported by the server is the cipher that is agreed upon.

See [Table 11: SSHv2 Default Index Values](#) in the [Security Command Reference](#) for the cipher index values and names.

The default list can be changed by manually removing a single index or as many indexes as required using the **no cipher index** command. The default list can also be customized by first removing an index and then redefining it for each algorithm as required (the 7705 SAR does not support customizing an index without first removing it).

3.5.1.5 SSH KEX Lists

The 7705 SAR supports configurable KEX client and KEX server lists that are used to negotiate the best compatible KEX algorithm between the SSH client and SSH server. Each list contains KEX algorithms and their corresponding index values, where a lower index value has a higher preference in the SSH negotiation. The list is ordered by preference from highest to lowest. When the client and server exchange their KEX lists, the first algorithm in the client list that is also supported by the server is the algorithm that is agreed upon.

The KEX client and KEX server each have a default list that contains all supported algorithms and their corresponding indexes. See [Table 12: Default KEX Index Values](#) in the [Security Command Reference](#) for the default KEX index values and algorithms.

The default list can be changed by manually removing a single index or as many indexes as required using the **no kex index** command. The default list can also be customized by first removing an index and then redefining it for each algorithm as required (the 7705 SAR does not support customizing an index without first removing it).

Once a change has been made to the default list, the 7705 SAR uses the changed list moving forward. To go back to using the hard-coded list, the default KEX indexes must be manually re-entered with their corresponding algorithms. If all the entries in a KEX list are removed, the list will be empty and any KEX algorithm brought to the negotiation will be rejected.

3.5.1.6 SSH Key Re-exchange Without Disabling SSH

The 7705 SAR supports periodic rollover (or re-exchange) of the SSH symmetric key without disabling SSH. Symmetric key rollover is important in long SSH sessions. Symmetric key rollover ensures that the encryption channel between the client and server is not jeopardized by an external hacker that is trying to break the encryption via a brute force attack. The feature can be configured on either the SSH client or server.

The following are triggers for symmetric key rollover and negotiation:

- the negotiation of the key based on a configured time period
- the negotiation of the key based on a configured data transmission size

Key re-exchange is enabled by default. The default values for both the client and server are 60 min and 1024 Mbytes, which is the RFC 4253 recommendation.

3.5.1.6.1 Key Re-exchange Procedure

The key re-exchange procedure is initiated by sending an `SSH_MSG_KEXINIT` message while not performing a key exchange. When this message is received by a client or server, the client or server must respond with its own `SSH_MSG_KEXINIT` message, except in cases where the received `SSH_MSG_KEXINIT` message was already sent as a reply. Either client or server can initiate the re-exchange, but the roles must not be changed (that is, the server must remain the server and the client must remain the client).

Key re-exchange is performed using whatever encryption was in effect when the exchange was initiated. Encryption, compression, and MAC methods are not changed before a new `SSH_MSG_NEWKEYS` message is sent after the key exchange (as in the initial key exchange). Re-exchange is processed in the same way as the initial key exchange, except that the session identifier remains unchanged. Some or all of the algorithms can be changed during the re-exchange. Host keys can also change. All keys and initialization vectors are recomputed after the exchange. Compression and encryption contexts are reset.



Note: If the key re-exchange parameters are modified, only new SSH connections inherit the new parameters. The existing SSH connections use the previously configured parameters.

3.5.1.7 SSH MAC Lists

The 7705 SAR supports configurable SSHv2 server MAC and client MAC lists that are used to negotiate the best compatible MAC algorithm between the SSH client and SSH server.

Each list contains MAC algorithms and their corresponding index values, where a lower index value has a higher preference in the SSHv2 negotiation. The list is ordered by preference from highest to lowest. When the client and server exchange their MAC lists, the first algorithm in the client list that is also supported by the server is the algorithm that is agreed upon.

In addition, strong HMAC algorithms can be configured at the top of the MAC list (that is, as the lowest index values in the list) in the order to be negotiated first between the client and server. The first algorithm in the list that is supported by both the client and the server is the one that is agreed upon.

The default list can be changed by manually removing a single index or as many indexes as required using the `no mac index` command. The default list can also be customized by first removing an index and then redefining it for each algorithm as required (the 7705 SAR does not support customizing an index without first removing it).

3.5.1.8 SSH File Transfer Protocol (SFTP)

When an SSH server is enabled on the 7705 SAR, users can connect to the node through SFTP. SFTP runs on top of SSH and uses the same password and authentication process, and once logged in, SFTP users will appear as regular SSH users. Additionally, all other user management features apply to users logging in to the 7705 SAR with an SFTP client.

Event logs are created to capture both successful and unsuccessful attempts to access the node through SFTP.

3.5.2 CSM Filters and CSM Security

IP forwarding supports CSM filters that are applied to IP packets extracted to the control plane. CSM filters are used to protect the control plane from DoS attacks, unauthorized access to the node, and similar security breaches.

IP filters scan all traffic and take the appropriate (configured) action against matching packets. Packets that are not filtered by the IP filters and are destined for the 7705 SAR are scanned by the configured CSM filter.

For information about IP filters, see the 7705 SAR Router Configuration Guide.



Note: Although the Control and Switching module on the 7705 SAR is called a CSM, the CSM filters are referred to as CPM filters in the CLI to maintain consistency with other SR routers.

Both IPv4 and IPv6 CSM filters are supported.

IPv4 CSM filters drop or accept incoming packets based on the following match criteria:

- DSCP name
- destination IP address
- destination port
- fragmentation
- ICMP code
- ICMP type
- IP option value
- multiple options
- option present
- source IP address
- source port
- TCP ACK
- TCP SYN

IPv6 CSM filters drop or accept incoming packets based on the following match criteria:

- DSCP name
- destination IP address
- destination port
- ICMP code
- ICMP type
- source IP address
- source port
- TCP ACK
- TCP SYN

To prevent DoS-like attacks from overwhelming the control plane while ensuring that critical control traffic such as signaling is always serviced in a timely manner, the 7705 SAR segregates the incoming control plane traffic into different queues. These queues are used to shape and rate-limit traffic for each protocol or group of protocols, or on a per-flow basis, with the main goal of mitigating DoS attacks and ensuring that the control plane does not end up with more traffic than it can handle.

These queues are fixed use (each queue handles a specific type of traffic, which is not user-configurable) and fixed configuration (each queue is configured for particular rates and buffering capacity and is not user-configurable).

3.5.3 Exponential Login Backoff

A malicious user can gain CLI access via a dictionary attack: using a script to try "admin" with any password.

The 7705 SAR increases the delay between login attempts exponentially to mitigate attacks. It is applied to the console login. SSH and Telnet sessions terminate after four attempts.

3.5.4 File Access Controls

Files on the 7705 SAR can be accessed locally using the CLI **file** commands and output modifiers, such as > (file redirect), or remotely via FTP or SCP. The 7705 SAR can control file access to:

- allow users to access all files
- allow users to access only the files in their home directory
- prevent users from accessing any files

The file access controls provide different levels of user access. File access controls can also be configured to allow users to save the configuration to a system file that is stored outside their home directory when their file access is restricted to their home directory. A home directory is typically a working space for the user; for example `cf2:/user1`. Although the home directory can be configured to contain saved configuration files, log files, or other system files, administrators should only do this for users who are intended to have access to those files.

The following commands configure file access controls for local or remote users; these commands can be set via the CLI, RADIUS VSAs, or TACACS+ VSAs:

- **home-directory** – home directory for the user; Nokia recommends that this command not be configured in the RADIUS or TACACS+ default template because each user should have their own home directory
- **restricted-to-home** – limits file access to only the files in the home directory of the user
- **save-when-restricted** – allows configuration save operations even if **restricted-to-home** is enabled

The following table describes the types of file access controls that can be configured for each user.

Table 4: File access control configuration

Command/Name ¹	Access to all files and can save the configuration	Access to home directory files and can save the configuration	Access to home directory files and cannot save the configuration	No file access and cannot save the configuration
home-directory	N/A	A valid home directory	A valid home directory	Unconfigured or an invalid home directory
restricted-to-home	Disabled	Enabled	Enabled	Enabled
save-when-restricted	N/A	Enabled	Disabled	Disabled

Note:

1. The CLI commands and the RADIUS and TACACS+ VSA names are the same.

3.5.5 Encryption

Data Encryption Standard (DES) and Triple DES (3DES) are supported for encryption.

- DES is a widely used method of data encryption using a private (secret) key. Both the sender and the receiver must know and use the same private key.
- 3DES is a more secure version of the DES protocol.

3.5.6 802.1x Network Access Control

The 7705 SAR supports network access control of client devices (PCs, STBs, and so on) on an Ethernet network using the IEEE 802.1x standard. 802.1x is known as Extensible Authentication Protocol (EAP) over a LAN network or EAPOL.

See the 7705 SAR Interface Configuration Guide for more information about IEEE 802.1x.

3.5.7 TCP Enhanced Authentication and Keychain Authentication

The 7705 SAR supports non-keychain MD5 authentication for OSPF, IS-IS, and RSVP-TE and TCP MD5 authentication for BGP and LDP. In previous releases, only a single authentication key or pre-hashed MD5 digest could be defined at a time using the **authentication-key** command. If this key was changed, the adjacency was reset, causing both the local and remote router to reconverge based on the lost adjacency. When a new key or digest was added, the adjacency was re-established, causing another reconvergence event within the network.

The 7705 SAR also supports the TCP Enhanced Authentication Option, as specified in *draft-bonica-tcpauth-05.txt, Authentication for TCP-based Routing and Management Protocols*. The TCP Enhanced Authentication option is a TCP extension that enhances security for BGP, LDP, and other TCP-based protocols. It extends the MD5 authentication option to include the ability to change keys in a BGP or LDP session seamlessly without tearing down the session, and allows for stronger authentication algorithms to be used. It is intended for applications where secure administrative access to both endpoints of the TCP connection is normally available.

TCP peers can use this extension to authenticate messages passed between one another. This strategy improves upon the practice described in RFC 2385, *Protection of BGP Sessions via the TCP MD5 Signature Option*. Using this new strategy, TCP peers can update authentication keys during the lifetime of a TCP connection. TCP peers can also use stronger authentication algorithms to authenticate routing messages.

3.5.7.1 Keychain Authentication

TCP enhanced authentication uses keychains that are associated with every protected TCP connection.

The keychain concept supported by BGP and LDP has also been extended to the OSPF, IS-IS, and RSVP-TE protocols.

The keychain mechanism allows for the creation of keys used to authenticate protocol communications. Each keychain entry defines the authentication attributes to be used in authenticating protocol messages from remote peers or neighbors; the keychain must include at least one key entry to be valid. The keychain

mechanism also allows authentication keys to be changed without affecting the state of the associated protocol adjacencies.

Each key within a keychain must include the following attributes for the authentication of protocol messages:

- key identifier – unique identifier, expressed as a decimal integer
- authentication algorithm – see [Table 5: Security Algorithm Support Per Protocol](#)
- authentication key – used by the authentication algorithm to authenticate packets
- direction – packet stream direction in which the key is applied (receive direction, send direction, or both)
- begin time – the time at which a new authentication key can be used

Optionally, each key can include the following attributes:

- end time – the time at which the authentication key becomes inactive (applies to received packets only)
- tolerance – period in which both old and new authentication key values can overlap and both keys will be allowed on received packets (applies to received packets only)

For added security, support for the Secure Hash Algorithm (SHA) has been added. [Table 5: Security Algorithm Support Per Protocol](#) lists the security algorithms supported per protocol.

Table 5: Security Algorithm Support Per Protocol

Protocol	Clear Text	MD5 (message digest)	HMAC-MD5	HMAC- SHA-1-96	HMAC- SHA-1	HMAC- SHA-256	AES-128- CMAC-96
OSPF	Yes	Yes	No	Yes	Yes	Yes	No
IS-IS	Yes	No	Yes	No	Yes	Yes	No
RSVP-TE	No	No	Yes	Yes	Yes	Yes	No
BGP	No	No	No	Yes	No	No	Yes
LDP	No	No	No	Yes	No	No	Yes

3.5.7.2 Keychain Configuration Guidelines and Behavior

- Either the existing **authentication-key** command or the new **auth-keychain** command can be used by the protocols, but both cannot be supported at the same time. If both commands are configured, the **auth-keychain** configuration will be applied and the **authentication-key** command will be ignored.
- A keychain cannot be referenced by a protocol until it has been configured.
- If a keychain is referenced by a protocol, the keychain cannot be deleted.
- If multiple keys in a keychain are valid at the same time, the newest key (key with the most current start time) is used.
- If a protocol sends a packet that is configured to use a keychain, the most current key from that keychain is used.

- If a protocol receives a packet that is configured to use a keychain, the current key set is returned to authenticate the received packet.
 - The key set includes the currently active keys (based on the current system time) and the begin/end time associated with each key in the specified keychain.
 - If a tolerance value is set for a key, the key is returned as part of the key set if the current time is within the key's begin time, plus or minus the tolerance value. For example, if the begin time is 12:00 p.m. and the tolerance is 600 seconds, the new key should be included from 11:55 a.m. and the key to be replaced should be included until 12:05 p.m.
- The end time and tolerance attributes apply only to received packets. Transmitted packets always use the newest key, regardless of the tolerance value.
- If a keychain exists but there are no active key entries with an authentication type that matches the type supported by the protocol, inbound protocol packets will not be authenticated and will be discarded and no outbound protocol packets will be sent.
- If a keychain exists but the last key entry has expired, a log entry will be raised indicating that all keychain entries have expired.
 - The OSPF and RSVP-TE protocols require that the protocols continue to authenticate inbound and outbound traffic using the last valid authentication key.
 - The IS-IS protocol requires that the protocol not revert to an unauthenticated state and requires that the old key not be used; therefore, when the last key has expired, all traffic will be discarded.

For information about associating keychains with protocols, see the 7705 SAR Routing Protocols Guide (for OSPF, IS-IS, and BGP), the 7705 SAR MPLS Guide (for RSVP-TE and LDP), and the 7705 SAR Services Guide (for OSPF and BGP in a VPRN service).

3.5.8 TLS

3.5.8.1 TLS Overview

Transport Layer Security (TLS) is used for two primary purposes:

- authentication of an end device (client or server) using a digital signature (DS)
TLS uses PKI for device authentication. DSs are used to authenticate the client or the server. The server typically sends a certificate with a DS to the client.

In specific situations, the server can request a certificate from the client to authenticate it. The client has a certificate (called a trust anchor) from the certificate authority (CA) that is used to authenticate the server certificate and its DS. After the client provides a digitally signed certificate to the server and both parties are authenticated, the encryption PDUs can then be transmitted.

- encryption and authentication of application PDUs
After the client and server have been successfully authenticated, the cipher suite is negotiated between the server and clients, and the PDUs are encrypted based on the agreed cipher protocol.

3.5.8.2 TLS Interaction with Applications

TLS is a standalone configuration. The user must configure a TLS client profile with certificates and trust anchors, and then assign the TLS client profile to the appropriate applications. When a TLS client profile is assigned to an application, the application does not send any PDUs until the TLS handshake has been

successfully completed and the encryption ciphers have been negotiated between the TLS server and the TLS client.

After successful negotiation and handshake, the application is notified that TLS is operationally up. The application begins transmitting PDUs encrypted using TLS based on the agreed ciphers. If at any point the TLS becomes operationally down, the application will stop transmitting PDUs.

For example, a TLS connection with the PCEP application operates as follows:

1. A TLS client is configured under PCEP on the 7705 SAR.
2. PCEP stops sending clear text PDUs because a TLS client profile has been assigned and TLS is not ready to encrypt.
3. The TLS client begins the handshake.
4. Authentication occurs at the TLS layer.
5. The TLS server and TLS client negotiate ciphers.
6. Salts are negotiated for the symmetric key. A salt is a seed for creating AES encryption keys.
7. When negotiations are successfully completed, the handshake finishes, TLS becomes operationally up, and PCEP is notified.
8. PCEP begins transmitting PDUs that are encrypted using TLS.

Until TLS becomes operationally up, PCEP does not transmit any PDUs.

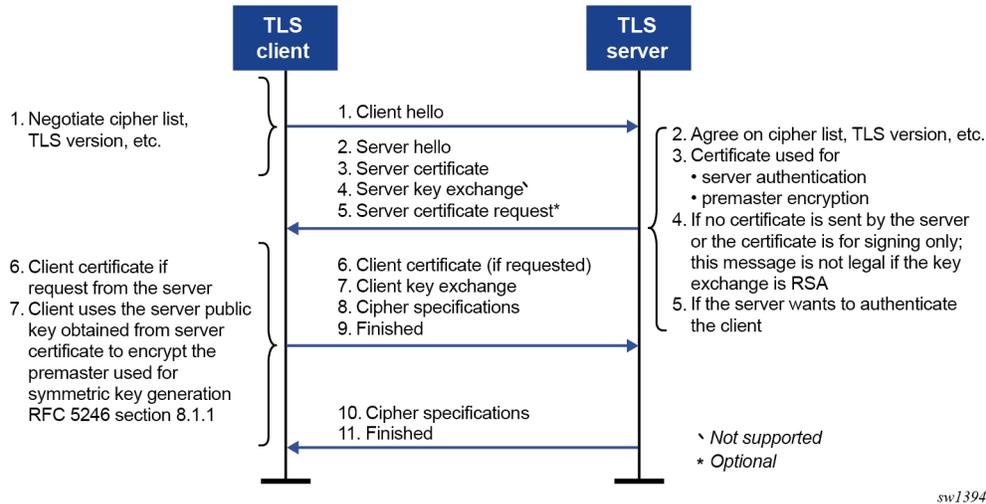
3.5.8.2.1 Application Support

The 7705 SAR supports TLS client profiles on the PCC to enable PCEP over TLS (PCEPS). See the "PCEP over TLS" section in the 7705 SAR MPLS Guide for more information.

3.5.8.3 TLS Handshake

The following figure shows the TLS handshake process and table describes the steps.

Figure 3: TLS Handshake



sw1394

Table 6: TLS Handshake Steps

Step	Description
1	The TLS handshake begins with the client Hello message. This message includes the cipher list that the client wants to use and negotiate.
2	The TLS server sends back a server Hello message, along with the first common cipher found on both the client cipher list and the server cipher list. This agreed cipher is used for data encryption.
3	The TLS server continues by sending a server certificate message, where the server provides a certificate to the client so that the client can authenticate the server identity. The public key of this certificate (RSA key) can also be used for encryption of the symmetric key seed that is used by the client and server to create the symmetric encryption key. This occurs only if PKI is using RSA for asymmetric encryption.
4	Server key exchange is not supported by the 7705 SAR. The 7705 SAR only uses RSA keys; Diffie-Hellman key exchange is not supported.
5	The server can optionally be configured to request a certificate from the client to authenticate the client.
6	If the server requests a certificate, the client must provide a certificate using a client certificate message. If the client does not provide a certificate, the server drops the TLS session.
7	The client uses the server public RSA key that was included in the server certificate to encrypt a seed used for creating the symmetric key. This seed is used by the client and server to create the identical symmetric key for encrypting and decrypting the data plane traffic.

Step	Description
8	The client sends a cipher specification to switch encryption to this symmetric key.
9	The client successfully finishes the handshake.
10	The server sends a cipher specification to switch encryption to this symmetric key.
11	The server successfully finishes the handshake.

After a successful handshake, TLS is operationally up and can be used for application encryption.

3.5.8.4 TLS 1.3

TLS 1.3 is required for faster handshakes, stronger encryption, and authentication algorithms.

All 7705 SAR applications that use TLS 1.2 also support TLS 1.3, unless specifically stated otherwise.

The user can configure the node to use TLS 1.2, TLS 1.3, or both for negotiation.

If TLS 1.3 is negotiated with a peer, the node does not negotiate the TLS version down to 1.2 as long as the session is alive.

TLS 1.3 handshake

The TLS 1.3 client handshake is very similar to TLS 1.2 because the client is able to negotiate TLS 1.2 or 1.3 when starting the TLS Hello message to the server. The client includes a "Supported Version" extension in its Hello message. The server responds with its own supported version and agreed ciphers. The server and client must agree on the TLS version to proceed with the connection.

In TLS 1.2 and TLS 1.3, the server can optionally request the client certificate to authenticate the client. If requested, the client must provide its certificate to the server.

TLS 1.3 configuration

The user can configure the TLS 1.3 cipher list independently of TLS 1.2. TLS 1.3 ciphers are configured using the **tls13-cipher** command. When the user configures a TLS 1.3 cipher list, TLS 1.3 is included as a supported version in the TLS handshake.

TLS 1.3 also introduces group lists and signature lists for the server and client.

In the Hello message sent by the client, the "supported_groups" extension indicates the named groups that the client supports for the key exchange, ordered from most preferred to least preferred. TLS 1.3 supports Elliptic-curve Diffie-Hellman Ephemeral (ECDHE) groups.



Note: TLS 1.2 does not support Diffie-Hellman groups as an asymmetric key.

TLS 1.3 also allows the selection of signature algorithms. The "signature_algorithms_cert" extension is included to allow implementations that support different sets of algorithms for certificates and in TLS itself to clearly signal their capabilities.

3.5.8.5 TLS Client Certificate

The TLS protocol is used for authentication, and therefore the server can ask to authenticate the client via PKI. If the server requests authentication from the client, the client must provide an X.509v3 certificate to the server so that it can be authenticated via the digital signature of its client.

The 7705 SAR supports the configuration of an X.509v3 certificate for TLS clients.

When the server requests a certificate via the server's Hello message, the client transmits its certificate to the server using a client certificate message.

3.5.8.6 TLS Symmetric Key Rollover

The 7705 SAR supports key rollover when the TLS server is enabled with a TLS renegotiation timer and sends a HelloRequest message as specified in RFC 5246, section 7.4.1.1.

3.5.8.7 Supported TLS Ciphers

As shown in [Figure 3: TLS Handshake](#), TLS negotiates the supported ciphers between the client and the server.

The client sends the supported cipher suites in the client Hello message, and the server compares them with the server cipher list. The top protocol on both lists is chosen and returned from the server in the server Hello message.

The 7705 SAR supports the following ciphers as a TLS 1.2 client:

- tls-rsa-with3des-ede-cbc-sha
- tls-rsa-with-aes128-cbc-sha
- tls-rsa-with-aes256-cbc-sha
- tls-rsa-with-aes128-cbc-sha256
- tls-rsa-with-aes256-cbc-sha256

The 7705 SAR supports the following TLS 1.3 ciphers, groups, and signature algorithms as a TLS 1.3 client:

- ciphers:
 - tls-aes128-gcm-sha256
 - tls-aes256-gcm-sha384
 - tls-chacha20-poly1305-sha256
 - tls-aes128-ccm-sha256
 - tls-aes128-ccm8-sha256
- groups:
 - tls-ecdh-256
 - tls-ecdh-384
 - tls-ecdh-521
 - tls-x25519
 - tls-x448

- signature algorithms:
 - tls-rsa-pkcs1-sha256
 - tls-rsa-pkcs1-sha384
 - tls-rsa-pkcs1-sha512
 - tls-ecdsa-secp256r1-sha256
 - tls-ecdsa-secp384r1-sha384
 - tls-ecdsa-secp521r1-sha512
 - tls-rsa-pss-rsae-sha256
 - tls-rsa-pss-rsae-sha384
 - tls-rsa-pss-rsae-sha512
 - tls-rsa-pss-pss-sha256
 - tls-rsa-pss-pss-sha384
 - tls-rsa-pss-pss-sha512
 - tls-ed25519
 - tls-ed448

3.5.8.8 Certificate Management

The 7705 SAR implements a centralized certificate management protocol that can be used by TLS. See the "IPSec" section in the 7705 SAR Services Guide for information about the configuration of the certificates and the corresponding protocols, such as OCSP and CRL.

3.5.8.8.1 Certificate Profile

The certificate profile is available for the TLS client and is configured with the **cert-profile** command. The certificate profile contains the certificates that the client sends to the TLS server along with its DS so that the server can authenticate it via the **trust-anchor** and CA certificate.

Multiple provider certificates can be configured; however, the 7705 SAR currently uses the smallest index as the active provider certificate, and only sends that certificate to the server.

3.5.8.8.2 TLS Server Authentication of the Client Certificate CN Field

If the client provides a certificate, the server checks the common name (CN) field against local CN configurations. The CN is validated via the client IPv4/IPv6 address or FQDN. If the common-name list authentication option is not enabled on the server, it uses certificate signature authentication instead.

3.5.8.9 Operational Guidelines

3.5.8.9.1 Server Authentication Behavior

Following the Hello messages, the server sends its certificate in a certificate message if it is to be authenticated.

The **trust-anchor-profile** command determines whether the server must be authenticated by the client.



Note: If the **trust-anchor-profile** is configured and the **ca-profile** is missing from this **trust-anchor-profile**, the TLS connection fails and an "unknown_ca" error is generated, as per RFC 5246, section 7.2.2.

One of the following configurations can be used to establish server connectivity:

1. If **trust-anchor-profile** is configured under the TLS **client-tls-profile** context, the server must be authenticated via the **trust-anchor-profile** command before a trusted connection is established between the server and the client.
2. If there is no **trust-anchor-profile** under the **client-tls-profile** context, the trusted connection can be established without server authentication. The RSA key of the certificate is used for public key encryption, requiring basic certificate checks to validate the certificate. These basic checks are as follows:

- **time validity**

The certificate is checked to ensure that it is not expired or not yet valid.

- **certificate type**

The certificate is not a CA certificate.

- **keyUsage extension**

If present, this must contain a digital signature and key encryption.

- **host verification**

The IP address or DNS name of the server is looked up, if available, in the common name (cn) or subjectAltName extension. This is to verify that the certificate was issued to that server and not to another.

3.5.8.9.2 TLS Client Profile and Trust Anchor Behavior and Scale

The 7705 SAR supports the creation of TLS client profiles, which can be assigned to applications such as PCEP to encrypt the application layer.

The **client-tls-profile** command is used for negotiating and authenticating the server. After the server is authenticated via the trust anchor profile (configured using the **trust-anchor-profile** command) of a TLS client profile, it negotiates the ciphers and authentication algorithms to be used for encryption of the data.

The TLS client profile must be assigned to an application for it to start encrypting. Up to 16 TLS client profiles can be configured. Because each of these client profiles needs a trust anchor profile to authenticate the server, up to 16 trust anchor profiles can be configured. A trust anchor profile holds up to 8 trust anchors (configured using the **trust-anchor** command), each of which holds a CA profile (**ca-profile**).

A CA profile is a container for installing CA certificates. These CA certificates are used to authenticate the server certificate. When the client receives the server certificate, it reads through the trust anchor profile CA certificates and tries to authenticate the server certificate against each CA certificate. The first CA certificate that authenticates the server is used.

3.5.8.10 Basic TLS Configuration

Basic TLS client configuration must have a cipher list created using the **config>system>security>tls>client-cipher-list** command, and the cipher list must be assigned to the TLS client profile using the **config>system>security>tls>client-tls-profile>cipher-list** command.

TLS imports the trust anchor certificate for peer certificate authentication and public key retrieval. The following example shows a TLS configuration.

Example:

```
A:node-2>config>system>security>tls# info
-----
trust-anchor-profile "server-1-ca" create
  trust-anchor "tls-server-1-ca"
exit
client-cipher-list "to-active-server" create
  cipher 1 name tls-rsa-with-aes256-cbc-sha256
  cipher 2 name tls-rsa-with-aes128-cbc-sha256
  cipher 3 name tls-rsa-with-aes256-cbc-sha
exit
client-tls-profile "server-1-profile" create
  cipher-list "to-active-server"
  trust-anchor-profile "server-1-ca"
  no shutdown
exit
-----
```

3.5.8.11 Common Configuration Tasks

3.5.8.11.1 Configuring a Client TLS Profile

The following displays the CLI syntax for a client TLS profile:

CLI Syntax:

```
config>system>security>tls
client-tls-profile name
  trust-anchor-profile name
```

3.5.8.11.2 Configuring a TLS Client Certificate

The following displays the CLI syntax for TLS certificate management:

CLI Syntax:

```
config>system>security>tls
cert-profile profile-name
  entry entry-id
    cert cert-filename
    key key-filename
    send-chain
      ca-profile name
    no shutdown
client-tls-profile name
```

```
cert-profile name
```

3.5.8.11.3 Configuring a TLS Trust Anchor

The following displays the CLI syntax for a TLS trust anchor:

CLI Syntax:

```
config>system>security>tls
  trust-anchor-profile name
  client-tls-profile name
  cipher-list name
  no shutdown
  trust-anchor-profile name
```

The following example shows a TLS trust anchor configuration:

Example:

```
*A:node-2>config>system>security>tls# info
-----
  trust-anchor-profile "server-1-ca" create
    trust-anchor "tls-server-1-ca"
  exit
  client-tls-profile "server-1-profile" create
    cipher-list "to-active-server"
    trust-anchor-profile "server-1-ca"
    no shutdown
  exit
```

3.6 Configuration Notes

This section describes security configuration guidelines and caveats.

- If a RADIUS or a TACACS+ server is not configured, password, profiles, and user access information must be configured on each router in the domain.
- If RADIUS authorization is enabled, VSAs must be configured on the RADIUS server.

3.7 Configuring Security with CLI

This section provides information to configure security using the command line interface. Topics in this section include:

- [Setting Up Security Attributes](#)
- [Security Configurations](#)
- [Security Configuration Procedures](#)

3.8 Setting Up Security Attributes

[Table 7: Security Configuration Requirements](#) depicts the capabilities of authentication, authorization, and accounting configurations. For example, authentication can be enabled locally and on RADIUS and TACACS+ servers. Authorization can be executed locally, on a RADIUS server, or on a TACACS+ server. Accounting can be performed on a RADIUS or TACACS+ server.

Table 7: Security Configuration Requirements

Authentication	Authorization	Accounting
Local	Local	None
RADIUS	Local and RADIUS	RADIUS
TACACS+	Local and TACACS+	TACACS+

3.8.1 Configuring Authentication

See the following sections to configure authentication:

- Local authentication
 - [Configuring Password Management Parameters](#)
 - [Configuring Profiles](#)
 - [Configuring Users](#)

- RADIUS authentication (with local authorization)

By default, authentication is enabled locally. Perform the following tasks to configure security on each participating 7705 SAR router:

- [Configuring Profiles](#)
- [Configuring RADIUS Authentication](#)
- [Configuring Users](#)

- RADIUS authentication (with RADIUS authorization)

To implement RADIUS authentication with authorization, perform the following tasks on each participating 7705 SAR router:

- [Configuring RADIUS Authentication](#)
- [Configuring RADIUS Authorization](#)

- TACACS+ authentication

To implement TACACS+ authentication, perform the following tasks on each participating 7705 SAR router:

- [Configuring Profiles](#)
- [Configuring Users](#)
- [Enabling TACACS+ Authentication](#)

3.8.2 Configuring Authorization

See the following sections to configure authorization:

- Local authorization

For local authorization, configure these tasks on each participating 7705 SAR router:

- [Configuring Profiles](#)
- [Configuring Users](#)

- RADIUS authorization with authentication

For RADIUS authorization with authentication, configure these tasks on each participating 7705 SAR router:

- [Configuring RADIUS Authorization](#)

For RADIUS authorization, VSAs must be configured on the RADIUS server. See [RADIUS VSAs](#).

- [Configuring RADIUS Authentication](#)
- [Configuring Profiles](#)

- TACACS+ authorization (only)

For TACACS+ authorization without authentication, perform the task in [Configuring TACACS+ Authorization](#) for each participating 7705 SAR router:

- TACACS+ authorization

For TACACS+ authorization with authentication, configure these tasks on each participating 7705 SAR router:

- [Enabling TACACS+ Authentication](#)
- [Configuring TACACS+ Authorization](#)

3.8.3 Configuring Accounting

See the following sections to configure accounting.

- Local accounting is not implemented. For information about configuring accounting policies, see [Configuring Logging with CLI](#).
- [Configuring RADIUS Accounting](#)
- [Configuring TACACS+ Accounting](#)

3.9 Security Configurations

This section provides information about configuring security and examples of configuration tasks.

To implement security features, configure the following components:

- management access filters
- CPM (CSM) filters
- profiles
- user access parameters
- password management parameters
- RADIUS or TACACS+
 - enable one to five RADIUS or TACACS+ (or both) servers
 - configure RADIUS or TACACS+ (or both) parameters

The following example displays default values for security parameters.

```

ALU-1>config>system>security# info detail
-----
management-access-filter
  ip-filter
    default-action permit
    entry 1
      action permit
      src-ip 10.10.10.xx/32
    exit
    entry 2
      action permit
      src-ip 10.10.0.xx/32
    exit
  exit
cpm-filter
  ip-filter
    shutdown
    entry 2 create
      action drop
    exit
  exit
profile "default"
  default-action none
  entry 10
    no description
    match "exec"
    action permit
  exit
...
  entry 70
    no description
    match "show"
    action permit
  exit
exit
profile "administrative"
  default-action permit-all
  entry 10
    no description

```

```

        match "configure system security"
        action permit
    exit
...
password
    authentication-order radius tacplus local
    no aging
    minimum-length 6
    attempts 3 time 5 lockout 10
    complexity
exit
user "admin"
    password "$2y$10$TQrZlpBDra86.qoexZUZqeBXDY1FcdDhGwdD9lLxMuFyPVSm00Gy6"
    access console
    no home-directory
    no restricted-to-home
    no save-when-restricted
    console
        no login-exec
        no cannot-change-password
        no new-password-at-login
        member "administrative"
    exit
exit
snmp
    view iso subtree 1
        mask ff type included
    exit
...
access group snmp-ro security-model snmpv1 security-level no-auth-no-
privacy read no-security notify no-security
access group snmp-ro security-model snmpv2c security-level no-auth-no-
privacy read no-security notify no-security
access group snmp-rw security-model snmpv1 security-level no-auth-no-
privacy read no-security write no-security notify no-security
access group snmp-rw security-model snmpv2c security-level no-auth-no-
privacy read no-security write no-security notify no-security
access group snmp-rwa security-model snmpv1 security-level no-auth-no-
privacy read iso write iso notify iso
access group snmp-rwa security-model snmpv2c security-level no-auth-no-
privacy read iso write iso notify iso
access group snmp-trap security-model snmpv1 security-level no-auth-no-
privacy notify iso
access group snmp-trap security-model snmpv2c security-level no-auth-no-
privacy notify iso
access group cli-readonly security-model snmpv2c security-level
no-auth-no-privacy read iso notify iso
access group cli-readwrite security-model snmpv2c security-level
no-auth-no-privacy read iso write iso notify iso
    attempts 20 time 5 lockout 10
    exit
    no ssh
    exit

```

3.10 Security Configuration Procedures

- [Configuring IPv4 or IPv6 Management Access Filters](#)
- [Configuring IPv4 or IPv6 CPM \(CSM\) Filters](#)
- [Configuring Password Management Parameters](#)

- [Managing IPsec Certificates](#)
- [Configuring Profiles](#)
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- [Configuring SSH](#)
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- [Configuring SSH MAC Algorithm Lists](#)
- [Configuring Login Controls](#)
- [Configuring RADIUS Parameters](#)
- [Configuring TACACS+ Parameters](#)
- [Configuring Keychains](#)

3.10.1 Configuring IPv4 or IPv6 Management Access Filters

Creating and implementing management access filters is optional. Management access filters control all traffic going in to the CSM, including all routing protocols. They apply to packets from all ports. The filters can be used to restrict management of the 7705 SAR router by other nodes outside either specific (sub)networks or through designated ports. By default, there are no filters associated with security options. The management access filter and entries must be explicitly created on each router.

Management access filters apply to the management Ethernet port, which supports both IPv4 and IPv6 filters.

The 7705 SAR exits the filter when the first match is found and executes the actions according to the specified action. For this reason, entries must be sequenced correctly from most to least explicit.

An entry may not have any match criteria defined (in which case, everything matches) but must have at least the keyword **action** to be considered complete. Entries without the **action** keyword are considered incomplete and are rendered inactive.

Use the following CLI commands to configure an IPv4 management access filter.

CLI Syntax:

```
config>system
  security
    management-access-filter
      ip-filter
        default-action {permit | deny | deny-host-unreachable}
      entry entry-id
        action {permit | deny | deny-host-unreachable}
        description description-string
        dst-port port [mask]
        log
        protocol protocol-id
        router router-instance
        src-ip {ip-prefix[/mask][netmask] | ip-prefix-list ip-
prefix-list-name}
        src-port {port-id | cpm}
        renum old-entry-number new-entry-number
        no shutdown
```

Use the following CLI commands to configure an IPv6 management access filter.

CLI Syntax:

```
config>system
  security
    management-access-filter
      ipv6-filter
        default-action {permit | deny | deny-host-unreachable}
        entry entry-id
          action {permit | deny | deny-host-unreachable}
          description description-string
          dst-port port [mask]
          flow-label value
          log
          next-header next-header
          router router-instance
          src-ip {ipv6-address/prefix-length | ipv6-prefix-
list ipv6-prefix-list-name}
          src-port {port-id | cpm}
          renum old-entry-number new-entry-number
          no shutdown
```

The following example displays an IPv4 management access filter configuration. This example only accepts packets matching the criteria specified in entries 1 and 2. Non-matching packets are denied.

Example:

```
config>system>security# management-access-filter
config>system>security>mgmt-access-filter# ip-filter default-action
deny
config>system>security>mgmt-access-filter# ip-filter entry 1
config>system>security>mgmt-access-filter>ip-filter>entry# src-
ip 10.10.10.104/32
config>system>security>mgmt-access-filter>ip-filter>entry# action
permit
config>system>security>mgmt-access-filter>ip-filter>entry# exit
config>system>security>mgmt-access-filter# entry 2
config>system>security>mgmt-access-filter>ip-filter>entry# src-
ip 10.10.10.1/32
config>system>security>mgmt-access-filter>ip-filter>entry# action
permit
config>system>security>mgmt-access-filter>ip-filter>entry# exit
```

The following example displays the management access filter configuration.

```
ALU-1>config>system>security# info
-----
      management-access-filter
        ip-filter
          default-action deny
          entry 1
            action permit
            src-ip 10.10.10.104/32
          exit
          entry 2
            action permit
            src-ip 10.10.0.1/32
          exit
        exit
-----
ALU-1>config>system>security#
```



Note: If configuring management access filters via a Telnet session, ensure that data from the host IP address is permitted before setting the default action to **deny**; otherwise, the session is dropped. To do this, set the default action to **permit**, configure an entry with the **src-ip** address of the host as a permitted match criterion, then set the default action back to **deny**. Alternatively, use a direct console connection to the node for configuration; in this case, the order of filter configuration does not matter.

3.10.2 Configuring IPv4 or IPv6 CPM (CSM) Filters

CPM filters control all traffic going in to the CSM, including all routing protocols. They apply to packets from all network and access ports, but not to packets from a management Ethernet port. CPM packet filtering is performed by network processor hardware using no resources on the main CPUs.

Use the following CLI commands to configure an IPv4 CPM filter.

CLI Syntax:

```
config>system>security
cpm-filter
  default-action {accept | drop}
  ip-filter
    entry entry-id [create]
      action {accept | drop}
      description description-string
      log log-id
      match [protocol protocol-id]
        dscp dscp-name
        dst-ip {ip-address/mask | ip-address ipv4-address-mask}
    | ip-prefix-list prefix-list-name
      dst-port [tcp/udp port-number] [mask]
      fragment {true | false}
      icmp-code icmp-code
      icmp-type icmp-type
      ip-option ip-option-value [ip-option-mask]
      multiple-option {true | false}
      option-present {true | false}
      src-ip {ip-address/mask | ip-address ipv4-address-mask}
    | ip-prefix-list prefix-list-name
      src-port src-port-number [mask]
      tcp-ack {true | false}
      tcp-syn {true | false}
      renum old-entry-id new-entry-id
```

Use the following CLI commands to configure an IPv6 CPM filter.

CLI Syntax:

```
config>system>security
cpm-filter
  default-action {accept | drop}
  ipv6-filter
    entry entry-id [create]
      action {accept | drop}
      description description-string
      log log-id
      match [next-header next-header]
      dscp dscp-name
      dst-ip {ipv6-address/prefix-length | ipv6-prefix-list}
    | ipv6-prefix-list-name
      dst-port [tcp/udp port-number] [mask]
      icmp-code icmp-code
```

```

        icmp-type icmp-type
        src-ip {ipv6-address/prefix-length | ipv6-prefix-
list ipv6-prefix-list-name}
        src-port src-port-number [mask]
        tcp-ack {true | false}
        tcp-syn {true | false}
        renum old-entry-id new-entry-id

```

The following displays an IPv4 CPM filter configuration example:

```

A:ALU-49>config>sys>sec>cpm>ip-filter# info
-----
        entry 10 create
        action drop
        description "CPM-Filter 10.4.101.2 #101"
        log 101
    exit
    entry 20 create
        no action
        description "CPM-Filter 10.4.101.2 #201"
        log 101
    exit
        no shutdown
-----
A:ALU-49>config>sys>sec>cpm>ip-filter#

```

3.10.3 Configuring Password Management Parameters

Configuring password management parameters consists of defining aging, the authentication order and authentication methods, password length and complexity, as well as the number of attempts a user can make to enter a password.

Depending on the authentication requirements, password parameters are configured locally or on the RADIUS or TACACS+ server.

Use the following CLI commands to configure password support:

CLI Syntax:

```

config>system>security
  password
    admin-password password [hash | hash2]
    aging days
    attempts count [time minutes1] [lockout minutes2]
    authentication-order [method-1] [method-2] [method-3] [exit-
on-reject]
    complexity [numeric] [special-character] [mixed-case]
    health-check
    minimum-length value

```

The following displays an example of the password command usage.

Example:

```

config>system>security#password
security>password# aging 365
security>password# minimum-length 8
security>password# attempts 5 time 5 lockout 20
security>password# authentication-order radius tacplus
local

```

The following example displays the password configuration:

```
ALU-1>config>system>security# info
-----
password
authentication-order radius tacplus local
aging 365
minimum-length 8
attempts 5 time 5 lockout 20
exit
-----
ALU-1>config>system>security#
```

3.10.4 Managing IPSec Certificates

The following is an example of importing a certificate from a **pem** format:

```
*A:ALU-A# admin certificate import type cert input cf3:/pre-import/
R10cert.pem output R1-0cert.der format pem
```

The following is an example of exporting a certificate to a **pem** format:

```
*A:ALU-A# admin certificate export type cert input R1-0cert.der output cf3:/
R10cert.pem format pem
```

The following example displays a profile output:

```
*A:ALU-A>config>system>security>pki# info
-----
ca-profile "Root" create
description "Root CA"
cert-file "R1-0cert.der"
crl-file "R1-0crl.der"
no shutdown
exit
-----
*A:ALU-A>config>system>security>pki#
```

The following example displays an **ike-policy** with **cert-auth** output:

```
*A:ALU-A>config>ipsec>ike-policy# info
-----
auth-method cert-auth
own-auth-method psk
-----
```

The following example displays a static LAN-to-LAN configuration using **cert-auth**:

```
interface "VPRN1" tunnel create
sap tunnel-1.private:1 create
ipsec-tunnel "Sanity-1" create
security-policy 1
local-gateway-address 192.168.0.0 peer 192.168.0.1 delivery-
service 300
dynamic-keying
ike-policy 1
pre-shared-key "Sanity-1"
```

```

transform 1
cert
  trust-anchor-profile "trustAnchorProfile_1"
  cert-profile "certProfile_4"
exit
exit
no shutdown
exit

```

3.10.5 Configuring Profiles

Profiles are used to deny or permit access to a hierarchical branch or specific commands. Profiles are referenced in a user configuration. A maximum of 16 user profiles can be defined. A user can participate in up to 16 profiles. Depending on the authorization requirements, passwords are configured locally or on the RADIUS server.

When configuring profiles, put more specific commands in the lower-numbered entries because the lower-numbered entries take precedence over the higher-numbered entries.

In the following example, because the general command in entry 10 takes precedence, entry 20 is ignored and the "show system" command will be permitted because it matches on "show". To avoid this, the "show system" entry needs to be a number lower than 10.

Example:

```

entry 10
  match "show"
  action permit
exit
entry 20
  match "show system"
  action deny
exit

```



Note: **security** commands in the **config>system**, **show>system**, **admin>system**, and **tools>perform** contexts that are not explicitly permitted are automatically denied.

Use the following CLI commands to configure user profiles:

CLI Syntax:

```

config>system>security
  profile user-profile-name
  default-action {deny-all | permit-all | none}
  renum old-entry-number new-entry-number
  entry entry-id
    description description-string
    match command-string
    action {permit | deny}

```

The following displays an example of the user profile command usage.

Example:

```

config>system>security# profile ghost
config>system>security>profile$ default-action permit-all
config>system>security>profile# entry 1
config>system>security>profile>entry$ action permit
config>system>security>profile>entry# match "configure"
config>system>security>profile>entry# exit
config>system>security>profile# entry 2

```

```
config>system>security>profile>entry$ match "show"
config>system>security>profile>entry# exit
config>system>security>profile# entry 3
config>system>security>profile>entry$ match "exit"
```

The following example displays the user profile output:

```
ALU-1>config>system>security# info
-----
...
    profile "ghost"
      default-action permit-all
      entry 1
        match "configure"
        action permit
      exit
      entry 2
        match "show"
      exit
      entry 3
        match "exit"
      exit
```

3.10.6 Configuring Users

Access parameters are configured for individual users. For each user, the login name and, optionally, information that identifies the user is defined. Use the following CLI syntax to configure access parameters for users. The **snmp authentication des-key** keyword is not available if the 7705 SAR node is running in FIPS-140-2 mode).

CLI Syntax:

```
config>system>security
  user user-name
    access [ftp] [snmp] [console]
    console
      cannot-change-password
      local-lockout
      login-exec url-prefix:source-url
      member user-profile-name [user-profile-name...(up to 8
max)]
      new-password-at-login
      home-directory url-prefix [directory] [directory/directory ..]
      password [password]
      restricted-to-home
      save-when-restricted
      snmp
        authentication {[none] | [[hash] {md5 key-1 | sha key-1}
privacy {none | des-key key-2 | aes-128-cfb-key key-2}}]
      group group-name
```

The following displays an example of the command usage.

Example:

```
config>system>security
config>system>security# user 49ers
config>system>security>user$ access ftp snmp console
config>system>security>user$ console
config>system>security>user>console# member default ghost
config>system>security>user>console# new-password-at-login
```

```

config>system>security>user>console# exit
config>system>security>user# password testuser1
config>system>security>user# restricted-to-home
config>system>security>user# save-when-restricted
config>system>security>user# exit

```

The following example displays the user configuration:

```

ALU-1>config>system>security# info
-----
...
        user "49ers"
        password "$2y$10$si0U8NvWRzFFtJj05wAII.7mr.57emDXUC14p6EZt0.pmr0aqLW
Sa"
        access console ftp snmp
        restricted-to-home
        save-when-restricted
        console
            member "default"
            member "ghost"
        exit
    exit
...
-----
ALU-1>config>system>security#

```

3.10.7 Copying and Overwriting Users and Profiles

You can copy a profile or user or overwrite an existing profile or user. The **overwrite** option must be specified; otherwise, an error occurs if the destination profile or username already exists.

3.10.7.1 Copying a User

CLI Syntax:

```

config>system>security# copy {user source-user | profile source-profile} to destination [overwrite]

```

Example:

```

config>system>security# copy user "testuser" to
"testuserA"
MINOR: CLI User "testuserA" already exists - use overwrite flag.
config>system>security#
config>system>security# copy user "testuser" to "testuserA" overwrite
config>system>security#

```

The following output displays the copied user configurations:

```

ALU-12>config>system>security# info
-----
...
        user "testuser"
        password "$2y$10$si0U8NvWRzFFtJj05wAII.7mr.57emDXUC14p6EZt0.pmr0aqL
Sa"
        access snmp
        snmp

```

```

        authentication hash md5 e14672e71d3e96e7a1e19472527ee969 privacy
none
        group "testgroup"
        exit
    exit
    user "testuserA"
        password "$2y$10$si0U8NvWRzFFtJj05wA1I.7mr.57emDXUC14p6EZt0.pmr0aqLW
Sa"
        access snmp
        console
            new-password-at-login
        exit
        snmp
            authentication hash md5 e14672e71d3e96e7a1e19472527ee969 privacy
none
        group "testgroup"
        exit
    exit
...
-----
ALU-12>config>system>security# info

```



Note: The **cannot-change-password** flag is not replicated when a copy user command is performed. A **new-password-at-login** flag is created instead.

```

ALU-12>config>system>security>user# info
-----
password "$2y$10$si0U8NvWRzFFtJj05wA1I.7mr.57emDXUC14p6EZt0.pmr0aqLWSa"
access snmp
console
    cannot-change-password
exit
snmp
    authentication hash md5 e14672e71d3e96e7a1e19472527ee969 privacy none
    group "testgroup"
exit
-----
ALU-12>config>system>security>user# exit
ALU-12>config>system>security# user testuserA
ALU-12>config>system>security>user# info
-----
password "$2y$10$si0U8NvWRzFFtJj05wA1I.7mr.57emDXUC14p6EZt0.pmr0aqLWSa"
access snmp
console
    new-password-at-login
exit
snmp
    authentication hash md5 e14672e71d3e96e7a1e19472527ee969 privacy none
    group "testgroup"
exit
-----
ALU-12>config>system>security>user#

```

3.10.7.2 Copying a Profile

CLI Syntax:

```
config>system>security# copy {user source-user | profile source-profile} to destination [overwrite]
```

Example:

```
config>system>security# copy profile default to testuser
```

The following output displays the copied profiles:

```
A:ALU-49>config>system>security# info
-----
...
A:ALU-49>config>system>security# info detail
-----
...
    profile "default"
      default-action none
      entry 10
        no description
        match "exec"
        action permit
      exit
      entry 20
        no description
        match "exit"
        action permit
      exit
      entry 30
        no description
        match "help"
        action permit
      exit
      entry 40
        no description
        match "logout"
        action permit
      exit
      entry 50
        no description
        match "password"
        action permit
      exit
      entry 60
        no description
        match "show config"
        action deny
      exit
      entry 70
        no description
        match "show"
        action permit
      exit
      entry 80
        no description
        match "enable-admin"
        action permit
      exit
    exit
  profile "testuser"
```

```
default-action none
entry 10
  no description
  match "exec"
  action permit
exit
entry 20
  no description
  match "exit"
  action permit
exit
entry 30
  no description
  match "help"
  action permit
exit
entry 40
  no description
  match "logout"
  action permit
exit
entry 50
  no description
  match "password"
  action permit
exit
entry 60
  no description
  match "show config"
  action deny
exit
entry 70
  no description
  match "show"
  action permit
exit
entry 80
  no description
  match "enable-admin"
  action permit
exit
exit
profile "administrative"
  default-action permit-all exit
...
```

3.10.8 Configuring SSH

Use the **ssh** command to configure the SSH server. This command should only be enabled or disabled when the SSH server is disabled. This setting cannot be changed while the SSH server is running.

CLI Syntax:

```
config>system>security
ssh
  preserve-key
  no server-shutdown
```

Example:

```
config>system>security# ssh
```

```
config>system>security>ssh# preserve-key
```

The following example displays the SSH server configuration using a host-key:

```
A:ALU-1>config>system>security>ssh# info
-----
                preserve-key
-----
A:ALU-1>config>system>security>ssh#
```

3.10.9 Configuring SSH Cipher Lists

Use the **ssh** command to configure SSHv2 cipher lists. Client cipher lists are used if the 7705 SAR is acting as an SSH client, and server cipher lists are used if the 7705 SAR is acting as an SSH server.



Note: When the 7705 SAR is running in FIPS-140-2 mode, the 3des-cbc cipher is not available.

CLI Syntax:

```
config>system>security
  ssh
    client-cipher-list
      cipher index name cipher-name
    server-cipher-list
      cipher index name cipher-name
```

Example:

```
config>system>security# ssh
config>system>security>ssh# client-cipher-list
config>system>security>ssh>client-cipher# cipher 2 name aes256-ctr
config>system>security>ssh>client-cipher# cipher 4 name aes128-ctr
config>system>security>ssh>client-cipher# cipher 6 name aes256-cbc
config>system>security>ssh>client-cipher# cipher 10 name aes128-cbc
config>system>security>ssh>client-cipher# cipher 20 name 3des-cbc
config>system>security>ssh>client-cipher# cipher 60 name aes192-cbc
config>system>security>ssh>client-cipher# cipher 70 name aes256-cbc
config>system>security>ssh>client-cipher# exit
config>system>security>ssh# server-cipher-list
config>system>security>ssh>server-cipher# cipher 2 name aes256-ctr
config>system>security>ssh>server-cipher# cipher 4 name aes192-ctr
config>system>security>ssh>server-cipher# cipher 6 name aes128-ctr
config>system>security>ssh>server-cipher# cipher 10 name aes128-cbc
config>system>security>ssh>server-cipher# cipher 20 name 3des-cbc
config>system>security>ssh>server-cipher# cipher 60 name aes192-cbc
config>system>security>ssh>server-cipher# cipher 70 name aes256-cbc
config>system>security>ssh>server-cipher# exit
config>system>security>ssh# exit
```

The following example displays SSHv2 client and server cipher list configurations:

```
A:Sar8 Dut-A>config>system>security>ssh# info detail
-----
client-cipher-list
  cipher 2 name aes256-ctr
  cipher 4 name aes192-ctr
  cipher 6 name aes128-ctr
  cipher 10 name aes128-cbc
```

```

cipher 20 name 3des-cbc
cipher 60 name aes192-cbc
cipher 70 name aes256-cbc
exit
server-cipher-list
cipher 2 name aes256-ctr
cipher 4 name aes192-ctr
cipher 6 name aes128-ctr
cipher 10 name aes128-cbc
cipher 20 name 3des-cbc
cipher 60 name aes192-cbc
cipher 70 name aes256-cbc
exit
-----
*A: Sar8 Dut-A>config>system>security>ssh#

```

3.10.10 Configuring SSH KEX Algorithm Lists

Use the **ssh** command to configure SSHv2 client and server KEX algorithm lists. Client KEX algorithm lists are used if the 7705 SAR is acting as an SSH client, and server KEX algorithm lists are used if the 7705 SAR is acting as an SSH server.



Note: When the 7705 SAR node is running in FIPS-140-2 mode, the diffie-hellman-group1-sha1 KEX algorithm is not available.

CLI Syntax:

```

config>system>security
ssh
  client-kex-list
    kex index name kex-name
  server-kex-list
    kex index name kex-name

```

Example:

```

config>system>security# ssh
config>system>security>ssh# client-kex-list
config>system>security>ssh>client-kex# kex 200 name diffie-hellman-
group16-sha512
config>system>security>ssh>client-kex# kex 210 name diffie-hellman-
group14-sha256
config>system>security>ssh>client-kex# kex 215 name diffie-hellman-
group14-sha1
config>system>security>ssh>client-kex# kex 220 name diffie-hellman-
group-exchange-sha1
config>system>security>ssh>client-kex# kex 225 name diffie-hellman-
group1-sha1
config>system>security>ssh>client-kex# exit
config>system>security>ssh# server-kex-list
config>system>security>ssh>server-kex# kex 200 name diffie-hellman-
group16-sha512
config>system>security>ssh>server-kex# kex 210 name diffie-hellman-
group14-sha256
config>system>security>ssh>server-kex# exit
config>system>security>ssh# exit

```

The following example displays SSHv2 client and server KEX list configurations:

```
A:~# config>system>security>ssh# info detail
-----
client-kex-list
  kex 200 name diffie-hellman-group16-sha512
  kex 210 name diffie-hellman-group14-sha256
  kex 215 name diffie-hellman-group14-sha1
  kex 220 name diffie-hellman-group-exchange-sha1
  kex 225 name diffie-hellman-group1-sha1
exit
server-kex-list
  kex 200 name diffie-hellman-group16-sha512
  kex 210 name diffie-hellman-group14-sha256
  kex 215 name diffie-hellman-group14-sha1
  kex 220 name diffie-hellman-group-exchange-sha1
  kex 225 name diffie-hellman-group1-sha1
exit
-----
*A:~# config>system>security>ssh#
```

3.10.11 Configuring SSH MAC Algorithm Lists

Use the **ssh** command to configure SSHv2 client and server MAC algorithm lists. Client MAC algorithm lists are used if the 7705 SAR is acting as an SSH client, and server MAC algorithm lists are used if the 7705 SAR is acting as an SSH server.



Note: When the 7705 SAR node is running in FIPS-140-2 mode, the following MAC algorithms are not available:

- hmac-sha1-96
- hmac-md5
- hmac-md5-96

CLI Syntax:

```
config>system>security
ssh
  client-mac-list
    mac index name mac-name
  server-mac-list
    mac index name mac-name
```

Example:

```
config>system>security# ssh
config>system>security>ssh# client-mac-list
config>system>security>ssh>client-mac# mac 200 name hmac-sha2-512
config>system>security>ssh>client-mac# mac 210 name hmac-sha2-256
config>system>security>ssh>client-mac# mac 215 name hmac-sha1
config>system>security>ssh>client-mac# mac 220 name hmac-sha1-96
config>system>security>ssh>client-mac# mac 225 name hmac-md5
config>system>security>ssh>client-mac# mac 240 name hmac-md5-96
config>system>security>ssh>client-mac# exit
config>system>security>ssh# server-mac-list
config>system>security>ssh>server-mac# mac 200 name hmac-sha2-512
config>system>security>ssh>server-mac# mac 210 name hmac-sha2-256
config>system>security>ssh>server-mac# exit
```

```
config>system>security>ssh# exit
```

The following example displays client and server MAC list configurations:

```
A:~# config>system>security>ssh# info detail
-----
client-mac-list
  mac 200 name hmac-sha2-512
  mac 210 name hmac-sha2-256
  mac 215 name hmac-sha1
  mac 220 name hmac-sha1-96
  mac 225 name hmac-md5
  mac 240 name hmac-md5-96
exit
server-mac-list
  mac 200 name hmac-sha2-512
  mac 210 name hmac-sha2-256
  mac 215 name hmac-sha1
  mac 220 name hmac-sha1-96
  mac 225 name hmac-md5
  mac 240 name hmac-md5-96
exit
exit
-----
*A:~# config>system>security>ssh#
```

3.10.12 Configuring Login Controls

Use the **login-control** context to configure parameters for console, FTP, SSH, and Telnet sessions.

CLI Syntax:

```
config>system
  login-control
    exponential-backoff
    ftp
      inbound-max-sessions value
    ssh
      [no] disable-graceful-shutdown
      inbound-max-sessions value
      outbound-max-sessions value
      ttl-security min-ttl-value
    telnet
      [no] enable-graceful-shutdown
      inbound-max-sessions value
      outbound-max-sessions value
      ttl-security min-ttl-value
  idle-timeout {minutes | disable}
  pre-login-message login-text-string [name]
  login-banner
  motd {url url-prefix:source-url | text motd-text-string}
```

The following example displays the login control configuration:

Example:

```
config>system>login-control# ftp inbound-max-sessions 5
config>system>login-control# ssh inbound-max-sessions 12
config>system>login-control# ssh outbound-max-sessions 8
config>system>login-control# ssh ttl-security 100
config>system>login-control# telnet enable-graceful-shutdown
```

```

config>system>login-control# telnet inbound-max-sessions 7
config>system>login-control# telnet outbound-max-sessions 2
config>system>login-control# idle-timeout 1440
config>system>login-control# pre-login-message "Property of Service
Routing Inc. Unauthorized access prohibited."
config>system>login-control# motd text "Notice to all users: Software
upgrade scheduled 3/2 1:00 AM"

```

The following example displays the login control configuration:

```

ALU-1>config>system# info
-----
...
    login-control
      ftp
        inbound-max-sessions 5
      exit
      ssh
        no disable-graceful-shutdown
        inbound-max-sessions 12
        outbound-max-sessions 8
        ttl-security 100
      telnet
        enable-graceful-shutdown
        inbound-max-sessions 7
        outbound-max-sessions 2
      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"
      exit
      no exponential-backoff
    ...
-----
ALU-1>config>system#

```

3.10.13 Configuring RADIUS Parameters

- [Configuring RADIUS Authentication](#)
- [Configuring RADIUS Authorization](#)
- [Configuring RADIUS Accounting](#)
- [Configuring 802.1x RADIUS Policies](#)

3.10.13.1 Configuring RADIUS Authentication

RADIUS is disabled by default and must be explicitly enabled. The mandatory commands to enable RADIUS on the local router are **radius** and **server server-index address ip-address secret key**. The **server** command adds a RADIUS server and configures the RADIUS server's IP address, index, and key values. The index determines the sequence in which the servers are queried for authentication requests.

Also, the system IP address must be configured in order for the RADIUS client to work. See "Configuring a System Interface" in the 7705 SAR Router Configuration Guide.

The other commands are optional.

On the local router, use the following CLI commands to configure RADIUS authentication:

CLI Syntax:

```
config>system>security
  radius
    port port
    retry count
    server server-index address ip-address secret key [hash1 |
hash2]
    timeout seconds
    no shutdown
```

The following example displays the CLI syntax usage:

Example:

```
config>system>security>
security# radius
security# no shutdown
security>radius# server 1 address A:A:A:A:A:A:1 secret test1
security>radius# server 2 address 10.10.0.1 secret test2
security>radius# server 3 address 10.10.0.2 secret test3
security>radius# server 4 address 10.10.0.3 secret test4
security>radius# retry 5
security>radius# timeout 5
config>system>security>radius# exit
```

The following example displays the RADIUS authentication configuration:

```
ALU-1>config>system>security# info
-----
      retry 5
      timeout 5
      server 1 address A:A:A:A:A:A:1 secret "test1"
      server 2 address 10.10.0.1 secret "test2"
      server 3 address 10.10.0.2 secret "test3"
      server 4 address 10.10.0.3 secret "test4"
      ...
-----
ALU-1>config>system>security#
```

3.10.13.2 Configuring RADIUS Authorization

In order for RADIUS authorization to function, RADIUS authentication must be enabled first. See [Configuring RADIUS Authentication](#).

In addition to the local configuration requirements, VSAs must be configured on the RADIUS server. See [RADIUS VSAs](#).

On the local router, use the following CLI commands to configure RADIUS authorization:

CLI Syntax:

```
config>system>security
  radius
    authorization
```

The following example displays the CLI syntax usage:

Example:

```
config>system>security>
```

```
config>system>security# radius
config>system>security>radius# authorization
```

The following example displays the RADIUS authorization configuration:

```
ALU-1>config>system>security# info
-----
...
    radius
      authorization
      retry 5
      timeout 5
      server 1 address 10.10.10.103 secret "test1"
      server 2 address 10.10.0.1 secret "test2"
      server 3 address 10.10.0.2 secret "test3"
      server 4 address 10.10.0.3 secret "test4"
    exit
...
-----
```

3.10.13.3 Configuring RADIUS Accounting

On the local router, use the following CLI commands to configure RADIUS accounting:

CLI Syntax:

```
config>system>security
  radius
    accounting
```

The following example displays the CLI syntax usage:

Example:

```
config>system>security>
config>system>security# radius
config>system>security>radius# accounting
```

The following example displays the RADIUS accounting configuration:

```
ALU-1>config>system>security# info
-----
...
    radius
      shutdown
      authorization
      accounting
      retry 5
      timeout 5
      server 1 address 10.10.10.103 secret "test1"
      server 2 address 10.10.0.1 secret "test2"
      server 3 address 10.10.0.2 secret "test3"
      server 4 address 10.10.0.3 secret "test4"
    exit
...
-----
ALU-1>config>system>security#
```

3.10.13.4 Configuring 802.1x RADIUS Policies

Use the following CLI commands to configure generic authentication parameters for clients using 802.1x EAPOL. Additional parameters are configured on Ethernet ports. See the 7705 SAR Interface Configuration Guide, "Configuration Command Reference", for more information about configuring 802.1x parameters on Ethernet ports.

To configure generic parameters for 802.1x authentication, enter the following CLI syntax:

CLI Syntax:

```
config>system>security
  dot1x
    radius-plcy name [create]
      retry count
      server server-index address ip-address secret key [hash |
hash2] [auth-port auth-port] [acct-port acct-port] [type server-type]
      no shutdown
      source-address ip-address
      timeout seconds
      no shutdown
```

The following example displays the CLI syntax usage:

Example:

```
config>system>security>
config>system>security# dot1x
config>system>security>dot1x# radius-plcy dot1x_plcy
create
config>system>security>dot1x>radius-plcy# server 1 address 10.10.10.1
secret abc auth-port 65000
config>system>security>dot1x>radius-plcy# server 2 address 10.10.10.3
secret xyz auth-port 862
config>system>security>dot1x>radius-plcy# source-address 10.10.10.255
```

The following example displays an 802.1x configuration:

```
*A:7705_custDoc>config>system>security>dot1x# info
-----
radius-plcy "dot1x_plcy" create
  server 1 address 10.10.10.1 auth-port 65000 acct-
port 1813 secret "WDoQz6DJf4.0M5dlpwjHbk" hash2 type authorization
  server 2 address 10.10.10.3 auth-port 862 acct-port 1813 secret
"WDoQz6DJf4.jlWcCeHZwz." hash2 type authorization
  source-address 10.10.10.255
  shutdown
exit
...
-----
A:ALU-1>config>system#
```

3.10.14 Configuring TACACS+ Parameters

- [Enabling TACACS+ Authentication](#)
- [Configuring TACACS+ Authorization](#)
- [Configuring TACACS+ Accounting](#)

3.10.14.1 Enabling TACACS+ Authentication

To use TACACS+ authentication on the router, configure one or more TACACS+ servers on the network. Use the following CLI commands to configure TACACS+ authentication:

CLI Syntax:

```
config>system>security
tacplus
server server-index address ip-address secret key [hash1 |
hash2]
timeout seconds
no shutdown
```

The following example is configured in the **config>system** context:

Example:

```
security# tacplus
security>tacplus# server 1 address A:A:A:A:A:A:1 secret test1
security>tacplus# server 2 address 10.10.0.6 secret test2
security>tacplus# server 3 address 10.10.0.7 secret test3
security>tacplus# server 4 address 10.10.0.8 secret test4
security>tacplus# server 5 address 10.10.0.9 secret test5
config>system>security>tacplus# timeout 5
config>system>security>tacplus# no shutdown
```

The following example displays the TACACS+ authentication configuration:

```
ALU-1>config>system>security>tacplus# info
-----
          timeout 5
          server 1 address A:A:A:A:A:A:1 secret "h6.TeL7YPohbmlvz0gob."
hash2
          server 2 address 10.10.0.6 secret "h6.TeL7YPog7WbLsR3QRd." hash2
          server 3 address 10.10.0.7 secret "h6.TeL7YPojGJqbYt85LVk" hash2
          server 4 address 10.10.0.8 secret "h6.TeL7YPoiCfWKUFHARvk" hash2
          server 5 address 10.10.0.9 secret "h6.TeL7YPojCyTFvTNGBU" hash2
```

3.10.14.2 Configuring TACACS+ Authorization

In order for TACACS+ authorization to function, TACACS+ authentication must be enabled first. See [Enabling TACACS+ Authentication](#).

On the local router, use the following CLI commands to configure TACACS+ authorization:

CLI Syntax:

```
config>system>security
tacplus
authorization
no shutdown
```

The following example displays the CLI syntax usage:

Example:

```
config>system>security>
config>system>security# tacplus
config>system>security>tacplus# authorization
```

```
config>system>security>tacplus# no shutdown
```

The following example displays the TACACS+ authorization configuration:

```
ALU-1>config>system>security>tacplus# info
-----
      authorization
      timeout 5
      server 1 address 10.10.0.5 secret "h6.TeL7YPohbmlvz0gob." hash2
      server 2 address 10.10.0.6 secret "h6.TeL7YPog7WbLsR3QRd." hash2
      server 3 address 10.10.0.7 secret "h6.TeL7YPojGJqbYt85LVk" hash2
      server 4 address 10.10.0.8 secret "h6.TeL7YPoiCfWKUFHARvk" hash2
      server 5 address 10.10.0.9 secret "h6.TeL7YPojCyTFvTNGBU" hash2
-----
ALU-1>config>system>security>tacplus#
```

3.10.14.3 Configuring TACACS+ Accounting

On the local router, use the following CLI commands to configure TACACS+ accounting:

CLI Syntax:

```
config>system>security
      tacplus
      accounting
```

The following example displays the CLI syntax usage:

Example:

```
config>system>security>
config>system>security# tacplus
config>system>security>tacplus# accounting
```

The following example displays the TACACS+ accounting configuration:

```
ALU-1>config>system>security>tacplus# info
-----
      accounting
      authorization
      timeout 5
      server 1 address 10.10.0.5 secret "h6.TeL7YPohbmlvz0gob." hash2
      server 2 address 10.10.0.6 secret "h6.TeL7YPog7WbLsR3QRd." hash2
      server 3 address 10.10.0.7 secret "h6.TeL7YPojGJqbYt85LVk" hash2
      server 4 address 10.10.0.8 secret "h6.TeL7YPoiCfWKUFHARvk" hash2
      server 5 address 10.10.0.9 secret "h6.TeL7YPojCyTFvTNGBU" hash2
-----
ALU-1>config>system>security>tacplus#
```

3.10.15 Configuring Keychains

The keychain mechanism allows for the creation of keys used to authenticate protocol communications. Each keychain entry defines the authentication attributes to be used in authenticating protocol messages from remote peers or neighbors; the keychain must include at least one key entry to be valid.

Each key within a keychain must include the following attributes for the authentication of protocol messages:

- key identifier
- authentication algorithm
- authentication key
- direction
- begin time

Optionally, each key can include an end time and tolerance.

Use the following CLI commands to configure a keychain:

CLI Syntax:

```
config>system>security
  keychain name
    description description-string
    direction
      bi
        entry entry-id [key authentication-key | hash-
key | hash2-key [hash | hash2] algorithm algorithm]
          begin-time [date] [hours-minutes] [UTC]
          tolerance {seconds | forever}
      uni
        receive
          entry entry-id [key authentication-key | hash-
key | hash2-key [hash | hash2] algorithm algorithm]
            begin-time [date] [hours-minutes] [UTC]
            tolerance {seconds | forever}
        send
          entry entry-id [key authentication-key | hash-
key | hash2-key [hash | hash2] algorithm algorithm]
            begin-time [date] [hours-minutes] [UTC]
```

The following example displays a keychain configuration:

```
A:ALU-1>config>system>security># info detail
-----
...
  keychain "ospf-md5"
    description "MD5 keychain for OSPF interfaces"
    tcp-option-number
      send 254
      receive 254
    exit
    direction
      bi
        entry 0 key "VyScMGUfEQw9vxb9YWEG8oEeyRxTrGC.aFwWKz101E
" hash2 algorithm message-digest
          no shutdown
          begin-time 2016/06/01 00:00:00 UTC
          no option
        exit
        entry 1 key "VyScMGUfEQw9vxb9YWEG6rfIEGa/.sGbxt3BaeWY0.
" hash2 algorithm message-digest
          no shutdown
          begin-time 2016/06/09 00:00:00 UTC
          no option
          tolerance 600
        exit
      exit
    exit
  exit
no shutdown
```

```

        exit
        keychain "rsvp-md5"
        description "MD5 keychain for RSVP interfaces"
        tcp-option-number
        send 254
        receive 254
        exit
        direction
        uni
        send
            entry 0 key "f4L8216viTz80MIKEcNfF/0BxU12MaZskrUHLTN
YMwY" hash2 algorithm message-digest
            no shutdown
            begin-time 2016/06/01 00:00:00 UTC
            exit
            entry 1 key "f4L8216viTz80MIKEcNfF0VmwDJEUYqX1ob50zL
E0HY" hash2 algorithm message-digest
            no shutdown
            begin-time 2016/06/09 00:00:00 UTC
            exit
        exit
        receive
            entry 0 key "dE.xAjca3DLqssbdJ8zc8vblBwYsvFXL57dvJEU
RQHE" hash2 algorithm message-digest
            no shutdown
            begin-time 2016/06/01 00:00:00 UTC
            tolerance 600
            exit
            entry 1 key "dE.xAjca3DLqssbdJ8zc4ty4BxUSFV5xl9ejgfr
YHGG" hash2 algorithm message-digest
            no shutdown
            begin-time 2016/06/09 00:00:00 UTC
            tolerance 600
        exit
    exit
exit
-----
A:ALU-1>config>system>security#

```

In the above example, two separate keychains are created, "ospf-md5" and "rsvp-md5", each with two possible keys.

For ospf-md5:

- entry 0 is valid starting at midnight (UTC) on 2016/06/01
- entry 1 will become valid at midnight (UTC) on 2016/06/09 and will replace entry 0
- there is an overlap (tolerance) period of 600 seconds in which packets with either key (entry 0 or entry 1) will be accepted

For rsvp-md5:

- for transmitted packets:
 - send key entry 0 is valid starting at midnight (UTC) on 2016/06/01
 - send key entry 1 will become valid at midnight (UTC) on 2016/06/09 and will replace entry 0
- for received packets:
 - receive key entry 0 is valid starting at midnight (UTC) on 2016/06/01
 - receive key entry 1 will become valid at midnight (UTC) on 2016/06/09 and will replace entry 0

- there is an overlap (tolerance) period of 600 seconds in which receive packets with either key (entry 0 or entry 1) will be accepted

3.11 Security Command Reference

3.11.1 Command Hierarchies

- [Admin Commands](#)
- [Configuration Commands](#)
 - [Security Configuration Commands](#)
 - [Management Access Filter Commands](#)
 - [IPv6 Management Access Filter Commands](#)
 - [CPM Filter Commands](#)
 - [IPv6 CPM Filter Commands](#)
 - [Password Commands](#)
 - [Profile Commands](#)
 - [User Commands](#)
 - [CLI Script Authorization Commands](#)
 - [RADIUS Commands](#)
 - [TACACS+ Commands](#)
 - [802.1x Commands](#)
 - [SSH Commands](#)
 - [TLS Commands](#)
 - [Keychain Authentication Commands](#)
 - [Login Control Commands](#)
- [Show Commands](#)
 - [Security](#)
 - [Login Control](#)
- [Clear Commands](#)
 - [Admin](#)
 - [Authentication](#)
- [Monitor Commands](#)
- [Debug Commands](#)

3.11.1.1 Admin Commands

```
admin
- system
  - security
    - system-password admin-password
```

3.11.1.2 Configuration Commands

3.11.1.2.1 Security Configuration Commands

```

config
- system
  - security
    - copy {user source-user | profile source-profile} to destination [overwrite]
    - ftp-server
    - no ftp-server
    - hash-control [read-version {1 | 2 | all}] [write-version {1 | 2}]
    - no hash-control
    - source-address
      - application app [ip-int-name | ip-address]
      - no application app
      - application6 app ipv6-address
      - no application6 app
    - [no] telnet-server
    - [no] telnet6-server
    - vprn-network-exceptions [number seconds]
    - no vprn-network-exceptions

```

3.11.1.2.2 Management Access Filter Commands

```

config
- system
  - security
    - [no] management-access-filter
    - ip-filter
      - default-action {permit | deny | deny-host-unreachable}
      - [no] entry entry-id
        - action {permit | deny | deny-host-unreachable}
        - no action
        - description description-string
        - no description
        - dst-port port [mask]
        - no dst-port
        - [no] log
        - [no] protocol protocol-id
        - router router-instance
        - router service-name service-name
        - no router
        - src-ip {ip-prefix [/mask] [netmask] | ip-prefix-list ip-prefix-list-
name}
        - no src-ip
        - src-port {port-id | cpm | lag lag-id}
        - no src-port
      - renum old-entry-number new-entry-number
      - [no] shutdown

```

3.11.1.2.3 IPv6 Management Access Filter Commands

```

config

```

```

- system
  - security
    - [no] management-access-filter
    - ipv6-filter
      - default-action {permit | deny | deny-host-unreachable}
      - [no] entry entry-id
        - action {permit | deny | deny-host-unreachable}
        - no action
        - description description-string
        - no description
        - dst-port port [mask]
        - no dst-port
        - flow-label value
        - no flow-label
        - [no] log
        - [no] next-header next-header
        - router router-instance
        - router service-name service-name
        - no router
        - src-ip {ipv6-address/prefix-length | ipv6-prefix-list ipv6-prefix-
list-name}
          - no src-ip
          - src-port {port-id | cpm | lag lag-id}
          - no src-port
      - renum old-entry-number new-entry-number
      - [no] shutdown

```

3.11.1.2.4 CPM Filter Commands

```

config
- system
  - security
    - [no] cpm-filter
      - default-action {accept | drop}
      - ip-filter
        - entry entry-id [create]
        - no entry entry-id
          - action {accept | drop}
          - no action
          - description description-string
          - no description
          - log log-id
          - no log
          - match [protocol protocol-id]
          - no match
            - dscp dscp-name
            - no dscp
            - dst-ip {ip-address/mask | ip-address ipv4-address-mask | ip-
prefix-list prefix-list-name}
              - no dst-ip
              - dst-port tcp/udp port-number [mask]
              - no dst-port
              - fragment {true | false}
              - no fragment
              - icmp-code icmp-code
              - no icmp-code
              - icmp-type icmp-type
              - no icmp-type
              - ip-option ip-option-value [ip-option-mask]
              - no ip-option
              - multiple-option {true | false}

```

```

- no multiple-option
- option-present {true | false}
- no option-present
- src-ip {ip-address/mask | ip-address ipv4-address-mask | ip-
prefix-list prefix-list-name}
- no src-ip
- src-port tcp/udp port-number [mask]
- no src-port
- tcp-ack {true | false}
- no tcp-ack
- tcp-syn {true | false}
- no tcp-syn
- renum old-entry-id new-entry-id
- [no] shutdown

```

3.11.1.2.5 IPv6 CPM Filter Commands

```

config
- system
  - security
    - [no] cpm-filter
      - default-action {accept | drop}
      - ipv6-filter
        - entry entry-id [create]
        - no entry entry-id
          - action {accept | drop}
          - no action
          - description description-string
          - no description
          - log log-id
          - no log
          - match [next-header next-header]
          - no match
            - dscp dscp-name
            - no dscp
            - dst-ip {ipv6-address/prefix-length | ipv6-prefix-list ipv6-
prefix-list-name}
            - no dst-ip
            - dst-port tcp/udp port-number [mask]
            - no dst-port
            - icmp-code icmp-code
            - no icmp-code
            - icmp-type icmp-type
            - no icmp-type
            - src-ip {ipv6-address/prefix-length | ipv6-prefix-list ipv6-
prefix-list-name}
            - no src-ip
            - src-port tcp/udp port-number [mask]
            - no src-port
            - tcp-ack {true | false}
            - no tcp-ack
            - tcp-syn {true | false}
            - no tcp-syn
          - renum old-entry-id new-entry-id
          - [no] shutdown

```

3.11.1.2.6 Password Commands

```

config
- system
  - security
    - password
      - admin-password password [hash | hash2]
      - no admin-password
      - aging days
      - no aging
      - attempts count [time minutes1] [lockout minutes2]
      - no attempts
      - authentication-order [method-1] [method-2] [method-3] [exit-on-reject]
      - no authentication-order
      - complexity-rules
        - [no] allow-user-name
        - credits [lowercase credits] [uppercase credits] [numeric credits]
        [special-character credits]
        - no credits
        - minimum-classes minimum
        - no minimum-classes
        - minimum-length value
        - no minimum-length
        - repeated-characters count
        - no repeated-characters
        - required [lowercase count] [uppercase count] [numeric count] [special-
character count]
        - no required
      - hashing {bcrypt | sha2-pbkdf2 | sha3-pbkdf2}
      - [no] health-check [interval interval]
      - history-size size
      - no history-size
      - minimum-age [days days] [hrs hours] [min minutes] [sec seconds]
      - no minimum-age
      - minimum-change length
      - no minimum-change

```

3.11.1.2.7 Profile Commands

```

config
- system
  - security
    - [no] profile user-profile-name
      - default-action {deny-all | permit-all | none}
      - [no] entry entry-id
        - action {permit | deny}
        - description description-string
        - no description
        - match command-string
        - no match
      - renum old-entry-number new-entry-number

```

3.11.1.2.8 User Commands

```

config
- system
  - security

```

```

- [no] user user-name
- [no] access [ftp] [snmp] [console]
- console
  - [no] cannot-change-password
  - [no] local-lockout
  - login-exec url-prefix:source-url
  - no login-exec
  - member user-profile-name [user-profile-name...(up to 8 max)]
  - no member user-profile-name
  - [no] new-password-at-login
- home-directory url-prefix [directory] [directory/directory...]
- no home-directory
- password [password]
- public-keys
  - ecdsa
    - [no] ecdsa-key key-id [create]
    - description description-string
    - no description
    - key-value public-key-value
    - no key-value
  - rsa
    - [no] rsa-key key-id [create]
    - description description-string
    - no description
    - key-value public-key-value
    - no key-value
- [no] restricted-to-home
- [no] save-when-restricted
- snmp
  - authentication none
  - authentication authentication-protocol authentication-key [privacy none]
[hash | hash2]
- authentication authentication-protocol authentication-
key privacy privacy-protocol privacy-key [hash | hash2]
- no authentication
- group group-name
- no group
- user-template {tacplus_default | radius_default}
- [no] access [ftp] [console]
- console
  - login-exec url-prefix:source-url
  - no login-exec
- home-directory url-prefix [directory] [directory/directory ..]
- no home-directory
- profile user-profile-name
- no profile
- [no] restricted-to-home
- [no] save-when-restricted

```

3.11.1.2.9 CLI Script Authorization Commands

```

config
- system
  - security
    - cli-script
      - authorization
        - cron
          - cli-user user-name
          - no cli-user
        - event-handler
          - cli-user user-name

```

```
- no cli-user
```

3.11.1.2.10 RADIUS Commands

```
config
- system
  - security
    - [no] radius
      - access-algorithm {direct | round-robin}
      - [no] access-algorithm
      - [no] accounting
      - accounting-port port
      - no accounting-port
      - [no] authorization
      - port port
      - no port
      - retry count
      - no retry
      - server server-index address ip-address secret key [hash | hash2]
      - no server server-index
      - [no] shutdown
      - timeout seconds
      - no timeout
      - use-default-template
```

3.11.1.2.11 TACACS+ Commands

```
config
- system
  - security
    - [no] tacplus
      - accounting [record-type {start-stop | stop-only}]
      - no accounting
      - [no] authorization
      - server server-index address ip-address secret key [hash | hash2] [port port]
      - no server server-index
      - timeout seconds
      - no timeout
      - [no] shutdown
      - [no] use-default-template
```

3.11.1.2.12 802.1x Commands

```
config
- system
  - security
    - [no] dot1x
      - [no] radius-plcy name [create]
        - retry count
        - no retry
        - server server-index address ip-address secret key [hash | hash2] [auth-
port auth-port] [acct-port acct-port] [type server-type]
        - no server server-index
        - source-address ip-address
        - no source-address
```

- [no] **shutdown**
- **timeout** *seconds*
- **no timeout**
- [no] **shutdown**

3.11.1.2.13 SSH Commands

```

config
- system
  - security
    - ssh
      - client-cipher-list
        - cipher index name cipher-name
        - no cipher index
      - client-kex-list
        - kex index name kex-name
        - no kex index
      - client-mac-list
        - mac index name mac-name
        - no mac index
      - key-re-exchange
        - client
          - mbytes {mbytes | disable}
          - no mbytes
          - minutes {minutes | disable}
          - no minutes
          - [no] shutdown
        - server
          - mbytes {mbytes | disable}
          - no mbytes
          - minutes {minutes | disable}
          - no minutes
          - [no] shutdown
      - [no] preserve-key
      - server-cipher-list
        - cipher index name cipher-name
        - no cipher index
      - server-kex-list
        - kex index name kex-name
        - no kex index
      - server-mac-list
        - mac index name mac-name
        - no mac index
      - [no] server-shutdown

```

3.11.1.2.14 TLS Commands

```

config
  system
    security
      tls
        cert-profile profile-name [create]
        no cert-profile profile-name
        entry entry-id [create]
        no entry entry-id
          cert cert-filename
          no cert
          key key-filename

```

```

        no key
        [no] send-chain
        [no] ca-profile name
    [no] shutdown
    client-cipher-list name [create]
no client-cipher-list name
    cipher index name cipher-suite-code
    no cipher index
    tls13-cipher index name cipher-suite-code
    no tls13-cipher index
    client-group-list name [create]
no client-group-list name
    tls13-group index name group-suite-code
    no tls13-group index
    client-signature-list name [create]
no client-signature-list name
    tls13-signature index name signature-suite-code
    no tls13-signature index
    client-tls-profile name [create]
no client-tls-profile name
    cert-profile name
    no cert-profile
    cipher-list name
    no cipher-list
    group-list name
    no group-list
    protocol-version TLS version
    no protocol-version
    [no] shutdown
    signature-list name
    no signature-list
    trust-anchor-profile name
    no trust-anchor-profile
    trust-anchor-profile name [create]
no trust-anchor-profile name
    [no] trust-anchor ca-profile-name

```

3.11.1.2.15 Keychain Authentication Commands

```

config
- system
  - security
    - [no] keychain keychain-name
      - description description-string
      - no description
      - direction
        - bi
          - entry entry-id [key authentication-key | hash-key | hash2-key [hash |
hash2] algorithm algorithm]
          - no entry entry-id
            - begin-time date hours-minutes [UTC]
            - begin-time {now | forever}
            - no begin-time
            - option {basic | isis-enhanced}
            - no option
            - [no] shutdown
            - tolerance {seconds | forever}
            - no tolerance
        - uni
          - receive

```

```

- entry entry-id [key authentication-key | hash-key | hash2-key
[hash | hash2] algorithm algorithm]
- no entry entry-id
  - begin-time date hours-minutes [UTC]
  - begin-time {now | forever}
  - no begin-time
  - end-time date hours-minutes [UTC]
  - end-time {now | forever}
  - no end-time
  - [no] shutdown
  - tolerance {seconds | forever}
  - no tolerance
- send
  - entry entry-id [key authentication-key | hash-key | hash2-key
[hash | hash2] algorithm algorithm]
  - no entry entry-id
    - begin-time date hours-minutes [UTC]
    - begin-time {now | forever}
    - no begin-time
    - [no] shutdown
- [no] shutdown
- tcp-option-number
  - receive option-number
  - no receive
  - send option-number
  - no send

```

3.11.1.2.16 Login Control Commands

```

config
- system
  - login-control
    - [no] exponential-backoff
    - ftp
      - inbound-max-sessions value
      - no inbound-max-sessions
    - idle-timeout {minutes | disable}
    - no idle-timeout
    - [no] login-banner
    - motd {url url-prefix: source-url | text motd-text-string}
    - no motd
    - pre-login-message login-text-string [name]
    - no pre-login-message
    - ssh
      - [no] disable-graceful-shutdown
      - inbound-max-sessions value
      - no inbound-max-sessions
      - outbound-max-sessions value
      - no outbound-max-sessions
      - ttl-security min-ttl-value
      - no ttl-security
    - telnet
      - [no] enable-graceful-shutdown
      - inbound-max-sessions value
      - no inbound-max-sessions
      - outbound-max-sessions value
      - no outbound-max-sessions
      - ttl-security min-ttl-value
      - no ttl-security

```

3.11.1.3 Show Commands

3.11.1.3.1 Security

```

show
- system
  - security
    - access-group [group-name]
    - authentication [statistics]
    - communities
    - cpm-filter
      - ip-filter [entry entry-id]
      - ipv6-filter [entry entry-id]
    - keychain [keychain] [detail]
    - management-access-filter
      - ip-filter [entry entry-id]
      - ipv6-filter [entry entry-id]
    - password-options
    - profile user-profile-name
    - source-address
    - ssh
    - tls
      - cert-profile name association
      - cert-profile [name]
      - cert-profile name entry 1..8
      - client-tls-profile [client-tls-profile]
      - client-tls-profile client-tls-profile association
      - client-tls-profile client-tls-profile [connections]
      - trust-anchor-profile trust-anchor-profile association
      - trust-anchor-profile [trust-anchor-profile]
    - user [user-id] detail
    - user [user-id] lockout
    - view [view-name] [detail] [capabilities]

```

3.11.1.3.2 Login Control

```

show
- users

```

3.11.1.4 Clear Commands

3.11.1.4.1 Admin

```

admin
- clear
  - lockout all
  - lockout user user-name
  - password-history all
  - password-history user user-name

```

3.11.1.4.2 Authentication

```
clear
- router
  - authentication
    - statistics [interface ip-int-name | ip-address]
```

3.11.1.5 Monitor Commands

```
monitor
- cpm-filter
  - ip entry entry-id [interval seconds] [repeat repeat] [absolute | rate]
  - ipv6 entry entry-id [interval seconds] [repeat repeat] [absolute | rate]
  - mac 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]
  - mac entry entry-id [interval seconds] [repeat repeat] [absolute | rate]
```

3.11.1.6 Debug Commands

```
debug
- radius [detail] [hex]
- no radius
```

3.11.2 Command Descriptions

- [Admin Commands](#)
- [Configuration Commands](#)
- [Show Commands](#)
- [Clear Commands](#)
- [Monitor Commands](#)
- [Debug Commands](#)

3.11.2.1 Admin Commands

```
system-password
```

Syntax

```
system-password admin-password
```

Context

```
admin>system>security
```

Description

This operational command changes a local administrative password.

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. Any subsequent invocation of **enable-admin** will require this new **admin-password**.

Parameters

admin-password

specifies to change the administrative password which is requested when a user tries to enable admin mode by running **enable-admin** to attain administrative privileges

3.11.2.2 Configuration Commands

- [Generic Security Commands](#)
- [Security Commands](#)
- [Management Access Filter Commands](#)
- [CPM Filter Commands](#)
- [Global Password Commands](#)
- [Password Commands](#)
- [Profile Management Commands](#)
- [User Management Commands](#)
- [CLI Script Authorization Commands](#)
- [RADIUS Client Commands](#)
- [TACACS+ Client Commands](#)
- [802.1x Commands](#)
- [SSH Commands](#)
- [Security TLS Commands](#)
- [Keychain Authentication Commands](#)
- [Login Control Commands](#)

3.11.2.2.1 Generic Security Commands

description

Syntax

description *description-string*

no description

Context

config>system>security>management-access-filter>ip-filter>entry

config>system>security>management-access-filter>ipv6-filter>entry

config>system>security>cpm-filter>ip-filter>entry

config>system>security>cpm-filter>ipv6-filter>entry

config>system>security>keychain

config>system>security>user>public-keys>ecdsa>ecdsa-key

config>system>security>user>public-keys>rsa>rsa-key

Description

This command creates a text description stored in the configuration file for a configuration context.

The **no** form of the command removes the string.

Default

n/a

Parameters

description-string

the description character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (such as #, \$, or spaces), the entire string must be enclosed within double quotes.

shutdown

Syntax

[no] shutdown

Context

config>system>security>management-access-filter>ip-filter

config>system>security>management-access-filter>ipv6-filter

config>system>security>cpm-filter>ip-filter

config>system>security>cpm-filter>ipv6-filter

config>system>security>keychain

config>system>security>keychain>direction>bi>entry

config>system>security>keychain>direction>uni>receive>entry

config>system>security>keychain>direction>uni>send>entry

config>system>security>radius

config>system>security>tacplus

Description

This command administratively disables the entity. The operational state of the entity is disabled as well as the operational state of any entities contained within. When disabled, an entity does not change, reset, or remove any configuration settings or statistics, other than the administrative state. Many objects must be shut down before they can be deleted.

The **no** form of the command puts an entity into the administratively enabled state. Many entities must be explicitly enabled using the no shutdown command.

Default

no shutdown

3.11.2.2.2 Security Commands

security

Syntax

security

Context

config>system

Description

This command enables the context to configure security settings.

Security commands manage user profiles and user membership. Security commands also manage user login registrations.

copy

Syntax

copy {*user source-user* | *profile source-profile*} **to** *destination* [**overwrite**]

Context

config>system>security

Description

This command copies the specified user or profile configuration parameters to another (destination) user or profile.

The password is set to the Return key and a new password at login must be selected.

Parameters

source-user

the user to copy from. The user must already exist.

source-profile

the profile to copy from. The profile must already exist.

destination

the destination user or profile

overwrite

specifies that the destination user or profile configuration will be overwritten with the copied source user or profile configuration. A configuration will not be overwritten if the overwrite command is not specified.

ftp-server

Syntax

[no] ftp-server

Context

config>system>security

Description

This command enables FTP servers running on the system.

FTP servers are disabled by default. At system startup, only SSH servers are enabled.

The **no** form of the command disables FTP servers running on the system.

Default

no ftp-server

hash-control

Syntax

hash-control [read-version {1 | 2 | all}] [write-version {1 | 2}]

no hash-control

Context

config>system>security

Description

Whenever the user executes a save or info command, the system will encrypt all passwords, keys, and so on for security reasons. At present, two algorithms exist.

The first algorithm is a simple, short key that can be copied and pasted in a different location when the user wants to configure the same password. However, because it is the same password and the hash key is limited to the password/key, it is obvious that it is the same key.

The second algorithm is a more complex key, and cannot be copied and pasted in different locations in the configuration file. In this case, if the same key or password is used repeatedly in different contexts, each encrypted (hashed) version will be different.

Default

all — read-version set to accept both versions 1 and 2

Parameters

read-version {1 | 2 | all}

when the read-version is configured as "all," both versions 1 and 2 will be accepted by the system. Otherwise, only the selected version will be accepted when reading configuration or exec files. The presence of incorrect hash versions will abort the script/startup.

write-version {1 | 2}

selects the hash version that will be used the next time the configuration file is saved (or an info command is executed). Be careful to save the read and write version correctly, so that the file can be properly processed after the next reboot or exec.

source-address

Syntax

source-address

Context

config>system>security

Description

This command specifies the source address that should be used in all unsolicited packets sent by the application.

application

Syntax

application *app* [*ip-int-name* | *ip-address*]

no application *app*

Context

config>system>security>source-address

Description

This command specifies the application to use the source IPv4 address specified by the **source-address** command.

The **no** form of the command removes the specified source address from the application, causing the application to use the system IP address as the source address.

Parameters

app

specifies the application name

Values cflowd, dns, ftp, ntp, ping, radius, snmptrap, sntp, ssh, syslog, tacplus, telnet, traceroute

ip-int-name | *ip-address*

specifies the name of the IP interface or IPv4 address. If the string contains special characters (such as #, \$, or spaces), the entire string must be enclosed within double quotes.

application6

Syntax

application6 *app* *ipv6-address*

no application6 *app*

Context

config>system>security>source-address

Description

This command specifies the application to use the source IPv6 address specified by the **source-address** command.

The **no** form of the command removes the specified source address from the application, causing the application to use the system IP address as the source address.

Parameters

app

specifies the application name

Values cflowd, dns, ftp, ssh, ntp, ping, radius, snmptrap, syslog, tacplus, telnet, traceroute

ipv6-address

specifies the IPv6 address

telnet-server

Syntax

[no] **telnet-server**

Context

config>system>security

Description

This command enables Telnet servers running on the system.

Telnet servers are off by default. At system startup, only SSH servers are enabled.

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 **no** form of the command disables Telnet servers running on the system.

Default

no telnet-server

telnet6-server

Syntax

[no] telnet6-server

Context

config>system>security

Description

This command enables Telnet IPv6 servers running on the system.

Telnet servers are off by default. At system startup, only SSH servers are enabled.

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 **no** form of the command disables Telnet servers running on the system.

Default

no telnet6-server

vprn-network-exceptions

Syntax

vprn-network-exceptions [*number seconds*]

no vprn-network-exceptions

Context

config>system>security

Description

This command configures the rate at which the 7705 SAR sends ICMP replies to a source IP address in response to TTL expiry IP packets that have been received for all VPRN instances in the system and from all network IP interfaces. Packets include labeled user packets as well as ping and traceroute packets within a VPRN.

This command does not apply to MPLS packets or service OAM packets such as VPRN ping and trace, LSP ping and trace, and VCC ping and trace.

When the command is issued without any *number* and *seconds* parameters specified, the default rate is 100 ICMP reply packets sent per 10 seconds. The **no** form of the command disables the rate-limiting of ICMP replies.

Default

no vprn-network-exceptions

Parameters

number

specifies the maximum number of ICMP reply messages that can be sent within the configured number of seconds

Values 10 to 1000

seconds

specifies the time frame in which the configured number of ICMP reply messages can be sent

Values 1 to 60

3.11.2.2.3 Management Access Filter Commands

management-access-filter

Syntax

[no] management-access-filter

Context

config>system>security

Description

This command enables the context to edit management access filters and to reset match criteria.

Management access filters control all traffic in and out of the CSM. They can be used to restrict management of the 7705 SAR by other nodes outside either specific (sub)networks or through designated ports.

Management filters, as opposed to other traffic filters, are enforced by system software.

The **no** form of the command removes management access filters from the configuration.

Default

n/a

ip-filter

Syntax

ip-filter

Context

```
config>system>security>management-access-filter
```

Description

This command enables the context to configure IP filter commands.

ipv6-filter

Syntax

```
ipv6-filter
```

Context

```
config>system>security>management-access-filter
```

Description

This command enables the context to configure IPv6 filter commands.

default-action

Syntax

```
default-action {permit | deny | deny-host-unreachable}
```

Context

```
config>system>security>management-access-filter>ip-filter  
config>system>security>management-access-filter>ipv6-filter
```

Description

This command creates the default action for management access in the absence of a specific management access filter match.

The **default-action** is applied to a packet that does not satisfy any match criteria in any of the management access filters. Whenever management access filters are configured, the **default-action** must be defined.

Default

n/a

Parameters

permit

specifies that packets not matching the configured selection criteria in any of the filter entries will be permitted

deny

specifies that packets not matching the selection criteria will be denied

deny-host-unreachable

specifies that packets not matching the selection criteria will be denied and a host unreachable message will be issued

entry**Syntax**

[no] entry

Context

config>system>security>management-access-filter>ip-filter

config>system>security>management-access-filter>ipv6-filter

Description

This command is used to create or edit a management access filter entry. Multiple entries can be created with unique *entry-id* numbers. The 7705 SAR exits the filter upon the first match found and executes the actions according to the respective action command. For this reason, entries must be sequenced correctly from most to least explicit.

An entry may not have any match criteria defined (in which case, everything matches) but must have at least the keyword **action** defined to be considered complete. Entries without the **action** keyword are considered incomplete and inactive.

The **no** form of the command removes the specified entry from the management access filter.

Default

n/a

Parameters

entry-id

an entry ID uniquely identifies a match criteria and the corresponding action. It is recommended that entries be numbered in staggered increments. This allows users to insert a new entry in an existing policy without having to renumber the existing entries.

Values 1 to 9999

action**Syntax**

action {permit | deny | deny-host-unreachable}

no action

Context

config>system>security>management-access-filter>ip-filter>entry

```
config>system>security>management-access-filter>ipv6-filter>entry
```

Description

This command creates the action associated with the management access filter match criteria entry.

The **action** keyword is required. If no action is defined, the filter is ignored. If multiple action statements are configured, the last one overwrites previous configured actions.

If the packet does not meet any of the match criteria, the configured default action is applied.

Default

n/a

Parameters

permit

specifies that packets matching the configured criteria will be permitted

deny

specifies that packets not matching the selection criteria will be denied

deny-host-unreachable

specifies that packets not matching the selection criteria will be denied and a host unreachable message will be issued

dst-port

Syntax

```
dst-port port [mask]
```

```
no dst-port
```

Context

```
config>system>security>management-access-filter>ip-filter>entry
```

```
config>system>security>management-access-filter>ipv6-filter>entry
```

Description

This command configures a destination TCP or UDP port number or port range for a management access filter match criterion.

The **no** form of the command removes the destination port match criterion.

Default

n/a

Parameters

port

the source TCP or UDP port number as match criteria

Values 1 to 65535 (decimal)

mask

mask used to specify a range of destination port numbers as the match criterion

This 16-bit mask can be configured using the formats in [Table 8: 16-bit Mask Formats](#).

Table 8: 16-bit Mask Formats

Format Style	Format Syntax	Example
Decimal	DDDDD	63488
Hexadecimal	0xHHHH	0xF800
Binary	0bBBBBBBBBBBBBBBBB	0b1111100000000000

For example, to select a range from 1024 up to 2047, specify 1024 0xFC00 for value and mask.

Values 1 to 65535 (decimal)

Default 65535 (exact match)

flow-label

Syntax

flow-label *value*

no flow-label

Context

config>system>security>management-access-filter>ipv6-filter>entry

Description

This command configures flow label match conditions for a management access filter match criterion. Flow labeling enables the labeling of packets belonging to particular traffic flows for which the sender requests special handling, such as non-default QoS or real-time service.

This command applies to IPv6 filters only.

Parameters

value

the flow identifier in an IPv6 packet header that can be used to discriminate traffic flows (see RFC 3595, *Textual Conventions for IPv6 Flow Label*)

Values 0 to 1048575

log

Syntax

[no] log

Context

config>system>security>management-access-filter>ip-filter>entry

config>system>security>management-access-filter>ipv6-filter>entry

Description

This command enables match logging.

The **no** form of this command disables match logging.

Default

no log

next-header

Syntax

[no] next-header *next-header*

Context

config>system>security>management-access-filter>ipv6-filter>entry

Description

This command specifies the next header to match as a management access filter match criterion.

This command applies to IPv6 filters only.

Parameters

next-header

protocol-number or *protocol-name*

protocol-number

the IPv6 next header to match, expressed as a protocol number in decimal, hexadecimal, or binary. This parameter is similar to the **protocol** parameter used in IPv4 filter match criteria. See [Table 9: IP Protocol IDs and Descriptions](#) for the protocol IDs and descriptions for the IP protocols.

Values	[0 to 255]D
	[0x0 to 0xFF]H
	[0b0 to 0b11111111]B

protocol-name

the IPv6 next header to match, expressed as a protocol name. This parameter is similar to the **protocol** parameter used in IPv4 filter match criteria. See [Table 9: IP Protocol IDs and Descriptions](#) for the protocol IDs and descriptions for the IP protocols.

Values none, icmp, igmp, ip, tcp, egg, igp, udp, rdp, ipv6, ipv6-route, ipv6-frag, idrp, rsvp, gre, ipv6-icmp, ipv6-no-nxt, ipv6-opts, iso-ip, eigrp, ospf-igp, ether-ip, encap, pnni, pim, vrrp, l2tp, stp, ptp, isis, crtp, crudp, sctp, mpls-in-ip, * - udp/tcp wildcard

protocol

Syntax

[no] protocol *protocol-id*

Context

config>system>security>management-access-filter>ip-filter>entry

Description

This command configures an IP protocol type to be used as a management access filter match criterion.

The protocol type is identified by its respective protocol number. Well-known protocol numbers include ICMP (1), TCP (6), and UDP (17).

This command applies to IPv4 filters only.

The **no** form of the command removes the protocol from the match criteria.

Default

n/a

Parameters

protocol-id

protocol-number or *protocol-name*

protocol-number

the protocol number for the match criterion, expressed in decimal, hexadecimal, or binary. See [Table 9: IP Protocol IDs and Descriptions](#) for the protocol IDs and descriptions for the IP protocols.

Values [0 to 255]D
[0x0 to 0xFF]H
[0b0 to 0b11111111]B

protocol-name

the protocol name for the match criterion. See [Table 9: IP Protocol IDs and Descriptions](#) for the protocol IDs and descriptions for the IP protocols.

Values none, icmp, igmp, ip, tcp, egg, igp, udp, rdp, ipv6, ipv6-route, ipv6-frag, idrp, rsvp, gre, ipv6-icmp, ipv6-no-nxt, ipv6-opts, iso-ip, eigrp,

ospf-igp, ether-ip, encap, pnni, pim, vrrp, l2tp, stp, ptp, isis, crtp,
 crudp, sctp, mpls-in-ip, * - udp/tcp wildcard

router

Syntax

router *router-instance*

router service-name *service-name*

no router

Context

config>system>security>management-access-filter>ip-filter>entry

config>system>security>management-access-filter>ipv6-filter>entry

Description

This command configures a router name or service ID to be used as a management access filter match criterion.

The **no** form of the command removes the router name or service ID from the match criteria.

Parameters

router-instance

specifies one of the following parameters for the router instance:

router-name — specifies a router name up to 32 characters to be used in the match criteria

service-id — specifies an existing service ID to be used in the match criteria

Values 1 to 2147483647

service-name

specifies the service name of an existing service

Values up to 64 characters

src-ip

Syntax

src-ip {*ip-prefix[/mask] [/netmask]* | **ip-prefix-list** *ip-prefix-list-name*}

no src-ip

Context

config>system>security>management-access-filter>ip-filter>entry

Description

This command specifies a source IPv4 address range or specifies an IPv4 prefix list configured under the **match-list** command to be used as a match criterion for a management access filter. See the 7705 SAR Router Configuration Guide for information about the **match-list** command.

To match on the source IP address, specify the address and the associated mask (for example, 10.1.0.0/16). The conventional notation of 10.1.0.0 255.255.0.0 can also be used.

The **no** form of the command removes the source IPv4 address or IPv4 prefix list match criterion.

Default

n/a

Parameters

ip-prefix

the IP prefix for the IP match criterion in dotted-decimal notation

Values a.b.c.d (host bits must be 0)

mask

the subnet mask length expressed as a decimal integer

Values 1 to 32

netmask

the subnet mask in dotted-decimal notation

Values a.b.c.d (network bits all 1, host bits must all 0)

ip-prefix-list-name

the name of the IP prefix list configured with the **match-list** command

src-ip

Syntax

src-ip {*ipv6-address/prefix-length* | **ipv6-prefix-list** *ipv6-prefix-list-name*}

no src-ip

Context

config>system>security>management-access-filter>ipv6-filter>entry

Description

This command configures a source IPv6 address range or specifies an IPv6 prefix list configured under the **match-list** command to be used as a match criterion for a management access filter. See the 7705 SAR Router Configuration Guide for information about the **match-list** command.

To match on the source IP address, specify the address and prefix length; for example, 11::12/128.

The **no** form of the command removes the source IP address or IPv6 prefix list match criterion.

Default

n/a

Parameters*ipv6-address/prefix-length*

the IPv6 address on the interface

Values	<i>ipv6-address:</i>	x:x:x:x:x:x:x (eight 16-bit pieces)
		x:x:x:x:x:d.d.d.d
		x: [0 to FFFF]H
		d: [0 to 255]D
	<i>prefix-length:</i>	1 to 128

*ipv6-prefix-list-name*the name of the IPv6 prefix list configured with the **match-list** command**src-port****Syntax****src-port** {*port-id* | **cpm** | **lag** *lag-id*}**no src-port****Context**

config>system>security>management-access-filter>ip-filter>entry

config>system>security>management-access-filter>ipv6-filter>entry

Description

This command restricts ingress management traffic to either the CSM Ethernet port or any other logical port (port or channel) on the device.

When the source interface is configured, only management traffic arriving on those ports satisfy the match criteria.

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

Default

any interface

Parameters*port-id*

the port ID

Values	<i>port-id</i>	<i>slot/mda/port</i>
---------------	----------------	----------------------

	bundle-id	bundle-type-slot/mda.bundle-num	
		<i>type</i>	ima, ppp
		<i>bundle-num</i>	1 to 128
cpm			
		specifies that ingress management traffic is restricted to the CSM Ethernet port	
<i>lag-id</i>			
		the LAG ID	
	Values	1 to 32	

renum

Syntax

renum *old-entry-number new-entry-number*

Context

config>system>security>management-access-filter>ip-filter

config>system>security>management-access-filter>ipv6-filter

Description

This command renumbers existing management access filter entries to resequence filter entries.

The 7705 SAR exits on the first match found and executes the actions in accordance with the accompanying action command. This may require some entries to be renumbered from most to least explicit.

Parameters

old-entry-number

the entry number of the existing entry

Values 1 to 9999

new-entry-number

the new entry number that will replace the old entry number

Values 1 to 9999

3.11.2.2.4 CPM Filter Commands

cpm-filter

Syntax

[no] cpm-filter

Context

config>system>security

Description

This command enables the context to configure a CPM (referred to as CSM on the 7705 SAR) filter. A CPM filter is a hardware filter (that is, implemented on the network processor) for the CSM-destined traffic that applies to all the traffic destined for the CSM CPU. It can be used to drop or accept packets, as well as allocate dedicated hardware queues for the traffic. The hardware queues are not user-configurable.

The **no** form of the command disables the CPM filter.

default-action

Syntax

default-action {accept | drop}

Context

config>system>security>cpm-filter

Description

This command specifies the action to be applied to packets when the packets do not match the specified criteria in all of the IP filter entries of the filter. If there are no filter entries defined, the packets received is either accepted or dropped based on that default action.

Default

accept

Parameters

accept

packets are accepted unless there is a specific filter entry that causes the packet to be dropped

drop

packets are dropped unless there is a specific filter entry that causes the packet to be accepted

ip-filter

Syntax

ip-filter

Context

config>system>security>cpm-filter

Description

This command enables the context to configure IPv4 CPM filter parameters.

ipv6-filter

Syntax

ipv6-filter

Context

config>system>security>cpm-filter

Description

This command enables the context to configure IPv6 CPM filter parameters.

entry

Syntax

entry *entry-id* [**create**]

no entry *entry-id*

Context

config>system>security>cpm-filter>ip-filter

config>system>security>cpm-filter>ipv6-filter

Description

This command specifies a particular CPM filter match entry. Every CPM filter must have at least one filter match entry. A filter entry with no match criteria set matches every packet, and the entry action is taken.

The **create** keyword must be used with every new entry configured. After the entry has been created, you can navigate to the entry context without using the **create** keyword.

All IPv4 filter entries can specify one or more matching criteria. There are no range-based restrictions on any IPv4 filter entries.

For IPv6 filters, the combined number of fields for all entries in a filter must not exceed 16 fields (or 256 bits), where a field contains the bit representation of the matching criteria.

Parameters

entry-id

identifies a CPM filter entry as configured on this system.

Values 1 to 64

action

Syntax

action {**accept** | **drop**}

no action

Context

config>system>security>cpm-filter>ip-filter>entry

config>system>security>cpm-filter>ipv6-filter>entry

Description

This command specifies the action to take for packets that match this filter entry.

Default

drop

Parameters

accept

packets matching the entry criteria are forwarded

drop

packets matching the entry criteria are dropped

log

Syntax

log *log-id*

no log

Context

config>system>security>cpm-filter>ip-filter>entry

config>system>security>cpm-filter>ipv6-filter>entry

Description

This command specifies the log in which packets matching this entry should be entered. The value 0 indicates that logging is disabled.

The **no** form of the command deletes the log ID.

Parameters

log-id

the log ID where packets matching this entry should be entered

Values 101 to 199

match

Syntax

match [**protocol** *protocol-id*]

no match

Context

config>system>security>cpm-filter>ip-filter>entry

Description

This command enables the context to enter match criteria for the IPv4 filter entry. When the match criteria have been satisfied, the action associated with the match criteria is executed.

If more than one match criterion (within one match statement) is configured, all criteria must be satisfied (AND function) before the action associated with the match is executed.

A match context may consist of multiple match criteria, but multiple match statements cannot be entered per entry.

The **no** form of the command removes the match criteria for the *entry-id*.

Parameters

protocol-id

protocol-number or *protocol-name*

protocol-number

the protocol number in decimal, hexadecimal, or binary, to be used as an IP filter match criterion. Common protocol numbers include ICMP(1), TCP(6), and UDP(17). See [Table 9: IP Protocol IDs and Descriptions](#) for the protocol IDs and descriptions for the IP protocols.

Values [0 to 255]D
[0x0 to 0xFF]H
[0b0 to 0b11111111]B

protocol-name

the protocol name to be used as an IP filter match criterion. See [Table 9: IP Protocol IDs and Descriptions](#) for the protocol IDs and descriptions for the IP protocols.

Values none, icmp, igmp, ip, tcp, egp, igp, udp, rdp, ipv6, ipv6-route, ipv6-frag, idrp, rsvp, gre, ipv6-icmp, ipv6-no-nxt, ipv6-opts, iso-ip, eigrp,

ospf-igp, ether-ip, encap, pnni, pim, vrrp, l2tp, stp, ptp, isis, crtp, crudp, sctp, mpls-in-ip, * - udp/tcp wildcard

Table 9: IP Protocol IDs and Descriptions

Protocol ID	Protocol	Description
1	icmp	Internet Control Message
2	igmp	Internet Group Management
4	ip	IP in IP (encapsulation)
6	tcp	Transmission Control
8	egp	Exterior Gateway Protocol
9	igp	Any private interior gateway
17	udp	User Datagram
27	rdp	Reliable Data Protocol
41	ipv6	IPv6
43	ipv6-route	Routing Header for IPv6
44	ipv6-frag	Fragment Header for IPv6
45	idr	Inter-Domain Routing Protocol
46	rsvp	Reservation Protocol
47	gre	General Routing Encapsulation
58	ipv6-icmp	ICMP for IPv6
59	ipv6-no-nxt	No Next Header for IPv6
60	ipv6-opts	Destination Options for IPv6
80	iso-ip	ISO Internet Protocol
88	eigrp	EIGRP
89	ospf-igp	OSPF-IGP
97	ether-ip	Ethernet-within-IP Encapsulation
98	encap	Encapsulation Header
102	pnni	PNNI over IP

Protocol ID	Protocol	Description
103	pim	Protocol Independent Multicast
112	vrrp	Virtual Router Redundancy Protocol
115	l2tp	Layer Two Tunneling Protocol
118	stp	Schedule Transfer Protocol
123	ptp	Performance Transparency Protocol
124	isis	ISIS over IPv4
126	crtp	Combat Radio Transport Protocol
127	crudp	Combat Radio User Datagram
132	sctp	Stream Control Transmission Protocol
137	mpls-in-ip	MPLS in IP

match

Syntax

match [**next-header** *next-header*]

no match

Context

config>system>security>cpm-filter>ipv6-filter>entry

Description

This command enables the context to enter match criteria for the IPv6 filter entry. When the match criteria have been satisfied, the action associated with the match criteria is executed.

If more than one match criterion (within one match statement) is configured, all criteria must be satisfied (AND function) before the action associated with the match is executed.

A match context may consist of multiple match criteria, but multiple match statements cannot be entered per entry.

The **no** form of the command removes the match criteria for the *entry-id*.

Parameters

next-header

protocol-number or protocol-name

protocol-number

the IPv6 next header to match, expressed as a protocol number in decimal, hexadecimal, or binary. This parameter is similar to the **protocol** parameter used in IPv4 filter match criteria. See [Table 9: IP Protocol IDs and Descriptions](#) for the protocol IDs and descriptions for the IP protocols.

Values [1 to 42 | 45 to 49 | 52 to 59 | 61 to 255]D
 [0x0 to 0x2A | 0x2D to 0x31 | 0x34 to 0x3B | 0x3D to 0xFF]H
 [0b0 to 0b101010 | 0b101101 to 0b110001 | 0b110100 to 0b111011
 | 0b111101 to 0b1111111]B

protocol-name

the IPv6 next header to match, expressed as a protocol name. This parameter is similar to the **protocol** parameter used in IPv4 filter match criteria. See [Table 9: IP Protocol IDs and Descriptions](#) for the protocol IDs and descriptions for the IP protocols.

Values none, icmp, igmp, ip, tcp, egp, igp, udp, rdp, ipv6, idrp, rsvp, gre, ipv6-icmp, ipv6-no-nxt, iso-ip, eigrp, ospf-igp, ether-ip, encap, pnni, pim, vrrp, l2tp, stp, ptp, isis, crtp, crudp, sctp, mpls-in-ip, * - udp/tcp wildcard

dscp

Syntax

dscp *dscp-name*
no dscp

Context

config>system>security>cpm-filter>ip-filter>entry>match
 config>system>security>cpm-filter>ipv6-filter>entry>match

Description

This command configures a DiffServ Code Point (DSCP) name to be used as an IP filter match criterion. The **no** form of the command removes the DSCP match criterion.

Default

no dscp

Parameters

dscp-name

a DSCP name that has been previously mapped to a value using the **dscp-name** command. The DiffServ Code Point can only be specified by its name.

Values be|cp1|cp2|cp3|cp4|cp5|cp6|cp7|cs1|cp9|af11|cp11|

```
af12|cp13|af13|cp15|cs2|cp17|af21|cp19|af22|cp21|
af23|cp23|cs3|cp25|af31|cp27|af32|cp29|af33|cp31|cs4|
cp33|af41|cp35|af42|cp37|af43|cp39|cs5|cp41|cp42|
cp43|cp44|cp45|ef|cp47|nc1|cp49|cp50|cp51|cp52|cp53|
cp54|cp55|nc2|cp57|cp58|cp59|cp60|cp61|cp62|cp63
```

dst-ip

Syntax

```
dst-ip {ip-address/mask | ip-address ipv4-address-mask | ip-prefix-list prefix-list-name}
no dst-ip
```

Context

```
config>system>security>cpm-filter>ip-filter>entry>match
```

Description

This command configures a destination IPv4 address range or specifies an IPv4 prefix list configured under the **match-list** command to be used as an IP filter match criterion. See the 7705 SAR Router Configuration Guide for information about the **match-list** command.

To match on the destination IP address, specify the address and its associated mask; for example, 10.1.0.0/16. The conventional notation of 10.1.0.0 255.255.0.0 can also be used.

The **no** form of the command removes the destination IPv4 address or IPv4 prefix list match criterion.

Default

```
no dst-ip
```

Parameters

ip-address

the IP prefix for the IP match criterion in dotted-decimal notation

Values 0.0.0.0 to 255.255.255.255

mask

the subnet mask length expressed as a decimal integer

Values 1 to 32

ipv4-address-mask

the dotted-decimal equivalent of the mask length

Values 0.0.0.0 to 255.255.255.255

prefix-list-name

the name of the IPv4 prefix list configured with the **match-list** command

dst-ip

Syntax

dst-ip {*ipv6-address/prefix-length* | **ipv6-prefix-list** *ipv6-prefix-list-name*}

no dst-ip

Context

config>system>security>cpm-filter>ipv6-filter>entry>match

Description

This command configures a destination IPv6 address range or specifies an IPv6 prefix list configured under the **match-list** command to be used as an IP filter match criterion. See the 7705 SAR Router Configuration Guide for information about the **match-list** command.

To match on the destination IP address, specify the address and prefix length; for example, 11::12/128.

The **no** form of the command removes the destination IPv6 address or IPv6 prefix list match criterion.

Default

n/a

Parameters

ipv6-address/prefix-length

the IPv6 address on the interface

Values	<i>ipv6-address:</i>	x:x:x:x:x:x:x (eight 16-bit pieces)
		x:x:x:x:x:d.d.d.d
		x: [0 to FFFF]H
		d: [0 to 255]D
	<i>prefix-length:</i>	1 to 128

ipv6-prefix-list-name

the name of the IPv6 prefix list configured with the **match-list** command

dst-port

Syntax

dst-port *tcp/udp port-number* [*mask*]

no dst-port

Context

config>system>security>cpm-filter>ip-filter>entry>match

config>system>security>cpm-filter>ipv6-filter>entry>match

Description

This command specifies the TCP/UDP port to match the destination port of the packet.

The **no** form of the command removes the destination port match criterion.

The TCP or UDP protocol must be configured using the match command before this filter can be configured.

Parameters

tcp/udp port-number

the destination port number to be used as a match criterion

Values [0 to 65535]D
 [0x0 to 0xFF]H
 [0b0 to 0b1111111111111111]B

mask

the 16-bit mask to be applied when matching the destination port

Values [0 to 65535]D
 [0x0000 to 0xFFFF]H
 [0b0000000000000000 to 0b1111111111111111]B

fragment

Syntax

fragment {true | false}

no fragment

Context

config>system>security>cpm-filter>ip-filter>entry>match

Description

This command configures fragmented or non-fragmented IP packets as an IP filter match criterion.

The **no** form of the command removes the match criterion.

This command applies to IPv4 filters only.

Default

false

Parameters

true

configures a match on all fragmented IP packets. A match occurs for all packets that have either the MF (more fragment) bit set or have the Fragment Offset field of the IP header set to a non-zero value.

false

configures a match on all non-fragmented IP packets. Non-fragmented IP packets are packets that have the MF bit set to zero and have the Fragment Offset field also set to zero.

icmp-code

Syntax

icmp-code *icmp-code*

no icmp-code

Context

config>system>security>cpm-filter>ip-filter>entry>match

config>system>security>cpm-filter>ipv6-filter>entry>match

Description

This command configures matching on an ICMP code field in the ICMP header of an IP packet as an IP filter match criterion.

The ICMP protocol must be configured using the match command before this filter can be configured.

The **no** form of the command removes the criterion from the match entry.

Default

no icmp-code

Parameters

icmp-code

icmp-code-number or *icmp-code-keyword*

icmp-code-number

the ICMP code number in decimal, hexadecimal, or binary, to be used as a filter match criterion

Values [0 to 255]D
[0x0 to 0xFF]H
[0b0 to 0b1111111]B

icmp-code-keyword

the ICMP code keyword to be used as a filter match criterion

Values **For IPv4 filter:** none, network-unreachable, host-unreachable, protocol-unreachable, port-unreachable, fragmentation-needed, source-route-failed, dest-network-unknown, dest-host-unknown,

src-host-isolated, network-unreachable-for-tos, host-unreachable-for-tos

For IPv6 filter: none, no-route-to-destination, comm-with-dest-admin-prohibited, beyond-scope-src-addr, address-unreachable, port-unreachable

icmp-type

Syntax

icmp-type *icmp-type*

no icmp-type

Context

config>system>security>cpm-filter>ip-filter>entry>match

config>system>security>cpm-filter>ipv6-filter>entry>match

Description

This command configures matching on an ICMP type field in the ICMP header of an IP packet as an IP filter match criterion.

The ICMP protocol must be configured using the match command before this filter can be configured.

The **no** form of the command removes the criterion from the match entry.

Default

no icmp-type

Parameters

icmp-type

icmp-type-number or *icmp-type-keyword*

icmp-type-number

the ICMP type number in decimal, hexadecimal, or binary, to be used as a match criterion

Values [0 to 255]D
[0x0 to 0xFF]H
[0b0 to 0b11111111]B

icmp-type-keyword

the ICMP type keyword to be used as a match criterion

Values **For IPv4 filter:** none, echo-reply, dest-unreachable, source-quench, redirect, echo-request, router-advt, router-selection, time-exceeded, parameter-problem, timestamp-request, timestamp-reply, addr-mask-request, addr-mask-reply, photuris

For IPv6 filter: none, dest-unreachable, packet-too-big, time-exceeded, parameter-problem, echo-request, echo-reply, multicast-listen-query, multicast-listen-report, multicast-listen-done, router-solicitation, router-advt, neighbor-solicitation, neighbor-advertisement, redirect-message, router-renumbering, icmp-node-info-query, icmp-node-info-resp, inv-nd-solicitation, inv-nd-adv-message, multicast-listener-report-v2, home-agent-ad-request, home-agent-ad-reply, mobile-prefix-solicitation, mobile-prefix-advt, cert-path-solicitation, cert-path-advt, multicast-router-advt, multicast-router-solicitation, multicast-router-termination, fmipv6, rpl-control, ilnpv6-locator-update, duplicate-addr-request, duplicate-addr-confirmation

ip-option

Syntax

ip-option *ip-option-value* [*ip-option-mask*]

no ip-option

Context

config>system>security>cpm-filter>ip-filter>entry>match

Description

This command configures matching packets with a specific IP option or a range of IP options in the IP header as an IP filter match criterion.

The option type octet contains 3 fields:

- 1 bit copied flag (copy options in all fragments)
- 2 bits option class
- 5 bits option number

The **no** form of the command removes the match criterion.

This command applies to IPv4 filters only.

Default

no ip-option

Parameters

ip-option-value

the 8-bit option type (can be entered using decimal, hexadecimal, or binary formats). The mask is applied as an AND to the option byte and the result is compared with the option value.

The decimal value entered for the match should be a combined value of the 8-bit option type field and not just the option number. Therefore, to match on IP packets that contain the Router Alert option (option number = 20), enter the option type of 148 (10010100).

Values 0 to 255

ip-option-mask

specifies a range of option numbers to use as the match criteria

This 8-bit mask can be entered using decimal, hexadecimal, or binary formats as shown in [Table 10: IP Option Formats](#).

Table 10: IP Option Formats

Format Style	Format Syntax	Example
Decimal	DDD	20
Hexadecimal	0xHH	0x14
Binary	0BBBBBBBB	0b0010100

Values 0 to 255

Default 255 (decimal) (exact match)

multiple-option

Syntax

multiple-option {true | false}

no multiple-option

Context

config>system>security>cpm-filter>ip-filter>entry>match

Description

This command configures matching packets that contain more than one option field in the IP header as an IP filter match criterion.

The **no** form of the command removes the checking of the number of option fields in the IP header as a match criterion.

This command applies to IPv4 filters only.

Default

no multiple-option

Parameters

true

specifies matching on IP packets that contain more than one option field in the header

false

specifies matching on IP packets that do not contain multiple option fields in the header

option-present

Syntax

option-present {**true** | **false**}

no option-present

Context

config>system>security>cpm-filter>ip-filter>entry>match

Description

This command configures matching packets that contain the option field or have an option field of 0 in the IP header as an IP filter match criterion.

The **no** form of the command removes the checking of the option field in the IP header as a match criterion.

This command applies to IPv4 filters only.

Parameters

true

specifies matching on all IP packets that contain the option field in the header. A match occurs for all packets that have the option field present. An option field of 0 is considered as no option present.

false

specifies matching on IP packets that do not have any option field present in the IP header (an option field of 0)

src-ip

Syntax

src-ip {*ip-address/mask* | *ip-address ipv4-address-mask* | **ip-prefix-list** *prefix-list-name*}

no src-ip

Context

config>system>security>cpm-filter>ip-filter>entry>match

Description

This command specifies the IPv4 address or specifies an IPv4 prefix list configured under the **match-list** command to be used as a match criterion for an IP filter. See the 7705 SAR Router Configuration Guide for information about the **match-list** command.

To match on the source IPv4 address, specify the address and its associated mask; for example, 10.1.0.0/16. The conventional notation of 10.1.0.0 255.255.0.0 can also be used.

The **no** form of the command removes the source IPv4 address or IPv4 prefix list match criterion.

Default

no src-ip

Parameters

ip-address

the IP prefix for the IP match criterion in dotted-decimal notation

Values 0.0.0.0 to 255.255.255.255

mask

the subnet mask length expressed as a decimal integer

Values 1 to 32

ipv4-address-mask

the dotted-decimal equivalent of the mask length

Values 0.0.0.0 to 255.255.255.255

prefix-list-name

the name of the IPv4 prefix list configured with the **match-list** command

src-ip

Syntax

src-ip {*ipv6-address/prefix-length* | **ipv6-prefix-list** *ipv6-prefix-list-name*}

no src-ip

Context

config>system>security>cpm-filter>ipv6-filter>entry>match

Description

This command configures a source IPv6 address range or specifies an IPv6 prefix list configured under the **match-list** command to be used as a match criterion for an IP filter. See the 7705 SAR Router Configuration Guide for information about the **match-list** command.

To match on the source IP address, specify the address and prefix length; for example, 11::12/128.

The **no** form of the command removes the source IP address match criterion.

Default

n/a

Parameters

ipv6-address/prefix-length

the IPv6 address on the interface

Values *ipv6-address:* x:x:x:x:x:x:x (eight 16-bit pieces)
 x:x:x:x:x:d.d.d.d
 x: [0 to FFFF]H
 d: [0 to 255]D
prefix-length 1 to 128

ipv6-prefix-list-name

the name of the IPv6 prefix list configured with the **match-list** command

src-port

Syntax

src-port *tcp/udp* *port-number* [*mask*]

no src-port

Context

config>system>security>cpm-filter>ip-filter>entry>match

config>system>security>cpm-filter>ipv6-filter>entry>match

Description

This command specifies the TCP/UDP port to match the source port of the packet.

Default

no src-port

Parameters

tcp/udp *port-number*

the source port number to be used as a match criterion

Values [0 to 65535]D
 [0x0 to 0xFF]H
 [0b0 to 0b1111111111111111]B

mask

the 16-bit mask to be applied when matching the source port

Values [0 to 65535]D
 [0x0000 to 0xFFFF]H
 [0b0000000000000000 to 0b1111111111111111]B

tcp-ack

Syntax

tcp-ack {true | false}

no tcp-ack

Context

config>system>security>cpm-filter>ip-filter>entry>match

config>system>security>cpm-filter>ipv6-filter>entry>match

Description

This command configures matching on the ACK bit being set or reset in the control bits of the TCP header of an IP packet as an IP filter match criterion.

The no form of the command removes the criterion from the match entry.

Default

no tcp-ack

Parameters

true

specifies matching on IP packets that have the ACK bit set in the control bits of the TCP header of an IP packet

false

specifies matching on IP packets that do not have the ACK bit set in the control bits of the TCP header of the IP packet

tcp-syn

Syntax

tcp-syn {true | false}

no tcp-syn

Context

config>system>security>cpm-filter>ip-filter>entry>match

config>system>security>cpm-filter>ipv6-filter>entry>match

Description

This command configures matching on the SYN bit being set or reset in the control bits of the TCP header of an IP packet as an IP filter match criterion.

The SYN bit is normally set when the source of the packet wants to initiate a TCP session with the specified destination IP address.

The **no** form of the command removes the criterion from the match entry.

Default

no tcp-syn

Parameters

true

specifies matching on IP packets that have the SYN bit set in the control bits of the TCP header

false

specifies matching on IP packets that do not have the SYN bit set in the control bits of the TCP header

renum

Syntax

renum old-entry-id new-entry-id

Context

config>system>security>cpm-filter>ip-filter

config>system>security>cpm-filter>ipv6-filter

Description

This command renumbers existing IP filter entries to resequence filter entries.

Resequencing may be required in some cases because the process is exited when the first match is found and the actions are executed according to the accompanying action command. This requires that entries be sequenced correctly from most to least explicit.

Parameters

old-entry-id

the entry number of an existing entry

Values 1 to 64

where: 1 to 29 are filter entries

30 to 64 are extended filter entries

new-entry-id

the new entry number to be assigned to the old entry

Values 1 to 64

where: 1 to 29 are filter entries

30 to 64 are extended filter entries

3.11.2.2.5 Global Password Commands

enable-admin

Syntax

enable-admin

Context

<global>

Description



Note: See the description for the [admin-password](#) command. If the **admin-password** is configured in the **config>system>security>password** context, any user can enter the special administrative mode by entering the **enable-admin** command.

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

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

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

- enter the **show users** command — the administrator can see which users are in enable-admin mode, indicated by the "A" on the same line as that username
- enter the **enable-admin** command again at the root prompt and an error message is returned

The # sign indicates the current session.

```
A:7705:Dut-C# show users
=====
Username                               Type
  From
  Router instance
  Connection ID                         Login time
  Session ID                           SSH Channel ID   Idle time
=====
--                                     Console
--
  6                                     --
    6                                     0d 00:03:20  --
-----
admin                                  Telnet
  192.168.192.37
  management
  8                                     030CT2023 14:06:52
    8                                     0d 00:01:04  --
-----
bla                                    Telnet
  192.168.192.37
  management
  9                                     030CT2023 14:08:42
    9                                     0d 00:00:09  A-
-----
```

```

admin                               SSHv2
  192.168.192.37
  management
  7                                030CT2023 14:06:24
  #7                                0d 00:00:00  --
-----
Number of users: 3
Number of sessions: 3
'#' indicates the current active session
'A' indicates user is in admin mode
=====
*A:7705:Dut-C#

```

3.11.2.2.6 Password Commands

password

Syntax

password

Context

config>system>security

Description

This command enables the context to configure password management parameters.

admin-password

Syntax

admin-password *password* [**hash** | **hash2**]

no admin-password

Context

config>system>security>password

Description

This command allows a user (with admin permissions) to configure a password which enables a user to become an administrator for one session. When enabled, no authorization to TACACS+ or RADIUS is performed and the user is locally regarded as an admin user.



Note: See the description for the [enable-admin](#) command. If the **admin-password** is configured in the **config>system>security>password** context, then any user can enter the admin mode by entering the **enable-admin** command and the correct admin password.

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



Note: The *password* argument of this command is not sent to the servers. This is consistent with other commands that configure secrets. Usernames and passwords in the FTP and TFTP URLs are not sent to the authorization or accounting servers when the **file>copy source-url dest-url** command is executed.

For example:

file copy ftp://test:secret@192.0.2.0/test/srcfile cf3:\destfile

In this example, the username "test" and password "secret" are not sent to the AAA servers (or to any logs). They are replaced with "*****".



Note: See the description for the [system-password](#) command. Any user that either has administrative privileges or has entered **enable-admin** mode can run the **admin>system>security>system-password admin-password** command to change this admin-password as required.

The **no** form of the command removes the admin password from the configuration.

Default

no admin-password

Parameters

password

configures the password that enables a user to become a system administrator. The maximum length is as follows:

- 56 characters if in unhashed plaintext

The unhashed plaintext form must meet all the requirements that are defined within the [complexity-rules](#) command context.

- 60 characters if hashed with bcrypt
- from 87 to 92 characters if hashed with PBKDF2 SHA-2
- from 131 to 136 characters if hashed with PBKDF2 SHA-3
- 32 characters if the **hash** keyword is specified
- 54 characters if the **hash2** keyword is specified

hash

specifies that the key is entered and stored on the node in encrypted form

hash2

specifies that the key is entered and stored on the node in a more complex encrypted form



Note: If neither the **hash** nor **hash2** keyword is specified, the key is entered in clear text. However, for security purposes, the key is stored on the node using bcrypt or PBKDF2 hash encryption.

aging

Syntax

aging *days*

no aging

Context

config>system>security>password

Description

This command configures the number of days a user password is valid before the user must change their password.

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

Default

no aging is enforced

Parameters

days

the maximum number of days the password is valid

Values 1 to 500

attempts

Syntax

attempts *count* [**time** *minutes1*] [**lockout** *minutes2*]

no attempts

Context

config>system>security>password

Description

This command configures a threshold value of unsuccessful login attempts allowed in a specified time frame.

If the threshold is exceeded, the user is locked out for a specified time period.

If multiple **attempts** commands are entered, each command overwrites the previously entered command.

The **no attempts** command resets all values to the default.

Default

count: 3 minutes1: 5 minutes2: 10

Parameters

count

the number of unsuccessful login attempts allowed for the specified time. This is a mandatory value that must be explicitly entered.

Values 1 to 64

minutes1

the period of time, in minutes, that a specified number of unsuccessful attempts can be made before the user is locked out

Values 0 to 60

minutes2

the lockout period, in minutes, where the user is not allowed to log in

Values 0 to 1440

When the user exceeds the attempted count times in the specified time, then that user is locked out from any further login attempts for the configured time period.

authentication-order

Syntax

authentication-order [*method-1*] [*method-2*] [*method-3*] [**exit-on-reject**]

no authentication-order

Context

config>system>security>password

Description

This command configures the sequence in which password authentication, authorization, and accounting is attempted among RADIUS, TACACS+, and local passwords.

The order should be from the most preferred authentication method to the least preferred. The presence of all methods in the command line does not guarantee that they are all operational. Specifying options that are not available delays user authentication.

If all (operational) methods are attempted and no authentication for a particular login has been granted, then an entry in the security log registers the failed attempt. Both the attempted login identification and originating IP address are logged with a timestamp.

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

Default

authentication-order radius tacplus local

Parameters

method-1

the first password authentication method to attempt

Values radius, tacplus, local

Default radius

method-2

the second password authentication method to attempt

Values radius, tacplus, local

Default tacplus

method-3

the third password authentication method to attempt

Values radius, tacplus, local

Default local

radius

RADIUS authentication

tacplus

TACACS+ authentication

local

password authentication based on the local password database

exit-on-reject

when enabled, and if one of the AAA methods configured in the authentication order sends a reject, then the next method in the order are not tried. If the **exit-on-reject** keyword is not specified and one AAA method sends a reject, the next AAA method is attempted. If in this process all the AAA methods are exhausted, it is considered a reject.

A rejection is distinct from an unreachable authentication server. When the **exit-on-reject** keyword is specified, authorization and accounting only use the method that provided an affirmation authentication; only if that method is no longer readable or is removed from the configuration other configured methods are attempted. If the **local** keyword is the first authentication and:

- **exit-on-reject** is configured and the user does not exist, the user is not authenticated
- the user is authenticated locally, then other methods, if configured, is used for authorization and accounting
- the user is configured locally but without console access, login is denied

complexity-rules

Syntax

complexity-rules

Context

config>system>security>password

Description

This command enables the context to configure security password complexity rules.

allow-user-name

Syntax

[no] **allow-user-name**

Context

config>system>security>password>complexity-rules

Description

This command allows a login name to be included as part of the password.

The **no** form of this command prevents a login name from being included as part of the password.

credits

Syntax

credits [**lowercase credits**] [**uppercase credits**] [**numeric credits**] [**special-character credits**]

no credits

Context

config>system>security>password>complexity-rules

Description

This command configures a credit value for each of the different character classes in a local password. When a password is created, credits are assigned for each character in a character class, up to the assigned *credits* limit. The credits each count as one additional character toward the minimum length of the password. This allows a trade-off between a very long, simple password and a short, complex one.

For example, if the password minimum length is seven and **lowercase credits** is set to 3, a password with four lowercase letters, such as "srty", is accepted. The first three lowercase letters are each given a credit worth one extra character. Combined with the four characters in the password, the total reaches the minimum length. If **lowercase credits** is set to 2 instead of 3, only the first two lowercase letters are

given credit. In this case, the "srty" password is worth only six characters (four characters plus two extra characters from credits) and would fail to reach the seven character minimum length.

The **no** form of this command removes all credit values.

Default

no credits

Parameters

credits

the number of credits allowed for each character class

Values 0 to 10

minimum-classes

Syntax

minimum-classes *minimum*

no minimum-classes

Context

config>system>security>password>complexity-rules

Description

This command enforces a minimum number of different character classes to be used in the password. The possible character classes are lowercase letters, uppercase letters, numbers, and special characters.

The **no** form of this command removes the minimum character class requirement.

Default

no minimum-classes

Parameters

minimum

the minimum number of character classes required in a password

Values 2 to 4

minimum-length

Syntax

minimum-length *value*

no minimum-length

Context

config>system>security>password>complexity-rules

Description

This command configures the minimum number of characters required for passwords.

If multiple **minimum-length** commands are entered, each command overwrites the previously entered command.

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

Default

6

Parameters

value

the minimum number of characters required for a password

Values 6 to 50

repeated-characters

Syntax

repeated-characters *count*

no repeated-characters

Context

config>system>security>password>complexity-rules

Description

This command configures the maximum number of times a character can be repeated consecutively in a password.

The **no** form of the command resets to the default value, which removes the restriction on repeated characters in passwords.

Default

no repeated-characters

Parameters

count

the maximum number of consecutive repeated characters allowed in the password

Values 1 to 8

required

Syntax

required [*lowercase count*] [**uppercase** *count*] [**numeric** *count*] [**special-character** *count*]

no required

Context

config>system>security>password>complexity-rules

Description

This command configures the minimum number of characters from each character class that are required for a password to be valid.

The **no** form of the command removes the minimum required characters from each character class.

Default

no required

Parameters

count

the minimum number of characters required from the character class

Values 0 to 10

hashing

Syntax

hashing {**bcrypt** | **sha2-pbkdf2** | **sha3-pbkdf2**}

Context

config>system>security>password

Description

This command configures the password hashing algorithm.

Default

bcrypt

Parameters

bcrypt

sets the password hashing algorithm to bcrypt

sha2-pbkdf2

sets the password hashing algorithm to PBKDF2 with SHA-2 hashing

sha3-pbkdf2

sets the password hashing algorithm to PBKDF2 with SHA-3 hashing

health-check**Syntax**

[no] **health-check** [**interval** *interval*]

Context

config>system>security>password

Description

This command specifies that RADIUS and TACACS+ servers are monitored for 3 s each during every polling interval. Servers that are not configured have 3 s of idle time. If a server is found to be unreachable, or a previously unreachable server starts responding, depending on the type of server, a trap is sent.

The **no** form of the command disables the periodic monitoring of the RADIUS and TACACS+ servers. In this case, the operational status for the active server is up if the last access was successful.

Default

30

Parameters

interval

the polling interval for RADIUS and TACACS+ servers, in seconds

Values 6 to 1500

history-size**Syntax**

history-size *size*

no history-size

Context

config>system>security>password

Description

This command configures the number of previous passwords to save in the system. A new password is matched against every old password and is rejected if it is identical to a password in the history.

The **no** form of the command prevents password history matching.

Default

no history-size

Parameters

size

specifies how many previous passwords are stored in the history

Values 1 to 20

minimum-age**Syntax**

minimum-age [*days days*] [*hrs hours*] [*min minutes*] [*sec seconds*]

no minimum-age

Context

config>system>security>password

Description

This command configures the minimum required age of a password before it can be changed again.

The **no** form of this command removes the minimum password age requirement.

Default

no minimum-age

Parameters

days

the minimum number of days before a password can be changed again

Values 0 to 1

hours

the minimum number of hours before a password can be changed again

Values 0 to 23

minutes

the minimum number of minutes before a password can be changed again

Values 0 to 59

seconds

the minimum number of seconds before a password can be changed again

Values 0 to 59

minimum-change

Syntax

minimum-change *length*

no minimum-change

Context

config>system>security>password

Description

This command configures the minimum number of characters in a new password that must be unique from the previous password.

The **no** form of the command removes the unique character requirement.

Default

no minimum-change

Parameters

length

the minimum number of characters in a new password that must be unique from a previous password

Values 1 to 20

3.11.2.2.7 Profile Management Commands

profile

Syntax

[no] profile *user-profile-name*

Context

config>system>security

Description

This command creates a context to create user profiles for CLI command tree permissions.

Profiles are used to either deny or allow user console access to a hierarchical branch or to specific commands.

After the profiles are created, the **user** command assigns users to one or more profiles. You can define up to 16 user profiles, but a maximum of 8 profiles can be assigned to a user.

The **no** form of the command deletes a user profile.

Default

user-profile default

Parameters

user-profile-name

the user profile name entered as a character string. The string is case-sensitive and limited to 32 ASCII 7-bit printable characters with no spaces.

default-action

Syntax

default-action {**deny-all** | **permit-all** | **none**}

Context

config>system>security>profile

Description

This command specifies the default action to be applied when no match conditions are met.

Default

none

Parameters

deny-all

sets the default of the profile to deny access to all commands

permit-all

sets the default of the profile to allow access to all commands



Note: The **permit-all** parameter does not change access to security commands. Security commands are only and always available to members of the admin-user profile.

none

sets the default of the profile to no-action. This option is useful to assign multiple profiles to a user.

For example, if a user is a member of two profiles and the default action of the first profile is **permit-all**, then the second profile will never be evaluated because **permit-all** is executed first. If the first profile default action is set to **none** and if no match conditions are met in the first profile, then the second profile will be evaluated. If the default action of the last profile is **none** and no explicit match is found, then the default-action **deny-all** takes effect.

entry

Syntax

[no] **entry** *entry-id*

Context

config>system>security>profile

Description

This command is used to create a user profile entry.

More than one entry can be created with unique *entry-id* numbers. The 7705 SAR exits when the first match is found and executes the actions according to the accompanying action command. Entries should be sequenced from most explicit to least explicit.

An entry may not have any match criteria defined (in which case, everything matches) but must have at least the keyword **action** for it to be considered complete.

The **no** form of the command removes the specified entry from the user profile.

Default

no entry IDs are defined

Parameters

entry-id

an entry ID uniquely identifies a user profile command match criteria and a corresponding action. If more than one entry is configured, the *entry-ids* should be numbered in staggered increments to allow users to insert a new entry without requiring renumbering of the existing entries.

Values 1 to 9999

action

Syntax

action {deny | permit}

Context

config>system>security>profile>entry

Description

This command configures the action associated with the profile entry.

Parameters

deny

specifies that commands matching the entry command match criteria will be denied

permit

specifies that commands matching the entry command match criteria will be permitted

match**Syntax**

match *command-string*

no match

Context

config>system>security>profile>entry

Description

This command configures a command or command subtree.

Because the 7705 SAR exits when the first match is found, subordinate levels cannot be modified with subsequent action commands. More specific action commands should be entered with a lower entry number or in a profile that is evaluated prior to this profile.

All commands below the hierarchy level of the matched command are denied.

The **no** form of this command removes a match condition.

Default

no match command string is specified

Parameters

command-string

the CLI command or CLI tree level that is the scope of the profile entry

renum**Syntax**

renum *old-entry-number new-entry-number*

Context

config>system>security>profile

Description

This command renumbers profile entries to resequence the entries.

Because the 7705 SAR exits when the first match is found and executes the actions according to the accompanying action command, renumbering is useful to rearrange the entries from most explicit to least explicit.

Parameters

old-entry-number

the entry number of an existing entry

Values 1 to 9999

new-entry-number

the new entry number

Values 1 to 9999

3.11.2.2.8 User Management Commands

user

Syntax

[no] **user** *user-name*

Context

config>system>security

Description

This command creates a local user and a context to edit the user configuration.

If a new *user-name* is entered, the user is created. When an existing *user-name* is specified, the user parameters can be edited.

When a new user is created and the **info** command is entered, the system displays a password with hash2 encryption in the output screen. However, when using that username, there is no password required. The user can log in to the system by entering their username and then pressing ↵ at the password prompt.

Unless an administrator explicitly changes the password, it is null. The hashed value displayed uses the username and null password field, so when the username is changed, the displayed hashed value changes.

The **no** form of the command deletes the user and all configuration data. Users cannot delete themselves.

Default

n/a

Parameters

user-name

the name of the user, up to 32 characters

user-template

Syntax

```
user-template {tacplus_default | radius_default}
```

Context

```
config>system>security
```

Description

This command configures default security user template parameters.

Parameters

tacplus_default

specifies that the TACACS+ default template is used for the configuration

radius_default

specifies that the RADIUS default template is used for the configuration

access

Syntax

```
[no] access [ftp] [snmp] [console]
```

```
[no] access [ftp] [console]
```

Context

```
config>system>security>user
```

```
config>system>security>user-template
```

Description

This command grants a user permission for FTP, SNMP, or console access.

If a user requires access to more than one application, then multiple applications can be specified in a single command. Multiple commands are treated sequentially.

The **no** form of the command removes access for a specific application.

The **no access** command denies permission for all management access methods. To deny a single access method, enter the **no** form of the command followed by the method to be denied; for example, **no access ftp** denies FTP access.

Default

```
no access
```

Parameters

ftp

specifies FTP permission

snmp

specifies SNMP permission. This keyword is only configurable in the **config>system>security>user** context.

console

specifies console access (serial port or Telnet) permission

console**Syntax**

console

Context

config>system>security>user

config>system>security>user-template

Description

This command enables the context to configure user profile membership for the console.

cannot-change-password**Syntax**

[no] **cannot-change-password**

Context

config>system>security>user>console

Description

This command allows a user to change their password for both FTP and console login.

To disable a user's privilege to change their password, use the **cannot-change-password** form of the command.

The **cannot-change-password** flag is not replicated when a user copy is performed. A **new-password-at-login** flag is created instead.

Default

no cannot-change-password

local-lockout**Syntax**

[no] **local-lockout**

Context

config>system>security>user>console

Description

This command prevents console or local serial access if a user is locked out remotely.

The **no** version of this command allows locked-out users to log in only for console or local serial access.

Default

local-lockout

login-exec

Syntax

[no] **login-exec** *url-prefix:source-url*

Context

config>system>security>user>console

config>system>security>user-template>console

Description

This command configures a user's login exec file, which executes whenever the user successfully logs in to a console session.

Only one exec file can be configured. If multiple **login-exec** commands are entered for the same user, each subsequent entry overwrites the previous entry.

The **no** form of the command disables the login exec file for the user.

Default

no login exec file is defined

Parameters

url-prefix: source-url

enter either a local or remote URL, up to 200 characters in length, that identifies the exec file that is executed after the user successfully logs in

member

Syntax

member *user-profile-name* [*user-profile-name...*]

no member *user-profile-name*

Context

```
config>system>security>user>console
```

Description

This command allows the user access to a profile.

A user can participate in up to eight profiles.

The **no** form of this command deletes access user access to a profile.

Default

default

Parameters

user-profile-name

the user profile name

new-password-at-login

Syntax

```
[no] new-password-at-login
```

Context

```
config>system>security>user>console
```

Description

This command forces the user to change passwords at the next console or FTP login.

If the user is limited to FTP access, the administrator must create the new password.

The **no** form of the command does not force the user to change passwords.

Default

no new-password-at-login

home-directory

Syntax

```
home-directory url-prefix [directory] [directory/directory...]
```

```
no home-directory
```

Context

```
config>system>security>user
```

```
config>system>security>user-template
```

Description

This command configures the local home directory for the user for file access. Files on the 7705 SAR can be accessed locally using the CLI **file** commands and output modifiers, such as > (file redirect), or remotely via FTP or SCP.

If the URL or the specified URL/directory structure is not present, a warning message is issued and the default is assumed.

The **no** form of the command removes the configured home directory.

Default

no home-directory



Note: If **restricted-to-home** has been configured, no file access is granted and no home directory is created; if **restricted-to-home** is not applied, root becomes the user's home directory.

Parameters

url-prefix [directory] [directory/directory...]

the user's local home directory URL prefix and directory structure, up to 190 characters in length

password

Syntax

password [*password*]

Context

config>system>security>user

Description

This command configures the user password for console and FTP access.

Passwords must be enclosed in double quotes (" ") at the time of password creation if they contain any special characters (such as #, \$, or spaces). The double quote character (") is not accepted inside a password. It is interpreted as the start or stop delimiter of a string.

The question mark character (?) cannot be directly inserted as input during a Telnet connection because the character is bound to the **help** command during a normal Telnet/console connection. To insert # or ? characters, they must be entered inside a notepad or clipboard program and then cut and pasted into the Telnet session in the password field that is encased in double quotes as delimiters for the password.

If a password is entered without any parameters, a password length of zero is implied (return key).

The password is stored in an encrypted format in the configuration file when specified.

Parameters

password

the password that must be entered by this user during the login procedure. The minimum length of the password is determined by the [minimum-length](#) command. The maximum length is as follows:

- 56 characters if in unhashed plaintext
The unhashed plaintext form must meet all the requirements that are defined within the [complexity-rules](#) command context.
- 60 characters if hashed with bcrypt
- from 87 to 92 characters if hashed with PBKDF2 SHA-2
- from 131 to 136 characters if hashed with PBKDF2 SHA-3

profile

Syntax

profile *user-profile-name*

no profile

Context

config>system>security>user-template

Description

This command specifies the user profile to associate with the user template. The profile must already be configured with the **profile** command under the **config>system>security** context.

The **no** form of this command removes the profile.

Default

profile "default"

Parameters

user-profile-name

an existing user profile name

public-keys

Syntax

public-keys

Context

config>system>security>user

Description

This command enables the context to configure public keys for SSH.

ecdsa

Syntax

ecdsa

Context

config>system>security>user>public-keys

Description

This command enables the context to configure ECDSA public keys.

ecdsa-key

Syntax

ecdsa-key *key-id* [**create**]

no ecdsa-key *key-id*

Context

config>system>security>user>public-keys>ecdsa

Description

This command creates an ECDSA public key and associates it with the specified user. Multiple public keys can be associated with the user. The key ID is used to identify these keys for the user.

Default

n/a

Parameters

key-id

the key identifier

Values 1 to 32

create

keyword required when first creating the ECDSA key. When the key is created, you can navigate into the context without the **create** keyword.

key-value

Syntax

key-value *public-key-value*

no key-value

Context

```
config>system>security>user>public-keys>ecdsa>ecdsa-key
config>system>security>user>public-keys>rsa>rsa-key
```

Description

This command configures a value for the ECDSA or RSA public key. The public key must be enclosed in quotation marks. For ECDSA, the key is between 1 and 1024 bits. For RSA, the key is between 768 and 4096 bits.

Default

no key-value

Parameters

public-key-value

the value for the ECDSA or RSA key

Values 255 characters max (ECDSA)
800 characters max (RSA)

```
rsa
```

Syntax

```
rsa
```

Context

```
config>system>security>user>public-keys
```

Description

This command enables the context to configure RSA public keys.

```
rsa-key
```

Syntax

```
rsa-key key-id [create]
no rsa-key key-id
```

Context

```
config>system>security>user>public-keys>rsa
```

Description

This command creates an RSA public key and associates it with the specified user. Multiple public keys can be associated with the user. The key ID is used to identify these keys for the user.

Parameters

key-id

the key identifier

Values 1 to 32

create

keyword required when first creating the RSA key. When the key is created, you can navigate into the context without the **create** keyword.

restricted-to-home

Syntax

[no] **restricted-to-home**

Context

config>system>security>user

config>system>security>user-template

Description

This command prevents users from navigating above their home directories for file access. A user is not allowed to navigate to a directory higher in the directory tree on the home directory device. The user is allowed to create and access subdirectories below their home directory.

If a home directory is not configured or the home directory is not available, the user has no file access.

The **no** form of the command allows the user access to navigate to directories above their home directory.

Default

no restricted-to-home

save-when-restricted

Syntax

[no] **save-when-restricted**

Context

config>system>security>user

config>system>security>user-template

Description

This command specifies whether the system allows all configuration save operations (for example, **admin save**) via the CLI even if **restricted-to-home** is enabled.

The home directory does not need to be configured.

The **no** form of the command prevents the user from performing any configuration save operations outside of their home directory when **restricted-to-home** is enabled.

Default

no save-when-restricted

snmp

Syntax

snmp

Context

config>system>security>user

Description

This command enables the context to configure SNMP group membership for a specific user and defines encryption and authentication parameters.

All SNMPv3 users must be configured with the commands available in this CLI context.

The 7705 SAR always uses the configured SNMPv3 username as the security username.

authentication

Syntax

authentication none

authentication *authentication-protocol authentication-key* [**privacy none**] [**hash | hash2**]

authentication *authentication-protocol authentication-key* **privacy** *privacy-protocol privacy-key* [**hash | hash2**]

no authentication

Context

config>system>security>user>snmp

Description

This command configures the SNMPv3 authentication and privacy protocols for the user to communicate with the router. The keys are stored in an encrypted format in the configuration.

The keys configured with these commands must be localized keys, which are a hash of the SNMP engine ID and a password. The password is not entered directly in this command. Use the **generate-key** command under the **tools>perform>system>management-interface >snmp** context to generate localized authentication and privacy keys. See the 7705 SAR OAM and Diagnostics Guide, "Tools Perform Commands" for information about this command.

If **authentication none** is configured, only the username is required to allow and authenticate SNMPv3 operations.

The **no** form of the command prevents the username used to configure the command from getting recognized by SNMP, and the same user cannot be used for any SNMP operations.

Default

authentication none — no authentication protocol is configured and privacy cannot be configured

Parameters

none

specifies that no authentication protocol is used

authentication-protocol authentication-key

specifies the SNMPv3 authentication protocol and localized authentication key

Values **hmac-md5-96** — specifies use of the HMAC-MD5-96 authentication protocol; the key must be entered as a 32-character hexadecimal string

hmac-sha1-96 — specifies use of the HMAC-SHA1-96 authentication protocol; the key must be entered as a 40-character hexadecimal string

hmac-sha2-224 — specifies use of the HMAC-SHA2-224 authentication protocol; the key must be entered as a 56-character hexadecimal string

hmac-sha2-256 — specifies use of the HMAC-SHA2-256 authentication protocol; the key must be entered as a 64-character hexadecimal string

hmac-sha2-384 — specifies use of the HMAC-SHA2-384 authentication protocol; the key must be entered as a 96-character hexadecimal string

hmac-sha2-512 — specifies use of the HMAC-SHA2-512 authentication protocol; the key must be entered as a 128-character hexadecimal string

privacy-protocol privacy-key

specifies the SNMPv3 privacy protocol and localized privacy key

Values **cbc-des** — specifies use of the CBC-DES privacy protocol; the key must be entered as a 32-character hexadecimal string. This parameter is not available in FIPS-140-2 mode.

cfb128-aes-128 — specifies use of the CFB128-AES-128 privacy protocol; the key must be entered as a 32-character hexadecimal string

cfb128-aes-192 — specifies use of the CFB128-AES-192 privacy protocol; the key must be entered as a 48-character hexadecimal string

cfb128-aes-256 — specifies use of the CFB128-AES-256 privacy protocol; the key must be entered as a 64-character hexadecimal string

privacy none

specifies that a privacy protocol is not used in the communication

Default privacy none

hash

specifies that the key is entered in an encrypted form. If the **hash** parameter is not used, the key is assumed to be in an unencrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the hash parameter specified.

hash2

specifies that the key is entered in a more complex encrypted form. If the **hash2** parameter is not used, the less encrypted **hash** form is assumed.

group**Syntax**

group *group-name*

no group

Context

config>system>security>user>snmp

Description

This command associates (or links) a user to a group name. The [access](#) command links the group with one or more views, security models, security levels, and read, write, and notify permissions.

Default

no group name is associated with a user

Parameters

group-name

enter the group name (between 1 and 32 alphanumeric characters) that is associated with this user. A user can be associated with one group name per security model.

3.11.2.2.9 CLI Script Authorization Commands

cli-script**Syntax**

cli-script

Context

```
config>system>security
```

Description

This command enables the context to configure CLI script security.

authorization**Syntax**

```
authorization
```

Context

```
config>system>security>cli-script
```

Description

This command enables the context to authorize CLI script execution for CRON and Event Handling System (EHS) scripts.

cron**Syntax**

```
cron
```

Context

```
config>system>security>cli-script>authorization
```

Description

This command enables the context to configure authorization for the CRON scheduler.

cli-user**Syntax**

```
cli-user user-name
```

```
no cli-user
```

Context

```
config>system>security>cli-script>authorization>cron
```

```
config>system>security>cli-script>authorization>event-handler
```

Description

This command defines the user context under which CRON and EHS CLI scripts must execute in order to authorize the script commands. The user must be a local user; TACACS+ and RADIUS users and authorization are not permitted for **cli-script** authorization.

Two unique users can be defined: one to authorize CLI commands for CRON scripts and one to authorize CLI commands for EHS scripts.

The **no** form of this command configures scripts to execute with no restrictions and without performing authorization.

Default

no cli-user

Parameters

user-name

the name of a user in the local node database. TACACS+ or RADIUS users cannot be used. The user configuration must reference a valid local profile for authorization.

event-handler

Syntax

event-handler

Context

config>system>security>cli-script>authorization

Description

This command enables the context to configure authorization for EHS. EHS is a tool that enables operator-defined behavior to be configured on the 7705 SAR. The operator can define a CLI script that the router executes in response to a log event.

3.11.2.2.10 RADIUS Client Commands

radius

Syntax

[no] radius

Context

config>system>security

Description

This command enables the context to configure RADIUS authentication on the 7705 SAR.
For redundancy, multiple server addresses can be configured for each 7705 SAR.
The **no** form of the command removes the RADIUS configuration.

access-algorithm

Syntax

access-algorithm {**direct** | **round-robin**}
[no] **access-algorithm**

Context

config>system>security>radius

Description

This command configures the algorithm used to access the set of RADIUS servers. Up to five servers can be configured.

In direct mode, the first server, as defined by the [server](#) command, is the primary server. This server is always used first when authenticating a request. In round-robin mode, the server used to authenticate a request is the next server in the list, following the last authentication request. For example, if server 1 is used to authenticate the first request, server 2 is used to authenticate the second request, and so on.

Default

direct

Parameters

direct

first server is always used to authenticate a request

round-robin

server used to authenticate a request is the next server in the list, following the last authentication request

accounting

Syntax

[no] **accounting**

Context

config>system>security>radius

Description

This command enables RADIUS accounting. The **no** form of this command disables RADIUS accounting.

Default

no accounting

accounting-port

Syntax

accounting-port *port*

no accounting-port

Context

config>system>security>radius

Description

This command specifies a UDP port number on which to contact the RADIUS server for accounting requests.

Parameters

port

specifies the UDP port number

Values 1 to 65535

Default 1813

authorization

Syntax

[no] authorization

Context

config>system>security>radius

Description

This command configures RADIUS authorization parameters for the system.

The **no** form of this command disables RADIUS authorization for the system.

Default

no authorization

port

Syntax

port *port*

no port

Context

config>system>security>radius

Description

This command configures the TCP port number to contact the RADIUS server.

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

Default

1812 (as specified in RFC 2865, Remote Authentication Dial In User Service (RADIUS))

Parameters

port

the TCP port number to contact the RADIUS server

Values 1 to 65535

retry

Syntax

retry *count*

no retry

Context

config>system>security>radius

Description

This command configures the number of times the router attempts to contact the RADIUS server for authentication if there are problems communicating with the server.

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

Default

3

Parameters

count

the retry count

Values 1 to 10

server

Syntax

server *server-index* **address** *ip-address* **secret** *key* [**hash** | **hash2**]

no server *server-index*

Context

config>system>security>radius

Description

This command adds a RADIUS server and configures the RADIUS server IP address, index, and key values.

Up to five RADIUS servers can be configured at any one time. RADIUS servers are accessed in order from lowest to highest index for authentication requests until a response from a server is received. A higher-indexed server is only queried if no response is received from a lower-indexed server (which implies that the server is not available). If a response from a server is received, no other RADIUS servers are queried. It is assumed that there are multiple identical servers configured as backups and that the servers do not have redundant data.

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

Default

no RADIUS servers are configured

Parameters

index

the index for the RADIUS server. The index determines the sequence in which the servers are queried for authentication requests. Servers are queried in order from lowest to highest index.

Values 1 to 5

ip-address

the IP address of the RADIUS server. Two RADIUS servers cannot have the same IP address. An error message is generated if the server address is a duplicate.

Values

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

key

the secret key to access the RADIUS server. This secret key must match the password on the RADIUS server.

Values up to 20 characters in length

hash

specifies that the key is entered in an encrypted form. If the **hash** parameter is not used, the key is assumed to be in an unencrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the **hash** parameter specified.

hash2

specifies that the key is entered in a more complex encrypted form. If the **hash2** parameter is not used, the less encrypted hash form is assumed.

timeout**Syntax**

timeout *seconds*

no timeout

Context

config>system>security>radius

Description

This command configures the number of seconds the router waits for a response from a RADIUS server.

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

Default

3

Parameters

seconds

the number of seconds the router waits for a response from a RADIUS server, expressed as a decimal integer

Values 1 to 90

use-default-template**Syntax**

[no] **use-default-template**

Context

```
config>system>security>radius
```

Description

This command specifies whether the user template defined by this entry is to be actively applied to the RADIUS user.

Default

```
no use-default-template
```

3.11.2.2.11 TACACS+ Client Commands

tacplus

Syntax

```
[no] tacplus
```

Context

```
config>system>security
```

Description

This command enables the context to configure TACACS+ authentication on the 7705 SAR.

For redundancy, multiple server addresses can be configured for each 7705 SAR.

The **no** form of the command removes the TACACS+ configuration.

accounting

Syntax

```
accounting [record-type {start-stop | stop-only}]
```

```
no accounting
```

Context

```
config>system>security>tacplus
```

Description

This command enables TACACS+ accounting and configures the type of accounting record packet that is to be sent to the TACACS+ server. The **record-type** parameter indicates whether TACACS+ accounting start and stop packets will be sent or just stop packets will be sent.

Default

```
record-type stop-only
```

Parameters

record-type start-stop

specifies that a TACACS+ start packet is sent whenever the user executes a command and a stop packet is sent when the command is complete

record-type stop-only

specifies that a stop packet is sent when the command execution is complete

authorization

Syntax

[no] authorization

Context

config>system>security>tacplus

Description

This command configures TACACS+ authorization parameters for the system.

Default

no authorization

server

Syntax

server *index* **address** *ip-address* **secret** *key* [**hash** | **hash2**] [**port** *port*]

no server *index*

Context

config>system>security>tacplus

Description

This command adds a TACACS+ server and configures the TACACS+ server IP address, index, and key values.

Up to five TACACS+ servers can be configured at any one time. TACACS+ servers are accessed in order from the lowest index to the highest index for authentication requests.

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

Default

no TACACS+ servers are configured

Parameters

index

the index for the TACACS+ server. The index determines the sequence in which the servers are queried for authentication requests. Servers are queried in order from the lowest index to the highest index.

Values 1 to 5

ip-address

the IP address of the TACACS+ server. Two TACACS+ servers cannot have the same IP address. An error message is generated if the server address is a duplicate.

Values

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

key

the secret key to access the RADIUS server. This secret key must match the password on the TACACS+ server.

Values up to 128 characters in length

hash

specifies that the key is entered in an encrypted form. If the **hash** parameter is not used, the key is assumed to be in an unencrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the **hash** parameter specified.

hash2

specifies that the key is entered in a more complex encrypted form. If the **hash2** parameter is not used, the less encrypted hash form is assumed.

port

the port ID

Values 0 to 65535

timeout

Syntax

timeout *seconds*

no timeout

Context

config>system>security>tacplus

Description

This command configures the number of seconds the router waits for a response from a TACACS+ server. The **no** form of the command reverts to the default value.

Default

3

Parameters

seconds

the number of seconds the router waits for a response from a TACACS+ server, expressed as a decimal integer

Values 1 to 90

use-default-template

Syntax

[no] use-default-template

Context

config>system>security>tacplus

Description

This command specifies whether the user template defined by this entry is to be actively applied to the TACACS+ user.

3.11.2.2.12 802.1x Commands

dot1x

Syntax

[no] dot1x

Context

config>system>security

Description

This command enables the context to configure 802.1x network access control on the 7705 SAR. The **no** form of the command removes the 802.1x configuration.

radius-plcy

Syntax

[no] radius-plcy *name* [**create**]

Context

config>system>security>dot1x

Description

This command enables the context to configure RADIUS server parameters for 802.1x network access control on the 7705 SAR.

The RADIUS server configured under the **config>system>security>dot1x>radius-plcy** context authenticates clients who get access to the data plane of the 7705 SAR. This configuration differs from the RADIUS server configured under the **config>system>security>radius** context that authenticates CLI login users who get access to the management plane of the 7705 SAR.

The **no** form of the command removes the RADIUS server configuration for 802.1x.

Parameters

name

the RADIUS policy name, up to 32 characters

create

keyword required when first creating the configuration context. When the context is created, you can navigate into the context without the create keyword.

retry

Syntax

retry *count*

no retry

Context

config>system>security>dot1x

Description

This command configures the number of times the router attempts to contact the RADIUS server for authentication if there are problems communicating with the server.

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

Default

3

Parameters

count

the retry count

Values 1 to 10

server

Syntax

server *server-index* **address** *ip-address* **secret** *key* [**hash** | **hash2**] [**auth-port** *auth-port*]

[**acct-port** *acct-port*] [**type** *server-type*]

no server *server-index*

Context

config>system>security>dot1x>radius-plcy

Description

This command adds an 802.1x server and configures the IP address, index, and key values.

Up to five 802.1x servers can be configured at any one time. These servers are accessed in order from lowest to highest index for authentication requests until a response from a server is received. A higher-indexed server is only queried if no response is received from a lower-indexed server (which implies that the server is not available). If a response from a server is received, no other 802.1x servers are queried. It is assumed that there are multiple identical servers configured as backups and that the servers do not have redundant data.

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

Default

n/a

Parameters

server-index

the index for the 802.1x server

Values 1 to 5

ip-address

the IP address of the 802.1x server. Each 802.1x server must have a unique IP address. An error message is generated if the server address is a duplicate.

Values a.b.c.d

key

the secret key to access the 802.1x server. This secret key must match the password on the 802.1x server.

Values up to 20 alphanumeric characters

hash

specifies that the key is entered in an encrypted form. If the **hash** parameter is not used, the key is assumed to be in an unencrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the **hash** 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 the **hash2** encrypted variable cannot be copied and pasted. If the **hash** or **hash2** parameter is not used, the key is assumed to be in an unencrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the **hash** parameter specified.

auth-port

the UDP port number used to contact the RADIUS server for authentication

Values 1 to 65535

acct-port

the UDP port number used to contact the RADIUS server for accounting requests

Values 1 to 65535

server-type

the server type

Values authorization, accounting, or combined

source-address

Syntax

source-address *ip-address*

no source-address

Context

config>system>security>dot1x>radius-plcy

Description

This command configures the NAS IP address to be sent in the RADIUS packet.

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

Default

system IP address

Parameters

ip-address

the source address of the RADIUS packet in dotted-decimal notation

Values 0.0.0.0 to 255.255.255.255

shutdown

Syntax

[no] shutdown

Context

config>system>security>dot1x

config>system>security>dot1x>radius-plcy

Description

This command administratively disables the 802.1x protocol operation. Shutting down the protocol does not remove or change the configuration other than the administrative state.

The operational state of the entity is disabled as well as the operational state of any entities contained within.

The **no** form of the command administratively enables the protocol.

Default

shutdown

timeout

Syntax

timeout *seconds*

no timeout

Context

config>system>security>dot1x>radius-plcy

Description

This command configures the number of seconds the router waits for a response from a RADIUS server.

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

Default

5

Parameters

seconds

the number of seconds the router waits for a response from a RADIUS server, expressed as a decimal integer

Values 1 to 90

3.11.2.2.13 SSH Commands

ssh

Syntax

ssh

Context

config>system>security

Description

This command enables the context to configure the SSH server parameters on the system.

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.

Default

n/a

client-cipher-list

Syntax

client-cipher-list

Context

config>system>security>ssh

Description

This command enables the context to configure the list of allowed ciphers on the SSH client.

Default

n/a

cipher

Syntax

cipher *index name cipher-name*

no cipher *index*

Context

config>system>security>ssh>client-cipher-list

config>system>security>ssh>server-cipher-list

Description

This command configures the allowed SSHv2 ciphers that are available on the SSH client or server. Client cipher and server cipher lists are used to negotiate the best compatible cipher between the SSH client and SSH server. Client ciphers are used when the 7705 SAR node is acting as an SSH client; server ciphers are used when the 7705 SAR node is acting as an SSH server.

Each list contains ciphers and their corresponding index values, where a lower index has a higher preference in the SSH negotiation. The list is ordered by preference from highest to lowest.

The following table lists the default index values used for SSHv2, in order of preference.

Table 11: SSHv2 Default Index Values

Cipher Index Value	Cipher Name
2	aes256-ctr
4	aes192-ctr
6	aes128-ctr
10	aes128-cbc
20	3des-cbc
60	aes192-cbc
70	aes256-cbc



Note: When the 7705 SAR is running in FIPS-140-2 mode, the 3des-cbc cipher is not available.

The **no** form of this command deletes the specified cipher index.

Default

n/a

Parameters

index

the index of the cipher in the list

Values 1 to 255

cipher-name

the allowed cipher name

Values For SSHv2 client ciphers: aes128-ctr, aes192-ctr, aes256-ctr, 3des-cbc, aes128-cbc, aes192-cbc, aes256-cbc

For SSHv2 server ciphers: aes128-ctr, aes192-ctr, aes256-ctr, 3des-cbc, aes128-cbc, aes192-cbc, aes256-cbc

client-kex-list

Syntax

client-kex-list

Context

config>system>security>ssh

Description

This command enables the context to configure a list of preferred KEX algorithms to be used by an SSHv2 client.

Default

n/a

kex

Syntax

kex *index name* *kex-name*

no kex *index*

Context

config>system>security>ssh>client-kex-list

config>system>security>ssh>server-kex-list

Description

This command configures the list of preferred KEX algorithms that are negotiated by the client and server using an SSHv2 phase one handshake.

By default, a KEX client and KEX server each have a hard-coded list that contains the default indexes and their corresponding algorithms. [Table 12: Default KEX Index Values](#) lists the default index values and algorithms, in order of preference.

Table 12: Default KEX Index Values

KEX Index Value	KEX Algorithm Name
200	diffie-hellman-group16-sha512
210	diffie-hellman-group14-sha256
215	diffie-hellman-group14-sha1
220	diffie-hellman-group-exchange-sha1
225	diffie-hellman-group1-sha1

The default list can be changed by manually removing a single index or as many indexes as required using the **no kex index** command. The default list can also be customized by first removing an index and then redefining it for each algorithm as required. To go back to using the original hard-coded list, the default KEX indexes must be manually re-entered with their corresponding algorithms.

In a KEX list, the algorithm with the lowest index value has the highest preference in the SSH negotiation. The list is ordered by preference from highest to lowest. When the client and server exchange their KEX lists, the first algorithm in the client list that is also supported by the server is the algorithm that is agreed upon.



Note: When the 7705 SAR is running in FIPS-140-2 mode, the diffie-hellman-group1-sha1 KEX algorithm is not available.

The **no** form of this command removes the specified KEX index. Removing all the indexes from a client or server list results in an empty list, and any KEX algorithm the client or server brings to the SSHv2 negotiation will be rejected.

Default

no kex

Parameters

index

the index of the KEX algorithm in the list. The list is ordered from highest to lowest.

Values 1 to 255

kex-name

the KEX algorithm for computing the shared secret key

Values diffie-hellman-group16-sha512, diffie-hellman-group14-sha256, diffie-hellman-group14-sha1, diffie-hellman-group-exchange-sha1, diffie-hellman-group1-sha1

client-mac-list

Syntax

client-mac-list

Context

config>system>security>ssh

Description

This command enables the context to configure a list of preferred MAC algorithms to be used by an SSHv2 client.

Default

n/a

mac

Syntax

mac *index* **name** *mac-name*

no mac *index*

Context

config>system>security>ssh>client-mac-list

config>system>security>ssh>server-mac-list

Description

This command configures the list of preferred MAC algorithms that are negotiated by an SSHv2 server or client.

Each algorithm in the list has a corresponding index value, where a lower index has a higher preference in the SSH negotiation. The list is ordered by preference from highest to lowest.

The following table lists the default client and server MAC index values used for SSHv2.

Table 13: Default SSHv2 MAC Index Values

MAC Index Value	MAC Algorithm Name
200	hmac-sha2-512
210	hmac-sha2-256
215	hmac-sha1
220	hmac-sha1-96
225	hmac-md5

MAC Index Value	MAC Algorithm Name
240	hmac-md5-96



Note: When the 7705 SAR is running in FIPS-140-2 mode, the following MAC algorithms are not available: hmac-sha1-96, hmac-md5, and hmac-md5-96.

The **no** form of this command removes the specified MAC index from the list.

Default

no mac

Parameters

index

the index of the MAC algorithm in the list

Values 1 to 255

mac-name

the algorithm for calculating the message authentication code

Values hmac-sha2-512, hmac-sha2-256, hmac-sha1, hmac-sha1-96, hmac-md5, hmac-md5-96

key-re-exchange

Syntax

key-re-exchange

Context

config>system>security>ssh

Description

This command enables the context to configure key re-exchange parameters for an SSH client or server.

client

Syntax

client

Context

config>system>security>ssh>key-re-exchange

Description

This command enables the context to configure key re-exchange parameters for an SSH client.

mbytes

Syntax

mbytes {*mbytes* | **disable**}

no mbytes

Context

config>system>security>ssh>key-re-exchange>client

config>system>security>ssh>key-re-exchange>server

Description

This command configures the maximum number of megabytes that can be transmitted during an SSH session before an SSH client or server initiates the key re-exchange procedure.

If both the **mbytes** and **minutes** key re-exchange parameters are configured, the key re-exchange will occur at whatever limit is reached first.

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

Default

1024

Parameters

mbytes

specifies the number of megabytes that can be transmitted during an SSH session before the key re-exchange occurs

Values 1 to 64000

disable

specifies that a session will never time out

minutes

Syntax

minutes {*minutes* | **disable**}

no minutes

Context

config>system>security>ssh>key-re-exchange>client

config>system>security>ssh>key-re-exchange>server

Description

This command configures the maximum time that an SSH session can be up before an SSH client or server initiates the key re-exchange procedure.

If both the **mbytes** and **minutes** key re-exchange parameters are configured, the key re-exchange will occur at whatever limit is reached first.

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

Default

60

Parameters

minutes

specifies the number of minutes before an SSH client or server initiates the key re-exchange

Values 1 to 1440

disable

specifies that a session will never time out

shutdown

Syntax

[no] **shutdown**

Context

config>system>security>ssh>key-re-exchange>client

config>system>security>ssh>key-re-exchange>server

Description

This command enables or disables initiating of the key re-exchange procedure when the configured thresholds are reached.

Default

no shutdown

server

Syntax

server

Context

config>system>security>ssh>key-re-exchange

Description

This command enables the context to configure key re-exchange parameters for an SSH server.

```
preserve-key
```

Syntax

```
[no] preserve-key
```

Context

```
config>system>security>ssh
```

Description

This command specifies the persistence of the SSH server host key. When enabled, the host key will be saved by the server and restored following a system reboot. This command can only be enabled or disabled when no SSH session is running.

The **no** form of the command specifies that the host key will be held in memory by the SSH server and not be restored following a system reboot.

Default

```
no preserve-key
```

```
server-cipher-list
```

Syntax

```
server-cipher-list
```

Context

```
config>system>security>ssh
```

Description

This command enables the context to configure the list of allowed ciphers on the SSH server.

Default

```
n/a
```

```
server-kex-list
```

Syntax

```
server-kex-list
```

Context

```
config>system>security>ssh
```

Description

This command enables the context to configure a list of preferred KEX algorithms to be used by an SSHv2 server.

Default

n/a

server-mac-list

Syntax

```
server-mac-list
```

Context

```
config>system>security>ssh
```

Description

This command enables the context to configure a list of preferred MAC algorithms to be used by an SSHv2 server.

Default

n/a

server-shutdown

Syntax

```
[no] server-shutdown
```

Context

```
config>system>security>ssh
```

Description

This command disables the SSH server running on the system. The **no** version of the command enables the SSH server.

When the **no server-shutdown** command is executed, an SSH security key is generated. Unless the **preserve-key** command is enabled, this key is valid until either the node is restarted or the SSH server is stopped with the **server-shutdown** command and restarted. The key size is non-configurable and is set to 2048 for SSHv2 RSA and to 1024 for SSHv2 DSA. Only SSHv2 RSA is supported in FIPS-140-2 mode.

Default

no server-shutdown

3.11.2.2.14 Security TLS Commands**tls****Syntax**

tls

Context

config>system>security

Description

This command enables the context to configure TLS parameters.

Default

n/a

cert-profile**Syntax**

cert-profile *profile-name* [create]

no cert-profile *profile-name*

Context

config>system>security>tls

Description

This command creates a new TLS certificate profile or specifies an existing certificate profile. The certificate profile contains the certificates that are sent to the TLS peer to authenticate itself. The TLS server must send this information. The TLS client can optionally send this information upon request from the TLS server.

The **no** form of the command deletes the specified TLS certificate profile.

Default

n/a

Parameters

profile-name

the name of the TLS certificate profile, up to 32 characters in length

create

keyword is mandatory when creating a new certificate profile

entry**Syntax**

entry *entry-id* [**create**]

no entry *entry-id*

Context

config>system>security>tls>cert-profile

Description

This command configures an entry for the TLS certificate profile. A certificate profile can have up to eight entries. Currently, TLS uses the entry with the lowest ID number when responding to server requests.

The **no** form of the command deletes the specified entry.

Default

n/a

Parameters

entry-id

the identification number of the TLS certificate profile entry

Values 1 to 8

create

keyword is mandatory when creating a new certificate profile

cert**Syntax**

cert *cert-filename*

no cert

Context

config>system>security>tls>cert-profile>entry

Description

This command specifies the filename of an imported certificate for the **cert-profile** entry.

The **no** form of the command removes the certificate.

Default

no cert

Parameters

cert-filename

the filename of the TLS certificate, up to 95 characters in length

key

Syntax

key *key-filename*

no key

Context

config>system>security>tls>cert-profile>entry

Description

This command specifies the filename of an imported key for the **cert-profile** entry.

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

Default

no key

Parameters

key-filename

the filename of the key, up to 95 characters in length

send-chain

Syntax

[no] send-chain

Context

config>system>security>tls>cert-profile>entry

Description

This command enables the sending of certificate authority (CA) certificates and enables the context to configure send-chain information.

By default, the system only sends the TLS client certificate specified by the **cert** command. This command allows the system to send additional CA certificates to the peer. The certificates must be in the chain of certificates specified by the **config>system>security>pki>ca-profile** command. The specification of the

send-chain is not necessary for a working TLS profile if the TLS peer has the CA certificate used to sign the client certificate in its own trust anchor.

For example, with a TLS client running on the 7705 SAR, the ROOT CA certificate resides on the TLS server, but the subsequent SUB-CA certificate needed to complete the chain resides within the 7705 SAR. The **send-chain** command allows these SUB-CA certificates to be sent from the 7705 SAR to the peer to be authenticated using the ROOT CA certificate that resides on the peer.

The **no** form of the command disables the send-chain.

Default

no send-chain

ca-profile

Syntax

[no] **ca-profile** *name*

Context

config>system>security>tls>cert-profile>entry>send-chain

Description

This command specifies that a CA certificate in the specified **ca-profile** is to be sent to the peer.

Up to seven configurations of this command are allowed in the same entry.

The **no** form of the command disables the transmission of a CA certificate from the specified CA profile.

Default

n/a

Parameters

name

the name of an existing CA

shutdown

Syntax

[no] **shutdown**

Context

config>system>security>tls>cert-profile

Description

This command disables the certificate profile. When the certificate profile is disabled, it will not be sent to the TLS server.

The **no** form of the command enables the certificate profile and allows it to be sent to the TLS server.

Default

shutdown

client-cipher-list

Syntax

client-cipher-list *name* [**create**]

no client-cipher-list *name*

Context

config>system>security>tls

Description

This command creates a cipher list or specifies an existing list that the client sends to the server in the client Hello message. The list contains ciphers that are supported and preferred by the 7705 SAR to be used in the TLS session. The server matches this list against the server cipher list. The most preferred cipher found in both lists is chosen.

The **no** form of the command deletes the specified cipher list.

Default

n/a

Parameters

name

the name of the client cipher list, up to 32 characters in length

create

keyword is mandatory when creating a new certificate profile

cipher

Syntax

cipher *index name cipher-suite-code*

no cipher *index*

Context

config>system>security>tls>client-cipher-list

Description

This command configures the TLS cipher suite code to be negotiated by the server and client.

The **no** form of the command removes the cipher suite code.

Default

n/a

Parameters

index

the index number of the cipher suite code, which indicates the position of the code in the negotiation list (the lower the index number, the higher the priority of the code)

Values 1 to 255

cipher-suite-code

specifies the cipher suite code

Values tls-rsa-with3des-edc-cbc-sha | tls-rsa-with-aes128-cbc-sha | tls-rsa-with-aes256-cbc-sha | tls-rsa-with-aes128-cbc-sha256 | tls-rsa-with-aes256-cbc-sha256

tls13-cipher

Syntax

tls13-cipher *index name cipher-suite-code*

no **tls13-cipher** *index*

Context

config>system>security>tls>client-cipher-list

Description

This command configures the TLS 1.3 supported ciphers that are used by the client and server.

The **no** form of the command removes the cipher suite code.

Default

n/a

Parameters

index

the index number of the TLS 1.3 cipher suite code, which indicates the position of the code in the negotiation list (the lower the index number, the higher the priority of the code)

Values 1 to 255

cipher-suite-code

specifies the cipher suite code

Values	tls-aes128-gcm-sha256 tls-aes256-gcm-sha384 tls-chacha20-poly1305-sha256 (not supported in FIPS mode) tls-aes128-ccm-sha256 tls-aes128-ccm8-sha256
---------------	--

client-group-list

Syntax

client-group-list *name* [**create**]

no client-group-list *name*

Context

config>system>security>tls

Description

This command creates a client group list or specifies an existing group list that the client sends in a client Hello message. The list contains group suite codes configured with the **tls13-group** command.

The **no** form of the command removes the client group list.

Default

n/a

Parameters

name

the name of the client group list, up to 32 characters

create

keyword is mandatory when creating a new certificate profile

tls13-group

Syntax

tls13-group *index name group-suite-code*

no tls13-group *index*

Context

config>system>security>tls>client-group-list

Description

This command configures the TLS 1.3 supported group suite codes sent by the client in the Hello message.

The 7705 SAR supports the use of Elliptic-curve Diffie-Hellman Ephemeral (ECDHE) groups.

The **no** form of the command removes the group suite code.

Default

n/a

Parameters*index*

the index number of the group suite code, which indicates the position of the code in the negotiation list (the lower the index number, the higher the priority of the code)

Values 1 to 255

group-suite-code

specifies the group suite code

Values tls-ecdh-256 | tls-ecdh-384 | tls-ecdh-521 | tls-x25519 | tls-x448

client-signature-list**Syntax**

client-signature-list *name* [**create**]

no client-signature-list *name*

Context

config>system>security>tls

Description

This command creates a client signature list or specifies an existing signature list that the client sends in a client Hello message.

The **no** form of the command removes the client signature list.

Default

n/a

Parameters*name*

the name of the client signature list, up to 32 characters

create

keyword is mandatory when creating a new certificate profile

tls13-signature**Syntax**

tls13-signature *index name signature-suite-code*

no tls13-signature *index***Context**

```
config>system>security>tls>client-signature-list
```

Description

This command configures the TLS 1.3 supported signature suite codes sent in the client Hello message.

The **no** form of the command removes the signature suite code.

Default

n/a

Parameters*index*

the index number of the TLS 1.3 signature suite code, which indicates the position of the code in the negotiation list (the lower the index number, the higher the priority of the code)

Values 1 to 255

signature-suite-code

specifies the signature suite code

Values tls-rsa-pkcs1-sha256 | tls-rsa-pkcs1-sha384 | tls-rsa-pkcs1-sha512 | tls-ecdsa-secp256r1-sha256 | tls-ecdsa-secp384r1-sha384 | tls-ecdsa-secp521r1-sha512 | tls-rsa-pss-rsae-sha256 | tls-rsa-pss-rsae-sha384 | tls-rsa-pss-rsae-sha512 | tls-rsa-pss-pss-sha256 | tls-rsa-pss-pss-sha384 | tls-rsa-pss-pss-sha512 | tls-ed25519 | tls-ed448

client-tls-profile**Syntax**

```
client-tls-profile name [create]
```

```
no client-tls-profile name
```

Context

```
config>system>security>tls
```

Description

This command creates a TLS client profile or specifies an existing client profile to be assigned to applications for encryption. Up to 16 TLS client profiles can be configured.

The **no** form of the command deletes the TLS client profile.

Default

n/a

Parameters

name

the name of the TLS client profile, up to 32 characters in length

create

keyword is mandatory when creating a new certificate profile

cert-profile**Syntax**

cert-profile *name*

no cert-profile

Context

config>system>security>tls>client-tls-profile

Description

This command assigns an existing TLS certificate profile to be used by the TLS client profile. This certificate is sent to the server for authentication of the client and public key.

The **no** form of the command removes the TLS certificate profile assignment.

Default

no cert-profile

Parameters

name

the name of the TLS certificate profile

cipher-list**Syntax**

cipher-list *name*

no cipher-list

Context

config>system>security>tls>client-tls-profile

Description

This command assigns an existing cipher list to be used by the TLS client profile for negotiation in the client Hello message.

Default

no cipher-list

Parameters

name

the name of the cipher list

group-list

Syntax

group-list *name*

no group-list

Context

config>system>security>tls>client-tls-profile

Description

This command assigns an existing TLS 1.3 group list to the TLS client profile.

The **no** form of the command removes the group list from the client profile.

Default

no group-list

Parameters

name

the name of the group list

protocol-version

Syntax

protocol-version *TLS version*

no protocol-version

Context

config>system>security>tls>client-tls-profile

Description

This command configures the TLS version to be negotiated between the client and server.

When configured, the client adds the specified version as a supported version in its Hello message to the server. If **tls-version-all** is specified, the client adds both TLS 1.2 and TLS 1.3 as supported versions in its Hello message.

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

Default

tls-version12

Parameters

TLS version

specifies the TLS version to include in the client Hello message

Values tls-version12 | tls-version13 | tls-version-all

shutdown

Syntax

[no] shutdown

Context

config>system>security>tls>client-tls-profile

Description

This command disables the client TLS profile.

The **no** form of the command enables the client TLS profile.

Default

shutdown

signature-list

Syntax

signature-list *name*

no signature-list

Context

config>system>security>tls>client-tls-profile

Description

This command assigns an existing TLS 1.3 signature list to the TLS client profile.

The **no** form of the command removes the signature list from the client profile.

Default

no signature-list

Parameters

name

the name of the signature list

trust-anchor-profile

Syntax

trust-anchor-profile *name*

no trust-anchor-profile

Context

config>system>security>tls>client-tls-profile

Description

This command assigns an existing trust anchor profile to be used by this TLS client profile to authenticate the server.

The **no** form of the command removes the trust anchor profile from the client profile.

Default

no trust-anchor-profile

Parameters

name

the name of the trust anchor profile

trust-anchor-profile

Syntax

trust-anchor-profile *name* [**create**]

no trust-anchor-profile *name*

Context

config>system>security>tls

Description

This command creates a trust anchor profile or specifies an existing trust anchor profile to be used in the TLS client profile. The trust anchor is used for authentication of the server certificate. Up to 16 trust anchor profiles can be configured, with up to 8 trust anchors in each profile.

Default

n/a

Parameters

name

the name of the trust anchor profile, up to 32 characters

create

keyword is mandatory when creating a new certificate profile

trust-anchor

Syntax

[no] trust-anchor *ca-profile-name*

Context

config>system>security>tls>trust-anchor-profile

Description

This command configures a trust anchor with a CA profile used by the TLS profile. Up to eight trust anchors can be configured under the TLS profile.

Default

n/a

Parameters

ca-profile-name

the name of the TLS trust anchor

3.11.2.2.15 Keychain Authentication Commands

keychain

Syntax

[no] keychain *keychain-name*

Context

```
config>system>security
```

Description

This command enables the context to configure keychain parameters that are used to authenticate protocol communications. A keychain must be configured on the system before it can be applied to a protocol session.

The keychain must include at least one key entry to be valid.

The **no** form of the command removes the keychain and all commands configured in the keychain context. If the keychain is associated with a protocol when the **no keychain** command is entered, the command will be rejected and an error indicating that the keychain is in use will be displayed.

Default

n/a

Parameters

keychain-name

the keychain name, up to 32 characters

direction

Syntax

```
direction
```

Context

```
config>system>security>keychain
```

Description

This command specifies the stream direction on which the keys will be applied.

Default

n/a

bi

Syntax

```
bi
```

Context

```
config>system>security>keychain>direction
```

Description

This command configures keys for both send and receive stream directions.

Default

n/a

entry

Syntax

entry *entry-id* [**key** *authentication-key* | *hash-key* | *hash2-key* [**hash** | **hash2**] **algorithm** *algorithm*]

no entry *entry-id*

Context

config>system>security>keychain>direction>bi

config>system>security>keychain>direction>uni>receive

config>system>security>keychain>direction>uni>send

Description

This command defines a key in the keychain. A keychain must have at least one key entry to be valid.

The **key** and **algorithm** keywords are mandatory when the entry is first created.

The **no** form of the command removes the entry from the keychain. If the key is the active key for sending, this command will cause a new active key to be selected (if one is available). If the key is the only possible send key, the command will be rejected and an error indicating that the configured key is the only available send key will be displayed. If the key is one of the eligible keys for receiving, it will be removed. If the key is the only eligible key for receiving, the command will be rejected and an error indicating that this is the only eligible key will be displayed.

Default

n/a

Parameters

entry-id

the ID of the key entry

Values 0 to 63 | null-key (the **null-key** parameter does not apply and should be ignored)

key

the authentication key ID that is used along with *keychain-name* and **direction** to uniquely identify this particular key entry

authentication-key

the authentication key that will be used by the encryption algorithm, up to 20 characters in any combination of letters and numbers. The key is used to sign and authenticate a protocol packet.

Values the key must be 160 bits for algorithm hmac-sha-1-96 and must be 128 bits for algorithm aes-128-cmac-96. If the key is configured with fewer than this number of bits, it is padded internally with zero bits up to the correct length.

hash-key | hash2-key

the hash key. The key can be any combination of ASCII characters up to 33 for the *hash-key* and up to 96 for the *hash2-key* (encrypted). If spaces are used in the string, the entire string must be enclosed in double quotes.

This parameter is useful when a user must configure the parameter, but for security purposes, the actual unencrypted key value is not provided.

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 an unencrypted, 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, meaning that the **hash2** encrypted variable cannot be copied and pasted. If the **hash** or **hash2** parameter is not used, the key is assumed to be in an unencrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the **hash** or **hash2** parameter specified.

algorithm

the encryption algorithm to be used by the key defined in the keychain

Values aes-128-cmac-96 — specifies an algorithm based on the AES standard for TCP authentication (BGP and LDP)

hmac-sha-1-96 — specifies an algorithm based on SHA-1 for OSPF, RSVP-TE, and TCP authentication

password — specifies a simple password authentication for OSPF and IS-IS

message-digest — specifies the MD5 hash authentication for OSPF

hmac-sha-1 — specifies the SHA-1 algorithm for OSPF, IS-IS, and RSVP-TE authentication

hmac-sha-256 — specifies the SHA-256 algorithm for OSPF, IS-IS, and RSVP-TE authentication

hmac-md5 — specifies the MD5 hash authentication for IS-IS and RSVP-TE

begin-time

Syntax

begin-time *date hours-minutes* [UTC]

begin-time {now | forever}

no begin-time

Context

config>system>security>keychain>direction>bi>entry

config>system>security>keychain>direction>uni>receive>entry

config>system>security>keychain>direction>uni>send>entry

Description

This command specifies the calendar date and time after which the key specified by the keychain authentication key entry is used to sign and authenticate the protocol stream.

Each entry within a bidirectional keychain or for a keychain direction (if unidirectional keys are used) must have a unique begin time.

If no date and time is set, the begin-time is represented by a date and time string with all NULLs and the key is not valid.

Default

forever

Parameters

date hours-minutes

the date (in YYYY/MM/DD format) and time (in hh:mm[:ss] format) at which the key becomes active

UTC

specifies that the date and time should be in UTC time rather than local time

now

specifies that the key should become active immediately (current system time)

forever

specifies that the key is always inactive

option

Syntax

option {basic | isis-enhanced}

no option

Context

config>system>security>keychain>direction>bi>entry

Description

This command enables options to be associated with the authentication key for IS-IS. The command is only applicable for IS-IS and will be ignored by other protocols associated with the keychain.

Default

no option

Parameters

basic

specifies that IS-IS should use RFC 5304 encoding of the authentication information

isis-enhanced

specifies that IS-IS should use RFC 5310 encoding of the authentication information

tolerance

Syntax

tolerance {*seconds* | **forever**}

no tolerance

Context

config>system>security>keychain>direction>bi>entry

config>system>security>keychain>direction>uni>receive>entry

Description

This command configures the amount of time that an eligible receive key overlaps with the currently active key. During that time, packets with either key will be accepted. Tolerance only applies to received packets. Transmitted packets always use the newest key, regardless of the tolerance value.

If a tolerance value is set for a key, the key is returned as part of the key set if the current time is within the key's begin time, plus or minus the tolerance value. For example, if the begin time is 12:00 p.m. and the tolerance is 600 seconds, the new key should be included from 11:55 a.m. and the key to be replaced should be included until 12:05 p.m.

Default

300

Parameters

seconds

specifies the length of time that an eligible receive key overlaps with the active key

Values 0 to 4294967294 seconds

forever

specifies that an eligible receive key will overlap with the active key forever

uni

Syntax

uni

Context

config>system>security>keychain>direction

Description

This command configures keys for send or receive stream directions.

Default

n/a

receive

Syntax

receive

Context

config>system>security>keychain>direction>uni

Description

This command enables the receive context. Entries defined under this context are used to authenticate packets that are received by the router.

Default

n/a

end-time

Syntax

end-time *date hours-minutes* [UTC]

end-time {now | forever}

no end-time

Context

config>system>security>keychain>direction>uni>receive>entry

Description

This command specifies the calendar date and time after which the key specified by the authentication key is no longer eligible to authenticate the protocol stream.

Default

forever

Parameters

date hours minutes

the date (in YYYY/MM/DD format) and time (in hh:mm[:ss] format) after which the key is no longer eligible to sign and authenticate the protocol stream. If no year is specified, the system assumes the current year.

UTC

specifies that the date and time should be in UTC time rather than local time

now

specifies that the key should become inactive immediately (current system time)

forever

specifies that the key is always active

send

Syntax

send

Context

config>system>security>keychain>direction>uni

Description

This command enables the send context. Entries defined under this context are used to sign packets that are being sent by the router to another device.

Default

n/a

tcp-option-number

Syntax

tcp-option-number

Context

config>system>security>keychain

Description

This command enables the context to configure the TCP option number to be placed in the TCP packet header.

receive

Syntax

receive *option-number*

no receive

Context

config>system>security>keychain>tcp-option-number

Description

This command configures the TCP option number that will be accepted in the header of received TCP packets.

Default

254

Parameters

option-number

the TCP option number to be used in the TCP header

Values 253, 254, 253&254

send

Syntax

send *option-number*

no send

Context

config>system>security>keychain>tcp-option-number

Description

This command configures the TCP option number that will be inserted in the header of sent TCP packets.

Default

254

Parameters

option-number

the TCP option number to be used in the TCP header

Values 253, 254

3.11.2.2.16 Login Control Commands

login-control

Syntax

login-control

Context

config>system

Description

This command enables the context to configure the session control for console, FTP, SSH, and Telnet sessions.

exponential-backoff

Syntax

[no] exponential-backoff

Context

config>system>login-control

Description

This command enables the exponential backoff of the login prompt. The **exponential-backoff** command is used to deter dictionary attacks, when a malicious user can gain access to the CLI by using a script to try **admin** with any conceivable password.

The **no** form of the command disables exponential-backoff.

Default

no exponential-backoff

ftp

Syntax

ftp

Context

config>system>login-control

Description

This command enables the context to configure FTP login control parameters.

inbound-max-sessions

Syntax

inbound-max-sessions *value*

no inbound-max-sessions

Context

config>system>login-control>ftp

Description

This command configures the maximum number of concurrent inbound FTP sessions.

This value is the combined total of inbound and outbound sessions.

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

Default

3

Parameters

value

the maximum number of concurrent FTP sessions on the node

Values 0 to 5

idle-timeout

Syntax

idle-timeout {*minutes* | **disable**}

no idle-timeout

Context

```
config>system>login-control
```

Description

This command configures the idle timeout for FTP, console, SSH, and Telnet sessions before the session is terminated by the system.

By default, each idle FTP, console, SSH, or Telnet session times out after 30 minutes of inactivity.

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

Default

30

Parameters

minutes

the idle timeout in minutes

Values 1 to 1440

disable

when the **disable** option is specified, a session will never time out. To re-enable idle timeout, enter the command without the **disable** option.

login-banner

Syntax

```
[no] login-banner
```

Context

```
config>system>login-control
```

Description

This command enables or disables the display of a login banner. The login banner contains the 7705 SAR copyright and build date information for a console login attempt.

The **no** form of the command causes only the configured **pre-login-message** and a generic login prompt to display.

motd

Syntax

```
motd {url url-prefix:source-url | text motd-text-string}
```

```
no motd
```

Context

config>system>login-control

Description

This command creates the message of the day that is displayed after a successful console login. Only one message can be configured.

The **no** form of the command removes the message.

Default

no motd

Parameters

url-prefix: source-url

when the message of the day is present as a text file, provide both the *url-prefix* and the *source-url* of the file containing the message of the day. The URL prefix can be local or remote.

motd-text-string

the text of the message of the day, up to 900 characters long. The *motd-text-string* must be enclosed in double quotes. Multiple text strings are not appended to one another.

Some special characters can be used to format the message text. The "\n" character creates multi-line MOTDs and the "\r" character restarts at the beginning of the new line. For example, entering "\n\r" will start the string at the beginning of the new line, while entering "\n" will start the second line below the last character from the first line.

pre-login-message

Syntax

pre-login-message *login-text-string* [*name*]

no pre-login-message

Context

config>system>login-control

Description

This command creates a message displayed prior to console login attempts on the console via Telnet.

Only one message can be configured. If multiple pre-login messages are configured, the last message entered overwrites the previous entry.

The system name can be added to an existing message without affecting the current pre-login message.

The **no** form of the command removes the message.

Default

no pre-login-message

Parameters

login-text-string

a text string, up to 900 characters. Any printable, 7-bit ASCII characters can be used. If the string contains special characters (such as #, \$, or spaces), the entire string must be enclosed within double quotes.

name

when the keyword **name** is defined, the configured system name is always displayed first in the login message. To remove the name from the login message, the message must be cleared and a new message entered without the name.

ssh

Syntax

ssh

Context

config>system>login-control

Description

This command enables the context to configure SSH login control parameters.

disable-graceful-shutdown

Syntax

[no] **disable-graceful-shutdown**

Context

config>system>login-control>ssh

Description

This command disables graceful shutdown of SSH sessions.

By default, SSH always performs a graceful shutdown on a TCP connection. When graceful shutdown is disabled, SSH sends a FIN message and then immediately terminates the connection.

The **no** form of the command enables graceful shutdown of SSH sessions.

Default

no disable-graceful-shutdown

inbound-max-sessions

Syntax

inbound-max-sessions *value*

no inbound-max-sessions

Context

config>system>login-control>ssh

Description

This command limits the number of inbound SSH sessions (channels). Each 7705 SAR router is limited to a total of 15 inbound SSH sessions (IPv4 and IPv6).

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

Default

5

Parameters

value

the maximum number of concurrent inbound SSH sessions, expressed as an integer

Values 0 to 15

outbound-max-sessions

Syntax

outbound-max-sessions *value*

no outbound-max-sessions

Context

config>system>login-control>ssh

Description

This command limits the number of outbound SSH sessions (channels). Each 7705 SAR router is limited to a total of 15 outbound SSH sessions (IPv4 and IPv6).

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

Default

5

Parameters

value

the maximum number of concurrent outbound SSH sessions, expressed as an integer

Values 0 to 15

telnet

Syntax

telnet

Context

config>system>login-control

Description

This command enables the context to configure the Telnet login control parameters.

enable-graceful-shutdown

Syntax

[no] enable-graceful-shutdown

Context

config>system>login-control>telnet

Description

This command enables graceful shutdown of Telnet sessions.

When graceful shutdown is enabled, Telnet sends a FIN message and waits for an acknowledgment before terminating the TCP connection.

The **no** form of the command disables graceful shutdown of Telnet sessions.

Default

no enable-graceful-shutdown

inbound-max-sessions

Syntax

inbound-max-sessions *value*

no inbound-max-sessions

Context

config>system>login-control>telnet

Description

This command limits the number of inbound Telnet sessions. Each 7705 SAR router is limited to a total of 15 inbound Telnet sessions (IPv4 and IPv6).

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

Default

5

Parameters

value

the maximum number of concurrent inbound Telnet sessions, expressed as an integer

Values 0 to 15

outbound-max-sessions

Syntax

outbound-max-sessions *value*

no outbound-max-sessions

Context

config>system>login-control>telnet

Description

This command limits the number of outbound Telnet sessions. Each 7705 SAR router is limited to a total of 15 outbound Telnet sessions (IPv4 and IPv6).

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

Default

5

Parameters

value

the maximum number of concurrent outbound Telnet sessions, expressed as an integer

Values 0 to 15

tll-security

Syntax

tll-security *min-ttl-value*

no tll-security

Context

```
config>system>login-control>telnet
config>system>login-control>ssh
```

Description

This command configures TTL security parameters for incoming packets. When the feature is enabled, SSH or Telnet connections will accept incoming IP packets from a peer only if the TTL value in the packet is greater than or equal to the minimum TTL value configured for that peer.

The **no** form of the command disables TTL security.

Default

```
no ttl-security
```

Parameters

min-ttl-value

specifies the minimum TTL value for an incoming packet

Values 1 to 255

3.11.2.3 Show Commands

- [Security Show Commands](#)
- [Login Control Show Commands](#)

3.11.2.3.1 Security Show Commands



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

```
access-group
```

Syntax

```
access-group [group-name]
```

Context

```
show>system>security
```

Description

This command displays SNMP access group information.

Parameters

group-name

displays information for the specified access group

Output

The following output is an example of system security access group information, and [Table 14: System Security Access Group Field Descriptions](#) describes the fields.

Output Example

```
A:ALU-4# show system security access-group
=====
Access Groups
=====
group name      security  security  read      write      notify
model           level     view      view      view
-----
snmp-ro         snmpv1   none      no-security          no-security
snmp-ro         snmpv2c  none      no-security          no-security
snmp-rw         snmpv1   none      no-security  no-security  no-security
snmp-rw         snmpv2c  none      no-security  no-security  no-security
snmp-rwa        snmpv1   none      iso           iso          iso
snmp-rwa        snmpv2c  none      iso           iso          iso
snmp-trap       snmpv1   none      no-security          iso
snmp-trap       snmpv2c  none      no-security          iso
=====
A:ALU-7#
```

Table 14: System Security Access Group Field Descriptions

Label	Description
Group name	The access group name
Security model	The security model required to access the views configured in this node
Security level	Specifies the required authentication and privacy levels to access the views configured in this node
Read view	Specifies the variable of the view to read the MIB objects
Write view	Specifies the variable of the view to configure the contents of the agent
Notify view	Specifies the variable of the view to send a trap about MIB objects

authentication

Syntax

authentication [**statistics**]

Context

show>system>security

Description

This command displays system login authentication configuration and statistics.

Parameters

statistics

appends login and accounting statistics to the display

Output

The following output is an example of system security authentication information, and [Table 15: System Security Authentication Field Descriptions](#) describes the fields.

Output Example

```
A:ALU-4# show system security authentication
=====
Authentication                sequence : radius tacplus local
=====
type                            status  timeout  retry
server address                 (secs)  count
-----
radius
 10.10.10.103                   up      5        5
radius
 10.10.0.1                      up      5        5
radius
 10.10.0.2                      up      5        5
tacplus
 10.10.0.9(49)                 down    5        n/a
-----
radius admin status : up
tacplus admin status : down
health check       : enabled (interval 30)
-----
No. of Servers: 4
=====
A:ALU-4#
```

```
A:ALU-7>show>system>security# authentication statistics
=====
Authentication                sequence : radius tacplus local
=====
type                            status  timeout  retry
server address                 (secs)  count
-----
radius
 10.10.10.103                   up      5        5
radius
 10.10.0.1                      up      5        5
radius
 10.10.0.2                      up      5        5
tacplus
 10.10.0.9(49)                 down    5        n/a
-----
radius admin status : up
tacplus admin status : down
health check       : enabled (interval 30)
-----
No. of Servers: 4
=====
```

```

Login Statistics
=====
server address                               conn  accepted  rejected
                                             errors logins   logins
-----
10.10.10.103                                0     0         0
10.10.0.1                                   0     0         0
10.10.0.2                                   0     0         0
10.10.0.9                                   0     0         0
local                                       n/a    1         0
=====
Authorization Statistics (TACACS+)
=====
server address                               conn  sent      rejected
                                             errors pkts     pkts
-----
10.10.0.9                                   0     0         0
=====
Accounting Statistics
=====
server address                               conn  sent      rejected
                                             errors pkts     pkts
-----
10.10.10.103                                0     0         0
10.10.0.1                                   0     0         0
10.10.0.2                                   0     0         0
=====
A:ALU-7#

```

Table 15: System Security Authentication Field Descriptions

Label	Description
Sequence	The sequence in which authentication is processed
Server address	The IP address of the RADIUS server
Status	The current status of the RADIUS server
Type	The authentication type
Timeout (secs)	The number of seconds the router waits for a response from a RADIUS server
Retry count	The number of times the router attempts to contact the RADIUS server for authentication if there are problems communicating with the server
Connection errors	The number of times a user has attempted to log in irrespective of whether the login succeeded or failed
Accepted logins	The number of times the user has successfully logged in
Rejected logins	The number of unsuccessful login attempts
Sent packets	The number of packets sent
Rejected packets	The number of packets rejected

communities

Syntax

communities

Context

show>system>security

Description

This command displays SNMP communities and characteristics.

Output

The following output is an example of community information, and [Table 16: Communities Field Descriptions](#) describes the fields.

Output Example

```
A:ALU-48# show system security communities
=====
Communities
=====
community      access  view          version  group name
-----
cli-readonly   r       iso           v2c     cli-readonly
cli-readwrite  rw      iso           v2c     cli-readwrite
public         r       no-security   v1 v2c  snmp-ro
-----
No. of Communities: 3
=====
A:ALU-48#
```

Table 16: Communities Field Descriptions

Label	Description
Community	The community string name for SNMPv1 and SNMPv2c access only
Access	r: The community string allows read-only access
	rw: The community string allows read-write access
	rwa: The community string allows read-write access
	mgmt: The unique SNMP community string assigned to the management router
View	The view name
Version	The SNMP version

Label	Description
Group Name	The access group name
No of Communities	The total number of configured community strings

cpm-filter

Syntax

cpm-filter ip-filter [**entry** *entry-id*]

cpm-filter ipv6-filter [**entry** *entry-id*]

Context

show>system>security

Description

This command displays information about CPM (CSM) filters.

If an entry number is not specified, all entries are displayed.

Parameters

entry-id

displays information about the specified CPM filter entry

Values 1 to 9999

Default all filter entries

Output

The following output is an example of CPM filter information, and [Table 17: CPM Filter Field Descriptions](#) describes the fields.

Output Example

```
A:ALU-35# show system security cpm-filter ip-filter
=====
CPM IP Filters
=====
Entry-Id  Dropped  Forwarded  Description
-----
2          0         0          CPM filter #2
3         25880     0          CPM filter #3
4         25880     0          CPM filter #4
5         25882     0          CPM filter #5
6         25926     0          CPM filter #6
7         25926     0          CPM filter #7
8         25944     0          CPM filter #8
9         25950     0          CPM filter #9
10        25968     0          CPM filter #10
11        25984     0          CPM filter #11
```

```

12      26000      0      CPM filter #12
13      26018      0      CPM filter #13
14      26034      0      CPM filter #14
15      26050      0      CPM filter #15
=====

```

```
A:ALU-35#
```

```
A:ALU-35# show system security cpm-filter ip-filter entry 2
```

```
=====
CPM IP Filter Entry
=====
```

```
Entry Id      : 2
Description   : CPM filter #2
-----
```

```
Filter Entry Match Criteria :
-----
```

```
Log Id       : 101
Src. IP      : 10.4.101.2/32      Src. Port    : 0
Dest. IP     : 10.4.101.1/32     Dest. Port   : 0
Protocol     : tcp                Dscp        : ef
ICMP Type    : Undefined         ICMP Code    : Undefined
Fragment     : True              Option-present : Off
IP-Option    : n/a               Multiple Option : True
TCP-syn      : Off                TCP-ack      : True
Match action  : Drop
Dropped pkts : 0                  Forwarded pkts : 0
=====
```

```
A:ALU-35#
```

```
A:ALU-35# show system security cpm-filter ipv6-filter entry 101
```

```
=====
CPM IPv6 Filter Entry
=====
```

```
Entry Id : 1
Description : CPM-Filter 11::101:2 #101
-----
```

```
Filter Entry Match Criteria :
-----
```

```
Log Id : n/a
Src. IP : 11::101:2      Src. Port : 0
Dest. IP : 11::101:1     Dest. Port : 0
next-header : none      Dscp : Undefined
ICMP Type : Undefined   ICMP Code : Undefined
TCP-syn : Off           TCP-ack : Off
Match action : Drop
Dropped pkts : 25880     Forwarded pkts : 0
=====
```

Table 17: CPM Filter Field Descriptions

Label	Description
CPM IP (or IPv6) Filter Entry	
Entry-id	Displays information about the specified CPM filter entry
Dropped	The number of dropped events
Forwarded	The number of forwarded events

Label	Description
Description	The CPM filter description
Filter Entry Match Criteria	
Log Id	The log ID where matched packets will be logged
Src. IP	The source IP address
Dest. IP	The destination IP address
Protocol	The Protocol field in the IP header (IPv4 filters only)
next-header	The next header ID. Undefined indicates no next header is specified. (IPv6 filters only)
ICMP Type	The ICMP type field in the ICMP header
Fragment	The 3-bit fragment flags or 13-bit fragment offset field (IPv4 filters only)
IP-Option	The IP option setting (IPv4 filters only)
TCP-syn	The SYN flag in the TCP header
Match action	When the criteria matches, displays drop or forward packet
Dropped pkts	The number of matched dropped packets
Src. Port	The source port number (range)
Dest. Port	The destination port number (range)
Dscp	The DSCP field in the IP header
ICMP Code	The ICMP code field in the ICMP header
Option-present	The option present setting (IPv4 filters only)
Multiple Option	The multiple option setting (IPv4 filters only)
TCP-ack	The ACK flag in the TCP header
Match action	When the criteria matches, displays drop or forward packet
Next Hop	If match action is forward, indicates destination of the matched packet
Forwarded pkts	Indicates number of matched forwarded packets

keychain

Syntax

keychain [*keychain*] [**detail**]

Context

show>system>security

Description

This command displays information about keychains.

If a keychain name is not specified, all keychains are displayed.

Parameters

keychain

displays information about the specified keychain

detail

displays detailed keychain information

Output

The following output is an example of keychain information, and [Table 18: Keychain Field Descriptions](#) describes the fields.

Output Example

```

=====
Key chain:ospf-md5
=====
Description           : MD5 keychain for OSPF interfaces
TCP-Option number send : 254                      Admin state   : Up
TCP-Option number receive : 254                Oper state    : Up
Used by                : None
Expired                : No
=====
*A:ALU-35#

```

```

A:ALU-35# show system security keychain ospf-md5 detail
=====
Key entries for key chain: ospf-md5
=====
Id           : 0           Direction      : send-receive
Algorithm    : message-digest Option         : none
Admin State  : Up         RX Valid      : No
TX Active    : No        Tolerance     : 300
Begin Time   : 2016/06/01 01:01:00 Begin Time (UTC) : 2016/06/01 01:01:00
End Time     : 2016/09/01 01:01:00 End Time (UTC)   : 2016/09/01 01:01:00
=====
Id           : 1           Direction      : send-receive
Algorithm    : message-digest Option         : none
Admin State  : Up         RX Valid      : Yes
TX Active    : Yes       Tolerance     : 600
Begin Time   : 2016/09/01 01:01:00 Begin Time (UTC) : 2016/09/01 01:01:00
End Time     : Forever    End Time (UTC)   : Forever
=====

```

*A: Sar18 Dut-B#

Table 18: Keychain Field Descriptions

Label	Description
Key chain: <i>name</i>	
Description	The text string description for the keychain
TCP-Option number send	The TCP option number to be inserted in the header of sent TCP packets
Admin state	The administrative state of the keychain: up or down
TCP-Option number receive	The TCP option number that will be accepted in the header of received TCP packets
Oper state	The operational state of the keychain: up or down
Used by	The protocols associated with this keychain
Expired	Indicates whether the keychain has expired
Key entries for key chain: <i>name</i>	
Id	The ID of the key entry
Direction	The stream direction on which keys will be applied for this entry: send, receive, or send-receive
Algorithm	The encryption algorithm to be used by this key entry
Option	Indicates the configured IS-IS encoding standard (indicates "none" if the associated protocol is not IS-IS)
Admin State	The administrative state of the key entry: up or down
RX Valid	Indicates if the receive key is valid
TX Active	Indicates if the transmit (sent) key is active
Tolerance	The tolerance time configured for support of both currently active and new keys
Begin Time	The time at which the new key is used to sign and/or authenticate protocol packets
Begin Time (UTC)	The begin time in UTC time
End Time	The time at which the key is no longer eligible to authenticate protocol packets
End Time (UTC)	The end time in UTC time

management-access-filter

Syntax

```
management-access-filter ip-filter [entry entry-id]
```

```
management-access-filter ipv6-filter [entry entry-id]
```

Context

```
show>system>security
```

Description

This command displays management access control filter information.

If no specific entry number is specified, all entries are displayed.

Parameters

entry-id

displays information about the specified management access filter entry

Values 1 to 9999

Default All filter entries

Output

The following output is an example of management access filter information, and [Table 19: Management Access Filter Field Descriptions](#) describes the fields.

Output Example

```
A:ALU-7# show system security management-access-filter ip-filter entry 1
=====
IPv4 Management Access Filters
=====

filter type:      : ip
Def. Action      : permit
Admin Status     : enabled (no shutdown)
-----
Entry            : 1
Description      : test description
Src IP           : 10.10.10.104
Src interface    : undefined
Dest port        : 10.10.10.103
Protocol         : 6
Router           : undefined
Action           : permit
Log              : disabled
Matches          : 0
=====
A:ALU-7#
```

```
A:ALU-7# show system security management-access-filter ipv6-filter entry 2
```

```

=====
IPv6 Management Access Filter
=====
filter type   : ipv6
Def. Action   : permit
Admin Status  : enabled (no shutdown)
-----
Entry        : 1
Src IP       : 2001::1/128
Flow label   : undefined
Src interface : undefined
Dest port    : undefined
Next-header  : undefined
Router       : undefined
Action       : permit
Log          : enabled
Matches      : 0
=====
A:ALU-7#

```

Table 19: Management Access Filter Field Descriptions

Label	Description
IPv4 (or IPv6) Management Access Filters	
filter type	The management access filter type
Def. Action	Permit: Specifies that packets not matching the configured selection criteria in any of the filter entries are permitted
	Deny: Specifies that packets not matching the configured selection criteria in any of the filter entries are denied and that a ICMP host unreachable message will be issued
	Deny-host-unreachable: Specifies that packets not matching the configured selection criteria in the filter entries are denied
Admin Status	Up: indicates that the management access filter is administratively enabled
	Down: indicates that the management access filter is administratively disabled
Entry	The entry ID in a policy or filter table
Description	A text string describing the filter
Src IP	The source IP address used for management access filter match criteria
Flow label	The flow label to match (IPv6 filters only)
Src interface	The interface name for the next hop to which the packet should be forwarded if it hits this filter entry
Dest port	The destination port

Label	Description
Next-header	The next header ID to match. Undefined indicates no next header is specified. (IPv6 filters only)
Protocol	The IP protocol to match (IPv4 filters only)
Action	The action to take for packets that match this filter entry
Matches	The number of times a management packet has matched this filter entry

password-options

Syntax

password-options

Context

show>system>security

Description

This command displays configured password options.

Output

The following output is an example of password options information, and [Table 20: Password Options Field Descriptions](#) describes the fields.

Output Example

```
A:7705:Dut-A# show system security password-options
=====
Password Options
=====
Password aging in days                : none
Time required between password changes : 0d 00:10:00
Number of invalid attempts permitted per login : 3
Time in minutes per login attempt      : 5
Lockout period (when threshold breached) : 10
Authentication order                  : radius tacplus local
User password history length           : disabled
Password hashing                       : bcrypt
Accepted password length               : 6..56 characters
Credits for each character class        : none
Number of required characters per class : none
Minimum number of required character classes : 0
Required distance with previous password : 5
Allow consecutively repeating a character : always
Allow passwords containing username    : no
Palindrome allowed                     : no
=====
A:7705:Dut-A#
```

Table 20: Password Options Field Descriptions

Label	Description
Password aging in days	The number of days a user password is valid before the user must change their password
Time required between password changes	The time interval required before a password can be changed
Number of invalid attempts permitted per login	The number of unsuccessful login attempts allowed for the specified time
Time in minutes per login attempt	The period of time, in minutes, that a specified number of unsuccessful attempts can be made before the user is locked out
Lockout period (when threshold breached)	The lockout period, in minutes, during which the user is not allowed to log in
Authentication order	The sequence in which password authentication is attempted among RADIUS, TACACS+, and local passwords
User password history length	The number of recent passwords stored in the history file to compare against new passwords. If a new password matches any of the passwords in the history file, it is rejected
Password hashing	The password hashing type, either bcrypt, sha2-pbkdf2, or sha3-pbkdf2
Accepted password length	The minimum and maximum password length
Credits for each character class	The maximum number of credits given for each character class
Number of required characters per class	The minimum number of characters for each character classes that is required in a password: uppercase, lowercase, numeric, or special character
Minimum number of required character classes	The number of different character classes that is required in a password: uppercase, lowercase, numeric, or special character
Required distance with previous password	The minimum number of characters required to be different in the new password from the old password.
Allow consecutively repeating a character	The number of times the same character is allowed to be repeated consecutively in a new command

Label	Description
Allow passwords containing username	Displays whether the username is allowed as part of the password
Palindrome allowed	Displays whether palindromes are allowed as part of the password

profile

Syntax

```
profile user-profile-name
```

Context

```
show>system>security
```

Description

This command displays user profile information.

If the *user-profile-name* is not specified, then information for all profiles is displayed.

Parameters

user-profile-name

displays information for the specified user profile

Output

The following output is an example of user profile information, and [Table 21: User Profile Field Descriptions](#) describes the fields.

Output Example

```
A:ALU-7# show system security profile administrative
=====
User Profile
=====
User Profile : administrative
Def. Action  : permit-all
LI           : no
-----
Entry       : 10
Description :
Match Command: configure system security
Action      : permit
-----
Entry       : 20
Description :
Match Command: show system security
Action      : permit
-----
No. of profiles: 1
=====
```

A:ALU-7#

Table 21: User Profile Field Descriptions

Label	Description
User Profile	The profile name used to deny or permit user console access to a hierarchical branch or to specific commands
Def. action	Permit all: Permits access to all commands
	Deny: Denies access to all commands
	None: No action is taken
Entry	The entry ID in a policy or filter table
Description	Displays the text string describing the entry
Match Command	Displays the command or subtree commands in subordinate command levels
Action	Permit all: Commands matching the entry command match criteria are permitted
	Deny: Commands not matching the entry command match criteria are not permitted
No. of profiles	The total number of profiles listed

source-address

Syntax

source-address

Context

show>system>security

Description

This command displays the source address configured for applications.

Output

The following output is an example of source address information, and [Table 22: Source Address Field Descriptions](#) describes the fields.

Output Example

```
A:ALU-1# show system security source-address
=====
Source-Address applications
```

```

=====
Application      IP address/Interface Name      Oper status
-----
telnet           10.20.1.7                       Up
radius           loopback1                         Up
=====
A:ALU-1#

```

Table 22: Source Address Field Descriptions

Label	Description
Application	The source-address application
IP address: Interface Name	The source address IP address or interface name
Oper status	Up: The source address is operationally up
	Down: The source address is operationally down

ssh

Syntax

```
ssh
```

Context

```
show>system>security
```

Description

This command displays all the SSH sessions as well as the SSH status and fingerprint. The type of SSH application (CLI, SCP, or SFTP) is indicated for each SSH connection.

Output

The following output is an example of SSH information for an SSH server, and [Table 23: SSH Field Descriptions](#) describes the fields.

Output Example

```

*A:7705:Dut-C# show system security ssh
=====
SSH Server
=====
Administrative State      : Enabled
Operational State        : Up
Preserve Key              : Disabled
Key-re-exchange          : 60 minutes / 1024 MB

SSH Protocol Version 2   : Enabled
DSA Host Key Fingerprint : MD5:0a:89:df:09:d8:8c:c4:0d:6c:dc:42:28:79:f9:a1:cf
                          SHA256:VY42oECtkK3Qy+H+FMKShDzjqGKFlo/cxCdfemVNfwE

```

```

RSA Host Key Fingerprint : MD5:8f:cf:0e:5e:48:1b:5d:ce:1a:fb:f6:15:57:1b:82:ac
                          SHA256:DEf9V0KmUz0rxRxhxoCmWs2E+Ny9ryVCADdornzCk/I
-----
Connection                               ConnectionID
Username                                 ConnectionStatus
RouterInstance                           Key-re-exchange
Version  KEX
      Cipher
      MAC
      SessionID          ChannelID  ServerName  ChannelStatus
-----
192.168.192.29                            14
admin                                     connected
management                                60 minutes / 1024 MB
SSHv2  diffie-hellman-group-exchange-sha1
      aes128-ctr
      hmac-sha1
      16                                0          cli          connected
      17                                1          cli          connected
      18                                2          cli          connected
-----
192.168.192.29                            17
admin                                     connected
management                                60 minutes / 1024 MB
SSHv2  diffie-hellman-group-exchange-sha1
      aes128-ctr
      hmac-sha1
      21                                0          sftp         connected
-----
Number of SSH connections : 2
Number of SSH sessions   : 4
=====
*A:7705

```

Table 23: SSH Field Descriptions

Label	Description
Administrative State	The administrative state of the SSH server: enabled or disabled
Operational State	The operational state of the SSH server: up or down
Preserve Key	The preserve-key configuration: enabled or disabled
Key-re-exchange	The maximum number of minutes elapsed or maximum number of megabytes transmitted before a key re-exchange is initiated
SSH Protocol Version 2	The SSHv2 configuration: enabled or disabled
DSA Host Key Fingerprint RSA Host Key Fingerprint	The key fingerprint is the digital signal algorithm (DSA) or Rivest, Shamir, and Adleman (RSA) host server's identity. Clients trying to connect to the server verify the server fingerprint. If the server fingerprint is not known, the client will get a warning message that the server may be spoofed and they will not be allowed to log in until

Label	Description
	the administrator fixes the issue. The MD5 and SHA 256 versions of the keys are supported.
Connection	The IP address of the connected routers (remote client)
ConnectionID	The SSH connection identifier
Username	The name of the user
ConnectionStatus	The status of the SSH connection: connected or disconnected
RouterInstance	The router instance used to establish the connection, either management or base
Key-re-exchange	The number of minutes or the number of megabytes transmitted after which a key re-exchange should occur for this connection
Version	SSHv2
KEX	The KEX algorithm used by the SSH session
Cipher	The cipher used by the SSH session
MAC	The MAC algorithm used by the SSH session
SessionID	The identifier for the session
ChannelID	The identifier for the channel
ServerName	The name of the server. For an SSH session, the value is cli. For an SFTP session, the value is sftp.
ChannelStatus	The status of the channel: connected or disconnected
Number of SSH connections	The total number of SSH connections
Number of SSH sessions	The total number of SSH sessions

cert-profile

Syntax

cert-profile *name* **association**

cert-profile [*name*]

cert-profile *name* **entry** 1..8

Context

show>system>security>tls

Description

This command displays information about TLS certificate profiles.

Parameters

name

the name of a certificate profile for which to display information

association

displays TLS client profiles that are associated with the certificate profile

1..8

Values 1 to 8

Output

The following outputs are examples of client certificate profile information.

Output Example

```
*A:7705# show system security tls cert-profile
```

```
=====
Certificate Profile
=====
```

```
Certificate Profile Name      AdminState  OperState  OperFlags
-----
```

```
certProfile1                 up          up
=====
```

```
A:7705# show system security tls cert-profile "certProfile1"
```

```
=====
Certificate Profile Entry "certProfile1"
=====
```

```
Id  Certificate File Name      Key File Name      Status Flags
-----
```

```
1   sarcert1                  sarkey1
=====
```

```
*A:7705# show system security tls cert-profile "certProfile1" entry 1
```

```
=====
TLS Certificate Profile: "certProfile1" Entry: 1 Detail
=====
```

```
Certificate File : sarcert1
Key File         : sarkey1
Status Flags     : (Not Specified)
=====
```

```
*A:7705# show system security tls cert-profile "certProfile1" association
```

```
=====
TLS Client Profiles using cert-profile "certProfile1"
=====
```

```
TLS Client Profile Name
-----
```

```

tlsClientProfile
-----
Number of TLS Client Profile entries: 1
=====

```

client-tls-profile

Syntax

```

client-tls-profile [client-tls-profile]
client-tls-profile client-tls-profile association
client-tls-profile client-tls-profile [connections]

```

Context

```
show>system>security>tls
```

Description

This command displays TLS client profile information.

Parameters

client-tls-profile
the name of the client TLS profile

association
displays TLS certificate profiles that are associated with the TLS client profile

connections
displays active TLS connections using the TLS client profile

Output

The following outputs are examples of TLS client profile information.

Output Example

```

*A:7705# show system security tls client-tls-profile "tlsClientProfile"
=====
Client Profile Entry "tlsClientProfile"
=====
Cipher List Name           : tlsClientCipherList
Certificate Profile Name   : certProfile1
Trust Anchor Profile Name  : trustAnchorProfile1
=====

A:7705:Dut-A# show system security tls client-tls-profile "tlsClientProfile" connections
=====
Active TLS connections using client-tls-profile "tlsClientProfile"
=====
      Cipher                Client Signature      Server Signature
      Matched Trust Anchor   Server IP
-----

```

```

Pcep
1   AES_128_CCM_8_SHA256      RSASSA-PSS-SHA256      RSASSA-PSS-SHA256
   rootCA                    10.20.1.4:4189
-----
Number of TLS connections: 1
=====

```

trust-anchor-profile

Syntax

trust-anchor-profile *trust-anchor-profile* **association**

trust-anchor-profile [*trust-anchor-profile*]

Context

show>system>security>tls

Description

This command displays information about TLS client profiles that are using the specified TLS trust anchor profile.

Parameters

trust-anchor-profile

specifies the trust anchor profile, up to 32 characters

association

displays TLS profiles that are associated with the trust anchor profile

Output

The following outputs are examples of trust anchor profile information.

Output Example

```

*A:7705# show system security tls trust-anchor-profile
=====
Trust Anchor Profile Information
=====
Name                               CA Profiles Down
-----
trustAnchorProfile1                0
=====

```

```

*A:7705# show system security tls trust-anchor-profile "trustAnchorProfile1"
=====
CA-profile List for Trust Anchor "trustAnchorProfile1"
=====
CA Profile Name                     AdminState   OperState
-----
rootCA                              up           up
=====

```

```

*A:7705:Dut-A# show system security tls trust-anchor-profile "trustAnchorProfile1" association

```

```

=====
TLS Client Profiles using trust-anchor-profile trustAnchorProfile1
=====
TLS Client Profile Name
-----
tlsClientProfile
-----
Number of TLS Client Profile entries: 1
=====

```

USER

Syntax

user [*user-id*] [**detail**]

user [*user-id*] **lockout**

Context

show>system>security

Description

This command displays user registration and security information. You can clear lockouts for users with the [lockout](#) command.

If no command line options are specified, summary information for all users displays.

Parameters

user-id

displays information for the specified user

Default all users

detail

displays detailed user information to the summary output

lockout

displays information about users that are currently locked out for too many failed login attempts

Output

The following output is an example of user information, and [Table 24: User Field Descriptions](#) describes the fields.

Output Example

```

*A:7705:Dut-C# show system security user detail
=====
Users
=====
User ID      New User Permissions      Password  Login  Failed  Local
            Pwd console ftp li snmp netconf Expires Attempts Logins  Conf
-----

```

```

admin      n  y      n  n  n  n      never      8      0      y
user3     n  y      n  n  n  n      never     21     9      y
-----
Number of users : 2
=====
User Configuration Detail
=====
user id      : admin
-----
console parameters
-----
new pw required : no                cannot change pw : no
home directory :
restricted to home : no
save when restrict*: no
login exec file :
profile       : administrative
locked-out    : no
-----
snmp parameters
-----
auth protocol  : hmac-sha2-512
auth key       : ffb8bb4392ccab627d903db396cd928fdde5ac8cdb78e7b6ecb39bde2c
                3ec67c8380cd0d91dfe6f30c041d9819a34e297994c3b759e68f2db075
                4bc408e3a001
privacy protocol : cfb128-aes-256
privacy key    : ffb8bb4392ccab627d903db396cd928fdde5ac8cdb78e7b6ecb39bde2c
                3ec67c
group         : moje
=====
*A:7705:Dut-C#

```

```

ALU-7# show system security user lockout
=====
Currently Failed Login Attempts
=====
User ID      Remaining Login attempts      Remaining Lockout Time (min:sec)
-----
jason123     N/A                            9:56
-----
Number of users : 1
=====

```

Table 24: User Field Descriptions

Label	Description
Users	
User ID	The name of a system user
New Pwd	Indicates whether the user must change their password at the next login: y or n
User Permissions	console Indicates whether the user is authorized for console access: y or n
	ftp:

Label	Description
	Indicates whether the user is authorized for FTP access: y or n
	li Indicates whether the user is authorized for lawful intercept (LI) access: y or n
	snmp: Indicates whether the user is authorized for SNMP access: y or n
	netconf: Indicates whether the user is authorized for NETCONF access (not supported on the 7705 SAR and always set to n)
Password Expires	The number of days the user has left before they must change their login password
Login Attempts	The number of times the user has attempted to log in regardless of whether the login succeeded or failed
Failed Logins	The number of unsuccessful login attempts
Local Conf	Indicates whether password authentication is based on the local password database: y or n
Number of users	The total number of listed users
User Configuration Detail	
console parameters	
new pwd required	Indicates whether the user must change their password at the next login: yes or no
cannot change pw	Indicates whether the user is prevented from changing their password: yes or no
home directory	The local home directory for the user for both console and FTP access
restricted to home	Indicates whether the user is restricted from navigating to a directory higher in the directory tree on the home directory device: yes or no
save when restricted	Indicates whether configuration save operations are allowed when the user is restricted to home: yes or no
login exec file	The user's login exec file, which executes whenever the user successfully logs in to a console session
profile	The security profiles associated with the user

Label	Description
locked-out	Indicates whether the user is locked out, and if they are locked out, how much time remains before the user can attempt to log in to the node again
snmp parameters	
auth protocol	The SNMPv3 authentication protocol
auth key	The SNMPv3 authentication key
privacy protocol	The SNMPv3 privacy protocol
privacy key	The SNMPv3 privacy key
group	The group to which the protocols apply
Currently Failed Login Attempts	
Remaining Login attempts	The number of login attempts remaining before the user is locked out
Remaining Lockout Time (min:sec)	The time remaining before the lockout time expires and the user can attempt another login

With the support of PKI on the 7705 SAR as an SSH server, the authentication process can be done via PKI or password. SSH clients usually authenticate via PKI and password if PKI is configured on the client. In this case, PKI takes precedence over password authentication in most clients.

All client authentications are logged and displayed in the **show>system>security>user detail** output.

[Table 25: Pass/Fail Login Attempts](#) shows the rules where pass and fail attempts are logged.

Table 25: Pass/Fail Login Attempts

Authentication Order	Client (for example, PuTTY)		Server (for example, 7705 SAR)		CLI Show System Security Attempts	
	Private Key Programmed	Public Key Configured	Public Key Configured	Password Configured	Login Attempts	Failed Logins
1. Public key	Yes	Yes	Yes	N/A	Increment	—
2. Password	Yes	Yes (if no match between client and server, go to password)	Yes	Yes	Increment	—
	Yes	No	No	Yes	Increment	—
	No	N/A	N/A	Yes	Increment	—
	No	N/A	N/A	No	—	Increment

Authentication Order	Client (for example, PuTTY)	Server (for example, 7705 SAR)		CLI Show System Security Attempts	
	Private Key Programmed	Public Key Configured	Password Configured	Login Attempts	Failed Logins
1. Public key (only)	Yes	Yes	N/A	Increment	—
	Yes	Yes (if no match between client and server, go to password)	N/A	—	Increment
	Yes	No	N/A	—	Increment
	No	N/A	N/A	—	Increment

view

Syntax

view [*view-name*] [**detail**] [**capabilities**]

Context

show>system>security

Description

This command displays one or all views and permissions in the MIB-OID tree.

Parameters

view-name

specifies the name of the view to display. If no view name is specified, the complete list of views displays.

detail

displays detailed view information

Output

The following output is an example of view information, and [Table 26: View Field Descriptions](#) describes the fields.

Output Example

```
A:ALU-48# show system security view
=====
Views
=====
view name      oid tree      mask          permission
-----
iso            1             11111111     included
read1         1.1.1.1      11111111     included
```

```

writel          2.2.2.2          11111111      included
testview       1                11111111      included
testview       1.3.6.1.2        11111111      excluded
mgmt-view      1.3.6.1.2.1.2    included
mgmt-view      1.3.6.1.2.1.4    included
mgmt-view      1.3.6.1.2.1.5    included
mgmt-view      1.3.6.1.2.1.6    included
mgmt-view      1.3.6.1.2.1.31   included
mgmt-view      1.3.6.1.2.1.77   included
mgmt-view      1.3.6.1.4.1.6527.3.1.2.3.7 included
mgmt-view      1.3.6.1.4.1.6527.3.1.2.3.11 included
vprn-view      1.3.6.1.2.1.2    included
vprn-view      1.3.6.1.2.1.4    included
vprn-view      1.3.6.1.2.1.5    included
vprn-view      1.3.6.1.2.1.6    included
vprn-view      1.3.6.1.2.1.7    included
vprn-view      1.3.6.1.2.1.23   included
vprn-view      1.3.6.1.2.1.31   included
vprn-view      1.3.6.1.2.1.77   included
vprn-view      1.3.6.1.4.1.6527.3.1.2.3.7 included
vprn-view      1.3.6.1.4.1.6527.3.1.2.3.11 included
vprn-view      1.3.6.1.4.1.6527.3.1.2.20.1 included
no-security    1                included
no-security    1.3.6.1.6.3       excluded
no-security    1.3.6.1.6.3.10.2.1 included
no-security    1.3.6.1.6.3.11.2.1 included
no-security    1.3.6.1.6.3.15.1.1 included
on-security    2                00000000      included
-----
No. of Views: 30
=====
A:ALU-48#

```

Table 26: View Field Descriptions

Label	Description
view name	The name of the view. Views control the accessibility of a MIB object within the configured MIB view and subtree
oid tree	The object identifier of the ASN.1 subtree
mask	The bit mask that defines a family of view subtrees
permission	Indicates whether each view is included or excluded
No. of Views	The total number of views

3.11.2.3.2 Login Control Show Commands



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

users

Syntax

users

Context

show

Description

This command displays console user login and connection information.

Output

The following output is an example of user login information, and [Table 27: Users Field Descriptions](#) describes the fields.

Output Example

```
*A:7705:Dut-C# show users
=====
Username                               Type
  From
  Router instance
  Connection ID                         Login time
  Session ID                           SSH Channel ID   Idle time
=====
                                           Console
  --
  --
  6                                     --
    6                                     0d 07:11:00  --
-----
admin                                  Telnet
  192.168.192.29
  management
  16                                     28SEP2023 21:03:11
    #20                                 --          0d 00:00:00  --
-----
admin                                  Telnet
  192.168.192.30
  management
  12                                     28SEP2023 16:58:33
    14                                 --          0d 04:40:43  --
-----
admin                                  SSHv2
  192.168.192.29
  management
  14                                     28SEP2023 20:29:54
    16                                 0          0d 00:00:25  --
    17                                 1          0d 00:17:59  --
    18                                 2          0d 01:17:08  --
-----
admin                                  SSHv2
  192.168.192.29
  management
  17                                     --
    21                                 0          0d 00:11:18  --
-----
admin                                  FTP
```

```

192.168.192.29
management
18
22          --          28SEP2023 21:46:59
                                0d 00:00:04  --
-----
Number of users: 5
Number of sessions: 7
'#' indicates the current active session
=====
*A:7705:Dut-C#

```

Table 27: Users Field Descriptions

Label	Description
Username	The name of the user
Type	The type of connection: console, Telnet, FTP, SFTP, SSH, or MCT The console session is always displayed but does not count against the number of sessions unless a user is logged in at the console. If no one is logged in at the console, the Username field is blank.
From	The originating IP address
Router instance	The routing instance used to establish the connection, either management or base
Connection ID	The identifier for the connection
Login time	The time the user logged in
Session ID	The identifier for the session
SSH Channel ID	The SSH channel identifier
Idle time	The amount of idle time for a specific login
Number of users	The total number of users logged in
Number of sessions	The total number of sessions across all FTP, SFTP, SSH, Telnet, and MCT connections

3.11.2.4 Clear Commands

lockout

Syntax

lockout all

lockout user *user-name*

Context

admin>clear

Description

This command clears a security lockout for a specific user, or for all users, after they have been locked out for failing too many login attempts.

Parameters

all

clears lockouts for all users

name

specifies a username

password-history

Syntax

password-history all

password-history user *user-name*

Context

admin>clear

Description

This command clears old passwords for a specific user or for all users.

Parameters

all

clears password history for all users

name

specifies a username

statistics

Syntax

statistics [interface *ip-int-name* | *ip-address*]

Context

clear>router>authentication

Description

This command clears authentication statistics.

Parameters

ip-int-name

clears the authentication statistics for the specified interface name. If the string contains special characters (such as #, \$, or spaces), the entire string must be enclosed within double quotes.

ip-address

clears the authentication statistics for the specified IP address

3.11.2.5 Monitor Commands

cpm-filter

Syntax

cpm-filter

Context

monitor

Description

This command displays monitor command output for CPM filters.

management-access-filter

Syntax

management-access-filter

Context

monitor

Description

This command enables the context to monitor management access filters.

ip

Syntax

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

Context

monitor>cpm-filter

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 120 (CPM filter)
1 to 9999 (management access filter)

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>cpm-filter

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 120 (CPM filter)
1 to 9999 (management access filter)

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

mac

Syntax

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

Context

monitor>cpm-filter

monitor>management-access-filter

Description

This command enables MAC filter monitoring. The statistical information for the specified MAC 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 MAC 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 120 (CPM filter)
1 to 9999 (management access filter)

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

3.11.2.6 Debug Commands

radius

Syntax

radius [detail] [hex]

no radius

Context

debug

Description

This command enables debugging for RADIUS connections.

The **no** form of the command disables the debugging.

Parameters**detail**

displays detailed output

hex

displays the packet dump in hexadecimal format

4 SNMP

This chapter provides information to configure SNMP.

Topics in this chapter include:

- [SNMP Overview](#)
- [SNMP Versions](#)
- [Configuration Notes](#)
- [Configuring SNMP with CLI](#)
- [SNMP Command Reference](#)

4.1 SNMP Overview

4.1.1 SNMP Architecture

The Service Assurance Manager (SAM) consists of two elements: managers and agents. The manager is the entity through which network management tasks are facilitated. An agent is a software module integrated into the operating system of the managed device that communicates with the network manager. Managed devices, such as bridges, hubs, routers, and network servers can contain managed objects. A managed object can be a configuration attribute, performance statistic, or control action that is directly related to the operation of a device.

Managed devices collect and store management information and use Simple Network Management Protocol (SNMP). SNMP is an application-layer protocol that provides a message format to facilitate communication between SNMP managers and agents. SNMP provides a standard framework to monitor and manage devices in a network from a central location.

An SNMP manager controls and monitors the activities of network hosts that use SNMP. An SNMP manager can obtain (get) a value from an SNMP agent or store (set) a value in the agent. The manager uses definitions in the management information base (MIB) to perform operations on the managed device such as retrieving values from variables or blocks of data, replying to requests, and processing traps.

Between the SNMP agent and the SNMP manager, the following actions can occur.

- The manager can get information from the agent.
- The manager can set the value of a MIB object that is controlled by an agent.
- The agent can send traps to notify the manager of significant events that occur on the managed device (for example, the 7705 SAR router).

SNMP is supported on network hosts using the IPv4 and IPv6 protocols.

4.1.2 Management Information Base

A MIB is a formal specifications document with definitions of management information used to remotely monitor, configure, and control a managed device or network system. The agent's management information consists of a set of network objects that can be managed with SNMP. Object identifiers are unique object names that are organized in a hierarchical tree structure. The main branches are defined by the Internet Engineering Task Force (IETF). When requested, the Internet Assigned Numbers Authority (IANA) assigns a unique branch for use by a private organization or company. The branch assigned to the 7705 SAR is 1.3.6.1.4.1.6527.

The SNMP agent provides management information to support a collection of IETF specified MIBs and a number of MIBs defined to manage device parameters and network data unique to the 7705 SAR.

4.1.3 SNMP Versions

The agent supports multiple versions of the SNMP protocol.

- SNMP Version 1 (SNMPv1) is the original Internet-standard network management framework.

SNMPv1 provides access control for communities and uses a community string match for authentication.

- SNMPv2c uses a community string match for authentication.
- SNMP Version 3 (SNMPv3) provides access control for users. In SNMPv3, User-based Security Model (USM) defines the user authentication and encryption features. The View Access Control MIB (VACM) defines the user access control features. The SNMP-COMMUNITY-MIB is used to associate SNMPv1/SNMPv2c community strings with SNMPv3 VACM access control.

SNMPv3 uses a username match for authentication.

4.1.4 Management Information Access Control

By default, the 7705 SAR implementation of SNMP uses SNMPv3. SNMPv3 incorporates security model and security level features. A security model is the authentication type for the group and the security level is the permitted level of security within a security model. The combination of the security level and security model determines which security mechanism handles an SNMP packet.

To implement SNMPv1 and SNMPv2c configurations, several access groups are predefined. These access groups are standard read-only, read-write, and read-write-all access groups and views that can simply be assigned community strings. In order to implement SNMP with security features, security models, security levels, and USM communities must be explicitly configured. Optionally, additional views that specify more specific OIDs (MIB objects in the subtree) can be configured.

Access to the management information in an SNMPv1/SNMPv2c agent is controlled by the inclusion of a community name string in the SNMP request. The community defines the subset of the agent's managed objects that can be accessed by the requester. It also defines what type of access is allowed: read-only or read-write.

The use of community strings provide minimal security and context checking for both agents and managers that receive requests and initiate trap operations. A community string is a text string that acts like a password to permit access to the agent on the 7705 SAR router.

The 7705 SAR implementation of SNMP has defined three levels of community-named access:

- read-only permission — grants only read access to objects in the MIB, except security objects
- read-write permission — grants read and write access to all objects in the MIB, except security objects
- read-write-all permission — grants read and write access to all objects in the MIB, including security objects

4.1.5 User-Based Security Model Community Strings

User-based security model (USM) community strings associate a community string with an SNMPv3 access group and its view. The access granted with a community string is restricted to the scope of the configured group.

4.1.6 Views

Views control the access to a managed object. The total MIB of a 7705 SAR router can be viewed as a hierarchical tree. When a view is created, either the entire tree or a portion of the tree can be specified and

made available to a user to manage the objects contained in the subtree. Object identifiers (OIDs) uniquely identify managed objects. A view defines the type of operations allowed, such as read, write, or notify.

OIDs are organized in a hierarchical tree with specific values assigned to different organizations. A view defines a subset of the agent's managed objects controlled by the access rules associated with that view.

Predefined views are available that are particularly useful when configuring SNMPv1 and SNMPv2c.

The SNMP agent associates SNMPv1 and SNMPv2c community strings with an SNMPv3 view.

4.1.7 Access Groups

Access groups associate a user group and a security model with the views the group can access. An access group is defined by a unique combination of a group name, security model (SNMPv1, SNMPv2c, or SNMPv3), and security level (no-authorization-no-privacy, authorization-no-privacy, or privacy).

An access group is a template that defines a combination of access privileges and views. A group can be associated with one or more network users to control their access privileges and views.

Additional access parameters must be explicitly configured if the preconfigured access groups and views for SNMPv1 and SNMPv2c do not meet the security requirements.

4.1.8 Users

By default, authentication and encryption parameters are not configured. Authentication parameters that a user must use in order to be validated by the 7705 SAR can be modified. SNMP authentication allows the device to validate the managing node that issued the SNMP message and determine if the message has been tampered with.

User access and authentication privileges must be explicitly configured. In a user configuration, a user is associated with an access group, which is a collection of users who have common access privileges and views.

4.2 SNMP Versions

SNMPv1 and SNMPv2c do not provide security, authentication, or encryption. Without authentication, an unauthorized user could perform SNMP network management functions and eavesdrop on management information as it passes from system to system. Many SNMPv1 and SNMPv2c implementations are restricted read-only access, which, in turn, reduces the effectiveness of a network monitor in which network control applications cannot be supported.

To implement SNMPv3, an authentication and encryption method must be assigned to a user in order to be validated by the 7705 SAR. SNMP authentication allows the router to validate the managing node that issued the SNMP message and determine if the message was tampered with.

4.2.1 SNMPv3 Authentication and Privacy Protocols

The following SNMPv3 authentication protocols are supported:

- HMAC-MD5-96
- HMAC-SHA-96
- HMAC-SHA-224
- HMAC-SHA-256
- HMAC-SHA-384
- HMAC-SHA-512

The following SNMPv3 privacy protocols are supported:

- CBC-DES
- CFB128-AES-128
- CFB128-AES-192
- CFB128-AES-256

4.3 Configuration Notes

This section describes SNMP configuration guidelines and caveats:

- To prevent management systems from attempting to manage a partially booted system, SNMP remains in a shutdown state if the configuration file fails to complete during system startup. While shut down, SNMP gets and sets are not processed. However, notifications are issued if an SNMP trap group has been configured.

In order to enable SNMP, the portions of the configuration that failed to load must be initialized properly. Start SNMP with the **config>system>snmp>no shutdown** command.

- Use caution when changing the SNMP engine ID. If the SNMP engine ID is changed in the **config>system>snmp>engineID** *engine-id* context, the current configuration must be saved and a reboot must be executed. If the configuration is not saved and the system is not rebooted, the previously configured SNMP communities and logger trap-target notify communities will not be valid for the new engine ID.

4.4 Configuring SNMP with CLI

This section provides information about configuring SNMP with CLI.

Topics in this chapter include:

- [SNMP Configuration Overview](#)
- [Basic SNMP Security Configuration](#)
- [Configuring SNMP Components](#)

4.5 SNMP Configuration Overview

This section describes how to configure SNMP components that apply to SNMPv1, SNMPv2c, and SNMPv3 on the 7705 SAR.

- [Configuring SNMPv1 and SNMPv2c](#)
- [Configuring SNMPv3](#)

4.5.1 Configuring SNMPv1 and SNMPv2c

The 7705 SAR router is based on SNMPv3. To use 7705 SAR routers with SNMPv1 or SNMPv2c, SNMP community strings must be configured. Three predefined access methods are available when SNMPv1 or SNMPv2c access is required. Each access method (**r**, **rw**, or **rwa**) is associated with an SNMPv3 access group that determines the access privileges and the scope of managed objects available. The **community** command is used to associate a community string with a specific access method and the required SNMP version (SNMPv1 or SNMPv2c). The access methods are:

- read-only — grants read-only access to the entire management structure with the exception of the security area
- read-write — grants read and write access to the entire management structure with the exception of the security area
- read-write-all — grants read and write access to the entire management structure, including security

If the predefined access groups do not meet your access requirements, then additional access groups and views can be configured. The **usm-community** command is used to associate an access group with an SNMPv1 or SNMPv2c community string.

SNMP trap destinations are configured in the **config>log>snmp-trap-group** context.

4.5.2 Configuring SNMPv3

The 7705 SAR implements SNMPv3. If security features other than the default views are required, the following parameters must be configured:

- views
- access groups
- SNMP users

4.6 Basic SNMP Security Configuration

This section provides information to configure SNMP parameters and provides examples of common configuration tasks. The minimal SNMP parameters are:

For SNMPv1 and SNMPv2c, configure community string parameters.

For SNMPv3:

- Configure view parameters
- Configure SNMP group
- Configure access parameters
- Configure user with SNMP parameters

The following displays SNMP default views, access groups, and attempts parameters.

```
ALU-1>config>system>security>snmp# info detail
-----
      view iso subtree 1
          mask ff type included
      exit
      view "mgmt-view" subtree 1.3.6.1.2.1.2
          mask ff type excluded
      exit
      view "mgmt-view" subtree 1.3.6.1.2.1.4
          mask ff type included
      exit
      view no-security subtree 1.3.6.1.6.3.11.2.1
          mask ff type included
      exit
      view no-security subtree 1.3.6.1.6.3.15.1.1
          mask ff type included
      exit
      access group snmp-ro security-model snmpv1 security-level no-auth-
no-privacy read no-security notify no-security
      access group snmp-ro security-model snmpv2c security-level no-auth-
no-privacy read no-security notify no-security
      access group snmp-rw security-model snmpv1 security-level no-auth-
no-privacy read no-security write no-security notify no-security
      access group snmp-rw security-model snmpv2c security-level no-auth-
no-privacy read no-security write no-security notify no-security
      access group snmp-rwa security-model snmpv1 security-level no-auth-
no-privacy read iso write iso notify iso
      access group snmp-trap security-model snmpv1 security-level no-auth-
no-privacy notify iso
      access group snmp-trap security-model snmpv2c security-level no-
auth-no-privacy notify iso
      attempts 20 time 5 lockout 10
```

4.7 Configuring SNMP Components

Use the CLI syntax displayed below to configure the following SNMP scenarios:

- [Configuring a Community String](#)
- [Configuring View Options](#)
- [Configuring Access Options](#)
- [Configuring USM Community Options](#)
- [Configuring Other SNMP Parameters](#)

CLI Syntax:

```
config>system>security>snmp
  access group group-name security-model security-model security-
  level security-level [context context-name [prefix-match]] [read view-
  name-1] [write view-name-2] [notify view-name-3]
  attempts [count] [time minutes1] [lockout minutes2]
  community community-string [hash | hash2] access-permissions
  [version SNMP-version]
  usm-community community-string [hash | hash2] group group-name
  view view-name [subtree oid-value]
  mask mask-value [type {included | excluded}]
```

4.7.1 Configuring a Community String

SNMPv1 and SNMPv2c community strings are used to define the relationship between an SNMP manager and agent. The community string acts like a password to allow access to the agent. The access granted with a community string is restricted to the scope of the configured group.

One or more of the following characteristics associated with the string can be specified:

- read-only, read-write, and read-write-all permission for the MIB objects accessible to the community
- assignment of a unique community string to the management router or management VPLS
- the SNMP version: SNMPv1, SNMPv2c, or both

Default access features are preconfigured by the agent for SNMPv1 and SNMPv2c.

Use the following CLI syntax to configure community options:

CLI Syntax:

```
config>system>security>snmp
  community community-string [hash | hash2] access-permissions
  [version SNMP-version]
```

The following example displays community string command usage:

Example:

```
config>system>security# snmp
config>system>security>snmp# community private hash2 rwa version both
config>system>security>snmp# community public hash2 r version v2c
```

The following example displays the SNMP community configuration:

```
ALU-1>config>system>security>snmp# info
-----
community "uTdc9j48PBRkxn5DcSjchk" hash2 rwa version both
community "Lla.RtAyRW2" hash2 r version v2c
-----
ALU-1>config>system>security>snmp#
```

4.7.2 Configuring View Options

Use the following CLI syntax to configure view options:

CLI Syntax:

```
config>system>security>snmp
view view-name subtree oid-value
mask mask-value[type {included | excluded}]
```

The following example displays view command usage:

Example:

```
config>system>security>snmp# view testview subtree 1
config>system>security>snmp>view$ mask ff type included
config>system>security>snmp>view$ exit
config>system>security>snmp# view testview subtree 1.3.6.1.2
config>system>security>snmp>view$ mask ff type X
config>system>security>snmp>view$ exit
```

The following example displays the view configuration:

```
ALU-1>config>system>security>snmp# info
-----
view "testview" subtree 1
mask ff
exit
view testview subtree 1.3.6.1.2
mask ff type excluded
exit
community "private" rwa version both
community "public" r version v2c
-----
ALU-1>config>system>security>snmp#
```

4.7.3 Configuring Access Options

The **access** command creates an association between a user group, a security model, and the views that the user group can access. Access must be configured unless security is limited to the preconfigured access groups and views for SNMPv1 and SNMPv2c. An access group is defined by a unique combination of the group name, security model, and security level.

Use the following CLI syntax to configure access features:

CLI Syntax:

```
config>system>security>snmp
```

```
access group group-name security-model security-model security-
level security-level [context context-name [prefix-match]] [read view-
name-1] [write view-name-2] [notify view-name-3]
```

The following example displays access command usage:

Example:

```
ALU-1>config>system>security>snmp# access group
testgroup security-model usm security-level auth-no-privacy read
testview write testview notify testview
```

The following example displays the access configuration with the view configurations.

```
ALU-1>config>system>security>snmp# info
-----
view "testview" subtree 1
    mask ff
    exit
view "testview" subtree 1.3.6.1.2
    mask ff type excluded
    exit
access group "testgroup" security-model usm security-level auth-no
-privacy read "testview" write "testview" notify "testview"
community "public" r version both
-----
```

Use the following CLI syntax to configure user group and authentication parameters:

CLI Syntax:

```
config>system>security# user user-name
access [ftp] [snmp] [console]
snmp
authentication none
authentication authentication-protocol authentication-key
[privacy none] [hash | hash2]
authentication authentication-protocol authentication-key
privacy privacy-protocol privacy-key [hash|hash2]
no authentication
group group-name
```

The following example displays user security command usage:

Example:

```
config>system>security# user testuser
config>system>security>user$ access snmp
config>system>security>user# snmp
config>system>security>user>snmp# authentication hash hmac-md5-96
e14672e71d3e96e7a1e19472527ee969 privacy none
config>system>security>user>snmp# group testgroup
config>system>security>user>snmp# exit
config>system>security>user# exit
```

The following example displays the user's SNMP configuration.

```
ALU-1>config>system>security# info
-----
user "testuser"
access snmp
snmp
```

```

        authentication hash hmac-md5-96 e14672e71d3e96e7a1e19472527ee969
    privacy none
        group testgroup
        exit
    exit
    ...
    -----
    ALU-1>config>system>security#

```

4.7.4 Configuring USM Community Options

User-based security model (USM) community strings associate a community string with an SNMPv3 access group and its view. The access granted with a community string is restricted to the scope of the configured group.

By default, the 7705 SAR implementation of SNMP uses SNMPv3. To implement SNMPv1 and SNMPv2c, USM community strings must be explicitly configured.

Use the following CLI syntax to configure USM community options:

CLI Syntax:

```

config>system>security>snmp
    usm-community community-string [hash | hash2] group group-name

```

The following example displays USM community string command usage. The group "testgroup" was configured in the **config>system>security>snmp>access** CLI context.

Example:

```

config>system>security>snmp# usm-community "test" hash2 group
"testgroup"

```

The following example displays the SNMP community configuration:

```

ALU-1>config>system>security>snmp# info
-----
        view testview subtree 1
            mask ff
        exit
        view testview subtree 1.3.6.1.2
            mask ff type excluded
        exit
        access group testgroup security-model usm security-level auth-no
-privacy read testview write testview notify testview
        community "private" hash2 rwa version both
        community "public" hash r version v2c
        usm-community "test" group "testgroup"
-----
ALU-1>config>system>security>snmp#

```

4.7.5 Configuring Other SNMP Parameters

Use the following CLI syntax to modify the system SNMP options:

CLI Syntax:

```

config>system>snmp
    engineID engine-id

```

```
general-port port
packet-size bytes
no shutdown
```

The following example displays the system SNMP default values:

```
ALU-104>config>system>snmp# info detail
-----
      shutdown
      engineID "0000xxxx0000000000xxxx00"
      packet-size 1500
      general-port 161
-----
ALU-104>config>system>snmp#
```

4.8 SNMP Command Reference

4.8.1 Command Hierarchies

- [Configuration Commands](#)
 - [SNMP System Commands](#)
 - [SNMP Security Commands](#)
- [Show Commands](#)

4.8.1.1 Configuration Commands

4.8.1.1.1 SNMP System Commands

```

config
- system
  - snmp
    - engineID engine-id
    - no engineID
    - general-port port
    - no general-port
    - packet-size bytes
    - no packet-size
    - [no] shutdown
    - streaming
      - [no] shutdown

```

4.8.1.1.2 SNMP Security Commands

```

config
- system
  - security
    - snmp
      - access group group-name security-model security-model security-level
        security-level [context context-name [prefix-match]] [read view-name-1] [write view-name-2]
        [notify view-name-3]
      - no access group group-name [security-model security-model] [security-level
        security-level] [context context-name [prefix-match]] [read view-name-1] [write view-name-2]
        [notify view-name-3]
      - attempts [count] [time minutes1] [lockout minutes2]
      - no attempts
      - community community-string [hash | hash2] access-permissions [version SNMP-
        version]
      - no community community-string [hash | hash2]
      - usm-community community-string [hash | hash2] group group-name
      - no usm-community community-string [hash | hash2]
      - view view-name subtree oid-value
      - no view view-name [subtree oid-value]
        - mask mask-value [type {included | excluded}]
        - no mask

```

The following commands configure user-specific SNMP features. See the [Security Command Reference](#) section for CLI syntax and command descriptions.

```
config
- system
  - security
    - [no] user user-name
      - [no] snmp
        - authentication {[none] | [[hash] {md5 key-1 | sha key-1} privacy
{privacy-level | key-2}]
        - group group-name
        - [no] group
```

4.8.1.2 Show Commands

```
show
- snmp
  - counters
  - streaming
    - counters
- system
  - information
  - security
    - access-group [group-name]
    - communities
    - user [user-id] [detail]
    - view [view-name] [capabilities] [detail]
```

4.8.2 Command Descriptions

- [Configuration Commands](#)
- [Show Commands](#)

4.8.2.1 Configuration Commands

- [SNMP System Commands](#)
- [SNMP Security Commands](#)

4.8.2.1.1 SNMP System Commands

```
snmp
```

Syntax

```
snmp
```

Context

```
config>system
```

Description

This command enables the context to configure SNMP parameters.

```
engineID
```

Syntax

```
[no] engineID engine-id
```

Context

```
config>system>snmp
```

Description

This command sets the SNMP engine ID to uniquely identify the SNMPv3 node. By default, the engine ID is generated using information from the system backplane.

If the SNMP engine ID is changed in the **config>system>snmp>engineID *engine-id*** context, the current configuration must be saved and a reboot must be executed. If the configuration is not saved and the system is not rebooted, the previously configured SNMP communities and logger trap-destination notify communities will not be valid for the new engine ID.



Caution: In conformance with IETF standard RFC 3414, *User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)*, hashing algorithms that

generate SNMPv3 MD5 or SHA security digest keys use the engine ID. Changing the SNMP engine ID invalidates all SNMPv3 MD5 and SHA security digest keys and may render the node unmanageable. If the SNMP engine ID is changed, the SNMP hash keys must be reconfigured.

This command could be used, for example, when a chassis is replaced. Use the engine ID of the first system and configure it in the new system to preserve SNMPv3 security keys. This allows management stations to use their existing authentication keys for the new system.

Ensure that the engine IDs are not used on multiple systems. A management domain can only have one instance of each engine ID.

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

Default

the engine ID is system-generated

Parameters

engine-id

an identifier from 10 to 64 hexadecimal digits (5 to 32 octet number), uniquely identifying this SNMPv3 node. This string is used to access this node from a remote host with SNMPv3.

general-port

Syntax

general-port *port-number*

no general-port

Context

config>system>snmp

Description

This command configures the port number used by this node to receive SNMP request messages and to send replies. SNMP notifications generated by the agent are sent from the port specified in the **config>log>snmp-trap-group>trap-target** command.

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

Default

161

Parameters

port-number

the port number used to send SNMP traffic other than traps

Values 1 to 65535 (decimal)

packet-size

Syntax

packet-size *bytes*

no packet-size

Context

config>system>snmp

Description

This command configures the maximum SNMP packet size generated by this node. If the packet size exceeds the MTU size of the egress interface, the packet will be fragmented.

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

Default

1500 bytes

Parameters

bytes

the SNMP packet size in bytes

Values 484 to 9216

shutdown

Syntax

[no] shutdown

Context

config>system>snmp

Description

This command administratively disables SNMP agent operations. System management can then only be performed using the CLI. Shutting down SNMP does not remove or change configuration parameters other than the administrative state. This command does not prevent the agent from sending SNMP notifications to any configured SNMP trap destinations. SNMP trap destinations are configured under the **config>log>snmp-trap-group** context.

This command is automatically invoked in the event of a reboot when the processing of the configuration file fails to complete or when an SNMP persistent index file fails while the **bof persist on** command is enabled.

The **no** form of the command administratively enables SNMP.

Default

no shutdown

streaming

Syntax

streaming

Context

config>system>snmp

Description

This command enables the proprietary SNMP request/response bundling and TCP-based transport mechanism for optimizing network management of the router nodes. In higher-latency networks, synchronizing router MIBs from network management via streaming takes less time than synchronizing via classic SNMP UDP requests. Streaming operates on TCP port 1491 and runs over IPv4 or IPv6.

shutdown

Syntax

[no] shutdown

Context

config>system>snmp>streaming

Description

This command administratively disables the proprietary SNMP request/response bundling and TCP-based transport mechanism for optimizing network management of the router nodes.

The **no** form of the command administratively re-enables SNMP request/response bundling and the TCP-based transport mechanism.

Default

shutdown

4.8.2.1.2 SNMP Security Commands

snmp

Syntax

snmp

Context

config>system>security

Description

This command enables the context to configure SNMPv1, SNMPv2c, and SNMPv3 parameters

access group

Syntax

[no] access group *group-name* **security-model** {snmpv1 | snmpv2c | usm} **security-level** {no-auth-no-privacy | auth-no-privacy | privacy}[**context** *context-name* [**prefix-match** {exact | prefix}]] [**read** *view-name-1*][**write** *view-name-2*][**notify** *view-name-3*]

Context

config>system>security>snmp

Description

This command creates an association between a user group, a security model, and the views that the user group can access. Access parameters must be configured unless security is limited to the preconfigured access groups and views for SNMPv1 and SNMPv2c. An access group is defined by a unique combination of the group name, security model, and security level.

Access must be configured unless security is limited to SNMPv1/SNMPv2c with community strings (see [community](#)).

Default access group configurations cannot be modified or deleted.

To remove the user group with associated security models and security levels, use the command **no access group** *group-name*.

To remove a security model and security level combination from a group, use the command **no access group** *group-name* **security-model** {snmpv1 | snmpv2c | usm} **security-level** {no-auth-no-privacy | auth-no-privacy | privacy}.

Default

n/a

Parameters

group-name

specifies a unique group name up to 32 characters

security-model {snmpv1 | snmpv2c | usm}

specifies the security model required to access the views configured in this node. A group can have multiple security models. For example, one view may only require SNMPv1/SNMPv2c access while another view may require USM (SNMPv3) access rights.

security-level {no-auth-no-priv | auth-no-priv | privacy}

specifies the required authentication and privacy levels to access the views configured in this node

security-level no-auth-no-privacy

specifies that no authentication and no privacy (encryption) is required. When configuring the user's authentication, select the **none** option.

security-level auth-no-privacy

specifies that authentication is required but privacy (encryption) is not required. When this option is configured, both the group and the user must be configured for authentication.

security-level privacy

specifies that both authentication and privacy (encryption) is required. When this option is configured, both the group and the user must be configured for authentication. The user must also be configured for privacy.

context-name

specifies a set of SNMP objects that are associated with the context-name. The context name is treated as either a full context name string or a context name prefix depending on the keyword specified (exact or prefix).

prefix-match

specifies the context-name prefix-match keywords, exact or prefix

Default exact

read *view-name-1*

specifies the keyword and variable of the view to read the MIB objects. This command must be configured for each view to which the group has read access.

Values up to 32 characters

write *view-name-2*

specifies the keyword and variable of the view to configure the contents of the agent. This command must be configured for each view to which the group has write access.

Values up to 32 characters

notify *view-name-3*

specifies the keyword and variable of the view to send a trap about MIB objects. This command must be configured for each view to which the group has notify access.

Values up to 32 characters

attempts

Syntax

attempts [*count*][*time minutes1*][*lockout minutes2*]

no attempts

Context

config>system>security>snmp

Description

This command configures a threshold value for the number of unsuccessful SNMP connection attempts allowed in a specified time frame. The command parameters are used to counter denial of service (DOS) attacks through SNMP.

If the threshold is exceeded, the host is locked out for the lockout time period.

If multiple attempts commands are entered, each command overwrites the previously entered command.

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

Default

attempts 20 time 5 lockout 10

Parameters

count

the number of unsuccessful SNMP attempts allowed for the specified time

Values 1 to 64

Default 20

time *minutes1*

the period of time, in minutes, that a specified number of unsuccessful attempts can be made before the host is locked out

Values 0 to 60

Default 5

lockout *minutes2*

the lockout period, in minutes, during which the host is not allowed to log in. When the host exceeds the attempted count times in the specified time, then that host is locked out from any further login attempts for the configured time period.

Values 0 to 1440

Default 10

community

Syntax

community *community-string*[**hash** | **hash2**]*access-permissions*[**version** *SNMP-version*]

no community *community-string*[**hash** | **hash2**]

Context

config>system>security>snmp

Description

This command creates SNMP community strings for SNMPv1 and SNMPv2c access. This command is used in combination with the predefined access groups and views. To create custom access groups and views and associate them with SNMPv1 or SNMPv2c access, use the **usm-community** command.

When configured, community implies a security model for SNMPv1 and SNMPv2c only.

For SNMPv3 security, the **snmp** command must be configured.

The **no** form of the command removes a community string.

Default

n/a

Parameters

community-string

configures the SNMPv1/SNMPv2c community string

hash1 | hash2

configures the hashing scheme for the community string

access-permissions

defines the access permissions

Values

- **r** — grants only read access to objects in the MIB, except security objects
- **rw** — grants read and write access to all objects in the MIB, except security objects
- **rwa** — grants read and write access to all objects in the MIB, including security objects
- **mgmt** — assigns a unique SNMP community string to the management router
- **vpls-mgmt** — assigns a unique SNMP community string to the management virtual router

version

specifies the SNMP version

Values v1 | v2c | both

usm-community

Syntax

usm-community *community-string*[**hash** | **hash2**] **group** *group-name*

no usm-community *community-string*[**hash** | **hash2**]

Context

config>system>security>snmp

Description

This command is used to associate a community string with an SNMPv3 access group and its view. The access granted with a community string is restricted to the scope of the configured group.

The 7705 SAR implementation of SNMP uses SNMPv3. In order to implement SNMPv1 and SNMPv2c configurations, several access groups are predefined. In order to implement SNMP with security features (version 3), security models, security levels, and USM communities must be explicitly configured. Optionally, additional views that specify more specific OIDs (MIB objects in the subtree) can be configured.

The **no** form of this command removes a community string.

Default

n/a

Parameters

community-string

configures the SNMPv1/SNMPv2c community string to determine the SNMPv3 access permissions to be used

hash1 | hash2

configures the hashing scheme for the community string

group

specifies the group that governs the access rights of this community string. This group must be configured first in the **config>system>security>snmp>access group** context.

group-name

specifies the group name

view

Syntax

view *view-name* **subtree** *oid-value*

no view *view-name*[**subtree** *oid-value*]

Context

config>system>security>snmp

Description

This command configures a view. Views control the accessibility of a MIB object within the configured MIB view and subtree. Object identifiers (OIDs) uniquely identify MIB objects in the subtree. OIDs are organized hierarchically with specific values assigned by different organizations.

When the subtree (OID) is identified, a mask can be created to select the portions of the subtree to be included or excluded for access using this particular view. See the [mask](#) command. The views configured with this command can subsequently be used in read, write, and notify commands that are used to assign specific access group permissions to created views and assigned to particular access groups.

Multiple subtrees can be added or removed from a view name to tailor a view to the requirements of the user access group.

The **no view** *view-name* command removes a view and all subtrees.

The **no view** *view-name subtree oid-value* command removes a sub-tree from the view name.

Default

no views are defined

Parameters

view-name

the 1 to 32 character view name

Default n/a

oid-value

the object identifier (OID) value for the *view-name*. This value, for example, 1.3.6.1.6.3.11.2.1, combined with the mask and include and exclude statements, configures the access available in the view.

It is possible to have a view with different subtrees with their own masks and include and exclude statements. This allows you to customize visibility and write capabilities for specific user requirements

mask

Syntax

mask *mask-value*[**type** {**included** | **excluded**}]

no mask

Context

config>system>security>snmp>view *view-name*

Description

The mask value and the mask type, along with the *oid-value* configured in the **view** command, determines the access of each sub-identifier of an object identifier (MIB subtree) in the view.

Each bit in the mask corresponds to a sub-identifier position; for example, the most significant bit for the first sub-identifier, the next most significant bit for the second sub-identifier, and so on. If the bit position on the sub-identifier is available, it can be included or excluded.

For example, the MIB subtree that represents MIB-II is 1.3.6.1.2.1. The mask that catches all MIB-II is 0xfc or 0b11111100.

Only a single mask may be configured per view and OID value combination. If more than one entry is configured, each subsequent entry overwrites the previous entry.

Per RFC 2575, *View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)*, each MIB view is defined by two sets of view subtrees, the included view subtrees, and the excluded view subtrees. Every view subtree, both the included and the excluded ones, are defined in this table. To determine if a particular object instance is in a particular MIB view, compare the object instance's object identifier (OID) with each of the MIB view's active entries in this table. If none match, then the

object instance is not in the MIB view. If one or more match, then the object instance is included in, or excluded from, the MIB view according to the value of `vacmViewTreeFamilyType` in the entry whose value of `vacmViewTreeFamilySubtree` has the most sub-identifiers.

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

Default

no mask

Parameters

mask-value

the mask value associated with the OID value determines whether the sub-identifiers are included or excluded from the view

The mask can be entered in either:

- hexadecimal format (for example, 0xfc)
- binary format (for example, 0b11111100)



Note: If the number of bits in the bit mask is less than the number of sub-identifiers in the MIB subtree, then the mask is extended with ones until the mask length matches the number of sub-identifiers in the MIB subtree.

Default all 1s

type {included | excluded}

specifies whether to include or exclude MIB subtree objects

included - all MIB subtree objects that are identified with a 1 in the mask are available in the view

excluded - all MIB subtree objects that are identified with a 1 in the mask are denied access in the view

Default included

4.8.2.2 Show Commands



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

counters

Syntax

counters

Context

show>snmp

Description

This command displays SNMP counter information. SNMP counters will continue to increase even when SNMP is shut down. Some internal modules communicate using SNMP packets.

Output

The following output is an example of SNMP counters information, and [Table 28: SNMP Counters Field Descriptions](#) describes the fields.

Output Example

```
A:ALU-1# show snmp counters
=====
SNMP counters:
=====
  in packets : 463
-----
  in gets    : 93
  in getnexts : 0
  in sets    : 370
  out packets: 463
-----
  out get responses : 463
  out traps         : 0
  variables requested: 33
  variables set     : 497
=====
A:ALU-1#
```

Table 28: SNMP Counters Field Descriptions

Label	Description
in packets	The total number of messages delivered to SNMP from the transport service
in gets	The number of SNMP get request PDUs accepted and processed by SNMP

Label	Description
in getnexts	The number of SNMP get next PDUs accepted and processed by SNMP
in sets	The number of SNMP set request PDUs accepted and processed by SNMP
out packets	The total number of SNMP messages passed from SNMP to the transport service
out get responses	The number of SNMP get response PDUs generated by SNMP
out traps	The number of SNMP Trap PDUs generated by SNMP
variables requested	The number of MIB objects requested by SNMP
variables set	The number of MIB objects set by SNMP as the result of receiving valid SNMP set request PDUs

streaming

Syntax

streaming

Context

show>snmp

Description

This command enables the context to display streaming counters information.

counters

Syntax

counters

Context

show>snmp>streaming

Description

This command displays counters information for the proprietary SNMP streaming protocol.

Output

The following output is an example of SNMP streaming counters information, and [Table 29: SNMP Streaming Counters Field Descriptions](#) describes the fields.

Output Example

```
*A:custDoc sar8# show snmp streaming counters
=====
STREAMING counters:
=====
in getTables   : 722
in getManys    : 26
-----
out responses  : 848
=====
```

Table 29: SNMP Streaming Counters Field Descriptions

Label	Description
in getTables	Displays the number of GetTable request packets received
in getManys	Displays the number of GetMany request packets received
out responses	Displays the number of response packets sent

information

Syntax

information

Context

show>system

Description

This command lists the SNMP configuration and statistics.

Output

The following output is an example of system information, and [Table 30: System Information Field Descriptions](#) describes the fields.

Output Example

```
A:7705:Dut-A# show system information
=====
System Information
=====
System Name       : A:7705:Dut-A
System Type       : 7705 SAR-8 v2
Chassis Topology  : Standalone
System Version    : B-0.0.I323
Crypto Module Version :
  CPM: SARCM 3.0 DP: SARDCM 1.0
System Contact    : Fred Information Technology
System Location   : Bldg.1-floor 2-Room 201
System Coordinates : N 85 58 23, W 34 56 12
```

```

System Active Slot      : A
System Up Time         : 1 days, 02:03:17.62 (hr:min:sec)

SNMP Port              : 161
SNMP Engine ID        : 0000197f00006883ff000000
SNMP Engine Boots     : 58
SNMP Max Message Size : 1500
SNMP Admin State      : Enabled
SNMP Oper State       : Enabled
SNMP Index Boot Status : Not Persistent
SNMP Sync State       : OK

Tel/Tel6/SSH/FTP Admin : Enabled/Disabled/Enabled/Disabled
Tel/Tel6/SSH/FTP Oper  : Up/Down/Up/Down

BOF Source            : cf3:
Image Source          : primary
Config Source         : primary
Last Booted Config File : cf3:/config.cfg
Last Boot Cfg Version  : FRI APR 20 16:24:27 2007 UTC
Last Boot Config Header : # TiMOS-B-5.0.R3 both/hops NOKIA 7705 SAR #
                        Copyright (c) 2016 Nokia. All rights
                        reserved. # All use subject to applicable license
                        agreements. # Built on Wed Feb 13 19:45:00 EST 2016 by
                        builder in /rel5.0/R3/panos/main # Generated TUE
                        MAR 11 16:24:27 2016 UTC

Last Boot Index Version : N/A
Last Boot Index Header  : # TiMOS-B-5.0.R3 both/hops NOKIA 7705 SAR #
                        Copyright (c) 2016 Nokia. All rights
                        reserved. # All use subject to applicable license
                        agreements. # Built on Wed Feb 13 19:45:00 EST 2016 by
                        builder in /rel5.0/R3/panos/main # Generated TUE
                        MAR 11 16:24:27 2016 UTC

Last Saved Config      : N/A
Time Last Saved       : N/A
Changes Since Last Save : Yes
User Last Modified    : admin
Time Last Modified    : 2016/03/19 10:03:09
Max Cfg/BOF Backup Rev : 5
Cfg-OK Script         : N/A
Cfg-OK Script Status  : not used
Cfg-Fail Script       : N/A
Cfg-Fail Script Status : not used

Microwave S/W Package : invalid

Management IP Addr    : 192.168.xxx.xxx/24
Primary DNS Server    : 192.168.xxx.xxx
Secondary DNS Server  : N/A
Tertiary DNS Server   : N/A
DNS Domain            : domain.com
DNS Resolve Preference : ipv4-only
BOF Static Routes     :
  To                   Next Hop
  192.xxx.0.0/16       192.xxx.1.1
ATM Location ID       : 01:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
ATM OAM Retry Up     : 2
ATM OAM Retry Down   : 4
ATM OAM Loopback Period : 10

ICMP Vendor Enhancement : Disabled
Eth QinQ Untagged SAP  : False
=====
A:7705:Dut-A#

```

Table 30: System Information Field Descriptions

Label	Description
System Name	The configured system name
System Type	The 7705 SAR chassis model
Chassis Topology	The chassis setup – always Standalone
System Version	The version of the installed software load
Crypto Module Version	The cryptographic module in the release
System Contact	A text string that describes the system contact information
System Location	A text string that describes the system location
System Coordinates	A text string that describes the system coordinates
System Active Slot	The active CSM slot
System Up Time	The time since the last boot
SNMP Port	The port number used by this node to receive SNMP request messages and to send replies
SNMP Engine ID	The SNMP engine ID to uniquely identify the SNMPv3 node
SNMP Engine Boots	The number of times that the SNMP engine has booted
SNMP Max Message Size:	The maximum SNMP packet size generated by this node
SNMP Admin State	Enabled — SNMP is administratively enabled and running
	Disabled — SNMP is administratively shut down and not running
SNMP Oper State	Enabled — SNMP is operationally enabled
	Disabled — SNMP is operationally disabled
SNMP Index Boot Status	Persistent — system indexes are saved between reboots
	Not Persistent — system indexes are not saved between reboots
Tel/Tel6/SSH/FTP Admin	The administrative state of the Telnet, Telnet IPv6, SSH, and FTP sessions
Tel/Tel6/SSH/FTP Oper	The operational state of the Telnet, Telnet IPv6, SSH, and FTP sessions
BOF Source	The location of the BOF

Label	Description
Image Source	Primary — Indicates that the directory location for runtime image file was loaded from the primary source
	Secondary — Indicates that the directory location for runtime image file was loaded from the secondary source
	Tertiary — Indicates that the directory location for runtime image file was loaded from the tertiary source
Config Source	Primary — Indicates that the directory location for configuration file was loaded from the primary source
	Secondary — Indicates that the directory location for configuration file was loaded from the secondary source
	Tertiary — Indicates that the directory location for configuration file was loaded from the tertiary source
Last Booted Config File	The URL and filename of the last loaded configuration file
Last Boot Cfg Version	The date and time of the last boot
Last Boot Config Header	The header information such as image version, date built, date generated
Last Boot Index Version	The version of the persistence index file read when this CSM card was last rebooted
Last Boot Index Header	The header of the persistence index file read when this CSM card was last rebooted
Last Saved Config	The location and filename of the last saved configuration file
Time Last Saved	The date and time of the last time configuration file was saved
Changes Since Last Save	Yes — There are unsaved configuration file changes
	No — There are no unsaved configuration file changes
User Last Modified	The username 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

Label	Description
Cfg-OK Script Status	Successful/Failed — the results from the execution of the CLI script file specified in the Cfg-OK Script location
	Not used — no CLI script file was executed
Cfg-Fail Script	URL — the location and name of the CLI script file executed following a failed boot-up configuration file execution
	Not used — no CLI script file was executed
Cfg-Fail Script Status	Successful/Failed — the results from the execution of the CLI script file specified in the Cfg-Fail Script location
	Not used — no CLI script file was executed
Microwave S/W Package	N/A
Management IP Addr	The management IP address and mask
Primary DNS Server	The IP address of the primary DNS server
Secondary DNS Server	The IP address of the secondary DNS server
Tertiary DNS Server	The IP address of the tertiary DNS server
DNS Domain	The DNS domain name of the node
DNS Resolve Preference	N/A
BOF Static Routes	To — the static route destination
	Next Hop — the next hop IP address used to reach the destination
	Metric — displays the priority of this static route versus other static routes
	None — no static routes are configured
ATM Location ID	For ATM OAM loopbacks — the address of the network device referenced in the loopback request
ATM OAM Retry Up	N/A
ATM OAM Retry Down	N/A
ATM OAM Loopback Period	N/A
ICMP Vendor Enhancement	Enabled — inserts one-way timestamp in outbound SAA ICMP ping packets

Label	Description
	Disabled — one-way timestamping is not performed on outbound SAA ICMP ping packets
Eth QinQ untagged SAP	True: QinQ untagged SAPs are enabled
	False: QinQ untagged SAPs are disabled

access-group

Syntax

```
access-group [group-name]
```

Context

```
show>system>security
```

Description

This command displays access group information.

Parameters

group-name

the access group name

Output

The following output is an example of access group information, and [Table 31: System Access Group Field Descriptions](#) describes the fields.

Output Example

```
A:ALU-1# show system security access-group
=====
Access Groups
=====
group name      security  security  read      write      notify
model          level    view      view      view
-----
snmp-ro        snmpv1   none      no-security          no-security
snmp-ro        snmpv2c  none      no-security          no-security
snmp-rw        snmpv1   none      no-security  no-security  no-security
snmp-rw        snmpv2c  none      no-security  no-security  no-security
snmp-rwa       snmpv1   none      iso          iso          iso
snmp-rwa       snmpv2c  none      iso          iso          iso
snmp-trap      snmpv1   none      iso          iso          iso
snmp-trap      snmpv2c  none      iso          iso          iso
-----
No. of Access Groups: 8
=====
A:ALU-1#
```

```
A:ALU-1# show system security access-group snmp-ro
```

```

=====
Access Groups
=====
group name      security  security  read      write      notify
model          level    view      view      view      view
-----
snmp-ro        snmpv1   none      no-security          no-security
-----
No. of Access Groups: 1
...
=====
A:ALU-1#

```

Table 31: System Access Group Field Descriptions

Label	Description
Group name	The access group name
Security model	The security model required to access the views configured in this node
Security level	The required authentication and privacy levels to access the views configured in this node
Read view	The view to read the MIB objects
Write view	The view to configure the contents of the agent
Notify view	The view to send a trap about MIB objects
No. of access groups	The total number of configured access groups

communities

Syntax

communities

Context

show>system>security

Description

This command lists SNMP communities and characteristics.

Output

The following output is an example of communities information, and [Table 32: Communities Field Descriptions](#) describes the fields.

Output Example

```
A:ALU-1# show system security communities
```

```

=====
Communities
=====
community      access  view              version  group name
-----
private        rw     iso              v1 v2c  snmp-rwa
cli-readonly   r      iso              v2c     cli-readonly
cli-readwrite  rw     iso              v2c     cli-readwrite
-----
No. of Communities: 3
=====
A:ALU-1#

```

Table 32: Communities Field Descriptions

Label	Description
Community	The community string name for SNMPv1 and SNMPv2c access only
Access	r: The community string allows read-only access to all objects in the MIB except security objects
	rw: The community string allows read-write access to all objects in the MIB except security objects
	rwa: The community string allows read-write access to all objects in the MIB including security objects
	mgmt: The unique SNMP community string assigned to the management router
View	The view name
Version	The SNMP version
Group Name	The access group name
No of Communities	The total number of configured community strings

user

Syntax

```
user [user-id][detail]
```

Context

```
show>system>security
```

Description

This command displays user information.

Parameters

user-id

the name of the user

detail

displays all information associated with the specified use

Output

The following output is an example of user information, and [Table 33: User Field Descriptions](#) describes the fields.

Output Example

```
A:ALU-1# show system security user
=====
Users
=====
user id          New   User Permissions Password   Login   Failed Local
 Pwd            console ftp snmp  Expires Attempts Logins  Conf
-----
admin            n     y     n     n     never    2       0       y
testuser         n     n     n     y     never    0       0       y
-----
Number of users : 2
=====
A:ALU-1#
```

Table 33: User Field Descriptions

Label	Description
User ID	The name of a system user
Need New PWD	Yes: the user must change their password at the next login
	No: the user is not forced to change their password at the next login
User Permissions	Console: specifies whether the user is permitted console/Telnet access
	FTP: specifies whether the user is permitted FTP access
	SNMP: specifies whether the user is permitted SNMP access
Password expires	The date on which the current password expires
Attempted logins	The number of times the user has attempted to log in, irrespective of whether the login succeeded or failed
Failed logins	The number of unsuccessful login attempts
Local Conf.	Y: password authentication is based on the local password database

Label	Description
	N: password authentication is not based on the local password database

view

Syntax

view [*view-name*][**detail** | **capabilities**]

Context

show>system>security

Description

This command lists one or all views and permissions in the MIB-OID tree.

Parameters

view-name

the name of the view

detail

displays all groups associated with the view

capabilities

displays all views, including excluded MIB-OID trees from unsupported features

Output

The following output is an example of system security view information, and [Table 34: System Security View Field Descriptions](#) describes the fields.

Output Example

```
A:ALU-1# show system security view
=====
Views
=====
view name      oid tree      mask          permission
-----
iso            1             included
no-security    1             included
no-security    1.3.6.1.6.3   excluded
no-security    1.3.6.1.6.3.10.2.1 included
no-security    1.3.6.1.6.3.11.2.1 included
no-security    1.3.6.1.6.3.15.1.1 included
-----
No. of Views: 6
=====
```

```
A:ALU-1# show system security view no-security detail
=====
Views
```

```

=====
view name      oid tree      mask      permission
-----
no-security    1             included
no-security    1.3.6.1.6.3   excluded
no-security    1.3.6.1.6.3.10.2.1 included
no-security    1.3.6.1.6.3.11.2.1 included
no-security    1.3.6.1.6.3.15.1.1 included
-----
No. of Views: 5
=====
no-security used in
=====
group name
-----
snmp-ro
snmp-rw
=====
A:ALU-1#

```

```

A:ATMIMA1>config# show system security view capabilities
=====
Views
=====
view name      oid tree      mask      permission
-----
iso            1             included
iso            1.0.8802     no-support
iso            1.3.6.1.3.37 no-support
iso            1.3.6.1.3.92 no-support
iso            1.3.6.1.3.95 no-support
iso            1.3.6.1.2.1.14 no-support
iso            1.3.6.1.2.1.15 no-support
iso            1.3.6.1.2.1.23 no-support
iso            1.3.6.1.2.1.51 no-support
iso            1.3.6.1.2.1.68 no-support
iso            1.3.6.1.2.1.85 no-support
iso            1.3.6.1.2.1.100 no-support
iso            1.3.6.1.2.1.4.39 no-support
iso            1.3.6.1.2.1.5.20 no-support
=====
A:ALU-1#

```

Table 34: System Security View Field Descriptions

Label	Description
View name	The name of the view. Views control the accessibility of a MIB object within the configured MIB view and subtree.
OID tree	The Object Identifier (OID) value. OIDs uniquely identify MIB objects in the subtree.
Mask	The mask value and the mask type, along with the <i>oid-value</i> configured in the view command, determines the access of each sub-identifier of an object identifier (MIB subtree) in the view
Permission	Included: specifies to include MIB subtree objects

Label	Description
	Excluded: specifies to exclude MIB subtree objects
	No-support: specifies not to support MIB subtree objects
No. of Views	The total number of configured views
Group name	The access group name

5 Event and Accounting Logs

This chapter provides information about configuring event and accounting logs on the 7705 SAR.

Topics in this chapter include:

- [Logging Overview](#)
- [Log Destinations](#)
- [Event Logs](#)
- [Accounting Logs](#)
- [Configuration Notes](#)
- [Configuring Logging with CLI](#)
- [Log Command Reference](#)

5.1 Logging Overview

The two primary types of logging supported on the 7705 SAR are:

- [Event Logging](#)
- [Accounting Logs](#)

5.1.1 Log file encryption

The log files saved in local storage can be encrypted using the AES-256-CTR algorithm.

Use the following CLI syntax to configure the log file encryption key and enable log file encryption:

```
configure
log
  encryption-key key [hash | hash2]
```



Note:

- The encrypted log files can be decrypted offline using the appropriate OpenSSL command:

```
openssl enc -aes-256-ctr -pbkdf2 -d -in <log file encrypted> -out <output log file> -p
-pass pass:<passphrase>
```

- When an encrypted log file is opened in a text editor, editing or viewing the file contents is not possible because the entire file is encrypted.

5.1.2 Event Logging

Event logging controls the generation, dissemination and recording of system events for monitoring status and troubleshooting faults within the system. Events are messages generated by the system by applications or processes within the 7705 SAR. The 7705 SAR groups events into four major categories or event sources:

- Security events — security events are generated by the SECURITY application and pertain to attempts to breach system security
- Change events — change events are generated by the USER application and pertain to the configuration and operation of the node
- Debug events — debug events are generated by the DEBUG application and pertain to trace or other debugging information
- Main events — main events pertain to 7705 SAR applications that are not assigned to other event categories/sources

The applications listed above have the following properties:

- a timestamp in UTC or local time
- the generating application
- a unique event ID within the application
- a router name identifying the VRF-ID that generated the event

- a subject identifying the affected object
- a short text description

Event control assigns the severity for each application event and determines whether the event should be generated or suppressed. The severity numbers and severity names supported in the 7705 SAR conform to ITU standards M.3100 X.733 and X.21 and are listed in [Table 35: Event Severity Levels](#) .

Table 35: Event Severity Levels

Severity Number	Severity Name
1	Cleared
2	Indeterminate (info)
3	Critical
4	Major
5	Minor
6	Warning

Event control maintains a count of the number of events generated (logged) and dropped (suppressed) for each application event. The severity of an application event can be configured in event control.

An event log within the 7705 SAR associates the event sources with logging destinations. Examples of logging destinations include the console session, memory logs, file destinations, SNMP trap groups, and syslog destinations. A log filter policy can be associated with the event log to control which events are logged in the event log based on combinations of application, severity, event ID range, and the subject of the event.

5.1.3 Accounting Logs

The 7705 SAR accounting logs collect comprehensive statistics to support several billing models. The 7705 SAR collects accounting data on services and on network interfaces on a per-forwarding class basis.

In addition to gathering information critical for service billing, accounting records can be analyzed to provide insight about customer service trends for potential service revenue opportunities. Accounting statistics on network ports can be used to track link utilization and network capacity planning. This information is valuable for traffic engineering and capacity planning within the network core.

The 7705 SAR also supports SAA accounting policies.

Accounting statistics are collected according to the parameters defined within the context of an accounting policy. Accounting policies are applied to customer Service Access Points (SAPs) and network interfaces. Accounting statistics are collected by counters for individual service queues defined on the customer's SAPs or by the counters within forwarding class (FC) queues defined on the network ports.

The type of record defined within the accounting policy determines where a policy is applied, which statistics are collected, and the time interval at which to collect statistics.

The only supported destination for an accounting log is a compact flash system device (*cf3*: on all platforms; also *cf1*: or *cf2*: on the 7705 SAR-18). Accounting data is stored within a standard directory structure on the device in compressed XML format.

5.2 Log Destinations

Both event logs and accounting logs use a common mechanism for referencing a log destination. The 7705 SAR supports the following log destinations:

- [Console](#)
- [Session](#)
- [Memory Logs](#)
- [Log Files](#)
- [SNMP Trap Group](#)
- [Syslog](#)

An event log can be associated with multiple event sources, but it can only have a single log destination. Any of the supported log destinations can be configured for an event log.

For an accounting log, the only type of log destination that can be configured is a file destination.

5.2.1 Console

Sending events to a console destination means the message will be sent to the system console. The console device can be used as an event log destination.

5.2.2 Session

A session destination is a temporary log destination that directs entries to the active Telnet or SSH session for the duration of the session. When the session is terminated, for example, when the user logs out, the **to session** configuration is removed. Event logs configured with a session destination are stored in the configuration file but the **to session** part of the configuration is not stored. Event logs can direct log entries to the session destination.

5.2.3 Memory Logs

A memory log is a circular buffer. When the log is full, the oldest entry in the log is replaced with the new entry. When a memory log is created, the specific number of entries it can hold can be specified; otherwise, it will assume a default size. An event log can send entries to a memory log destination.

5.2.4 Log Files

Log files can be used by both event logs and accounting logs and are stored on the compact flash device (*cf3*: on all platforms; also *cf1*: or *cf2*: on the 7705 SAR-18) in the file system. A log file destination is configured using the **config>log>file-id log-file-id** command. A log file destination is applied to an event log using the **config>log>log-id>to file** command and to an accounting file using the **config>log>accounting-policy>to file** command.

A log file is identified by a single log file ID, but a log file will generally be composed of a number of individual files in the file system. A log file is configured with the following parameters:

- **rollover**: represents the length of time, expressed in minutes, that an individual log file should be written to before a new file is created for the relevant log file ID. The rollover time is checked only when an update to the log is performed. Thus this rule is subject to the incoming rate of the data being logged. For example, if the rate is very low, the actual rollover time may be longer than the configured value.
- **retention time**: for a log file, specifies the amount of time the file should be retained on the system based on the creation date and time of the file. The retention time is used as a factor to determine which files should be deleted first if the file system device nears 100% usage.

When a log file is created, only the compact flash device for the log file is specified. Log files are created in specific subdirectories with standardized names depending on the type of information stored in the log file.

5.2.4.1 Event Log Files

Event log files are always created in the `\log` directory on the compact flash device. The naming convention for event log files is:

logeeff-timestamp

where:

- *ee* is the event log ID
- *ff* is the log file destination ID
- *timestamp* is the timestamp when the file is created in the form of *yyyymmdd-hhmmss*

where:

- *yyyy* is the four-digit year (for example, 2015)
- *mm* is the two-digit number representing the month (for example, 12 for December)
- *dd* is the two-digit number representing the day of the month (for example, 03 for the 3rd of the month)
- *hh* is the two-digit hour in a 24-hour clock (for example, 04 for 4 a.m.)
- *mm* is the two-digit minute (for example, 30 for 30 minutes past the hour)
- *ss* is the two-digit second (for example, 14 for 14 seconds)

5.2.4.2 Accounting Log Files

Accounting log files are created in the `\act-collect` directory on the compact flash device. The naming convention for accounting logs is:

actaaff-timestamp.xml.gz

where:

- *aa* is the accounting policy ID
- *ff* is the log file destination ID
- *timestamp* is the timestamp when the file is created, in the same form as for event logs.

Accounting logs are **.xml** files that are created in a compressed format and have a **.gz** extension.

The `\act-collect` directory is where active accounting logs are written. When an accounting log is rolled over, the active file is closed and archived in the `\act` directory before a new active accounting log file is created in `\act-collect`.

5.2.5 SNMP Trap Group

An event log can be configured to send events to SNMP trap receivers by specifying an SNMP trap group destination.

An SNMP trap group can have multiple trap targets. Each trap target can have different operational parameters.

A trap destination has the following properties:

- the IP address of the trap receiver (IPv4 or IPv6)
- the UDP port used to send the SNMP trap
- SNMP version (v1, v2c, or v3) used to format the SNMP notification
- SNMP community name for SNMPv1 and SNMPv2c receivers
- security name and level for SNMPv3 trap receivers

For SNMP traps that will be sent out-of-band through the Management Ethernet port on the CSM, the source IP address of the trap is the IP interface address defined on the Management Ethernet port. For SNMP traps that will be sent in-band, the source IP address of the trap is the system IP address of the 7705 SAR.

Each trap target destination of a trap group receives the identical sequence of events as defined by the log ID and the associated sources and log filter applied.

5.2.6 Syslog

An event log can be configured to send events to one syslog destination. Syslog destinations have the following properties:

- syslog server IP address (IPv4 or IPv6)
- the UDP port used to send the syslog message
- the Syslog Facility Code
- the Syslog Severity Threshold (0 to 7) (events exceeding the configured level will be sent)

Because syslog uses eight severity levels, whereas the 7705 SAR uses six internal severity levels, the severity levels are mapped to syslog severities. [Table 36: 7705 SAR to Syslog Severity Level Mappings](#) displays the severity level mappings to syslog severities.

Table 36: 7705 SAR to Syslog Severity Level Mappings

7705 SAR Severity Level	Syslog Severity Level (highest to lowest)	Syslog Configured Severity	Definition
3 critical	0	emergency	System is unusable
	1	alert	Action must be taken immediately
4 major	2	critical	Critical conditions

7705 SAR Severity Level	Syslog Severity Level (highest to lowest)	Syslog Configured Severity	Definition
5 minor	3	error	Error conditions
6 warning	4	warning	Warning conditions
	5	notice	Normal but significant condition
1 cleared	6	info	Informational messages
2 indeterminate	7	debug	Debug-level messages

5.3 Event Logs

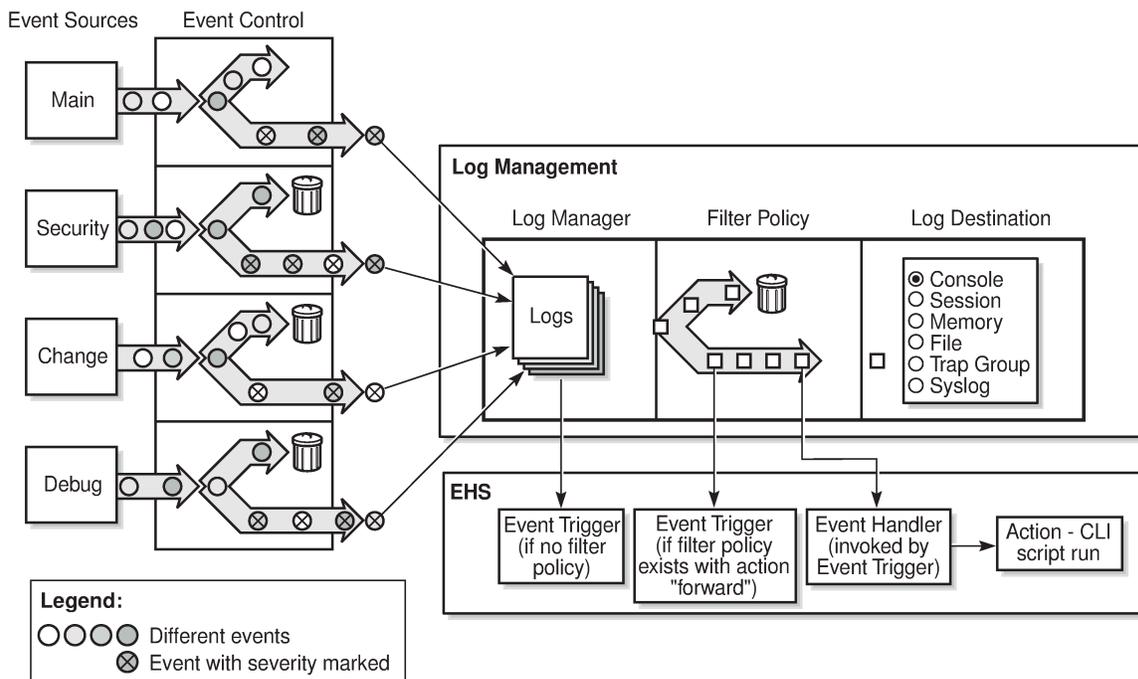
This section contains the following topics:

- [Event Sources](#)
- [Event Control](#)
- [Log Manager and Event Logs](#)
- [Event Filter Policies](#)
- [Event Log Entries](#)
- [Simple Logger Event Throttling](#)
- [Default System Logs](#)
- [Event Handling System](#)

Event logs are the means of recording system-generated events for later analysis. Events are messages generated by the system by applications or processes within the 7705 SAR.

Figure 4: Event Logging Block Diagram depicts a functional block diagram of event logging.

Figure 4: Event Logging Block Diagram



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5.3.1 Event Sources

In [Figure 4: Event Logging Block Diagram](#), the event sources are the main categories of events that feed the log manager.

- **Security** — The security event source is all events that affect attempts to breach system security, such as failed login attempts, attempts to access MIB tables to which the user is not granted access, or attempts to enter a branch of the CLI to which access has not been granted. Security events are generated by the SECURITY application.
- **Change** — The change activity event source is all events that directly affect the configuration or operation of the node. Change events are generated by the USER application.
- **Debug** — The debug event source is the debugging configuration that has been enabled on the system. Debug events are generated by the DEBUG application.
- **Main** — The main event source receives events from all other applications within the 7705 SAR.

The **show log applications** command displays all applications:

```
*A:ALU-48# show log applications
=====
Log Event Application Names
=====
Application Name
-----
APS
...
BGP
CHASSIS
CPMHWFILTER
...
IGMP_SNOOPING
IP
IPSEC
...
MIRROR
MLD
MLD_SNOOPING
...
ROUTE_POLICY
RSVP
...
VRTR
FIREWALL
...
=====
*A:ALU-48#
```

5.3.2 Event Control

Event control preprocesses the events generated by applications before the event is passed into the main event stream. Event control assigns a severity to application events and can either forward the event to the main event source or suppress the event. Suppressed events are counted in event control, but these events do not generate log entries as they never reach the log manager.

Simple event throttling is another method of event control and is configured in the same way as the generation and suppression options. See [Simple Logger Event Throttling](#).

Events are assigned a default severity level in the system, but the application event severities can be changed by the user.

Application events contain an event number and description that describes why the event is generated. The event number is unique within an application, but the number can be duplicated in other applications.

The following example, generated by querying event control for application-generated events, displays a partial list of event numbers and names.

```

router# show log event-control
=====
Log Events
=====
Application
ID#      Event Name                                P  g/s    Logged    Dropped
-----
ATM:
  2011 tAtmPlcpSubLayerClear                 MI  gen    0         0
  2012 tAtmEpOutOfPeerVpiOrVciRange        WA  gen    0         0
  2013 tAtmMaxPeerVccsExceeded             WA  gen    0         0
...
CHASSIS:
  2001 cardFailure                         MA  gen    0         0
  2002 cardInserted                       MI  gen    7         0
  2003 cardRemoved                        MI  gen    0         0
...
DEBUG:
L 2001 traceEvent                          MI  gen    0         0
EFM_OAM:
  2001 tmnxDot30amPeerChanged             MI  gen    0         0
  2002 tmnxDot30amLoopDetected           MI  gen    0         0
FILTER:
  2001 tIPFilterPBRPacketsDrop            WA  gen    0         0
  2002 tFilterEntryActivationFailed        WA  gen    0         0
  2003 tFilterEntryActivationRestored      WA  gen    0         0
GSMP:
  2001 tmnxAncpIngRateMonitorEvent        WA  gen    0         0
L 2002 tmnxAncpIngRateMonitorEventL      WA  gen    0         0
  2003 tmnxAncpEgrRateMonitorEvent        WA  gen    0         0
...
IP:
L 2001 clearRTMError                      MI  gen    0         0
L 2002 ipEtherBroadcast                  MI  gen    0         0
L 2003 ipDuplicateAddress                 MI  gen    0         0
...
LDP:
  2001 vRtrLdpStateChange                 MI  gen    0         0
  2002 vRtrLdpInstanceStateChange        MI  gen    0         0
  2003 vRtrLdpIfStateChange              MI  gen    0         0
...
LOGGER:
L 2001 STARTED                           MI  gen    5         0
  2002 tmnxLogTraceError                  CR  gen    0         0
  2005 tmnxLogSpaceContention            MA  gen    0         0
...
MPLS:
  2001 mplsXCUp                           WA  gen    0         0
  2002 mplsXCDown                         WA  gen    0         0
  2003 mplsTunnelUp                       WA  gen    0         0
...
NTP:
  2001 tmnxNtpAuthMismatch                WA  gen    0         0
  2002 tmnxNtpNoServersAvail             MA  gen    0         0

```

```

    2003 tmnxNtpServersAvail          MI gen          0          0
...
SYSTEM:
    2001 stiDateAndTimeChanged       WA gen          0          0
    2002 ssiSaveConfigSucceeded     MA gen          0          0
    2003 ssiSaveConfigFailed        CR gen          0          0
...
USER:
L 2001 cli_user_login               MI gen          4          0
L 2002 cli_user_logout              MI gen          3          0
L 2003 cli_user_login_failed        MI gen          0          0
...
VRTR:
    2001 tmnxVRtrMidRouteTCA        MI gen          0          0
    2002 tmnxVRtrHighRouteTCA      MI gen          0          0
    2003 tmnxVRtrHighRouteCleared   MI gen          0          0
...
=====
router#

```

5.3.3 Log Manager and Event Logs

Events that are forwarded by event control are sent to the log manager. The log manager manages the event logs in the system and the relationships between the log sources, event logs and log destinations, and log filter policies.

An event log has the following properties:

- a unique log ID

The log ID is a short, numeric identifier for the event log. A maximum of 10 logs can be configured at a time.

- one or more log sources

The source stream or streams to be sent to log destinations can be specified. The source must be identified before the destination can be specified. The events can be from the main event stream, events in the security event stream, or events in the user activity stream.

- one event log destination

A log can only have a single destination. The destination for the log ID destination can be one of console, session, syslog, snmp-trap-group, memory, or a file on the local file system.

- an optional event filter policy

An event filter policy defines whether to forward or drop an event or trap based on match criteria.

5.3.4 Event Filter Policies

The log manager uses event filter policies to control which events are forwarded or dropped based on various criteria. Like other policies with the 7705 SAR, filter policies have a default action. The default actions are either:

- forward
- drop

Filter policies also include a number of filter policy entries that are identified with an entry ID and define specific match criteria and a forward or drop action for the match criteria.

Each entry contains a combination of matching criteria that define the application, event number, router, severity, and subject conditions. The entry's action determines how the packets should be treated if they have met the match criteria.

Entries are evaluated in order from the lowest to the highest entry ID. The first matching event is subject to the forward or drop action for that entry.

Filter policy 1001 exists by default and collects events for the Serious Error Log (log ID 100). Filter policy 1001 is preconfigured with one entry that is configured to collect events of major severity or higher. Filter policy 1001 can be reconfigured by the user.

Valid operators are displayed in [Table 37: Valid Filter Policy Operators](#) .

Table 37: Valid Filter Policy Operators

Operator	Description
eq	Equal to
neq	Not equal to
lt	Less than
lte	Less than or equal to
gt	Greater than
gte	Greater than or equal to

A match criteria entry can include combinations of:

- equal to or not equal to a specified system application
- equal to, not equal to, less than, less than or equal to, greater than, or greater than or equal to an event number within the application
- equal to, not equal to, less than, less than or equal to, greater than, or greater than or equal to a severity level
- equal to or not equal to a router name string or regular expression match
- equal to or not equal to an event subject string or regular expression match

5.3.5 Event Log Entries

Log entries that are forwarded to a destination are formatted in a way that is appropriate for the specific destination; for example, whether it is to be recorded to a file or sent as an SNMP trap, but log event entries also have common elements or properties. All application-generated events have the following properties:

- a timestamp in UTC or local time
- the generating application
- a unique event ID within the application

- a router name identifying the VRF-ID that generated the event
- a subject identifying the affected object
- a short text description

The general format for an event in an event log with either a memory, console or file destination is as follows:

```
nnnn YYYY/MM/DD HH:MM:SS.SS <severity>:<application> # <event_id> <router-
name> <subject> description
```

The following is an event log example:

```
475 2015/11/27 00:19:40.38 WARNING: SNMP #2008 Base 1/1/1
"interface 1/1/1 came up"
```

The specific elements that make up the general format are described in [Table 38: Log Entry Field Descriptions](#).

Table 38: Log Entry Field Descriptions

Label	Description
nnnn	The log entry sequence number
YYYY/MM/DD	The UTC date stamp for the log entry YYYY — Year MM — Month DD — Day
HH:MM:SS.SS	The UTC timestamp for the event HH — Hours (24-hour format) MM — Minutes SS.SS — Seconds
<severity>	The severity level name of the event CLEARED — a cleared event (severity number 1) INFO — an indeterminate/informational severity event (severity level 2) CRITICAL — a critical severity event (severity level 3) MAJOR — a major severity event (severity level 4) MINOR — a minor severity event (severity level 5) WARNING — a warning severity event (severity 6)
<application>	The application generating the log message
<event_id>	The application's event ID number for the event

Label	Description
<router>	The router name representing the VRF-ID that generated the event
<subject>	The subject/affected object for the event
<description>	A text description of the event

5.3.6 Simple Logger Event Throttling

Simple event throttling provides a mechanism to protect event receivers from being overloaded when a scenario causes many events to be generated in a very short period of time. A throttling rate (events/seconds) can be configured. Specific application events can be configured to be throttled. When the throttling event limit is exceeded in a throttling interval, any further events of that type are dropped and the dropped events counter is incremented. Dropped events counts are displayed with the **show>log>event-control** command. Events are dropped before being sent to one of the logger event collector tasks. There is no record of the details of the dropped events and therefore no way to retrieve event history data lost by this throttling method.

A particular event type can be generated by multiple managed objects within the system. At the point that this throttling method is applied, the logger application has no information about the managed object that generated the event and cannot distinguish between events generated by object "A" from events generated by object "B". If the events have the same event-id, they are throttled regardless of the managed object that generated them. The logger application also cannot distinguish between events that will be logged to destination log-id <n> from events that will be logged to destination log-id <m>.

Throttle rate applies commonly to all event types. It is not configurable for a specific event type.

A timer task checks for events dropped by throttling when the throttle interval expires. If any events have been dropped, a TIMETRA-SYSTEM-MIB::tmnxTrapDropped notification is sent.

By default, event throttling is set to off for each specific event type. It must be explicitly enabled for each event type where throttling is needed. This makes backwards compatibility of configuration files easier to manage.

5.3.7 Default System Logs

Log 99 is a preconfigured memory-based log that collects events from the main event source (that is, not the security, debug, or change source). Log 100 is preconfigured to be associated with filter policy 1001, which is preconfigured to collect events of major severity or higher. Log 100 can be reconfigured by the user.

Log 99 and log 100 exist by default.

The following example displays the log 99 and log 100 configurations.

```
ALU-1>config>log# info detail
#-----
echo "Log Configuration "
#-----
...
    log-id 99
      description "Default system log"
```

```
no filter
time-format utc
from main
to memory 500
no shutdown
exit
log-id 100
description "Default Serious Errors Log"
filter 1001
time-format utc
from main
to memory 500
no shutdown
exit
-----
```

5.3.8 Event Handling System

The Event Handling System (EHS) is a tool that enables operator-defined behavior to be configured on the 7705 SAR. The operator can define a CLI script that the router executes in response to a log event. The event is referred to as the trigger, where the trigger can be all or part of any event message. Regular expression (regex) matching can be done on various fields in the log event to give flexibility in the trigger definition.

EHS gives operators the flexibility to configure the 7705 SAR to take actions based on specific events that cannot be done by protocols or services. For example, event-triggered actions can:

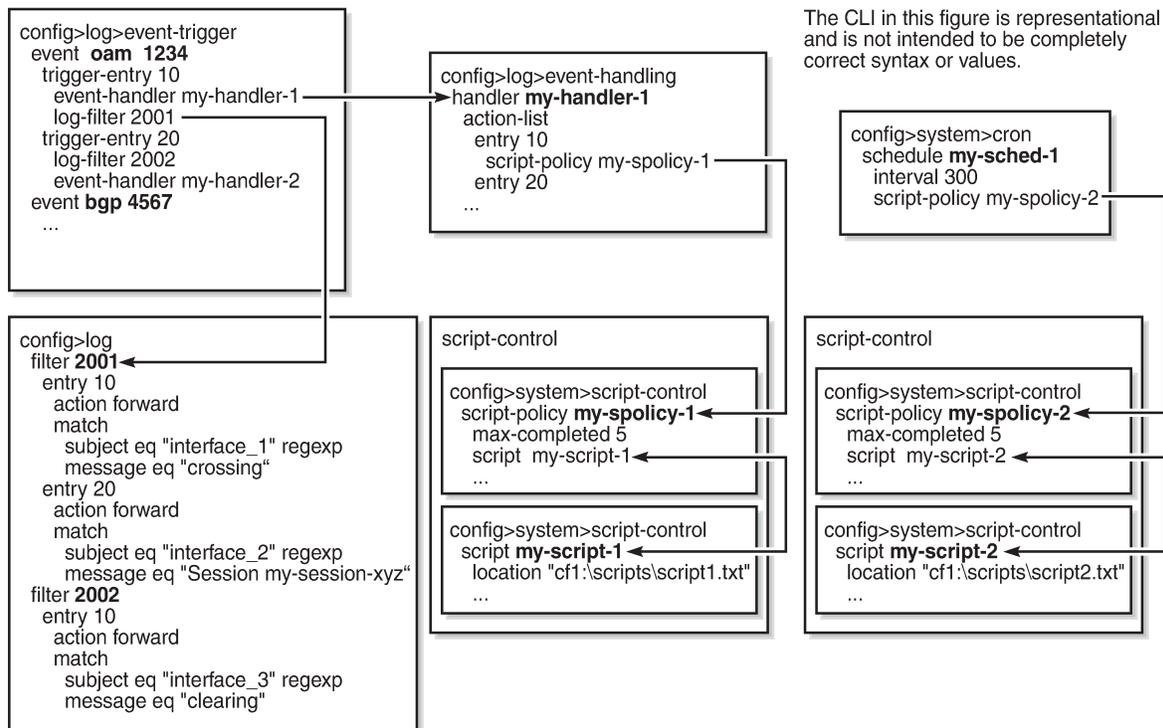
- help with network convergence in response to a specific event
- provide automatic exception handling upon detection of a specific problem

EHS objects are used to tie together trigger events (typically log events that match some configurable criteria) and a set of actions to perform (typically one or more CLI scripts).

EHS, along with CRON, makes use of the **script-control** functions for scripts. Any command available in the CLI can be executed in a script as the result of an event handler being triggered, except for commands that require interaction (for example, a y/n prompt for **admin reboot** without the **now** keyword, or commands that require a password). A script will error out if it encounters a command that requests input.

[Figure 5: EHS Object Relationships](#) shows the relationships between the different configurable objects used by EHS (and CRON).

Figure 5: EHS Object Relationships



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5.3.8.1 Configuring Event Handling

As shown in [Figure 5: EHS Object Relationships](#), the steps involved in configuring EHS are:

- configure a script and script policy under the **config>system>script-control** context; the script policy references the configured script
- configure an event handler under the **config>log>event-handling** context and assign actions that reference the previously configured script policy
- configure the event trigger under the **config>log>event-trigger** context that defines the event that triggers the running of the script

See the 7705 SAR Basic System Configuration Guide, "CLI Script Control" for information about configuring scripts and script policies.

5.3.8.1.1 Event Handlers

Event handlers are created under the **config>log>event-handling** context. Each event handler is assigned an event handler name and an action list that consists of one or more entries. Each entry in the list references a configured script policy, which in turn references a configured script.

5.3.8.1.2 Event Triggers

Event triggers are created under the **config>log>event-trigger** context. Each event trigger is associated with an application and event ID. One or more trigger entries can be configured for the event.

Each trigger entry references a previously configured event handler (which references a configured script policy, which in turn references the script that should be run). A trigger entry can be configured with a previously configured log filter. If a filter is configured, the event trigger calls the filter to determine whether the event should be dropped or forwarded. If the event is to be forwarded, the event trigger invokes the event handler.

All log filter matching options are supported. Regexp matching is supported. Complex rules can be configured to match on log events as a trigger for an EHS event handler.

The EHS triggers on log events that are dropped by user-configured log filters that are assigned to individual logs (with the **config>log>log-id>filter** command). The EHS event trigger occurs before the distribution of log event streams into individual logs.

If there is no filter configured for the trigger entry, the event trigger invokes the event handler as soon as the event occurs.

Log events can be configured to be suppressed or throttled (with the **config>log>event-control** command). EHS does not trigger on suppressed or throttled events.

5.3.8.1.2.1 Debounce

EHS debounce is the ability to trigger an action (for example, an EHS script), if an event happens (N) times within a specific time period (window) in seconds (S):

where:

N = 2 to 15 occurrences

S = 1 to 604800 seconds

For example, if linkDown occurs N times in S seconds, an EHS script is triggered to shut down the port.



Note:

- Triggering happens with the Nth event, not at the end of the time window (S).
- There is no sliding time window (for example, a trigger at the Nth event, N+1 event, and N+2 event) because N is reset after a trigger and the count is restarted.
- When EHS debouncing is used, the varbinds passed in to an EHS script at script triggering time are from the Nth event occurrence (the Nth triggering event); see [Variable Passing](#).
- If S is not specified, the 7705 SAR continues to trigger every Nth event.

5.3.8.1.2.2 Variable Passing

The common parameters and variable bindings (varbinds) of a triggering log event are passed in to the triggered EHS script and can be used in the script as passed-in (dynamic) variables. These variables are:

- the common event parameters: appid, name, eventid, severity, subject, and gentime
- the predefined varbinds in a log event message; a varbind is a list of values or attributes included in a log event

Passed-in variables are read-only.



Note:

- To view event parameters and varbinds, use the show log [event-parameters](#) command.
- The passed-in event **gentime** is always UTC.
- The event sequence number is not passed in to the script.

5.3.8.1.3 EHS Scripting

An EHS script can contain local (static) variables and use some basic `.if` and `.set` commands. The use of variables with `.if` and `.set` commands in an EHS script adds more logic to EHS scripting and allows the reuse of a single EHS script for more than one trigger or action.

Both the passed-in and local variables can be used in the EHS script either as part of the CLI commands or as part of the `.if` or `.set` commands.

The following applies to both CLI commands and `.if` or `.set` commands.

- Using `$X` (without using single or double quotes) replaces the variable `X` with its string or integer value.
- Using `"X"` (with double quotes) means the literal string `X`.
- Using `"$X"` (with double quotes) replaces the variable `X` with its string or integer value.
- Using `'X'` (with single quotes) means the literal string `X`.
- Using `'$X'` (with single quotes) does not replace the variable `X` with its value but means the literal string `$X`.

In summary:

- All characters within single quotes are interpreted as string characters.
- All characters within double quotes are interpreted as string characters except for `$`, which replaces the variable with its value (for example, shell expansion inside a string).

Some supported shell command scenarios are as follows (the commands are pseudo commands):

- ```
.if $string_variable==string_value_or_string_variable {
 CLI_commands_set1
} else {
 CLI_commands_set2
} endif
```
- ```
.if ($string_variable==string_value_or_string_variable) {
  CLI_commands_set1
} else {
  CLI_commands_set2
} endif
```
- ```
.if $integer_variable==integer_value_or_integer_variable {
 CLI_commands_set1
} else {
```

```

 CLI_commands_set2
 } endif
 • .if ($integer_variable==integer_value_or_integer_variable) {
 CLI_commands_set1
 } else {
 CLI_commands_set2
 } endif
 • .if $string_variable!=string_value_or_string_variable {
 CLI_commands_set1
 } else {
 CLI_commands_set2
 } endif
 • .if ($string_variable!=string_value_or_string_variable) {
 CLI_commands_set1
 } else {
 CLI_commands_set2
 } endif
 • .if $integer_variable!=integer_value_or_integer_variable {
 CLI_commands_set1
 } else {
 CLI_commands_set2
 } endif
 • .if ($integer_variable!=integer_value_or_integer_variable) {
 CLI_commands_set1
 } else {
 CLI_commands_set2
 } endif
 • .set $string_variable = string_value_or_string_variable
 • .set ($string_variable = string_value_or_string_variable)
 • .set $integer_variable = integer_value_or_integer_variable
 • .set ($integer_variable = integer_value_or_integer_variable)

```

where:

- *CLI\_commands\_set1* is a set of one or more CLI commands
- *CLI\_commands\_set2* is a set of one or more CLI commands
- *string\_variable* is a local string variable
- *string\_value\_or\_string\_variable* is a string value/variable

- *integer\_variable* is a local integer variable
- *integer\_value\_or\_integer\_variable* is an integer value/variable

**Note:**

- A maximum of 100 local variables per EHS script is imposed. Exceeding this limit may result in an error and only partial execution of the script.
- When a set statement is used to set a *string\_variable* to a *string\_value*, the *string\_value* can be any non-integer value with optional single or double quotes.
- A "." preceding a directive (for example, if, and set) is always expected to start a new line.
- An end of line is always expected after {.
- A CLI command is always expected to start a new line.
- Passed-in (dynamic) variables are always read-only inside an EHS script and cannot be overwritten using a set statement.
- .if commands support == and != operators only.
- .if and .set commands support addition, subtraction, multiplication, and division of integers.
- .if and .set commands support concatenation of strings.

Valid examples:

- configure service epipe \$serviceID  
where *\$serviceID* is either a local integer variable or passed-in integer variable
- echo srcAddr is \$srcAddr  
where *\$srcAddr* is a passed-in string variable
- .set \$ipAddr = "10.0.0.1"  
where *\$ipAddr* is a local string variable
- .set \$ipAddr = \$srcAddr  
where *\$srcAddr* is a passed-in string variable  
*\$ipAddr* is a local string variable
- .set (\$customerID = 50)  
where *\$customerID* is a local integer variable
- .set (\$totalPackets = \$numIngrPackets + \$numEgrPackets)  
where *\$totalPackets*, *\$numIngrPackets*, *\$numEgrPackets* are local integer variables
- .set (\$portDescription = \$portName + \$portLocation)  
where *\$portDescription*, *\$portName*, *\$portLocation* are local string variables
- if (\$srcAddr == "CONSOLE") {  
CLI\_commands\_set1  
.else {  
CLI\_commands\_set2  
.} endif  
where *\$srcAddr* is a passed-in string variable

*CLI\_commands\_set1* is a set of one or more CLI commands

*CLI\_commands\_set2* is a set of one or more CLI commands

- `.if ($customerId == 10) {`

*CLI\_commands\_set1*

`.else {`

*CLI\_commands\_set2*

`.} endif`

where *\$customerId* is a passed-in integer variable

*CLI\_commands\_set1* is a set of one or more CLI commands

*CLI\_commands\_set2* is a set of one or more CLI commands

- `.if ($numIngrPackets == $numEgrPackets) {`

*CLI\_commands\_set1*

`.else {`

*CLI\_commands\_set2*

`.} endif`

where *\$numIngrPackets* and *\$numEgrPackets* are local integer variables

*CLI\_commands\_set1* is a set of one or more CLI commands

*CLI\_commands\_set2* is a set of one or more CLI commands

Invalid examples:

- `.set $srcAddr = "10.0.0.1"`

where *\$srcAddr* is a passed-in string variable

Reason: passed-in variables are read-only in an EHS script

- `.set ($ipAddr = '$numIngrPackets' + $numEgrPackets)`

where *\$ipAddr* is a local string variable

*\$numIngrPackets* and *\$numEgrPackets* are local integer variables

Reason: variable types do not match; cannot assign a string to an integer

- `.set ($numIngrPackets = $ipAddr + $numEgrPackets)`

where *\$ipAddr* is a local string variable

*\$numIngrPackets* and *\$numEgrPackets* are local integer variables

Reason: variable types do not match; cannot concatenate a string to an integer

- `.set $ipAddr = "10.0.0.1"100`

where *\$ipAddr* is a local string variable

Reason: when double quotes are used, they must enclose the entire string

- `.if ($totalPackets == "10.1.1.1") {`

`.} endif`

where *\$totalPackets* is a local integer variable

Reason: cannot compare an integer variable to a string value

- `.if ($ipAddr == 10) {  
 .} endif`

where *\$ipAddr* is a local string variable

Reason: cannot compare a string variable to an integer value

- `.if ($totalPackets == $ipAddr) {`

where *\$totalPackets* is a local integer variable

*\$ipAddr* is a local string variable

Reason: cannot compare an integer variable to a string variable

#### 5.3.8.1.4 Hardware Support

EHS is supported on all 7705 SAR cards, modules, and fixed platforms.

## 5.4 Accounting Logs

This section contains the following topics:

- [Accounting Records](#)
- [Accounting Files](#)
- [Design Considerations](#)

Before an accounting policy can be created, a target log file must be created to collect the accounting records. The files are stored in system memory on a compact flash (*cf3*: on all platforms; also *cf1*: or *cf2*: on the 7705 SAR-18) in a compressed (tar) XML format and can be retrieved using FTP or SCP.

### 5.4.1 Accounting Records

An accounting policy must define a record name and collection interval. Only one record name can be configured per accounting policy. Also, a record name can only be used in one accounting policy.

[Table 39: Accounting Record Name and Collection Periods](#) lists the record name, sub-record types, and default collection period for service and network accounting policies.

*Table 39: Accounting Record Name and Collection Periods*

| Record Name                     | Sub-Record Types        | Accounting Object | Default Collection Period (minutes) |
|---------------------------------|-------------------------|-------------------|-------------------------------------|
| service-ingress-octets          | sio                     | SAP               | 5                                   |
| service-egress-octets           | seo                     | SAP               | 5                                   |
| service-ingress-packets         | sip                     | SAP               | 5                                   |
| service-egress-packets          | sep                     | SAP               | 5                                   |
| combined-service-ing-egr-octets | cmSio and cmSeo         | SAP               | 5                                   |
| complete-service-ingress-egress | cpSipo and cpSepa       | SAP               | 5                                   |
| saa                             | saa (png)<br>trc<br>hop | SAA or SAA test   | 5                                   |
| network-ingress-octets          | nio                     | Network port      | 15                                  |
| network-egress-octets           | neo                     | Network port      | 15                                  |
| network-ingress-packets         | nip                     | Network port      | 15                                  |
| network-egress-packets          | nep                     | Network port      | 15                                  |

| Record Name                                           | Sub-Record Types        | Accounting Object | Default Collection Period (minutes) |
|-------------------------------------------------------|-------------------------|-------------------|-------------------------------------|
| combined-network-ing-egr-octets                       | cmNio and cmNeo         | Network port      | 15                                  |
| complete-network-ingr-egr                             | cpNipo and cpNepo       | Network port      | 15                                  |
| combined-mpls-lsp-ingress<br>combined-mpls-lsp-egress | mplsLsplng<br>mplsLspEg | lsp               | 5                                   |
| combined-ldp-lsp-egress                               | ldpEgr                  | lsp               | 5                                   |

The 7705 SAR supports simultaneous collection for some records. For example, "complete-network-ingr-egr" (cpNipo and cpNepo) simultaneously collects statistics on network-ingress octets, network-ingress packets, network-egress octets, and network-egress packets for the same network port.

Similarly, on the service side, "complete-service-ingr-egr" (cpSipo and cpSepo) simultaneously collects statistics on service-ingress octets, service-ingress packets, service-egress octets, and service-egress packets from a single SAP.

When creating accounting policies, one service accounting policy and one network accounting policy can be defined as the default. If statistics collection is enabled on a SAP or network port and no accounting policy is applied, the respective default policy is used. If no default policy is defined, no statistics are collected unless a specifically defined accounting policy is applied.

Each accounting record name is composed of one or more sub-records, which are in turn composed of multiple fields. [Table 40: Accounting Record Name Details](#) lists the accounting policy record names and the statistics that are collected with each.

Table 40: Accounting Record Name Details

| Record Name                                                                      | Sub-Record                           | Field      | Field Description                |
|----------------------------------------------------------------------------------|--------------------------------------|------------|----------------------------------|
| combined-mpls-lsp-ingress<br>combined-mpls-lsp-egress<br>combined-ldp-lsp-egress | cmmplslsi<br>cmmplsspe<br>cmlldplspe | cmmplslsi  | combined mpls lsp ingress        |
|                                                                                  |                                      | cmmplsspe  | combined mpls lsp egress         |
|                                                                                  |                                      | cmlldplspe | combined ldp lsp egress          |
|                                                                                  |                                      | iof        | InProfileOctetsForwarded         |
|                                                                                  |                                      | oof        | OutOfProfileOctetsForwarded      |
|                                                                                  |                                      | ipf        | In-profile packets forwarded     |
|                                                                                  |                                      | opf        | Out-of-profile packets forwarded |
|                                                                                  |                                      | fc         | Packet forwarding class          |
| service-ingress-octets                                                           | sio                                  | svc        | SvcId                            |
|                                                                                  |                                      | sap        | SapId                            |

| Record Name             | Sub-Record | Field | Field Description           |
|-------------------------|------------|-------|-----------------------------|
|                         |            | qid   | QueueId                     |
|                         |            | hoo   | OfferedHiPrioOctets         |
|                         |            | hod   | DroppedHiPrioOctets         |
|                         |            | loo   | LowOctetsOffered            |
|                         |            | lod   | LowOctetsDropped            |
|                         |            | uco   | UncoloredOctetsOffered      |
|                         |            | iof   | InProfileOctetsForwarded    |
|                         |            | oof   | OutOfProfileOctetsForwarded |
| service-egress-octets   | seo        | svc   | SvcId                       |
|                         |            | sap   | SapId                       |
|                         |            | qid   | QueueId                     |
|                         |            | iof   | InProfileOctetsForwarded    |
|                         |            | iod   | InProfileOctetsDropped      |
|                         |            | oof   | OutOfProfileOctetsForwarded |
|                         |            | ood   | OutOfProfileOctetsDropped   |
| service-ingress-packets | sip        | svc   | SvcId                       |
|                         |            | sap   | SapId                       |
|                         |            | qid   | QueueId                     |
|                         |            | hpo   | HighPktsOffered             |
|                         |            | hpd   | HighPktsDropped             |
|                         |            | lpo   | LowPktsOffered              |
|                         |            | lpd   | LowPktsDropped              |
|                         |            | ucp   | UncoloredPacketsOffered     |
|                         |            | ipf   | InProfilePktsForwarded      |
|                         |            | opf   | OutOfProfilePktsForwarded   |
| service-egress-packets  | sep        | svc   | SvcId                       |
|                         |            | sap   | SapId                       |

| Record Name                                                         | Sub-Record            | Field      | Field Description         |
|---------------------------------------------------------------------|-----------------------|------------|---------------------------|
|                                                                     |                       | qid        | QueueId                   |
|                                                                     |                       | ipf        | InProfilePktsForwarded    |
|                                                                     |                       | ipd        | InProfilePktsDropped      |
|                                                                     |                       | opf        | OutOfProfilePktsForwarded |
|                                                                     |                       | opd        | OutOfProfilePktsDropped   |
|                                                                     |                       | sap        | SapId                     |
|                                                                     |                       | slaProfile | SlaProfile                |
| complete-service-ingress-egress (cp Sipo and cpSepo)                | cpSipo                | svc        | SvcId                     |
|                                                                     |                       | sap        | SapId                     |
|                                                                     |                       | pid        | PolicerId                 |
|                                                                     |                       | hpo        | HighPktsOffered           |
|                                                                     |                       | hpd        | HighPktsDropped           |
|                                                                     |                       | lpo        | LowPktsOffered            |
|                                                                     |                       | lpd        | LowPktsDropped            |
|                                                                     |                       | ucp        | UncoloredPacketsOffered   |
|                                                                     |                       | hoo        | OfferedHiPrioOctets       |
|                                                                     |                       | hod        | DroppedHiPrioOctets       |
|                                                                     |                       | loo        | LowOctetsOffered          |
|                                                                     |                       | lod        | LowOctetsDropped          |
|                                                                     |                       | uco        | UncoloredOctetsOffered    |
|                                                                     |                       | apo        | AllPacketsOffered         |
|                                                                     |                       | aoo        | AllOctetsOffered          |
|                                                                     |                       | apd        | AllPacketsDropped         |
| aod                                                                 | AllOctetsDropped      |            |                           |
| complete-service-ingress-egress (cp Sipo and cpSepo)<br>(continued) | cpSipo<br>(continued) | apf        | AllPacketsForwarded       |
|                                                                     |                       | aof        | AllOctetsForwarded        |
|                                                                     |                       | ipd        | InProfilePktsDropped      |

| Record Name                                           | Sub-Record                | Field | Field Description            |
|-------------------------------------------------------|---------------------------|-------|------------------------------|
|                                                       |                           | iod   | InProfileOctetsDropped       |
|                                                       |                           | opd   | OutOfProfilePktsDropped      |
|                                                       |                           | ood   | OutOfProfileOctetsDropped    |
|                                                       |                           | hpf   | HighPriorityPacketsForwarded |
|                                                       |                           | hof   | HighPriorityOctetsForwarded  |
|                                                       |                           | lpf   | LowPriorityPacketsForwarded  |
|                                                       |                           | lof   | LowPriorityOctetsForwarded   |
|                                                       |                           | ipf   | InProfilePktsForwarded       |
|                                                       |                           | opf   | OutOfProfilePktsForwarded    |
|                                                       |                           | iof   | InProfileOctetsForwarded     |
|                                                       |                           | oof   | OutOfProfileOctetsForwarded  |
|                                                       | cpSepo                    | svc   | SvcId                        |
|                                                       |                           | sap   | SapId                        |
|                                                       |                           | qid   | QueueId                      |
|                                                       |                           | ipf   | InProfilePktsForwarded       |
|                                                       |                           | ipd   | InProfilePktsDropped         |
|                                                       |                           | opf   | OutOfProfilePktsForwarded    |
|                                                       |                           | opd   | OutOfProfilePktsDropped      |
|                                                       |                           | iof   | InProfileOctetsForwarded     |
|                                                       |                           | iod   | InProfileOctetsDropped       |
|                                                       |                           | oof   | OutOfProfileOctetsForwarded  |
| ood                                                   | OutOfProfileOctetsDropped |       |                              |
| combined-service-ingr-egr-octets<br>(cmSio and CmSeo) | cmSio                     | svc   | SvcId                        |
|                                                       |                           | sap   | SapId                        |
|                                                       |                           | qid   | QueueId                      |
|                                                       |                           | hoo   | OfferedHiPrioOctets          |
|                                                       |                           | hod   | DroppedHiPrioOctets          |

| Record Name             | Sub-Record             | Field | Field Description           |
|-------------------------|------------------------|-------|-----------------------------|
|                         |                        | loo   | LowOctetsOffered            |
|                         |                        | lod   | LowOctetsDropped            |
|                         |                        | uco   | UncoloredOctetsOffered      |
|                         |                        | iof   | InProfileOctetsForwarded    |
|                         |                        | oof   | OutOfProfileOctetsForwarded |
|                         | cmSeo                  | svc   | SvcId                       |
|                         |                        | sap   | SapId                       |
|                         |                        | qid   | QueueId                     |
|                         |                        | iof   | InProfileOctetsForwarded    |
|                         |                        | iod   | InProfileOctetsDropped      |
|                         |                        | oof   | OutOfProfileOctetsForwarded |
|                         |                        | ood   | OutOfProfileOctetsDropped   |
|                         | network-ingress-octets | nio   | port                        |
| qid                     |                        |       | QueueId                     |
| iof                     |                        |       | InProfileOctetsForwarded    |
| iod                     |                        |       | InProfileOctetsDropped      |
| oof                     |                        |       | OutOfProfileOctetsForwarded |
| ood                     |                        |       | OutOfProfileOctetsDropped   |
| network-egress-octets   | neo                    | port  | PortId                      |
|                         |                        | qid   | QueueId                     |
|                         |                        | iof   | InProfileOctetsForwarded    |
|                         |                        | iod   | InProfileOctetsDropped      |
|                         |                        | oof   | OutOfProfileOctetsForwarded |
|                         |                        | ood   | OutOfProfileOctetsDropped   |
| network-ingress-packets | nip                    | port  | PortId                      |
|                         |                        | qid   | QueueId                     |
|                         |                        | ipf   | InProfilePktsForwarded      |

| Record Name                                                      | Sub-Record | Field | Field Description           |
|------------------------------------------------------------------|------------|-------|-----------------------------|
|                                                                  |            | ipd   | InProfilePktsDropped        |
|                                                                  |            | opf   | OutOfProfilePktsForwarded   |
|                                                                  |            | opd   | OutOfProfilePktsDropped     |
| network-egress-packets                                           | nep        | port  | PortId                      |
|                                                                  |            | qid   | QueueId                     |
|                                                                  |            | ipf   | InProfilePktsForwarded      |
|                                                                  |            | ipd   | InProfilePktsDropped        |
|                                                                  |            | opf   | OutOfProfilePktsForwarded   |
|                                                                  |            | opd   | OutOfProfilePktsDropped     |
| combined-network-ing-egr-octets (cmNio and cmNeo)                | cmNio      | port  | PortId                      |
|                                                                  |            | qid   | QueueId                     |
|                                                                  |            | iof   | InProfileOctetsForwarded    |
|                                                                  |            | iod   | InProfileOctetsDropped      |
|                                                                  |            | oof   | OutOfProfileOctetsForwarded |
|                                                                  |            | ood   | OutOfProfileOctetsDropped   |
| combined-network-ing-egr-octets (cmNio and cmNeo)<br>(continued) | cmNeo      | port  | PortId                      |
|                                                                  |            | qid   | QueueId                     |
|                                                                  |            | iof   | InProfileOctetsForwarded    |
|                                                                  |            | iod   | InProfileOctetsDropped      |
|                                                                  |            | oof   | OutOfProfileOctetsForwarded |
|                                                                  |            | ood   | OutOfProfileOctetsDropped   |
| complete-network-ingr-egr (cpNipo and cpNepo)                    | cpNipo     | port  | PortId                      |
|                                                                  |            | qid   | QueueId                     |
|                                                                  |            | ipf   | InProfilePktsForwarded      |
|                                                                  |            | ipd   | InProfilePktsDropped        |
|                                                                  |            | opf   | OutOfProfilePktsForwarded   |
|                                                                  |            | opd   | OutOfProfilePktsDropped     |

| Record Name | Sub-Record | Field | Field Description           |
|-------------|------------|-------|-----------------------------|
|             |            | iof   | InProfileOctetsForwarded    |
|             |            | iod   | InProfileOctetsDropped      |
|             |            | oof   | OutOfProfileOctetsForwarded |
|             |            | ood   | OutOfProfileOctetsDropped   |
|             | cpNepo     | port  | PortId                      |
|             |            | qid   | QueueId                     |
|             |            | ipf   | InProfilePktsForwarded      |
|             |            | ipd   | InProfilePktsDropped        |
|             |            | opf   | OutOfProfilePktsForwarded   |
|             |            | opd   | OutOfProfilePktsDropped     |
|             |            | iof   | InProfileOctetsForwarded    |
|             |            | iod   | InProfileOctetsDropped      |
|             |            | oof   | OutOfProfileOctetsForwarded |
|             |            | ood   | OutOfProfileOctetsDropped   |
| saa         | saa        | tmd   | TestMode                    |
|             |            | own   | OwnerName                   |
|             |            | tst   | TestName                    |
|             |            | png   | PingRun subrecord           |
|             |            | rid   | RunIndex                    |
|             |            | trr   | TestRunResult               |
|             |            | mnr   | MinRtt                      |
|             |            | mrx   | MaxRtt                      |
|             |            | avr   | AverageRtt                  |
|             |            | rss   | RttSumOfSquares             |
|             |            | pbr   | ProbeResponses              |
|             |            | spb   | SentProbes                  |
|             |            | mnt   | MinOutTt                    |

| Record Name     | Sub-Record | Field | Field Description |
|-----------------|------------|-------|-------------------|
|                 |            | mxt   | MaxOutTt          |
|                 |            | avt   | AverageOutTt      |
|                 |            | tss   | OutTtSumOfSquares |
|                 |            | mni   | MinInTt           |
|                 |            | mxi   | MaxInTt           |
|                 |            | avi   | AverageInTt       |
|                 |            | iss   | InTtSumOfSqsrs    |
|                 |            | ojt   | OutJitter         |
|                 |            | ijt   | InJitter          |
|                 |            | rjt   | RtJitter          |
|                 |            | prt   | ProbeTimeouts     |
|                 |            | prf   | ProbeFailures     |
| saa (continued) | trc        | rid   | RunIndex          |
|                 |            | trr   | TestRunResult     |
|                 |            | lgp   | LastGoodProbe     |
|                 | hop        | hop   | TraceHop          |
|                 |            | hid   | HopIndex          |
|                 |            | mnr   | MinRtt            |
|                 |            | mrx   | MaxRtt            |
|                 |            | avr   | AverageRtt        |
|                 |            | rss   | RttSumOfSquares   |
|                 |            | pbr   | ProbeResponses    |
|                 |            | spb   | SentProbes        |
|                 |            | mnt   | MinOutTt          |
|                 |            | mxt   | MaxOutTt          |
|                 |            | avt   | AverageOutTt      |
|                 |            | tss   | OutTtSumOfSquares |

| Record Name | Sub-Record | Field | Field Description |
|-------------|------------|-------|-------------------|
|             |            | mni   | MinInTt           |
|             |            | mxi   | MaxInTt           |
|             |            | avi   | AverageInTt       |
|             |            | iss   | InTtSumOfSqrs     |
|             |            | ojt   | OutJitter         |
|             |            | ijt   | InJitter          |
|             |            | rjt   | RtJitter          |
|             |            | prt   | ProbeTimeouts     |
|             |            | prf   | ProbeFailures     |
|             |            | tat   | TraceAddressType  |
|             |            | tav   | TraceAddressValue |

## 5.4.2 Accounting Files

When a policy has been created and applied to a service or network port, the accounting file is stored on the compact flash in a compressed XML file format. The 7705 SAR creates two directories on the compact flash to store the files. The following output displays a directory named `act-collect` that holds accounting files that are open and actively collecting statistics, and a directory named `act` that stores the files that have been closed and are awaiting retrieval.

```

ALU-1>file cf3:\# dir act*
12/19/2006 06:08a <DIR> act-collect
12/19/2006 06:08a <DIR> act

ALU-1>file cf3:\act-collect\ # dir
Directory of cf3:\act-collect#

12/23/2006 01:46a <DIR> .
12/23/2006 12:47a <DIR> ..
12/23/2006 01:46a 112 act1111-20031223-014658.xml.gz
12/23/2006 01:38a 197 act1212-20031223-013800.xml.gz

```

Accounting files always have the prefix `act` followed by the accounting policy ID, log ID and timestamp. The accounting log file naming and log file destination properties (such as rollover and retention) are discussed in more detail in [Log Files](#).

A file ID can only be assigned to either one event log ID or one accounting log.

### 5.4.3 Design Considerations

The 7705 SAR has ample resources to support large-scale accounting policy deployments. When preparing for an accounting policy deployment, verify that data collection, file rollover, and file retention intervals are properly tuned for the amount of statistics to be collected.

If the accounting policy collection interval is too brief, there may be insufficient time to store the data from all the services and network interfaces within the specified interval. If that is the case, some records may be lost or incomplete. Interval time, record types, and number of services using an accounting policy are all factors that should be considered when implementing accounting policies.

The rollover and retention intervals on the log files and the frequency of file retrieval must also be considered when designing accounting policy deployments. The amount of data stored depends on the type of record collected, the number of services that are collecting statistics, and the collection interval that is used.

## 5.5 Configuration Notes

This section describes logging configuration guidelines and restrictions.

- A file or filter cannot be deleted if it has been applied to a log.
- File IDs, syslog IDs, or SNMP trap groups must be configured in the **config>log** context before they can be applied to a log ID.
- A file ID can only be assigned to either one log ID or one accounting policy.
- Accounting policies must be configured in the **config>log** context before they can be applied to a service SAP or service interface, or applied to a network port.
- A log ID associated with the **snmp-trap-group** command must be the same as a log ID associated with the **log-id** command.

## 5.6 Configuring Logging with CLI

This section provides information to configure logging using the command line interface.

Topics in this section include:

- [Log Configuration Overview](#)
- [Log Type](#)
- [Basic Event Log Configuration](#)
- [Common Configuration Tasks](#)
- [Log Management Tasks](#)

## 5.7 Log Configuration Overview

Logging on the 7705 SAR is used to provide the operator with logging information for monitoring and troubleshooting. You can configure logging parameters to save information in a log file or direct the messages to other devices. Logging commands allow you to:

- select the types of logging information to be recorded
- assign a severity to the log messages
- select the source and target of logging information

## 5.8 Log Type

Logs can be configured in the following contexts:

- Log file — log files can contain log event message streams or accounting/billing information. Log file IDs are used to direct events, alarms/traps, and debug information to their respective targets.
- SNMP trap groups — SNMP trap groups contain an IP address and community names that identify targets to send traps following specified events
- Syslog — information can be sent to a syslog host that is capable of receiving selected syslog messages from a network element
- Event control — configures a particular event, or all events associated with an application, to be generated or suppressed
- Event filters — an event filter defines whether to forward or drop an event or trap based on match criteria
- Accounting policies — an accounting policy defines the accounting records that will be created. Accounting policies can be applied to one or more service access points (SAPs) and to network ports.
- Event logs — an event log defines the types of events to be delivered to an associated destination
- Event throttling rate — defines the rate of throttling events

## 5.9 Basic Event Log Configuration

The most basic log configuration must have the following:

- a log ID or an accounting policy ID
- a log source
- a log destination

The following displays a log configuration example.

```
ALU-12>config>log# info
#-----
echo "Log Configuration"
#-----
 file-id 1
 description "This is a test file-id."
 location cf3:
 exit
 file-id 2
 description "This is a test log."
 location cf3:
 exit
 snmp-trap-group 7
 trap-target 10.10.10.10 "snmpv2c" notify-community "public"
 exit
 log-id 2
 from main
 to file 2
 exit

ALU-12>config>log#
```

## 5.10 Common Configuration Tasks

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

- [Configuring an Event Log](#)
- [Configuring a File ID](#)
- [Configuring an Accounting Policy](#)
- [Configuring Event Control and Throttle Rate](#)
- [Configuring a Log Filter](#)
- [Configuring an SNMP Trap Group](#)
- [Configuring a Syslog Target](#)

### 5.10.1 Configuring an Event Log

An event log file is identified by a *log-id* and contains information used to direct messages generated by system applications (such as events, alarms, traps, and debug information) to their respective destinations. One or more event sources can be specified using the **from** command. Event destinations (such as file IDs, SNMP trap groups, or syslog IDs) must be configured using the **to** command before they can be applied to an event log ID. Only one destination can be specified.

Use the **file-id** *log-file-id* command to specify the destination compact flash. See [Configuring a File ID](#).

Use the following CLI syntax to configure a log file:

#### CLI Syntax:

```
config>log
 log-id log-id
 description description-string
 filter filter-id
 from {[main] [security] [change] [debug-trace]}
 to console
 to file log-file-id
 to memory [size]
 to session
 to snmp [size]
 to syslog syslog-id
 time-format {local | utc}
 no shutdown
```

The following displays an example of the event log file configuration command syntax:

#### Example:

```
config# log
config>log# log-id 2
config>log>log-id$ description "This is a test log file."
config>log>log-id# filter 1
config>log>log-id# from main security
config>log>log-id# to file 1
config>log>log-id# no shutdown
config>log>log-id# exit
```

The following displays a log file configuration:

```
ALU-12>config>log>log-id# info

...
 log-id 2
 description "This is a test log file."
 filter 1
 from main security
 to file 1
 exit
...

ALU-12>config>log>log-id#
```

### 5.10.2 Configuring a File ID

To create a log file, a file ID is defined that specifies the target compact flash drive and the rollover and retention interval period for the file. The rollover interval is defined in minutes and determines how long a file is used before it is closed and a new log file is created. The retention interval determines how long the file is stored on the compact flash drive before it is deleted.

The minimum amount of free space for log files on a compact flash drive is the lesser of 10% of the compact flash disk capacity or 5 Mb (5 242 880).

Use the following CLI syntax to configure a log file ID:

#### CLI Syntax:

```
config>log
 file-id log-file-id
 description description-string
 location cflash-id
 rollover minutes[retention hours]
```

The following displays an example of the log file ID configuration command syntax:

#### Example:

```
config# log
config>log# file-id 1
config>log>file-id# description "This is a log file."
config>log>file-id# location cf3:
config>log>file-id# rollover 600 retention 24
```

The following displays the file ID configuration:

```
ALU-12>config>log# info

 file-id 1
 description "This is a log file."
 location cf3:
 rollover 600 retention 24
 exit

ALU-12>config>log#
```

### 5.10.3 Configuring an Accounting Policy

Before an accounting policy can be created, a target log file must be created to collect the accounting records. The files are stored in system memory on the compact flash drive in a compressed (tar) XML format and can be retrieved using FTP or SCP. See [Configuring an Event Log](#) and [Configuring a File ID](#).

Accounting policies must be configured in the **config>log** context before they can be applied to a SAP or service interface, or applied to a network port. For information about associating an accounting policy with a SAP or a network port, see the 7705 SAR Services Guide or the 7705 SAR Interface Configuration Guide (respectively).

An accounting policy must define a record type and collection interval. Only one record type can be configured per accounting policy.

When creating accounting policies, one service accounting policy and one network accounting policy can be defined as **default**. If statistics collection is enabled on a SAP or network port and no accounting policy is applied, the respective default policy is used. If no default policy is defined, no statistics are collected unless a specifically defined accounting policy is applied.

Use the following CLI syntax to configure an accounting policy:

#### CLI Syntax:

```
config>log>
 accounting-policy acct-policy-id
 collection-interval minutes
 default
 description description-string
 record record-name
 to file log-file-id
 no shutdown
```

The following displays an example of the accounting policy configuration command syntax:

#### Example:

```
config>log# accounting-policy 4
config>log>acct-policy# description "This is the default
 accounting policy."
config>log>acct-policy# record service-ingress-packets
config>log>acct-policy# default
config>log>acct-policy# to file 1
config>log>acct-policy# exit
config>log# accounting-policy 5
config>log>acct-policy# description "This is a test
 accounting policy."
config>log>acct-policy# record service-ingress-packets
config>log>acct-policy# to file 2
config>log>acct-policy#
```

The following displays the accounting policy configuration:

```
ALU-12>config>log# info

 accounting-policy 4
 description "This is the default accounting policy."
 record service-ingress-packets
 default
 to file 1
 exit
 accounting-policy 5
 description "This is a test accounting policy."
```

```

 record service-ingress-packets
 to file 2
 exit

ALU-12>config>log#

```

### 5.10.4 Configuring Event Control and Throttle Rate

Use the following CLI syntax to configure event control. The **throttle** parameter used in the **event-control** command syntax enables throttling for a specific event type. The **config>log>throttle-rate** command configures the number of events and interval length to be applied to all event types that have throttling enabled by this **event-control** command. The throttling rate can also be configured independently for each log event by using the **specific-throttle-rate** parameter; this rate overrides the globally configured throttle rate for the specified log event.

#### CLI Syntax:

```

config>log
 event-control application-id [event-name | event-number] generate
 [severity-level][throttle] [specific-throttle-rate events-limit
 interval seconds | disable-specific-throttle]
 event-control application-id [event-name | event-number] suppress
 throttle-rate events[interval seconds]

```

The following displays an example of throttle rate configuration for all events that have throttling enabled:

#### Example:

```

config# log
config>log# event-control aps 2003 generate major throttle
config>log# event-control aps 2006 generate major throttle
config>log# throttle-rate 500 interval 10

```

The following displays the throttle rate configuration:

```

ALU-12>config>log# info
#-----
echo "Log Configuration"
#-----
 throttle-rate 500 interval 10
 event-control "aps" 2003 generate major throttle
 event-control "aps" 2006 generate major throttle
..

ALU-12>config>log#

```

The following displays an example of throttle rate configuration for a specific event. The **specific-throttle-rate** configured for application **aps**, event **2003**, overrides the globally configured **throttle-rate**.

#### Example:

```

config# log
config>log# event-control aps 2003 generate major throttle specific-
throttle-rate 600 interval 15
config>log# event-control aps 2006 generate major throttle
config>log# throttle-rate 500 interval 10

```

The following displays the specific throttle rate configuration:

```
ALU-12>config>log# info
#-----
echo "Log Configuration"
#-----
 throttle-rate 500 interval 10
 event-control "aps" 2003 generate major throttle specific-throttle-
rate 600 interval 15
 event-control "aps" 2006 generate major throttle
..

ALU-12>config>log>#
```

## 5.10.5 Configuring a Log Filter

Use the following CLI syntax to configure a log filter:

### CLI Syntax:

```
config>log
 filter filter-id
 default-action {drop | forward}
 description description-string
 entry entry-id
 action {drop | forward}
 description description-string
 match
 application {eq | neq} application-id
 message {eq | neq} pattern pattern [regex]
 number {eq | neq | lt | lte | gt | gte} event-id
 router {eq | neq} router-instance [regex]
 severity {eq | neq | lt | lte | gt | gte} severity-
level
 subject {eq | neq} subject [regex]
```

The following displays an example of the log filter configuration command syntax:

### Example:

```
config# log
config>log# filter 1
config>log>filter# description "This is a test filter."
config>log>filter# default-action drop
config>log>filter# entry 1
config>log>filter>entry$ action forward
config>log>filter>entry# match application eq atm
config>log>filter>entry# match severity eq critical
config>log>filter>entry# exit
```

The following displays the log filter configuration:

```
ALU-12>config>log# info
#-----
echo "Log Configuration"
#-----
 file-id 1
 description "This is our log file."
 location cf3:
 rollover 600 retention 24
exit
```

```

filter 1
 default-action drop
 description "This is a test filter."
 entry 1
 action forward
 match
 application eq "atm"
 severity eq critical
 exit
 exit
exit
...
log-id 2
 shutdown
 description "This is a test log file."
 filter 1
 from main security
 to file 1
exit
...

ALU-12>config>log#

```

## 5.10.6 Configuring an SNMP Trap Group

The associated *log-id* does not have to be configured before a **snmp-trap-group** can be created; however, the **snmp-trap-group** must exist before the *log-id* can be configured to use it.

Use the following CLI syntax to configure an SNMP trap group:

### CLI Syntax:

```

config>log
 snmp-trap-group log-id
 trap-target name address ip-address [port port] [snmpv1 |
 snmpv2c | snmpv3] notify-community communityName|snmpv3Security
 Name[security-level {no-auth-no-privacy |
 auth-no-privacy | privacy}]

```

The following displays an example of the SNMP trap group configuration command syntax:

### Example:

```

config# log
config>log# snmp-trap-group 2
config>log>snmp-trap-group# trap-target "target name" address
 10.10.10.104 notify-community "communitystring" security-level no-
 auth-no-privacy
config>log>snmp-trap-group# exit

```

The following displays the SNMP trap group configuration:

```

ALU-12>config>log# info

...
 snmp-trap-group 2
 trap-target "target name" address 10.10.10.104:5 "snmpv3" notify-community
 "communitystring"
 exit
...
 log-id 2

```

```

 description "This is a test log file."
 filter 1
 from main security
 to file 1
 exit
 ...

ALU-12>config>log#

```

### 5.10.7 Configuring a Syslog Target

Log events cannot be sent to a syslog target host until a valid syslog ID exists.

Use the following CLI syntax to configure a syslog file:

#### CLI Syntax:

```

config>log
 syslog syslog-id
 address ip-address
 description description-string
 facility syslog-facility
 level {emergency | alert | critical | error | warning | notice
| info | debug}
 log-prefix log-prefix-string
 port port

```

The following displays an example of the syslog file configuration command syntax:

#### Example:

```

config# log
config>log# syslog 1
config>log>syslog$ description "This is a syslog file."
config>log>syslog# address 10.10.10.104
config>log>syslog# facility user
config>log>syslog# level warning

```

The following displays the syslog configuration:

```

ALU-12>config>log# info

...
 syslog 1
 description "This is a syslog file."
 address 10.10.10.104
 facility user
 level warning
 exit
 ...

ALU-12>config>log#

```

## 5.11 Log Management Tasks

This section discusses the following logging tasks:

- [Modifying a Log File](#)
- [Deleting a Log File](#)
- [Modifying a File ID](#)
- [Deleting a File ID](#)
- [Modifying a Syslog ID](#)
- [Deleting a Syslog ID](#)
- [Modifying an SNMP Trap Group](#)
- [Deleting an SNMP Trap Group](#)
- [Modifying a Log Filter](#)
- [Deleting a Log Filter](#)
- [Modifying Event Control Parameters](#)
- [Returning to the Default Event Control Configuration](#)

### 5.11.1 Modifying a Log File

If the log destination needs to be changed or if the *size* of an SNMP log or memory log needs to be modified, the log ID must be removed and then recreated.

Use the following CLI syntax to modify a log file:

#### CLI Syntax:

```
config>log
 log-id log-id
 description description-string
 filter filter-id
 from {[main] [security] [change] [debug-trace]}
 to console
 to file file-id
 to memory [size]
 to session
 to snmp [size]
 to syslog syslog-id
```

The following displays the current log configuration:

```
ALU-12>config>log>log-id# info

...
 log-id 2
 description "This is a test log file."
 filter 1
 from main security
 to file 1
 exit
...

```

```
ALU-12>config>log>log-id#
```

The following displays an example of modifying log file parameters:

**Example:**

```
config# log
config>log# log-id 2
config>log>log-id# description "Chassis log file."
config>log>log-id# filter 2
config>log>log-id# from security
config>log>log-id# exit
```

The following displays the modified log file configuration:

```
ALU-12>config>log# info

...
 log-id 2
 description "Chassis log file."
 filter 2
 from security
 to file 1
 exit
...

ALU-12>config>log#
```

### 5.11.2 Deleting a Log File

The log ID must be shut down first before it can be deleted. In a previous example, file 1 is associated with **log-id 2**.

```
ALU-12>config>log# info

 file-id 1
 description "LocationTest."
 location cf3:
 rollover 600 retention 24
 exit
...
 log-id 2
 description "Chassis log file."
 filter 2
 from security
 to file 1
 exit
...

ALU-12>config>log#
```

Use the following CLI syntax to delete a log file:

**CLI Syntax:**

```
config>log
 no log-id log-id
 shutdown
```

The following displays an example of deleting a log file:

**Example:**

```
config# log
config>log# log-id 2
config>log>log-id# shutdown
config>log>log-id# exit
config>log# no log-id 2
```

### 5.11.3 Modifying a File ID



**Note:** When the **file-id** location parameter is modified, log files are not written to the new location until a rollover occurs or the log is manually cleared. A rollover can be forced by using the **clear>log** command. Subsequent log entries are then written to the new location. If a rollover does not occur or the log is not cleared, the old location remains in effect.

Use the following CLI syntax to modify a file ID:

**CLI Syntax:**

```
config>log
 file-id log-file-id
 description description-string
 location [cflash-id]
 rollover minutes[retention hours]
```

The following displays the current file ID configuration:

```
ALU-12>config>log# info

 file-id 1
 description "This is a log file."
 location cf3:
 rollover 600 retention 24
 exit

ALU-12>config>log#
```

The following displays an example of modifying file ID parameters:

**Example:**

```
config# log
config>log# file-id 1
config>log>file-id# description "LocationTest."
config>log>file-id# location cf3:
config>log>file-id# rollover 2880 retention 500
config>log>file-id# exit
```

The following displays the file ID modifications:

```
ALU-12>config>log# info

...
 file-id 1
 description "LocationTest."
 location cf3:
 rollover 2880 retention 500
```

```

 exit
 ...

```

### 5.11.4 Deleting a File ID



**Note:** All references to the file ID must be deleted before the file ID can be removed.

Use the following CLI syntax to delete a file ID:

**CLI Syntax:**

```

config>log
 no file-id log-file-id

```

The following displays an example of deleting a file ID:

**Example:**

```

config>log# no file-id 1

```

### 5.11.5 Modifying a Syslog ID

Use the following CLI syntax to modify syslog ID parameters:

**CLI Syntax:**

```

config>log
 syslog syslog-id
 address ip-address
 description description-string
 facility syslog-facility
 level {emergency | alert | critical | error | warning | notice
| info | debug}
 log-prefix log-prefix-string
 port port

```

The following displays an example of the syslog ID modifications:

**Example:**

```

config# log
config>log# syslog 1
config>log>syslog$ description "Test syslog."
config>log>syslog# address 10.10.0.91
config>log>syslog# facility mail
config>log>syslog# level info

```

The following displays the syslog configuration:

```

ALU-12>config>log# info

...
 syslog 1
 description "Test syslog."
 address 10.10.10.91
 facility mail

```

```

 level info
 exit
 ...

ALU-12>config>log#

```

### 5.11.6 Deleting a Syslog ID



**Note:** All references to the syslog ID must be deleted before the syslog ID can be removed. Use the **show>log>log-id** command to view syslog references.

Use the following CLI syntax to delete a syslog ID:

**CLI Syntax:**

```

config>log
no syslog syslog-id

```

The following displays an example of deleting a syslog ID:

**Example:**

```

config# log
config>log# no syslog 1

```

### 5.11.7 Modifying an SNMP Trap Group

Use the following CLI syntax to modify an SNMP trap group:

**CLI Syntax:**

```

config>log
snmp-trap-group log-id
 trap-target name [address ip-address] [port port] [snmpv1
| snmpv2c | snmpv3] notify-community communityName|snmpv3SecurityName[security-level {no-auth-no-privacy |
auth-no-privacy | privacy}]

```

The following displays the current SNMP trap group configuration:

```

ALU-12>config>log# info

...
snmp-trap-group 10
 trap-target 10.10.10.104:5 "snmpv3" notify-community "communitystring"
 exit
...

ALU-12>config>log#

```

The following displays an example of the command usage to modify an SNMP trap group:

**Example:**

```

config# log
config>log# snmp-trap-group 10
config>log>snmp-trap-group# no trap-target 10.10.10.104:5

```

```
config>log>snmp-trap-group# snmp-trap-group# trap- target
10.10.0.91:1 snmpv2c notify-community "com1"
```

The following displays the SNMP trap group configuration:

```
ALU-12>config>log# info

...
 snmp-trap-group 10
 trap-target 10.10.0.91:1 "snmpv2c" notify-community "com1"
 exit
...

ALU-12>config>log#
```

### 5.11.8 Deleting an SNMP Trap Group

Use the following CLI syntax to delete a trap target and SNMP trap group:

**CLI Syntax:**

```
config>log
no snmp-trap-group log-id
no trap-target name
```

The following displays the SNMP trap group configuration:

```
ALU-12>config>log# info

...
 snmp-trap-group 10
 trap-target 10.10.0.91:1 "snmpv2c" notify-community "com1"
 exit
...

ALU-12>config>log#
```

The following displays an example of deleting a trap target and an SNMP trap group.

**Example:**

```
config>log# snmp-trap-group 10
config>log>snmp-trap-group# no trap-target 10.10.0.91:1
config>log>snmp-trap-group# exit
config>log# no snmp-trap-group 10
```

### 5.11.9 Modifying a Log Filter

Use the following CLI syntax to modify a log filter:

**CLI Syntax:**

```
config>log
filter filter-id
 default-action {drop | forward}
 description description-string
 entry entry-id
 action {drop | forward}
```

```

description description-string
match
 application {eq | neq} application-id
 message {eq | neq} pattern pattern [regexp]
 number{eq | neq | lt | lte | gt | gte}event-id
 router {eq | neq} router-instance [regexp]
 severity {eq | neq | lt | lte | gt | gte} severity-
level
 subject {eq | neq} subject [regexp]

```

The following output displays the current log filter configuration:

```

ALU-12>config>log# info
#-----
echo "Log Configuration"
#-----
...
 filter 1
 default-action drop
 description "This is a test filter."
 entry 1
 action forward
 match
 application eq "atm"
 severity eq critical
 exit
 exit
 exit
...

ALU-12>config>log#

```

The following displays an example of the log filter modifications:

**Example:**

```

config# log
config>log# filter 1
config>log>filter# description "This allows <n>."
config>log>filter# default-action forward
config>log>filter# entry 1
config>log>filter>entry$ action drop
config>log>filter>entry# match
config>log>filter>entry>match# application eq user
config>log>filter>entry>match# number eq 2001
config>log>filter>entry>match# no severity
config>log>filter>entry>match# exit

```

The following displays the log filter configuration:

```

ALU-12>config>log>filter# info
#-----
...
 description "This allows <n>."
 entry 1
 action drop
 match
 application eq "user"
 number eq 2001
 exit
 exit
exit

```

```
...

ALU-12>config>log>filter#
```

### 5.11.10 Deleting a Log Filter

Use the following CLI syntax to delete a log filter:

**CLI Syntax:**

```
config>log
 no filter filter-id
```

The following displays an example of the command to delete a log filter:

**Example:**

```
config>log# no filter 1
```

### 5.11.11 Modifying Event Control Parameters

Use the following CLI syntax to modify event control parameters:

**CLI Syntax:**

```
config>log
 event-control application-id [event-name | event-number] generate
 [severity-level][throttle] [specific-throttle-rate events-limit
 interval seconds | disable-specific-throttle]
 event-control application-id [event-name | event-number] suppress
```

The following displays the current event control configuration:

```
ALU-12>config>log# info

...
 event-control "atm" 2014 generate critical
...

ALU-12>config>log#
```

The following displays an example of event control modifications:

**Example:**

```
config# log
config>log# event-control atm 2014 suppress
```

The following displays the log filter configuration:

```
ALU-12>config>log# info

...
 event-control "atm" 2014 suppress
...

ALU-12>config>log#
```

### 5.11.12 Returning to the Default Event Control Configuration

The **no** form of the **event-control** command returns modified values back to the default values.

Use the following CLI syntax to return to the default event control configuration:

**CLI Syntax:**

```
config>log
no event-control application[event-name |event-number]
```

The following displays an example of the command usage to return to the default values:

**Example:**

```
config# log
config>log# no event-control "atm" 2014
config>log# no event-control "filter" 2001
config>log# no event-control "mpls" 2001
```

```
ALU-12>config>log# info detail

#-----
echo "Log Configuration"
#-----
...
event-control "atm" 2004 generate minor
event-control "atm" 2005 generate warning
event-control "atm" 2006 generate warning
event-control "atm" 2007 generate critical
event-control "atm" 2008 generate warning
event-control "atm" 2009 generate warning
event-control "atm" 2010 generate warning
event-control "atm" 2011 generate warning
event-control "atm" 2012 generate warning
event-control "atm" 2013 generate warning
event-control "atm" 2014 generate warning
event-control "atm" 2015 generate warning
event-control "atm" 2016 generate warning
event-control "atm" 2017 generate warning
...

ALU-12>config>log#
```

## 5.12 Log Command Reference

### 5.12.1 Command Hierarchies

- Configuration Commands
  - Accounting Policy Commands
  - Event Control Commands
  - Event Handling Commands
  - Event Trigger Commands
  - Log file commands
  - Log Filter Commands
  - Syslog Commands
  - Logging Destination Commands
  - SNMP Trap Groups Commands
- Show Commands
- Clear Commands

#### 5.12.1.1 Configuration Commands

##### 5.12.1.1.1 Accounting Policy Commands

```

config
- log
 - accounting-policy acct-policy-id
 - no accounting-policy acct-policy-id
 - collection-interval minutes
 - no collection-interval
 - [no] default
 - description description-string
 - no description
 - record record-name
 - no record
 - [no] shutdown
 - to file log-file-id
 - to no-file

```

##### 5.12.1.1.2 Event Control Commands

```

config
- log
 - event-control application-id [event-name | event-number] generate [severity-level]
 [throttle] [specific-throttle-rate events-limit interval seconds | disable-specific-throttle]
 - event-control application-id [event-name | event-number] suppress

```

- **throttle-rate** *events* [**interval** *seconds*]
- **no throttle-rate**

### 5.12.1.1.3 Event Handling Commands

```

config
- log
 - event-handling
 - [no] handler event-handler-name
 - action-list
 - [no] entry entry-id
 - description description-string
 - no description
 - min-delay [delay]
 - no min-delay
 - script-policy policy-name [owner policy-owner]
 - no script-policy
 - [no] shutdown
 - description description-string
 - no description
 - [no] shutdown

```

### 5.12.1.1.4 Event Trigger Commands

```

config
- log
 - event-trigger
 - [no] event application-id event-name-id
 - description description-string
 - no description
 - [no] shutdown
 - [no] trigger-entry entry-id
 - debounce occurrences [within seconds]
 - no debounce
 - description description-string
 - no description
 - event-handler event-handler
 - no event-handler
 - log-filter filter-id
 - no log-filter
 - [no] shutdown

```

### 5.12.1.1.5 Log file commands

```

config
- log
 - encryption-key key [hash | hash2]
 - no encryption-key
 - [no] file-id log-file-id
 - description description-string
 - no description
 - location cflash-id
 - rollover minutes [retention hours]
 - no rollover

```

### 5.12.1.1.6 Log Filter Commands

```

config
- log
 - [no] filter filter-id
 - default-action {drop | forward}
 - no default-action
 - description description-string
 - no description
 - [no] entry entry-id
 - action {drop | forward}
 - no action
 - description description-string
 - no description
 - [no] match
 - application {eq | neq} application-id
 - no application
 - message {eq | neq} pattern pattern [regexp]
 - no message
 - number {eq | neq | lt | lte | gt | gte} event-id
 - no number
 - router {eq | neq} router-instance [regexp]
 - no router
 - severity {eq | neq | lt | lte | gt | gte} severity-level
 - no severity
 - subject {eq | neq} subject [regexp]
 - no subject

```

### 5.12.1.1.7 Syslog Commands

```

config
- log
 - [no] syslog syslog-id
 - address ip-address
 - no address
 - description description-string
 - no description
 - facility syslog-facility
 - no facility
 - level syslog-level
 - no level
 - log-prefix log-prefix-string
 - no log-prefix
 - port port
 - no port

```

### 5.12.1.1.8 Logging Destination Commands

```

config
- log
 - [no] log-id log-id
 - description description-string
 - no description
 - filter filter-id
 - no filter
 - from {[main] [security] [change] [debug-trace]}

```

```

- no from
- [no] shutdown
- time-format {local | utc}
- to console
- to file log-file-id
- to memory [size]
- to session
- to snmp [size]
- to syslog syslog-id

```

### 5.12.1.1.9 SNMP Trap Groups Commands

```

config
- log
 - [no] snmp-trap-group log-id
 - description description-string
 - no description
 - trap-target name address ip-address [port port] [snmpv1 | snmpv2c | snmpv3]
 notify-community {communityName | snmpv3SecurityName}[security-level {no-auth-no-privacy |
 auth-no-privacy | privacy}]
 - no trap-target name

```

### 5.12.1.2 Show Commands

```

show
- log
 - accounting-policy [acct-policy-id] [access | network] [associations]
 - accounting-records
 - applications
 - event-control [application-id [event-name | event-number]]
 - event-control application-id event-name detail
 - event-handling
 - handler [handler-name]
 - handler detail
 - information
 - scripts
 - event-parameters [application-id [event-name | event-number]]
 - file-id [log-file-id]
 - filter-id [filter-id]
 - log-collector
 - log-id [log-id] [severity severity-level] [application application] [sequence from-
 seq [to-seq]] [count count] [router router-instance [expression]] [subject subject [regexp]]
 [ascending | descending]
 - snmp-trap-group [log-id]
 - syslog [syslog-id]

```

### 5.12.1.3 Clear Commands

```

clear
- log
 - log-id log-id
 - event-handling
 - handler event-handler-name
 - information

```

## 5.12.2 Command Descriptions

- [Configuration Commands](#)
- [Show Commands](#)
- [Clear Commands](#)

### 5.12.2.1 Configuration Commands

- [Generic Commands](#)
- [Accounting Policy Commands](#)
- [Event Control Commands](#)
- [Event Handling Commands](#)
- [Event Trigger Commands](#)
- [Log File commands](#)
- [Log Filter Commands](#)
- [Syslog Commands](#)
- [Logging Destination Commands](#)
- [SNMP Trap Groups Commands](#)

#### 5.12.2.1.1 Generic Commands

description

#### Syntax

**description** *description-string*

**no description**

#### Context

config>log>accounting-policy

config>log>event-handling>handler

config>log>event-handling>handler>action-list>entry

config>log>event-trigger>event

config>log>event-trigger>event>trigger-entry

config>log>file-id

config>log>snmp-trap-group

config>log>filter

config>log>filter>entry

```
config>log>log-id
config>log>syslog
```

### Description

This command creates a text description stored in the configuration file for a configuration context.

The command associates a text string with a configuration context to help identify the content in the configuration file.

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

### Default

No text description is associated with this configuration.

### Parameters

*string*

The description can contain a string of up to 80 characters composed of printable, 7-bit ASCII characters. If the string contains special characters (such as #, \$, or spaces), the entire string must be enclosed within double quotes.

## shutdown

### Syntax

```
[no] shutdown
```

### Context

```
config>log>accounting-policy
config>log>event-handling>handler
config>log>event-handling>handler>action-list>entry
config>log>event-trigger>event
config>log>event-trigger>event>trigger-entry
config>log>log-id
```

### Description

This command administratively disables an 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 administratively enables an entity.

### Default

```
no shutdown
```

## Special Cases

### log-id

when a *log-id* is shut down, no events are collected for the entity. This leads to the loss of event data.

### accounting-policy

when an accounting policy is shut down, no accounting data is written to the destination log ID. Counters in the billing data reflect totals, not increments, so when the policy is re-enabled (no shutdown), the counters include the data collected during the period the policy was shut down.

## 5.12.2.1.2 Accounting Policy Commands

### accounting-policy

#### Syntax

**accounting-policy** *acct-policy-id*

**no accounting-policy** *acct-policy-id*

#### Context

config>log

#### Description

This command creates an access or network accounting policy. An accounting policy defines the accounting records that are created.

Access accounting policies are policies that can be applied to one or more service access points (SAPs). Changes made to an existing policy, using any of the sub-commands, are applied immediately to all SAPs where this policy is applied.

Network accounting policies are policies that can be applied to one or more network ports. Changes made to an existing policy, using any of the sub-commands, are applied immediately to all network ports where this policy is applied.

If an accounting policy is not specified on a SAP or network port, accounting records are produced in accordance with the access or network policy designated as the **default**. For more information, see the [default](#) command.

The **no** form of the command deletes the policy from the configuration. The accounting policy cannot be deleted unless it is removed from all the SAPs or network ports where the policy is applied. Use the **show>log>accounting-policy** command to see where an accounting policy is used and which accounting policy is the default policy.

#### Default

n/a

#### Parameters

*acct-policy-id*

the policy ID that uniquely identifies the accounting policy, expressed as a decimal integer

**Values** 1 to 99

## collection-interval

### Syntax

**collection-interval** *minutes*

**no collection-interval**

### Context

config>log>accounting-policy

### Description

This command configures the interval between collection of accounting records.

### Parameters

*minutes*

the interval, in minutes, at which accounting records are collected

**Values** 1 to 120

## default

### Syntax

[no] **default**

### Context

config>log>accounting-policy

### Description

This command configures the accounting policy specified by *acct-policy-id* to be the default accounting policy that is used by all SAPs or network ports that do not have a specified accounting policy.

For a SAP or network port, if no accounting policy is explicitly specified and a **default** policy is defined, records are produced as per the **default** accounting policy. If no **default** policy is defined, no records are collected. However, if an accounting policy is explicitly defined for a SAP or network port, records are collected for that SAP or network port.

Only one access accounting policy ID can be designated as the default access policy. Similarly, only one network accounting policy ID can be designated as the default network accounting policy.

The *record-name* must be specified before configuring an accounting policy as **default**.

If a policy is configured as the default policy, a **no default** command must be issued before a new default policy can be configured.

Default accounting policies cannot be explicitly applied. For example, if **default** is set for **accounting-policy 10**, policy 10 cannot be assigned.

The **no** form of the command removes the default policy designation from the policy ID. The accounting policy is removed from all SAPs or network ports that do not have a policy explicitly defined. If there is no policy defined as the **default** policy, no accounting policy is applied to those entities.

## record

### Syntax

**record** *record-name*

**no record**

### Context

config>log>accounting-policy

### Description

This command adds the record name to the accounting policy, specifying which records to forward to the configured accounting file (identified by *log-file-id*). Each accounting policy can only contain one record name. To obtain a list of all record types that can be configured, use the **show>log>accounting-records** command.

```
ALU-12>config>log# show log accounting-records
=====
Accounting Policy Records
=====
Record # Record Name Def. Interval

1 service-ingress-octets 5
2 service-egress-octets 5
3 service-ingress-packets 5
4 service-egress-packets 5
5 network-ingress-octets 15
6 network-egress-octets 15
7 network-ingress-packets 15
8 network-egress-packets 15
11 combined-network-ing-egr-octets 15
12 combined-service-ing-egr-octets 5
13 complete-service-ingress-egress 5
32 saa 5
54 complete-network-ing-egr 15
=====
ALU-12>config>log#
```

The *record-name* must be specified before configuring an accounting policy as **default**.

To configure an accounting policy for access ports, select a service record (for example, service-ingress-octets). To change the service record to another service record, re-enter the **record** command with the new *record-name* to replace the old *record-name*.

When configuring an accounting policy for network ports, select a network record. To change the network record to another network record, re-enter the **record** command with the new *record-name* to replace the old *record-name*.

Only one record may be configured in a single accounting policy. If changing the record switches it from network to service, or from service to network, the old *record-name* must be removed using the **no** form of this command. For example, to change an accounting policy configuration from a **network-egress-octets** record to a **service-ingress-octets** record, use the **no record** command and then enter the **service-ingress-octets** record.



**Note:** Collecting excessive statistics may adversely affect CPU usage and take up large amounts of storage space.

The **no** form of the command removes the record from the policy.

## Default

n/a

## Parameters

*record-name*  
the accounting record name

to

## Syntax

**to file** *log-file-id*

**to no-file**

## Context

config>log>accounting-policy

## Description

This command specifies the destination for the accounting records selected for the accounting policy.

## Default

No destination is specified

## Parameters

*log-file-id*

the log file ID specifies the destination for the accounting records associated with this accounting policy. The characteristics of the log file ID, such as rollover and retention intervals, must have already been defined in the **config>log>file-id** context. A log file ID can only be used once.

The file is generated when the log file ID is first referenced. This command identifies the type of accounting file to be created. If the **to** command is executed while the accounting policy is in operation, it becomes active during the next collection interval.

**Values** 1 to 99

### 5.12.2.1.3 Event Control Commands

#### event-control

##### Syntax

**event-control** *application-id* [*event-name* | *event-number*] **generate** [*severity-level*] [**throttle**] [**specific-throttle-rate** *events-limit interval seconds* | **disable-specific-throttle**]

**event-control** *application-id* [*event-name* | *event-number*] **suppress**

**no event-control** *application-id* [*event-name* | *event-number*]

##### Context

config>log

##### Description

This command is used to specify that a particular event, or all events associated with an application, are either generated or suppressed.

Events are generated by an application and contain an event number and a description of the cause of the event. Each event has a default designation that directs it to be generated or suppressed.

Events are generated with a default severity level that can be modified by using the *severity-level* option. For example, to change event reporting for an external alarm output on the chassis, do the following:

1. Specify the application by using the **config>log>event-control>chassis** command.
2. Specify the event name or number by using the **config>log>event-control>chassis>extAlarmInput1Detected** command.
3. Specify whether the event is generated or suppressed by using the **config>log>event-control>chassis>extAlarmInput1Detected>generate** command.
4. Change the severity level (for example, major severity) by using the **config>log>event-control>chassis>extAlarmInput1Detected>generate>major** command.



**Note:** To display a list of events, use the **show>log>event-control** command.

Events that are suppressed by default are typically used for debugging purposes. Events are suppressed at the time the application requests the event's generation. No event log entry is generated regardless of the destination. While this feature can save processor resources, there may be a negative effect on the ability to troubleshoot problems if the logging entries are not generated. However, the generation of too many events may cause excessive overhead.

The **throttle** parameter enables event throttling for these events. The throttling rate is set globally for all events with the **throttle-rate** command. The throttling rate can also be configured independently for each log event by using the **specific-throttle-rate** parameter; this rate overrides the globally configured throttle rate for the specified log event.

The **no** form of the command resets the parameters to the default setting for events for the application or a specific event within the application. The *severity-level*, **generate**, and **suppress** options will also be reset to the initial values.

## Default

Each event has a default suppress or generate state. To display a list of all events and the current configuration use the **event-control** command.

## Parameters

### *application-id*

the application whose events are affected by this event control filter

**Values** A valid application name. To display a list of valid application names, use the [applications](#) command. Valid applications are:  
aps, atm, bgp, cflowd, chassis, debug, dhcp, dhcps, efm\_oam, ering, eth\_cfm, filter, firewall, igmp, igmp\_snooping, ip, ipsec, isis, lag, lcr, ldp, lldp, logger, mcpath, mc\_redundancy, mirror, mld, mld\_snooping, mpls, msdp, mwmgr, ntp, oam, ospf, pcap, pim, pim\_snooping, port, ppp, ptp, radius, rip, rip\_ng, route\_policy, rsvp, scada, security, snmp, stp, svcmgr, system, tss, user, vrrp, vrtr

**Default** none; this parameter must be explicitly specified

### *event-name | event-number*

to generate, suppress, or revert to default for a single event, enter the specific number or event short name. If no event number or name is specified, the command applies to all events in the application. To display a list of all event short names use the **show>log>event-control** command.

**Values** *event name*: 32 characters maximum  
*event number*: 0 to 4294967295

**Default** n/a

### **generate**

specifies that a log event is created when this event occurs. The **generate** keyword can be used with two optional parameters: *severity-level* and **throttle**.

**Default** generate

### *severity-level*

An ASCII string representing the severity level to associate with the specified generated events

**Values** one of: cleared, indeterminate, critical, major, minor, warning

**Default** the system-assigned severity level

### **throttle**

specifies whether events of this type will be throttled

**Default** By default, event throttling is off for each specific event type. It must be explicitly enabled for each event type where throttling is needed. This makes backwards compatibility easier to manage.

**suppress**

indicates that the specified events will not be logged. If the **suppress** keyword is not specified, then the events are generated by default.

**Default** generate

**specific-throttle-rate** *events-limit*

configures an independent log event throttling rate for each log event, which overrides the globally configured throttle rate for the specified log event

**Values** 1 to 20000

*seconds*

the number of seconds that the specific throttling interval lasts

**Values** 1 to 1200

**disable-specific-throttle**

specifies to disable the **specific-throttle-rate**

## throttle-rate

**Syntax**

**throttle-rate** *events* [*intervalseconds*]

**no throttle-rate**

**Context**

config>log

**Description**

This command configures an event throttling rate.

**Parameters***events*

specifies the number of log events that can be logged within the specified interval for a specific event. When the limit has been reached, any additional events of that type will be dropped, and the event drop count will be incremented. At the end of the throttle interval, if any events have been dropped, a trap notification will be sent.

**Values** 1 to 20000

**Default** 2000

*seconds*

specifies the number of seconds that an event throttling interval lasts

**Values** 1 to 1200

Default 1

### 5.12.2.1.4 Event Handling Commands

#### event-handling

**Syntax**`event-handling`**Context**`config>log`**Description**

This command enables the context to configure event handling in the Event Handler System (EHS).

#### handler

**Syntax**`[no] handler event-handler-name`**Context**`config>log>event-handling`**Description**

This command configures an event handler.

The **no** form of the command removes the specified event handler.

**Parameters**

*event-handler-name*

the name of the event handler, up to 32 characters in length

#### action-list

**Syntax**`action-list`**Context**`config>log>event-handling>handler`

## Description

This command enables the context to configure the event handler action list.

**entry**

## Syntax

**[no] entry** *entry-id*

## Context

config>log>event-handling>handler>action-list

## Description

This command configures an event handler action-list entry. An action list consists of one or more entries. Each entry in the list references a configured script policy, which in turn references a configured script.

Multiple entries can be configured in the action list if multiple actions are required when an event triggers the event handler; for example, an event trigger results in the execution of different scripts. When the handler is triggered, it runs through the entries in sequence.

The **no** form of the command removes the specified action-list entry.

## Parameters

*entry-id*

the identifier of the event handler action-list entry

**Values** 1 to 1500

**min-delay**

## Syntax

**min-delay** [*delay*]

**no min-delay**

## Context

config>log>event-handling>handler>action-list>entry

## Description

This command specifies the minimum delay between subsequent executions of the action specified in this entry. This is useful, for example, to ensure that a script does not get triggered to execute too often.

## Default

no min-delay

## Parameters

*delay*

the delay time, in seconds

**Values** 1 to 604800

## script-policy

## Syntax

**script-policy** *policy-name* [**owner** *policy-owner*]

**no script-policy**

## Context

config>log>event-handling>handler>action-list>entry

## Description

This command specifies the script policy to use for this event handler action-list entry. The associated script is launched when the handler is triggered.

The script policy must already have been configured under the **config>system>script-control** context.

## Default

no script-policy

## Parameters

*policy-name*

the script policy name

*policy-owner*

the script policy owner associated with the script policy name

## 5.12.2.1.5 Event Trigger Commands

## event-trigger

## Syntax

**event-trigger**

## Context

config>log

## Description

This command enables the context to configure log events as triggers for event handlers in the EHS.

## event

## Syntax

[no] event *application-id event-name-id*

## Context

config>log>event-trigger

## Description

This command defines a specific log event that triggers the associated event handler. Further matching criteria can be applied (with the [log-filter](#) command) to only trigger certain handlers with certain instances of the log event.

The log event consists of an application ID and event ID.

The **no** form of the command removes the specified log event.

## Parameters

*application-id*

the type of application that triggers the event

**Values** aps, atm, bgp, cflowd, chassis, debug, dhcp, dhcps, efm\_oam, ering, eth\_cfm, filter, firewall, igmp, igmp\_snooping, ip, ipsec, isis, lag, lcr, ldp, lldp, logger, mcpath, mc\_redundancy, mirror, mld, mld\_snooping, mpls, msdp, mwmgr, ntp, oam, ospf, pcap, pim, pim\_snooping, port, ppp, ptp, radius, rip, rip\_ng, route\_policy, rsvp, scada, security, snmp, stp, svcmgr, system, tss, user, vrrp, vrtr

*event-name-id*

the numerical identifier or name of the event

**Values** 0 to 4294967295 | *event-name*: 32 characters maximum

## trigger-entry

## Syntax

[no] trigger-entry *entry-id*

## Context

config>log>event-trigger>event

## Description

This command configures a trigger entry for the specified log event. A trigger entry references a previously configured event handler. One or more trigger entries can be configured for the event.

Trigger entries can also be configured with a previously configured log filter.

The **no** form of the command removes the specified trigger entry.

## Parameters

*entry-id*

the identifier of the event trigger entry

**Values** 1 to 1500

## debounce

## Syntax

**debounce** *occurrences* [**within** *seconds*]

**no debounce**

## Context

config>log>event-trigger>event>trigger-entry

## Description

This command configures how many times the specified log event occurs before an action is triggered (for example, an EHS script). The number of occurrences of the event can be optionally bounded by a time window. If no time window is specified, the action is triggered every specified Nth event.

Triggering occurs at the specified Nth event, not at the end of the time window.

## Default

no debounce

## Parameters

*occurrences*

the number of times the event must occur in order for EHS to trigger an action

**Values** 2 to 15

*seconds*

the time window, in seconds, in which the specified number of occurrences must happen in order for EHS to trigger an action

**Values** 1 to 604800

## event-handler

### Syntax

**event-handler** *event-handler*

**no event-handler**

### Context

config>log>event-trigger>event>trigger-entry

### Description

This command specifies the event handler to be used for this trigger entry. The event handler must have already been configured under the **config>log>event-handling>handler** context.

If the log event occurs and matches the criteria configured in the log filter (see [log-filter](#)), the event handler is triggered. When the event handler is triggered, the script that is referenced by the script policy that is in turn referenced by the event handler, is executed.

### Parameters

*event-handler*

the name of the event handler

## log-filter

### Syntax

**log-filter** *filter-id*

**no log-filter**

### Context

config>log>event-trigger>event>trigger-entry

### Description

This command specifies the log filter to be used for this trigger entry. The log filter must have already been configured under the **config>log>filter** context.

The log filter defines the matching criteria that must be met in order for the log event to trigger the event handler. The log filter is applied to the log event, and if the filtering decision results in a **forward** action, the event handler is triggered.

### Parameters

*filter-id*

the log filter identifier

**Values** 1 to 1500

### 5.12.2.1.6 Log File commands

#### encryption-key

##### Syntax

**encryption-key** *key* [**hash** | **hash2**]

**no encryption-key**

##### Context

config>log

##### Description

This command specifies the encryption key used by AES-265-CTR for log file encryption. The encryption key is used for all local log files on the system.

The **no** form of this command deletes the encryption key.

##### Parameters

*key*

specifies the encryption key

If the **hash** or **hash2** parameter is not configured, the key is entered in plaintext and the key length must be between 8 and 32 characters. A plaintext key cannot contain embedded nulls or end with "hash" or "hash2".

If the **hash** or **hash2** parameter is configured, the key is hashed and the key length must be between 1 and 64 characters.

**hash**

specifies that the key is entered and stored on the node in encrypted form

**hash2**

specifies that the key is entered and stored on the node in a more complex encrypted form. The **hash2** encryption scheme is node-specific and the key cannot be transferred between nodes

#### file-id

##### Syntax

[**no**] **file-id** *log-file-id*

##### Context

config>log

## Description

This command enables the context to configure a file ID template that is used as a destination for an event log or an accounting (billing) file.

The template defines the file location and characteristics of the destination for a log event message stream or for accounting and billing information. The *log-file-id* variable defined in this context is subsequently specified in the **to** command under **config>log>log-id** or **config>log>accounting-policy** contexts, to direct specific logging or accounting source streams to the file destination.

A file ID can only be assigned to either one **log-id** or one **accounting-policy**. It cannot be reused for multiple instances. A file ID and associated file definition must exist for each log and accounting file that will be stored in the file system.

A file is created when the file ID defined by this command is selected as the destination type for a specific log or accounting record. Log files are collected in a "log" directory. Accounting files are collected in an "act" directory.

The filenames for a log or accounting file are created by the system (see [Table 41: Log Filenames](#)).

Table 41: Log Filenames

| File Type       | Filename                   |
|-----------------|----------------------------|
| Log File        | <i>log/lff-timestamp</i>   |
| Accounting File | <i>act/aaaff-timestamp</i> |

where:

- *ll* is the *log-id*
- *aa* is the *accounting policy-id*
- *ff* is the *file-id*
- *timestamp* is the actual timestamp when the file is created. The format for the timestamp is *yyyymmdd-hhmmss*, where:
  - *yyyy* is the year (for example, 2016)
  - *mm* is the month number (for example, 12 for December)
  - *dd* is the day of the month (for example, 03 for the 3rd of the month)
  - *hh* is the hour of the day in 24-hour format (for example, 04 for 4 a.m.)
  - *mm* is the minutes (for example, 30 for 30 minutes past the hour)
  - *ss* is the number of seconds (for example, 14 for 14 seconds)

The accounting file is compressed and has a **.gz** extension.

When initialized, each file contains:

- the *log-id* description
- the time the file was opened
- the reason the file was created
- the sequence number of the last event stored on the log (if the event log file was closed properly)

If the process of writing to a log file fails (for example, the compact flash card is full), the log file will not become operational even if the compact flash card is replaced. Enter a **clear log** command or a **shutdown/no shutdown** command sequence to reinitialize the file.

If the location fails (for example, the compact flash card fills up during the write process), a trap is sent.

The **no** form of the command removes the file ID from the configuration. A file ID can only be removed from the configuration if the file is not the designated output for a log destination. The actual file remains on the file system.

## Default

n/a

## Parameters

*log-file-id*

the file identification number for the file, expressed as a decimal integer

**Values** 1 to 99

## location

## Syntax

**location** *cf-flash-id*

**no location**

## Context

config>log>file-id

## Description

This command specifies the location where the log or accounting billing file will be created.

The **location** command is optional. If the **location** command is not explicitly configured, log and accounting files will be created on cf3: for the following:

- 7705 SAR-8 Shelf V2
- 7705 SAR-A
- 7705 SAR-Ax
- 7705 SAR-H
- 7705 SAR-Hc
- 7705 SAR-M
- 7705 SAR-Wx
- 7705 SAR-X

For the 7705 SAR-18, log files are created by default on cf1: and accounting files are created by default on cf2:. There are no overflows onto other devices.



**Note:** The 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-Wx, 7705 SAR-Hc, and 7705 SAR-X do not have field-replaceable compact flash drives; they are shipped with integrated flash memory that is used to store system boot software, OS software, and configuration files and logs. The flash memory is identified as cf3-A: by the system. On the 7705 SAR-X and 7705 SAR-Ax, the flash memory is 512 Mbytes; for the other platforms, the flash memory is 256 Mbytes.

When multiple **location** commands are entered in a single file ID context, the last command overwrites the previous command.

When the location of a file ID that is associated with an active log ID is changed, the log events are not immediately written to the new location. The new location does not take effect until the log rolls over, either because the rollover period has expired or a **clear>log log-id** command is entered to manually roll over the log file.

When creating log or accounting files, the designated location is used as long as there is available space. If no space is available, an attempt is made to delete unnecessary files that are past their retention date.

If sufficient space is not available, an attempt is made to remove the oldest to newest closed log or accounting files. After each file is deleted, the system attempts to create the new file.

A medium severity trap is issued to indicate that the compact flash is either not available or that no space is available on the specified flash.

A high-priority alarm condition is raised if the compact flash device for this file ID is not present or if there is insufficient space available. If space does becomes available, the alarm condition will be cleared.

Use the **no** form of this command to revert to default settings.

## Default

For the 7705 SAR-8 Shelf V2, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-M, 7705 SAR-Wx, and 7705 SAR-X, log and accounting files are created on cf3:

For the 7705 SAR-18, log files are created on cf1: and accounting files are created on cf2:

## Parameters

*cf-flash-id*

specifies the location of the flash

**Values** *cf-flash-id*: cf3: for all platforms; also cf1: or cf2: for the 7705 SAR-18

## rollover

### Syntax

**rollover** *minutes* [**retention** *hours*]

**no rollover**

### Context

config>log>file-id

## Description

This command configures how often an event or accounting log is rolled over or partitioned into a new file.

An event or accounting log is actually composed of multiple individual files. The system creates a new file for the log based on the rollover time, expressed in minutes.

The **retention** option, expressed in hours, allows you to modify the default time that the file is kept in the system. The retention time is based on the rollover time of the file. The retention time is used as a factor to determine which files should be deleted first as the file space becomes full.

When multiple **rollover** commands for a file ID are entered, the last command overwrites the previous command.

## Default

rollover 1440

retention 12

## Parameters

*minutes*

the rollover time, in minutes

**Values** 5 to 10080

*hours*

the retention period, in hours, expressed as a decimal integer. The retention period is based on the creation time of the file. The file becomes a candidate for removal when the creation timestamp + rollover time + retention time is less than the current timestamp.

**Values** 1 to 500

## 5.12.2.1.7 Log Filter Commands

**filter**

### Syntax

[no] **filter** *filter-id*

### Context

config>log

### Description

This command creates a context for an event filter. An event filter specifies whether to forward or drop an event or trap based on the match criteria.

Filters are configured in the **filter** *filter-id* context and then applied to a log in the **log-id** *log-id* context. Only events for the configured log source streams destined for the log ID where the filter is applied are filtered.

Any changes made to an existing filter, using any of the sub-commands, are immediately applied to the destinations where the filter is applied.

The **no** form of the command removes the filter association from log IDs, which causes those logs to forward all events.

## Default

No event filters are defined.

## Parameters

*filter-id*

uniquely identifies the filter

**Values** 1 to 1001

**Default** 1001

## default-action

## Syntax

**default-action** {drop | forward}

**no default-action**

## Context

config>log>filter

## Description

The default action specifies the action that is applied to events when no action is specified in the event filter entries or when an event does not match the specified criteria.

When multiple **default-action** commands are entered, the last command overwrites the previous command.

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

## Default

default-action forward

## Parameters

**drop**

the events that are not explicitly forwarded by an event filter match are dropped

**forward**

the events that are not explicitly dropped by an event filter match are forwarded

## entry

### Syntax

**[no] entry** *entry-id*

### Context

config>log>filter

### Description

This command is used to create or edit an event filter entry. Multiple entries may be created using unique *entry-id* numbers. The -TiMOS implementation exits the filter on the first match found and executes the action in accordance with the **action** command.

Comparisons are performed in an ascending entry ID order. When entries are created, they should be arranged sequentially from the most explicit entry to the least explicit. Matching ceases when a packet matches an entry. The entry action is performed on the packet, either drop or forward. To be considered a match, the packet must meet all the conditions defined in the entry.

An entry may have no match criteria defined (in which case, everything matches) but must have at least the **action** keyword for it to be considered complete. Entries without the **action** keyword will be considered incomplete and rendered inactive.

The **no** form of the command removes the specified entry from the event filter. Entries removed from the event filter are immediately removed from all log IDs where the filter is applied.

### Default

No event filter entries are defined. An entry must be explicitly configured.

### Parameters

*entry-id*

uniquely identifies a set of match criteria corresponding action within a filter. Entry ID values should be configured in staggered increments so you can insert a new entry in an existing policy without renumbering the existing entries.

**Values** 1 to 999

## action

### Syntax

**action** {**drop** | **forward**}

**no action**

### Context

config>log>filter>entry

## Description

This command specifies a drop or forward action associated with the filter entry.

If neither drop nor forward is specified, the [default-action](#) will be used for traffic that conforms to the match criteria. This could be considered a No-Op filter entry used to explicitly exit a set of filter entries without modifying previous actions.

When multiple action commands are entered, the last command will overwrite the previous command.

The **no** form of the command removes the specified [action](#) statement.

## Default

no action

## Parameters

### drop

specifies that packets matching the entry criteria will be dropped

### forward

specifies that packets matching the entry criteria will be forwarded

## match

## Syntax

[no] match

## Context

config>log>filter>entry

## Description

This command enables the context to enter or edit match criteria for a filter entry. When the match criteria is satisfied, the action associated with the entry is executed.

If more than one match parameter (within one match statement) is specified, then all the criteria must be satisfied and functional before the action associated with the match is executed.

Use the [applications](#) command to display a list of the valid applications.

Match context can consist of multiple match parameters (application, event-number, severity, subject), but multiple match statements cannot be entered per entry.

The **no** form of the command removes the match criteria for the *entry-id*.

## Default

No match context is defined.

## application

### Syntax

**application** {**eq** | **neq**} *application-id*

**no application**

### Context

config>log>filter>entry>match

### Description

This command adds a TiMOS application as an event filter match criterion.

A TiMOS application is the software entity that reports the event. Examples of applications include: IP, MPLS, CLI, and SERVICES. Only one application can be specified per entry.

When multiple **application** commands are entered, the last command will overwrite the previous command.

The **no** form of the command removes the application as a match criterion.

### Default

no application

### Parameters

**eq**

specifies that the matching criteria should be equal to the specified value

**neq**

specifies that the matching criteria should not be equal to the specified value

*application-id*

the application name string

**Values**    aps, atm, bgp, cflowd, chassis, debug, dhcp, dhcps, efm\_oam, ering, eth\_cfm, filter, firewall, igmp, igmp\_snooping, ip, ipsec, isis, lag, lcr, ldp, lldp, logger, mcpath, mc\_redundancy, mirror, mld, mld\_snooping, mpls, msdp, mwmgr, ntp, oam, ospf, pcap, pim, pim\_snooping, port, ppp, ptp, radius, rip, rip\_ng, route\_policy, rsvp, scada, security, snmp, stp, svcmgr, system, tss, user, vrrp, vrtr

## message

### Syntax

**message** {**eq** | **neq**}*pattern* *pattern* [**regexp**]

**no message**

## Context

```
config>log>filter>entry>match
```

## Description

This command adds system messages as a match criterion.

The **no** form of the command removes system messages as a match criterion.

## Parameters

### **eq**

specifies that the matching criteria should be equal to the specified value

### **neq**

specifies that the matching criteria should not be equal to the specified value

### *pattern*

specifies a message up to 400 characters in length to be used in the match criteria

### **regexp**

specifies the type of string comparison to use to determine if the log event matches the value of **message** command parameters. When the **regexp** keyword is specified, the string in the **message** command is a regular expression string that will be matched against the message string in the log event being filtered. When the **regexp** keyword is not specified, the default matching algorithm used is a basic substring match.

## number

## Syntax

```
number {eq | neq | lt | lte | gt | gte} event-id
```

```
no number
```

## Context

```
config>log>filter>entry>match
```

## Description

This command adds a TiMOS application event number as a match criterion.

TiMOS event numbers uniquely identify a specific logging event within an application.

Only one **number** command can be entered per event filter entry. If multiple **number** commands are entered, the last command overwrites the previous command.

The **no** form of the command removes the event number as a match criterion.

## Default

```
no event-number
```

## Parameters

```
eq | neq | lt | lte | gt | gte
```

this operator specifies the type of match. Valid operators are listed in [Table 42: Valid Match Operators for Event Numbers](#).

Table 42: Valid Match Operators for Event Numbers

| Operator | Notes                    |
|----------|--------------------------|
| eq       | Equal to                 |
| neq      | Not equal to             |
| lt       | Less than                |
| lte      | Less than or equal to    |
| gt       | Greater than             |
| gte      | Greater than or equal to |

*event-id*

the event ID, expressed as a decimal integer

**Values** 1 to 4294967295

## router

### Syntax

**router** {**eq** | **neq**} *router-instance* [**regexp**]

**no router**

### Context

config>log>filter>entry>match

### Description

This command specifies the log event matches for the router.

### Parameters

**eq**

specifies that the matching criteria should be equal to the specified value

**neq**

specifies that the matching criteria should not be equal to the specified value

*router-instance*

specifies a router name up to 32 characters to be used in the match criteria

**regexp**

specifies the type of string comparison to use to determine if the log event matches the value of **router** command parameters. When the **regexp** keyword is specified, the string in

the **router** command is a regular expression string that will be matched against the router string in the log event being filtered. When the **regexp** keyword is not specified, the **router** command string is matched exactly by the event filter.

## severity

### Syntax

**severity** {**eq** | **neq** | **lt** | **lte** | **gt** | **gte**} *severity-level*

**no severity**

### Context

config>log>filter>entry>match

### Description

This command adds an event severity level as a match criterion. Only one **severity** command can be entered per event filter entry. When multiple **severity** commands are entered, the last command overwrites the previous command.

The **no** form of the command removes the severity match criterion.

### Default

no severity

### Parameters

**eq** | **neq** | **lt** | **lte** | **gt** | **gte**

this operator specifies the type of match. Valid operators are listed in [Table 43: Valid Operators for Event Severity](#).

Table 43: Valid Operators for Event Severity

| Operator | Notes                    |
|----------|--------------------------|
| eq       | Equal to                 |
| neq      | Not equal to             |
| lt       | Less than                |
| lte      | Less than or equal to    |
| gt       | Greater than             |
| gte      | Greater than or equal to |

*severity-level*

the ITU severity level number. [Table 44: Severity Levels](#) lists severity levels and corresponding numbers per ITU standards M.3100 X.733 & X.21 severity levels.

Table 44: Severity Levels

| Severity Number | Severity Level       |
|-----------------|----------------------|
| 1               | Cleared              |
| 2               | Indeterminate (info) |
| 3               | Critical             |
| 4               | Major                |
| 5               | Minor                |
| 6               | Warning              |

## subject

### Syntax

**subject** {**eq** | **neq**} *subject* [**regexp**]

**no subject**

### Context

config>log>filter>entry>match

### Description

This command adds an event subject as a match criterion.

The *subject* is the entity for which the event is reported, such as a port. In this case, the *port-id* string would be the *subject*.

Only one **subject** command can be entered per event filter entry. If multiple **subject** commands are entered, the last command overwrites the previous command.

The **no** form of the command removes the subject match criterion.

### Default

no subject

### Parameters

**eq**

specifies that the matching criteria should be equal to the specified value

**neq**

specifies that the matching criteria should not be equal to the specified value

*subject*

a string used as the subject match criterion

**regex**

specifies the type of string comparison to use to determine if the log event matches the value of **subject** command parameters. When the **regex** keyword is specified, the string in the **subject** command is a regular expression string that will be matched against the subject string in the log event being filtered.

When the **regex** keyword is not specified, the **subject** command string is matched exactly by the event filter.

### 5.12.2.1.8 Syslog Commands

#### syslog

**Syntax**

[no] **syslog** *syslog-id*

**Context**

config>log

**Description**

This command enables the context to configure a syslog target host that is capable of receiving selected syslog messages from the 7705 SAR.

A valid *syslog-id* must have the target syslog host address configured.

A maximum of 10 syslog IDs can be configured.

No log events are sent to a syslog target address until the *syslog-id* has been configured as the log destination (**to**) in the log-id node.

**Default**

No syslog IDs are defined.

**Parameters**

*syslog-id*

the syslog ID number for the syslog destination, expressed as a decimal integer

**Values** 1 to 10

#### address

**Syntax**

**address** *ip-address*

**no address**

**Context**

```
config>log>syslog
```

**Description**

This command associates the syslog target host IP address with the syslog ID.

This parameter is mandatory. If no address is configured, syslog data cannot be forwarded to the syslog target host.

Only one address can be associated with a *syslog-id*. If multiple addresses are entered, the last address entered overwrites the previous address.

The same syslog target host can be used by multiple log IDs.

The **no** form of the command removes the syslog target host IP address.

**Default**

no address

**Parameters**

*ip-address*

the IP address of the syslog target host

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

**facility****Syntax**

```
facility syslog-facility
```

```
no facility
```

**Context**

```
config>log>syslog
```

**Description**

This command configures the facility code for messages sent to the syslog target host.

Multiple syslog IDs can be created with the same target host but each syslog ID can only have one facility code. If multiple facility codes are entered, the last facility code entered overwrites the previous facility code.

If multiple facilities need to be generated for a single syslog target host, then multiple **log-id** entries must be created, each with its own filter criteria to select the events to be sent to the syslog target host with a given facility code.

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

## Default

local7

## Parameters

*syslog-facility*

the syslog facility name for the event type being sent to the syslog target host. Valid codes are as per RFC 3164, *The BSD syslog Protocol*.

**Values** kernel, user, mail, systemd, auth, syslogd, printer, netnews, uucp, cron, authpriv, ftp, ntp, logaudit, logalert, cron2, local0, local1, local2, local3, local4, local5, local6, local7

## level

## Syntax

**level** *syslog-level*

**no level**

## Context

config>log>syslog

## Description

This command configures the syslog message severity level threshold. All messages with a severity level equal to or higher than the threshold are sent to the syslog target host.

Only a single threshold level can be specified. If multiple **level** commands are entered, the last command will overwrite the previous command.

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

## Default

info

## Parameters

*syslog-level*

the threshold severity level value, as described in [Table 45: Threshold Severity Level Values](#). See [Table 35: Event Severity Levels](#) for the numeric values associated with the severity levels.

**Values** emergency, alert, critical, error, warning, notice, info, or debug

Table 45: Threshold Severity Level Values

| Configured Severity | Definition                       |
|---------------------|----------------------------------|
| Emergency           | System is unusable               |
| Alert               | Action must be taken immediately |
| Critical            | Critical condition               |
| Error               | Error condition                  |
| Warning             | Warning condition                |
| Notice              | Normal but significant condition |
| Info                | Informational messages           |
| Debug               | Debug-level messages             |

## log-prefix

### Syntax

**log-prefix** *log-prefix-string*

**no log-prefix**

### Context

config>log>syslog

### Description

This command adds the string prepended to every syslog message sent to the syslog host.

RFC 3164, *The BSD syslog Protocol*, allows an alphanumeric string (tag) to be prepended to the content of every log message sent to the syslog host. This alphanumeric string can, for example, be used to identify the node that generates the log entry. The software appends a colon (:) and a space to the string and it is inserted in the syslog message after the date stamp and before the syslog message content.

Only one string can be entered. If multiple strings are entered, the last string overwrites the previous string. The alphanumeric string can contain lowercase (a-z), uppercase (A-Z) and numeric (0-9) characters.

The **no** form of the command removes the log prefix string.

### Default

no log-prefix

### Parameters

*log-prefix-string*

an alphanumeric string of up to 32 characters. Spaces and colons (:) cannot be used in the string.

## port

### Syntax

**port** *value*

**no port**

### Context

config>log>syslog

### Description

This command configures the UDP port that will be used to send syslog messages to the syslog target host.

The port configuration is needed if the syslog target host uses a port other than the standard UDP syslog port 514.

Only one port can be configured. If multiple **port** commands are entered, the last entered port overwrites the previously entered ports.

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

### Default

no port

### Parameters

*value*

the configured UDP port number used when sending syslog messages

**Values** 0 to 65535

## 5.12.2.1.9 Logging Destination Commands

## log-id

### Syntax

[**no**] **log-id** *log-id*

### Context

config>log

## Description

This command creates a context to configure destinations for event streams.

The **log-id** context is used to direct events, alarms, traps, and debug information to respective destinations.

A maximum of 100 logs can be configured.

Before an event can be associated with this *log-id*, the **log-id>from** command identifying the source of the event must be configured.

Only one destination can be specified for a *log-id*. The destination of an event stream can be an in-memory buffer, console, session, snmp-trap-group, syslog, or file.

Use the **event-control** command to suppress the generation of events, alarms, and traps for all log destinations.

An event filter policy can be applied in the **log-id** context to limit which events, alarms, and traps are sent to the specified *log-id*.

Log-IDs 99 and 100 are created by the agent. Log-ID 99 captures all log messages. Log-ID 100 captures log messages with a severity level of major and above.

The **no** form of the command deletes the log destination ID from the configuration.

## Default

No log destinations are defined

## Parameters

*log-id*

the log ID number, expressed as a decimal integer

**Values** 1 to 100

## filter

## Syntax

**filter** *filter-id*

**no filter**

## Context

config>log>log-id

## Description

This command associates an event filter policy with the log destination.

The **filter** command is optional. If no event filter is configured, all events, alarms and traps generated by the source stream will be forwarded to the destination.

An event filter policy defines (limits) the events that are forwarded to the destination configured in the *log-id*. The event filter policy can also be used to select the alarms and traps to be forwarded to a destination **snmp-trap-group**.

The application of filters for debug messages is limited to application and subject only.

Accounting records cannot be filtered using the **filter** command.

Only one *filter-id* can be configured per log destination.

The **no** form of the command removes the specified event filter from the *log-id*.

## Default

no filter

## Parameters

*filter-id*

the event filter policy ID that is used to associate the filter with the *log-id* configuration. The event filter policy ID must already be defined in the **config>log>filter** *filter-id* context. Log ID 100 is preconfigured by the system as a Severe Event Log that is associated with filter policy 1001 by default.

**Values** 1 to 1001

from

## Syntax

**from** {[main] [security] [change] [debug-trace]}

**no from**

## Context

config>log>log-id

## Description

This command selects the source stream to be sent to a log destination.

One or more source streams must be specified. The source of the data stream must be identified using the **from** command before you can configure the destination using the **to** command. The **from** command can identify multiple source streams in a single statement (for example: **from main change debug-trace**).

Only one **from** command may be entered for a single *log-id*. If multiple **from** commands are entered, then the last command entered overwrites the previous command.

The **no** form of the command removes all previously configured source streams.

## Default

no from

## Parameters

**main**

instructs all events in the main event stream to be sent to the destination defined in the **to** command for this destination *log-id*. The main event stream contains the events that

are not explicitly directed to any other event stream. To limit the events forwarded to the destination, configure filters using the `filter` (log destination) command.

#### **security**

instructs all events in the security event stream to be sent to the destination defined in the `to` command for this destination *log-id*. The security stream contains all events that affect attempts to breach system security such as failed login attempts, attempts to access MIB tables to which the user is not granted access, or attempts to enter a branch of the CLI to which access has not been granted. To limit the events forwarded to the destination, configure filters using the `filter` (log destination) command.

#### **change**

instructs all events in the user activity stream to be sent to the destination configured in the `to` command for this destination *log-id*. The change event stream contains all events that directly affect the configuration or operation of this node. To limit the events forwarded to the change stream destination, configure filters using the `filter` (log destination) command.

#### **debug-trace**

instructs all debug-trace messages in the debug stream to be sent to the destination configured in the `to` command for this destination *log-id*. Filters applied to debug messages are limited to application and subject.

## to console

### **Syntax**

`to console`

### **Context**

`config>log>log-id`

### **Description**

This command instructs the events selected for the log ID to be directed to the console. If the console is not connected, all entries are dropped.

The command is one of the `to` commands used to specify the log ID destination. A `to` command is mandatory when configuring a log destination.

The source of the data stream must be specified in the `from` command before configuring the destination with the `to` command.

The `to` command can only be set once. It cannot be modified or re-entered. If the log destination needs to be changed or if the maximum size of an SNMP log or memory log needs to be modified, the log ID must be removed and then recreated.

### **Default**

No destination is specified

## to file

### Syntax

**to file** *log-file-id*

### Context

config>log>log-id

### Description

This command instructs the events selected for the log ID to be directed to a specified file.

The command is one of the **to** commands used to specify the log ID destination. A **to** command is mandatory when configuring a log destination.

The source of the data stream must be specified in the **from** command before configuring the destination with the **to** command.

The **to** command can only be set once. It cannot be modified or re-entered. If the log destination needs to be changed or if the maximum size of an SNMP log or memory log needs to be modified, the log ID must be removed and then recreated.

### Default

No destination is specified

### Parameters

*log-file-id*

instructs the events selected for the log ID to be directed to the *log-file-id*. The characteristics of the *log-file-id* referenced here must have already been defined in the **config>log>file-id** *log-file-id* context.

**Values** 1 to 99

## to memory

### Syntax

**to memory** [*size*]

### Context

config>log>log-id

### Description

This command instructs the events selected for the log ID to be directed to a memory file. A memory file is a circular buffer. When the file is full, each new entry replaces the oldest entry in the log.

The command is one of the **to** commands used to specify the log ID destination. A **to** command is mandatory when configuring a log destination.

The source of the data stream must be specified in the **from** command before configuring the destination with the **to** command.

The **to** command can only be set once. It cannot be modified or re-entered. If the log destination needs to be changed or if the maximum size of an SNMP log or memory log needs to be modified, the log ID must be removed and then recreated.

### Default

No destination is specified

### Parameters

*size*

indicates the number of events that can be stored in the memory log

**Values** 50 to 3000

**Default** 100

## to session

### Syntax

**to session**

### Context

config>log>log-id

### Description

This command instructs the events selected for the log ID to be directed to the current console or Telnet session. This command is only valid for the duration of the session. When the session is terminated, the **to session** configuration is removed. A log ID with a session destination is saved in the configuration file but the **to session** part of the configuration is not stored.

The command is one of the **to** commands used to specify the log ID destination. A **to** command is mandatory when configuring a log destination.

The source of the data stream must be specified in the **from** command before configuring the destination with the **to** command.

The **to** command can only be set once. It cannot be modified or re-entered. If the log destination needs to be changed or if the maximum size of an SNMP log or memory log needs to be modified, the log ID must be removed and then recreated.

### Default

No destination is specified

## to snmp

### Syntax

**to snmp** [*size*]

### Context

config>log>log-id

### Description

This command instructs the alarms and traps to be directed to the **snmp-trap-group** associated with the *log-id*.

A local circular memory log is always maintained for SNMP notifications sent to the specified **snmp-trap-group** for the *log-id*.

The command is one of the **to** commands used to specify the log ID destination. A **to** command is mandatory when configuring a log destination.

The source of the data stream must be specified in the **from** command before configuring the destination with the **to** command.

The **to** command can only be set once. It cannot be modified or re-entered. If the log destination needs to be changed or if the maximum size of an SNMP log or memory log needs to be modified, the log ID must be removed and then recreated.

### Default

No destination is specified

### Parameters

*size*

defines the number of events stored in this memory log

**Values** 50 to 3000

**Default** 100

## to syslog

### Syntax

**to syslog** *syslog-id*

### Context

config>log>log-id

### Description

This command instructs the alarms and traps to be directed to a specified syslog. To remain consistent with the standards governing syslog, messages to syslog are truncated to 1 kbyte.

The command is one of the **to** commands used to specify the log ID destination. A **to** command is mandatory when configuring a log destination.

The source of the data stream must be specified in the **from** command before configuring the destination with the **to** command.

The **to** command can only be set once. It cannot be modified or re-entered. If the log destination needs to be changed or if the maximum size of an SNMP log or memory log needs to be modified, the log ID must be removed and then recreated.

## Default

No destination is specified

## Parameters

*syslog-id*

instructs the events selected for the log ID to be directed to the *syslog-id*. The characteristics of the *syslog-id* referenced here must have been defined in the **config>log>syslog** *syslog-id* context.

**Values** 1 to 10

## time-format

### Syntax

**time-format** {**local** | **utc**}

### Context

config>log>log-id

### Description

This command specifies whether the time should be displayed in local or Coordinated Universal Time (UTC) format.

### Default

utc

### Parameters

**local**

specifies that timestamps are written in the system's local time

**utc**

specifies that timestamps are written using the UTC value. This was formerly called Greenwich Mean Time (GMT) and Zulu time.

### 5.12.2.1.10 SNMP Trap Groups Commands

#### snmp-trap-group

##### Syntax

```
[no] snmp-trap-group log-id
```

##### Context

```
config>log
```

##### Description

This command enables the context to configure a group of SNMP trap receivers and their operational parameters for a specified *log-id*.

A trap group specifies the types of SNMP traps and specifies the log ID that will receive the group of SNMP traps. A trap group must be configured in order for SNMP traps to be sent.

To suppress the generation of all alarms and traps, see the [event-control](#) command. To suppress alarms and traps that are sent to this *log-id*, see the [filter](#) (log destination) command. When alarms and traps are generated, they can be directed to one or more SNMP trap groups. Logger events that can be forwarded as SNMP traps are always defined on the main event source.

The **no** form of the command deletes the SNMP trap group.

##### Default

There are no default SNMP trap groups.

##### Parameters

*log-id*

the log ID value of a log configured in the [to snmp](#) context. Alarms and traps cannot be sent to the trap receivers until a valid *log-id* exists.

**Values** 1 to 99

#### trap-target

##### Syntax

```
trap-target name address ip-address [port port] [snmpv1 | snmpv2c | snmpv3] notify-community {communityName | snmpv3SecurityName} [security-level {no-auth-no-privacy | auth-no-privacy | privacy}]
```

```
no trap-targetname
```

##### Context

```
config>log>snmp-trap-group
```

## Description

This command adds or modifies a trap receiver and configures the operational parameters for the trap receiver. A trap reports significant events that occur on a 7705 SAR, such as errors or failures.

Before an SNMP trap can be issued to a trap receiver, the [to console](#), [snmp-trap-group](#), and at least one **trap-target** must be configured.

The **trap-target** command is used to add or remove a trap receiver from an [snmp-trap-group](#). The operational parameters specified in the command include:

- the IP address of the trap receiver
- the UDP port used to send the SNMP trap
- SNMP version
- SNMP community name for SNMPv1 and SNMPv2c receivers
- security name and level for SNMPv3 trap receivers

A single **snmp-trap-group** *log-id* can have multiple trap receivers. Each trap receiver can have different operational parameters.

An address can be configured as a trap receiver more than once as long as a different port is used for each instance.

To prevent resource limitations, only configure a maximum of 10 trap receivers.



**Note:** If the same **trap-target** *name* **port** *port* parameter value is specified in more than one SNMP trap group, each trap destination should be configured with a different **notify-community** value. This allows a trap receiving an application, such as NMS, to reconcile a separate event sequence number stream for each 7705 SAR event log when multiple event logs are directed to the same IP address and port destination.

The **no** form of the command removes the SNMP trap receiver from the SNMP trap group.

## Default

No SNMP trap targets are defined.

## Parameters

*name*

specifies the name of the trap target, up to 28 characters in length

*ip-address*

the IP address of the trap receiver. Only one IP address destination can be specified per trap destination group.

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

*port*

the destination UDP port used for sending traps to the destination, expressed as a decimal integer. Only one port can be specified per **trap-target** statement. If multiple traps need to be issued to the same address, multiple ports must be configured.

**Values** 0 to 65535

**Default** 162

### **snmpv1 | snmpv2c | snmpv3**

specifies the SNMP version format to use for traps sent to the trap receiver

| <b>Values</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| snmpv1        | Selects the SNMP version 1 format. When specifying <b>snmpv1</b> , the <b>notify-community</b> parameter must be configured for the correct SNMP community string that the trap receiver expects to be present in alarms and traps messages. If the SNMP version is changed from <b>snmpv3</b> to <b>snmpv1</b> , then the <b>notify-community</b> parameter must be changed to reflect the community string instead of the <i>snmpv3securityName</i> that is used by <b>snmpv3</b> . |  |
| snmpv2c       | Selects the SNMP version 2c format. When specifying <b>snmpv2c</b> , the <b>notify-community</b> parameter must be configured for the correct SNMP community string that the trap receiver expects to be present in alarms and traps messages. If the SNMP version is changed from <b>snmpv3</b> to <b>snmpv2c</b> , then the <b>notify-community</b> parameter must be changed to reflect the community string instead of the <i>security-name</i> that is used by <b>snmpv3</b> .   |  |
| snmpv3        | Selects the SNMP version 3 format. When specifying <b>snmpv3</b> , the <b>notify-community</b> parameter must be configured for the SNMP <i>security-name</i> . If the SNMP version is changed from <b>snmpv1</b> or <b>snmpv2c</b> to <b>snmpv3</b> , then the <b>notify-community</b> parameter must be changed to reflect the <i>security-name</i> instead of the community string used by <b>snmpv1</b> or <b>snmpv2c</b> .                                                       |  |

**Default** snmpv3

### **notify-community** *communityName* | *snmpv3SecurityName*

specifies the community string for **snmpv1** or **snmpv2c**, or the **snmpv3** *security-name*. If no **notify-community** parameter is configured, then no alarms or traps are issued for the trap destination. If the SNMP version is modified, the **notify-community** parameter must be changed to the correct form for the SNMP version.

| <b>Values</b>             |                                                                                                                                                                  |  |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <i>communityName</i>      | the community string as required by the <b>snmpv1</b> or <b>snmpv2c</b> trap receiver. The community string can be an ASCII string up to 32 characters in length |  |
| <i>snmpv3SecurityName</i> | the security name as defined in the <b>config&gt;system&gt;security&gt;user</b> context for SNMP                                                                 |  |

v3. The *snmpv3SecurityName* can be an ASCII string up to 32 characters in length

### **security-level {no-auth-no-privacy | auth-no-privacy | privacy}**

specifies the required authentication and privacy levels required to access the views configured on this node when configuring an **snmpv3** trap receiver.

| Values |                    |                                                                                                                                                                                       |
|--------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | no-auth-no-privacy | Specifies that no authentication and no privacy (encryption) are required.                                                                                                            |
|        | auth-no-privacy    | Specifies that authentication is required but no privacy (encryption) is required. When this option is configured, the <i>security-name</i> must be configured for authentication.    |
|        | privacy            | Specifies that both authentication and privacy (encryption) are required. When this option is configured, the <i>security-name</i> must be configured for authentication and privacy. |

**Default** No default. The security level must be specified when configuring an SNMPv3 trap receiver.

## 5.12.2.2 Show Commands



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

### accounting-policy

#### Syntax

**accounting-policy** [*acct-policy-id*] [**access** | **network**] [**associations**]

#### Context

show>log

#### Description

This command displays accounting policy information.

#### Parameters

*acct-policy-id*

the policy ID that uniquely identifies the accounting policy, expressed as a decimal integer

**Values** 1 to 99

**access**

only displays access accounting policies

**network**

only displays network accounting policies

**associations**

only displays accounting policy associations

**Output**

The following output is an example of accounting policy information, and [Table 46: Accounting Policy Field Descriptions](#) describes the fields.

**Output Example**

```
A:ALU-1# show log accounting-policy
=====
Accounting Policies
=====
Policy Type Def Admin Oper Intvl File Record Name
Id State State State Id

1 access No Up Up 15 1 service-ingress-packets
2 access Yes Up Up 15 2 service-ingress-octets
=====
A:ALU-1#
```

```
A:ALU-1# show log accounting-policy 10
=====
Accounting Policies
=====
Policy Type Def Admin Oper Intvl File Record Name
Id State State State Id

10 access Yes Up Up 5 3 service-ingress-packets

Description : (Not Specified)
Data Loss Count : 0 Data Loss TimeStamp: N/A

This policy is applied to:
 Svc Id: 100 SAP : 1/1/8:0 Collect-Stats
 Svc Id: 101 SAP : 1/1/8:1 Collect-Stats
 Svc Id: 102 SAP : 1/1/8:2 Collect-Stats
 Svc Id: 106 SAP : 1/1/8:6 Collect-Stats
 Svc Id: 107 SAP : 1/1/8:7 Collect-Stats
 Svc Id: 108 SAP : 1/1/8:8 Collect-Stats
 Svc Id: 109 SAP : 1/1/8:9 Collect-Stats
...
=====
A:ALU-1#
```

```
A:ALU-1# show log accounting-policy access
=====
Accounting Policies
=====
Policy Type Def Admin Oper Intvl File Record Name
Id State State State Id

10 access Yes Up Up 5 3 service-ingress-packets
```

-----  
 A:ALU-1#

Table 46: Accounting Policy Field Descriptions

| Label                     | Description                                                                                                                                         |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Policy ID                 | The identifying value assigned to a specific policy                                                                                                 |
| Type                      | Identifies the accounting policy type forwarded to the configured accounting file                                                                   |
|                           | access: indicates that the policy is an access accounting policy                                                                                    |
|                           | network: indicates that the policy is a network accounting policy                                                                                   |
|                           | none: indicates no accounting policy types assigned                                                                                                 |
| Def                       | Yes: indicates that the policy is a default policy                                                                                                  |
|                           | No: indicates that the policy is not a default policy                                                                                               |
| Admin State               | Displays the administrative state of the policy                                                                                                     |
|                           | Up: indicates that the policy is administratively enabled                                                                                           |
|                           | Down: indicates that the policy is administratively disabled                                                                                        |
| Oper State                | Displays the operational state of the policy                                                                                                        |
|                           | Up: indicates that the policy is operationally up                                                                                                   |
|                           | Down: indicates that the policy is operationally down                                                                                               |
| Intvl                     | Displays the interval, in minutes, in which statistics are collected and written to their destination. The default depends on the record name type. |
| File ID                   | The log destination                                                                                                                                 |
| Record Name               | The accounting record name that represents the configured record type                                                                               |
| Description               | The description of the accounting policy                                                                                                            |
| Data Loss Count           | The number of times a statistics data loss has occurred                                                                                             |
| Data Loss Timestamp       | The timestamp of the last data loss occurrence. If there are no losses, the timestamp is N/A.                                                       |
| This policy is applied to | Specifies the entities that the accounting policy is applied to                                                                                     |

## accounting-records

### Syntax

**accounting-records**

### Context

show>log

### Description

This command displays accounting policy record names.

### Output

The following output is an example of accounting policy record information, and [Table 47: Accounting Records Field Descriptions](#) describes the fields.

### Output Example

```
A: ALU-1# show log accounting-records
=====
Accounting Policy Records
=====
Record # Record Name Def. Interval

1 service-ingress-octets 5
2 service-egress-octets 5
3 service-ingress-packets 5
4 service-egress-packets 5
5 network-ingress-octets 15
6 network-egress-octets 15
7 network-ingress-packets 15
8 network-egress-packets 15
11 combined-network-ing-egr-octets 15
12 combined-service-ing-egr-octets 5
13 complete-service-ingress-egress 5
32 saa 5
54 complete-network-ing-egr 15
=====
A:ALU-1#
```

*Table 47: Accounting Records Field Descriptions*

| Label         | Description                                                                                          |
|---------------|------------------------------------------------------------------------------------------------------|
| Record #      | The record ID that uniquely identifies the accounting policy, expressed as a decimal integer         |
| Record Name   | The accounting record name                                                                           |
| Def. Interval | The default interval, in minutes, in which statistics are collected and written to their destination |

## applications

### Syntax

**applications**

### Context

show>log

### Description

This command displays a list of all application names that can be used in event-control and filter commands.

### Output

The following output is an example of an application list (not all applications apply to the 7705 SAR).

### Output Example

```
A:ALU-1# show log applications
=====
Log Event Application Names
=====
Application Name

APS
ATM
BFD
BGP
CHASSIS
CPMHWFILTER
DEBUG
DHCP
DHCPS
DOT1X
EFM_OAM
ERING
ETH_CFM
FILTER
FIREWALL
FR
IGMP
IGMP_SNOOPING
IP
IPSEC
IPSEC_CPM
ISIS
LAG
LDP
LLDP
LOGGER
MCPATH
MC_REDUNDANCY
MIRROR
MLD
MLD_SNOOPING
MPLS
MWMGR
NGE
NTP
```

```

OAM
OSPF
PIM
PIM_SNOOPING
PORT
PPP
PTP
QOS
RADIUS
RIP
RIP_NG
ROUTE_NEXT_HOP
ROUTE_POLICY
RSVP
SCADA
SECURITY
SNMP
STP
SUB_HOST_TRK
SVC_MGR
SYSTEM
TIP
TSS
USER
VRRP
VRTR
=====
A:ALU-1#

```

## event-control

### Syntax

```

event-control [application-id [event-name | event-number]]
event-control application-id event-namedetail

```

### Context

```
show>log
```

### Description

This command displays event control settings for events, including whether the event is suppressed or generated, and the severity level for the event.

If no options are specified, all events, alarms, and traps are listed.

### Parameters

*application-id*  
displays event control for the specified application

**Values**    aps, atm, cflowd, bgp, chassis, debug, dhcp, dhcps, efm\_oam, ering, eth\_cfm, filter, firewall, igmp, igmp\_snooping, ip, ipsec, isis, lag, lcr, ldp, lldp, logger, mcpath, mc\_redundancy, mirror, mld, mld\_snooping, mpls, msdp, mwmgr, ntp, oam, ospf, pcap, pim,

pim\_snooping, port, ppp, ptp, radius, rip, rip\_ng, route\_policy, rsvp, scada, security, snmp, stp, svcmgr, system, tss, user, vrrp, vrtr

**Default** all applications

#### *event-name*

displays event control for the named application event

**Values** 32 characters maximum

**Default** all events for the application

#### *event-number*

displays event control for the specified application event number

**Values** 0 to 4294967295

**Default** all events for the application

#### **detail**

displays detailed event-control information

## Output

The following output is an example of event control information, and [Table 48: Event Control Field Descriptions](#) describes the fields. Because the output is very large, only a sample of the events are shown here.

### Output Example

```
A:gal171# show log event-control
=====
Log Events
=====
Application
ID# Event Name P g/s Logged Dropped

ATM:
 2004 tAtmTcSubLayerDown MI gen 0 0
 2005 tAtmTcSubLayerClear MI gen 0 0
L 2006 atmVclStatusChange WA gen 0 0
...
CHASSIS:
 2001 cardFailure MA gen 4 0
 2002 cardInserted MI gen 3 0
 2003 cardRemoved MI gen 8 0
 2004 cardWrong MI gen 0 0
 2005 EnvTemperatureTooHigh MA gen 0 0
 2007 powerSupplyOverTemp CR gen 0 0
 2008 powerSupplyAcFailure CR gen 0 0
 2009 powerSupplyDcFailure CR gen 0 0
 2010 powerSupplyInserted MA gen 0 0
 2011 powerSupplyRemoved MA gen 0 0
 2012 redPrimaryCPMFail CR gen 0 0
 2016 clearNotification MA gen 0 0
 2017 syncIfTimingHoldover CR gen 0 0
 2018 syncIfTimingHoldoverClear CR gen 0 0
 2019 syncIfTimingRef1Alarm MI gen 0 0
```

|          |                              |                                |     |     |   |   |
|----------|------------------------------|--------------------------------|-----|-----|---|---|
| 2020     | syncIfTimingRef1AlarmClear   | MI                             | gen | 0   | 0 |   |
| 2021     | syncIfTimingRef2Alarm        | MI                             | gen | 0   | 0 |   |
| 2022     | syncIfTimingRef2AlarmClear   | MI                             | gen | 0   | 0 |   |
| 2023     | flashDataLoss                | MA                             | gen | 0   | 0 |   |
| 2024     | flashDiskFull                | MA                             | gen | 0   | 0 |   |
| 2025     | softwareMismatch             | MA                             | gen | 0   | 0 |   |
| 2026     | softwareLoadFailed           | MA                             | gen | 0   | 0 |   |
| 2027     | bootloaderMismatch           | MA                             | gen | 0   | 0 |   |
| 2028     | bootromMismatch              | MA                             | gen | 0   | 0 |   |
| 2029     | fpgaMismatch                 | MA                             | gen | 0   | 0 |   |
| 2030     | syncIfTimingBITSAAlarm       | MI                             | gen | 0   | 0 |   |
| 2031     | syncIfTimingBITSAAlarmClear  | MI                             | gen | 0   | 0 |   |
| 2032     | cardUpgraded                 | MA                             | gen | 0   | 0 |   |
| 2033     | cardUpgradeInProgress        | MA                             | gen | 0   | 0 |   |
| 2034     | cardUpgradeComplete          | MA                             | gen | 0   | 0 |   |
| 2050     | powerSupplyInputFailure      | CR                             | gen | 0   | 0 |   |
| 2051     | powerSupplyOutputFailure     | CR                             | gen | 0   | 0 |   |
| 2052     | mdaHiBwMulticastAlarm        | MI                             | gen | 0   | 0 |   |
| 2056     | mdaCfgNotCompatible          | MA                             | gen | 0   | 0 |   |
| 2057     | extAlarmInput1Detected       | CR                             | gen | 0   | 0 |   |
| 2058     | extAlarmInput2Detected       | MA                             | gen | 0   | 0 |   |
| 2059     | extAlarmInput3Detected       | MA                             | gen | 0   | 0 |   |
| 2060     | extAlarmInput4Detected       | MI                             | gen | 0   | 0 |   |
| 2061     | extAlarmCleared              | MA                             | gen | 0   | 0 |   |
| 2062     | syncIfTimingExternAlarm      | MI                             | gen | 0   | 0 |   |
| 2063     | syncIfTimingExternAlarmClear | MI                             | gen | 0   | 0 |   |
| 2064     | cardBgDiagsFault             | MI                             | gen | 0   | 0 |   |
| 2065     | fanCriticalFailure           | CR                             | gen | 0   | 0 |   |
| 2066     | fanMinorFailure              | MI                             | gen | 0   | 0 |   |
| 2067     | cardSyncFileNotPresent       | MI                             | gen | 0   | 0 |   |
| 2058     | tmnxEqMdaXplError            | MI                             | sup | 0   | 0 |   |
| ...      |                              |                                |     |     |   |   |
| DEBUG:   |                              |                                |     |     |   |   |
| L        | 2001                         | traceEvent                     | MI  | gen | 0 | 0 |
| DOT1AG:  |                              |                                |     |     |   |   |
|          | 2001                         | dot1agCfmFaultAlarm            | MI  | gen | 0 | 0 |
| EFM_OAM: |                              |                                |     |     |   |   |
|          | 2001                         | tmnxDot30amPeerChanged         | MI  | gen | 0 | 0 |
|          | 2002                         | tmnxDot30amLoopDetected        | MI  | gen | 0 | 0 |
|          | 2003                         | tmnxDot30amLoopCleared         | MI  | gen | 0 | 0 |
| FILTER:  |                              |                                |     |     |   |   |
|          | 2001                         | tIPFilterPBRPacketsDrop        | WA  | gen | 0 | 0 |
|          | 2002                         | tFilterEntryActivationFailed   | WA  | gen | 0 | 0 |
|          | 2003                         | tFilterEntryActivationRestored | WA  | gen | 0 | 0 |
| IP:      |                              |                                |     |     |   |   |
| L        | 2001                         | clearRTMError                  | MI  | gen | 0 | 0 |
| L        | 2002                         | ipEtherBroadcast               | MI  | gen | 0 | 0 |
| L        | 2003                         | ipDuplicateAddress             | MI  | gen | 0 | 0 |
| L        | 2004                         | ipArpInfoOverwritten           | MI  | gen | 0 | 0 |
| L        | 2005                         | fibAddFailed                   | MA  | gen | 0 | 0 |
| L        | 2006                         | qosNetworkPolicyMallocFailed   | MA  | gen | 0 | 0 |
| L        | 2007                         | ipArpBadInterface              | MI  | gen | 0 | 0 |
| L        | 2008                         | ipArpDuplicateIpAddress        | MI  | gen | 0 | 0 |
| L        | 2009                         | ipArpDuplicateMacAddress       | MI  | gen | 0 | 0 |
| ....     |                              |                                |     |     |   |   |
| ....     |                              |                                |     |     |   |   |
| USER:    |                              |                                |     |     |   |   |
| L        | 2001                         | cli_user_login                 | MI  | gen | 2 | 0 |
| L        | 2002                         | cli_user_logout                | MI  | gen | 1 | 0 |
| L        | 2003                         | cli_user_login_failed          | MI  | gen | 0 | 0 |
| L        | 2004                         | cli_user_login_max_attempts    | MI  | gen | 0 | 0 |
| L        | 2005                         | ftp_user_login                 | MI  | gen | 0 | 0 |
| L        | 2006                         | ftp_user_logout                | MI  | gen | 0 | 0 |

```

L 2007 ftp_user_login_failed MI gen 0 0
L 2008 ftp_user_login_max_attempts MI gen 0 0
L 2009 cli_user_io MI sup 0 48
L 2010 snmp_user_set MI sup 0 0
L 2011 cli_config_io MI gen 4357 0
=====
A:ALU-1#

```

Table 48: Event Control Field Descriptions

| Label       | Description                                                                                                                                                                                                                                          |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Application | The application name                                                                                                                                                                                                                                 |
| ID#         | The event ID number within the application<br>L ID#: an "L" in front of an ID represents event types that do not generate an associated SNMP notification. Most events generate a notification; only the exceptions are marked with a preceding "L". |
| Event Name  | The event name                                                                                                                                                                                                                                       |
| P           | CL: the event has a cleared severity/priority                                                                                                                                                                                                        |
|             | CR: the event has critical severity/priority                                                                                                                                                                                                         |
|             | IN: the event has indeterminate severity/priority                                                                                                                                                                                                    |
|             | MA: the event has major severity/priority                                                                                                                                                                                                            |
|             | MI: the event has minor severity/priority                                                                                                                                                                                                            |
| g/s         | WA: the event has warning severity/priority                                                                                                                                                                                                          |
|             | gen: the event is generated/logged by event control                                                                                                                                                                                                  |
|             | sup: the event is suppressed/dropped by event control                                                                                                                                                                                                |
| g/s         | thr: specifies that throttling is enabled                                                                                                                                                                                                            |
|             |                                                                                                                                                                                                                                                      |
| Logged      | The number of events logged/generated                                                                                                                                                                                                                |
| Dropped     | The number of events dropped/suppressed                                                                                                                                                                                                              |

## event-handling

### Syntax

event-handling

### Context

show>log

## Description

This command enables the context to display Event Handling System (EHS) information.

## handler

## Syntax

**handler** [*handler-name*]

**handler detail**

## Context

show>log>event-handling

## Description

This command displays event handler information.

## Parameters

*handler-name*

specifies an event handler name

**detail**

displays detailed information for all event handlers

## Output

The following is an example of event handler information, and [Table 49: Event Handler Field Descriptions](#) describes the fields.

## Output Example

```

A:7705:Dut-C# show log event-handling handler "handler_1"
=====
Event Handling System - Handlers
=====
Handler : handler_1
=====
Description : test_handler
Admin State : up
Oper State : up

Handler Execution Statistics
Success : 1
Err No Entry : 0
Err Adm Status : 0
Total : 1

Handler Action-List Entry

Entry-id : 1
Description : test_entry
Admin State : up
Oper State : up

```

```

Script
 Policy Name : script_policy_1
 Policy Owner : TiMOS CLI
 Min Delay : 0
 Last Exec : 05/24/2018 19:03:31

Handler Action-List Entry Execution Statistics
 Success : 1
 Err Mn Delay : 0
 Err Launch : 0
 Err Adm Status : 0
 Total : 1
=====

```

Table 49: Event Handler Field Descriptions

| Label                        | Description                                                                                                 |
|------------------------------|-------------------------------------------------------------------------------------------------------------|
| Handler                      | The name of the event handler                                                                               |
| Description                  | The event handler description string                                                                        |
| Admin State                  | The administrative state of the event handler                                                               |
| Oper State                   | The operational state of the event handler                                                                  |
| Handler Execution Statistics |                                                                                                             |
| Success                      | The number of times that the event handler was successfully triggered                                       |
| Err No Entry                 | The number of times that the event handler failed to trigger due to no action-list entry                    |
| Err Adm Status               | The number of times that the event handler was not executed because the entry was administratively disabled |
| Total                        | The total number of times that the event handler attempted execution                                        |
| Handler Action-List Entry    |                                                                                                             |
| Entry-id                     | The action-list entry identifier                                                                            |
| Description                  | The action-list entry description string                                                                    |
| Admin State                  | The administrative state of the action-list entry                                                           |
| Oper State                   | The operational state of the action-list entry                                                              |
| Script                       |                                                                                                             |
| Policy Name                  | The name of the related script policy                                                                       |
| Policy Owner                 | The owner of the related script policy                                                                      |

| Label                                          | Description                                                                                                                                                                                                                                                  |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Min Delay                                      | The configured minimum delay time between subsequent executions of the action specified in the entry                                                                                                                                                         |
| Last Exec                                      | The timestamp of the last successful execution of the action-list entry                                                                                                                                                                                      |
| Handler Action-List Entry Execution Statistics |                                                                                                                                                                                                                                                              |
| Success                                        | The number of times that the action-list entry was successfully queued to run. For a script-policy entry, this indicates that the script request has been enqueued but does not necessarily indicate that the script has successfully launched or completed. |
| Err Mn Delay                                   | The number of times that the action-list entry attempted to execute before the minimum delay time expired                                                                                                                                                    |
| Err Launch                                     | The number of times that the action-list entry was not successfully queued to run. This could be caused by a number of conditions, including a full script request input queue.                                                                              |
| Err Adm Status                                 | The number of times that the action-list entry was not executed because the entry was administratively disabled                                                                                                                                              |
| Total                                          | The total number of times that the action-list entry attempted execution                                                                                                                                                                                     |

## information

### Syntax

#### information

### Context

show>log>event-handling

### Description

This command displays general information about EHS, as well as handler and trigger statistics.

### Output

The following is an example of EHS information.

#### Output Example

```
A:7705:Dut-C# show log event-handling information
=====
Event Handling System - Event Trigger Statistics
=====
Application Name
```

| Event Id                                         | Total    | Success  | ErrNoEntry | AdmStatus  |           |           |            |
|--------------------------------------------------|----------|----------|------------|------------|-----------|-----------|------------|
| -----                                            |          |          |            |            |           |           |            |
| OAM                                              |          |          |            |            |           |           |            |
| 2001                                             | 0        | 0        | 0          | 0          |           |           |            |
| -----                                            |          |          |            |            |           |           |            |
| Entry                                            | FilMatch | Trigger  | Debounce   | FilFail    | ErrAdmSta | ErrFilter | ErrHandler |
| -----                                            |          |          |            |            |           |           |            |
| 1                                                | 0        | 0        | 0          | 0          | 0         | 0         | 0          |
| 10                                               | 0        | 0        | 0          | 0          | 0         | 0         | 0          |
| -----                                            |          |          |            |            |           |           |            |
| SUM                                              | 0        | 0        | 0          | 0          | 0         | 0         | 0          |
| -----                                            |          |          |            |            |           |           |            |
| Application Name                                 |          |          |            |            |           |           |            |
| Event Id                                         | Total    | Success  | ErrNoEntry | AdmStatus  |           |           |            |
| -----                                            |          |          |            |            |           |           |            |
| OAM                                              |          |          |            |            |           |           |            |
| 2004                                             | 0        | 0        | 0          | 0          |           |           |            |
| -----                                            |          |          |            |            |           |           |            |
| Entry                                            | FilMatch | Trigger  | Debounce   | FilFail    | ErrAdmSta | ErrFilter | ErrHandler |
| -----                                            |          |          |            |            |           |           |            |
| 1                                                | 0        | 0        | 0          | 0          | 0         | 0         | 0          |
| -----                                            |          |          |            |            |           |           |            |
| SUM                                              | 0        | 0        | 0          | 0          | 0         | 0         | 0          |
| =====                                            |          |          |            |            |           |           |            |
| EVENTS PROCESSED                                 |          | Total    | Success    | ErrNoEntry | AdmStatus |           |            |
|                                                  |          | 0        | 0          | 0          | 0         |           |            |
| =====                                            |          |          |            |            |           |           |            |
| Event Handling System - Event Handler Statistics |          |          |            |            |           |           |            |
| =====                                            |          |          |            |            |           |           |            |
| Handler                                          | Total    | Success  | ErrNoEntry | AdmStatus  |           |           |            |
| handler_1                                        | 0        | 0        | 0          | 0          |           |           |            |
| -----                                            |          |          |            |            |           |           |            |
| Entry Id                                         | Launch   | MinDelay | ErrLaunch  | ErrAdmSta  |           |           |            |
| -----                                            |          |          |            |            |           |           |            |
| 1                                                | 0        | 0        | 0          | 0          |           |           |            |
| -----                                            |          |          |            |            |           |           |            |
| SUMMARY                                          | 0        | 0        | 0          | 0          |           |           |            |
| =====                                            |          |          |            |            |           |           |            |
| HANDLERS SUMMARY                                 |          | Total    | Success    | ErrNoEntry | AdmStatus |           |            |
|                                                  |          | 0        | 0          | 0          | 0         |           |            |
| =====                                            |          |          |            |            |           |           |            |

## scripts

### Syntax

#### scripts

### Context

show>log>event-handling

### Description

This command displays handler configuration and script run queue information.

## Output

The following is an example of script information.

### Output Example

```
A:7705:Dut-C# show log event-handling scripts
=====
Event Handling System - Script Policy Association
=====

No Matching Entries Found
=====

Event Handling System - Script Association
=====

No Matching Entries Found
=====

Event Handling System - Script Launched List
=====

Run # Script owner Script name Script state

No Matching Entries
=====
```

## event-parameters

### Syntax

**event-parameters** [*application-id* [*event-name* | *event-number*]]

### Context

show>log

### Description

This command displays the common parameters and specific parameters of log event or of all log events. This lets a user know what parameters can be passed from a triggering event to the triggered EHS script.

### Parameters

*application-id*

displays event parameters for the specified application

**Values**    aps, atm, bgp, cflowd, chassis, debug, dhcp, dhcps, efm\_oam, ering, eth\_cfm, filter, firewall, igmp, igmp\_snooping, ip, ipsec, isis, lag, lcr, ldp, lldp, logger, mcpath, mc\_redundancy, mirror, mld, mld\_snooping, mpls, msdp, mwmgr, ntp, oam, ospf, pcap, pim, pim\_snooping, port, ppp, ptp, radius, rip, rip\_ng, route\_policy, rsvp, scada, security, snmp, stp, svcmgr, system, tss, user, vrrp, vtr

**Default**    all applications

*event-name*

displays event parameters for the named application event

**Values** 32 characters maximum

**Default** all events for the application

#### *event-number*

displays event parameters for the specified application event number

**Values** 0 to 4294967295

**Default** all events for the application

## Output

The following is an example of log event parameter information.

### Output Example

```
show log event-parameters "oam" 2001
=====
Common Event Parameters
 appid
 name
 eventid
 severity
 subject
 gentime
Event Specific Parameters
 tmnx0amPingCtlOwnerIndex
 tmnx0amPingCtlTestIndex
 tmnx0amPingCtlTgtAddrType
 tmnx0amPingCtlTgtAddress
 tmnx0amPingResultsTestRunIndex
 tmnx0amPingResultsOperStatus
 tmnx0amPingResultsMinRtt
 tmnx0amPingResultsMaxRtt
 tmnx0amPingResultsAverageRtt
 tmnx0amPingResultsRttSumOfSquares
 tmnx0amPingResultsRtt0FSumSquares
 tmnx0amPingResultsMtuResponseSize
 tmnx0amPingResultsSvcPing
 tmnx0amPingResultsProbeResponses
 tmnx0amPingResultsSentProbes
 tmnx0amPingResultsLastGoodProbe
 tmnx0amPingCtlTestMode
 tmnx0amPingHistoryIndex
=====
```

## file-id

### Syntax

**file-id** [*log-file-id*]

## Context

show>log

## Description

This command displays event log file information.

If no command line parameters are specified, a summary output of all event log files is displayed.

Specifying a file ID displays detailed information about the event log file.

## Parameters

*log-file-id*

displays detailed information about the specified event log file

**Values** 1 to 99

## Output

The following output is an example of event log file information, and [Table 50: Log File Summary Field Descriptions](#) describes the fields.

### Output Example

```
A:ALU-1# show log file-id
=====
File Id List
=====
file-id rollover retention admin backup oper
 location location location

1 60 4 cf3: none none
2 60 3 cf3: none none
3 1440 12 cf3: none none
10 1440 12 cf3: none none
11 1440 12 cf3: none none
15 1440 12 cf3: none none
20 1440 12 cf3: none none
=====
A:ALU-1#
```

```
A:ALU-1# show log file-id 10
=====
File Id List
=====
file-id rollover retention admin backup oper
 location location location

10 1440 12 cf3: none none
Description : Main
=====
File Id 10 Location cf3:
=====
file name expired state

cf3:\log\log0302-20060501-012205 yes complete
cf3:\log\log0302-20060501-014049 yes complete
cf3:\log\log0302-20060501-015344 yes complete
```

```
cf3:\log\log0302-20060501-015547 yes in progress
=====
```

Table 50: Log File Summary Field Descriptions

| Label           | Description                                                                                                     |
|-----------------|-----------------------------------------------------------------------------------------------------------------|
| file-id         | The log file ID                                                                                                 |
| rollover        | The rollover time for the log file, which is the amount of time before the file is partitioned into a new file. |
| retention       | The retention time for the file in the system, which is how long the file should be retained in the file system |
| admin location  | The flash device specified for the file location                                                                |
|                 | none: indicates no specific flash device was specified                                                          |
| backup location | The backup compact flash device specified for the file location                                                 |
| oper location   | The actual flash device on which the log file exists                                                            |
| file name       | The complete pathname of the file associated with the log ID                                                    |
| expired         | Indicates whether the retention period for this file has passed                                                 |
| state           | in progress: indicates the current open log file                                                                |
|                 | complete: indicates the old log file                                                                            |

## filter-id

### Syntax

```
filter-id [filter-id]
```

### Context

```
show>log
```

### Description

This command displays event log filter policy information. If you specify a filter ID, the command also displays the filter match criteria.

### Parameters

*filter-id*

displays detailed information about the specified event filter policy ID

**Values** 1 to 1001

## Output

The following outputs are examples of event log filter policy information:

- filter ID summary information ([Output Example, Table 51: Filter ID Summary Field Descriptions](#))
- filter ID information with match criteria specified ([Output Example, Table 52: Filter ID Match Criteria Field Descriptions](#))

### Output Example

```
*A:ALU-48>config>log# show log filter-id
=====
Log Filters
=====
Filter Applied Default Description
Id Action

1 no forward
5 no forward
10 no forward
1001 yes drop Collect events for Serious Errors Log
=====
*A:ALU-48>config>log#
```

Table 51: Filter ID Summary Field Descriptions

| Label          | Description                                                                                           |
|----------------|-------------------------------------------------------------------------------------------------------|
| Filter Id      | The event log filter ID                                                                               |
| Applied        | no: the event log filter is not currently in use by a log ID                                          |
|                | yes: the event log filter is currently in use by a log ID                                             |
| Default Action | drop: the default action for the event log filter is to drop events not matching filter entries       |
|                | forward: the default action for the event log filter is to forward events not matching filter entries |
| Description    | The description string for the filter ID                                                              |

### Output Example

```
*A:ALU-48>config>log# show log filter-id 1001
=====
Log Filter
=====
Filter-id : 1001 Applied : yes Default Action: drop
Description : Collect events for Serious Errors Log

Log Filter Match Criteria

Entry-id : 10 Action : forward
Application : Operator : off
Event Number : 0 Operator : off
Severity : major Operator : greaterThanOrEqual
Subject : Operator : off
Match Type : exact string
```

```

Router : Operator : off
Match Type : exact string :
Description : Collect only events of major severity or higher

=====

```

Table 52: Filter ID Match Criteria Field Descriptions

| Label                                                                                  | Description                                                                                                                    |
|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Entry-id                                                                               | The event log filter entry ID                                                                                                  |
| Action                                                                                 | default: there is no explicit action for the event log filter entry and the filter's default action is used on matching events |
|                                                                                        | drop: the action for the event log filter entry is to drop matching events                                                     |
|                                                                                        | forward: the action for the event log filter entry is to forward matching events                                               |
| Description: (Entry-id)                                                                | The description string for the event log filter entry                                                                          |
| Application                                                                            | The event log filter entry application match criterion                                                                         |
| Event Number                                                                           | The event log filter event ID match criterion                                                                                  |
| Severity                                                                               | cleared: the event log filter severity match is cleared                                                                        |
|                                                                                        | indeterminate: the event log filter entry application event severity indeterminate match criterion                             |
|                                                                                        | critical: the event log filter entry application event severity critical match criterion                                       |
|                                                                                        | major: the event log filter entry application event severity cleared match criterion                                           |
|                                                                                        | minor: the event log filter entry application event severity minor match criterion                                             |
| warning: the event log filter entry application event severity warning match criterion |                                                                                                                                |
| Subject                                                                                | Displays the event log filter entry <b>subject</b> string match criterion                                                      |
| Router                                                                                 | Displays the event log filter entry <b>router</b> <i>router-instance</i> string match criterion                                |
| Operator:                                                                              | There is an operator field for each match criteria:<br>application, event number, severity, and subject                        |
|                                                                                        | <b>equal</b> : matches when equal to the match criterion                                                                       |

| Label | Description                                                                             |
|-------|-----------------------------------------------------------------------------------------|
|       | <b>greaterThan</b> : matches when greater than the match criterion                      |
|       | <b>greaterThanOrEqualTo</b> : matches when greater than or equal to the match criterion |
|       | <b>lessThan</b> : matches when less than the match criterion                            |
|       | <b>lessThanOrEqualTo</b> : matches when less than or equal to the match criterion       |
|       | <b>notEqual</b> : matches when not equal to the match criterion                         |
|       | <b>off</b> : no operator specified for the match criterion                              |

## log-collector

### Syntax

**log-collector**

### Context

show>log

### Description

This command displays log collector statistics for the main, security, change and debug log collectors.

### Output

The following output is an example of log collector statistics, and [Table 53: Log Collector Field Descriptions](#) describes the fields.

### Output Example

```
A:ALU-1# show log log-collector
=====
Log Collectors
=====
Main Logged : 1224 Dropped : 0
 Dest Log Id: 99 Filter Id: 0 Status: enabled Dest Type: memory
 Dest Log Id: 100 Filter Id: 1001 Status: enabled Dest Type: memory

Security Logged : 3 Dropped : 0

Change Logged : 3896 Dropped : 0

Debug Logged : 0 Dropped : 0
=====
A:ALU-1#
```

Table 53: Log Collector Field Descriptions

| Label            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <Collector Name> | Main: the main event stream contains the events that are not explicitly directed to any other event stream                                                                                                                                                                                                                                                                                                                                                                                               |
|                  | Security: the security stream contains all events that affect attempts to breach system security, such as failed login attempts, attempts to access MIB tables to which the user is not granted access or attempts to enter a branch of the CLI to which access has not been granted                                                                                                                                                                                                                     |
|                  | Change: the change event stream contains all events that directly affect the configuration or operation of this node                                                                                                                                                                                                                                                                                                                                                                                     |
|                  | Debug: the debug-trace stream contains all messages in the debug stream                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Dest. Log ID     | Specifies the event log stream destination                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Filter ID        | The value is the index to the entry that defines the filter to be applied to this log's source event stream to limit the events output to this log's destination. If the value is 0, then all events in the source log are forwarded to the destination.                                                                                                                                                                                                                                                 |
| Status           | Enabled: logging is enabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                  | Disabled: logging is disabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Dest. Type:      | Console: a log created with the console type destination displays events to the physical console device<br>Events are displayed to the console screen whether a user is logged in to the console or not.<br>A user logged in to the console device or connected to the CLI via a remote Telnet or SSH session can also create a log with a destination type of 'session'. Events are displayed to the session device until the user logs off. When the user logs off, the 'session' type log is deleted. |
|                  | Syslog: all selected log events are sent to the syslog address                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                  | SNMP traps: events defined as SNMP traps are sent to the configured SNMP trap destinations and are logged in NOTIFICATION-LOG-MIB tables                                                                                                                                                                                                                                                                                                                                                                 |
|                  | File: all selected log events are directed to a file on the CSM's compact flash disk                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                  | Memory: all selected log events are directed to an in-memory storage area                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## log-id

### Syntax

**log-id** [*log-id*][**severity** *severity-level*] [**application** *application*] [**sequence** *from-seq* [*to-seq*]] [**count** *count*] [**router** *router-instance* [**expression**]] [**subject** *subject* [**regexp**]] [**ascending** | **descending**]

### Context

show>log

### Description

This command displays an event log summary with settings and statistics or the contents of a specific log file, SNMP log, or memory log.

If the command is specified with no command line options, a summary of the defined system logs is displayed. The summary includes log settings and statistics.

If the log ID of a memory, SNMP, or file event log is specified, the command displays the contents of the log. Additional command line options control what and how the contents are displayed.

Contents of logs with console, session or syslog destinations cannot be displayed. The actual events can only be viewed on the receiving syslog or console device.

### Parameters

#### *log-id*

displays the contents of the specified log file or memory log ID. The log ID must have a destination of an SNMP or log file or a memory log for this parameter to be used.

**Values** 1 to 100

**Default** displays the event log summary

#### *severity-level*

displays only events with the specified and higher severity

**Values** cleared, indeterminate, critical, major, minor, and warning

**Default** all severity levels

#### *application*

displays only events generated by the specified application

**Values** aps, atm, bgp, cflowd, chassis, debug, dhcp, dhcps, efm\_oam, ering, eth\_cfm, filter, firewall, igmp, igmp\_snooping, ip, ipsec, isis, lag, lcr, ldp, lldp, logger, mcpath, mc\_redundancy, mirror, mld, mld\_snooping, mpls, msdp, mwmgr, ntp, oam, ospf, pcap, pim, pim\_snooping, port, ppp, ptp, radius, rip, rip\_ng, route\_policy, rsvp, scada, security, snmp, stp, svcmgr, system, tss, user, vrrp, vrtr

**Default** all applications

*from-seq [to-seq]*

displays the log entry numbers from a particular entry sequence number (*from-seq*) to another sequence number (*to-seq*). The *to-seq* value must be larger than the *from-seq* value.

If the *to-seq* number is not provided, the log contents to the end of the log are displayed unless the count parameter is present, in which case the number of entries displayed is limited by the count.

**Values** 1 to 4294967295

**Default** all sequence numbers

*count*

limits the number of log entries displayed to the number specified

**Values** 1 to 4294967295

**Default** all log entries

*router-instance*

specifies a router name up to 32 characters to be used in the display criteria

**expression**

specifies to use a regular expression as match criteria for the router instance string

*subject*

displays only log entries matching the specified text subject string. The subject is the object affected by the event; for example, the *port-id* would be the subject for a link-up or link-down event.

**regexp**

specifies to use a regular expression as parameters with the specified *subject* string

**ascending | descending**

specifies the log sort direction. Logs are normally shown from the newest entry to the oldest in descending sequence number order on the screen. When using the ascending parameter, the log will be shown from the oldest to the newest entry.

**Default** Descending

**Output**

The following output is an example of event log summary information, and [Table 54: Log ID Field Descriptions](#) describes the fields.

**Output Example**

```
A:ALU-1# show log log-id
=====
Event Logs
=====
Log Source Filter Admin Oper Logged Dropped Dest Dest Size
Id Id State State Type Id

1 none none up down 52 0 file 10 N/A
```

```

2 C none up up 41 0 syslog 1 N/A
99 M none up up 2135 0 memory 1 500
=====
A:ALU-1#

```

Table 54: Log ID Field Descriptions

| Label       | Description                                                                                                                                                                                                                                              |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Log Id      | An event log destination                                                                                                                                                                                                                                 |
| Source      | no: the event log filter is not currently in use by a log ID                                                                                                                                                                                             |
|             | yes: the event log filter is currently in use by a log ID                                                                                                                                                                                                |
|             | M: the event source for the log ID is the Main event category                                                                                                                                                                                            |
|             | C: the event source for the log ID is the Change event category                                                                                                                                                                                          |
|             | none: the event log filter is currently in use by a log ID                                                                                                                                                                                               |
| Filter ID   | The value is the index to the entry that defines the filter to be applied to this log's source event stream to limit the events output to this log's destination. If the value is 0, then all events in the source log are forwarded to the destination. |
| Admin State | Up: indicates that the administrative state is up                                                                                                                                                                                                        |
|             | Down: indicates that the administrative state is down                                                                                                                                                                                                    |
| Oper State  | Up: indicates that the operational state is up                                                                                                                                                                                                           |
|             | Down: indicates that the operational state is down                                                                                                                                                                                                       |
| Logged      | The number of events that have been sent to the log sources that were forwarded to the log destination                                                                                                                                                   |
| Dropped     | The number of events that have been sent to the log sources that were not forwarded to the log destination because they were filtered out by the log filter                                                                                              |
| Dest. Type  | Console: all selected log events are directed to the system console. If the console is not connected, then all entries are dropped.                                                                                                                      |
|             | Syslog: all selected log events are sent to the syslog address                                                                                                                                                                                           |
|             | SNMP traps: events defined as SNMP traps are sent to the configured SNMP trap destinations and are logged in NOTIFICATION-LOG-MIB tables                                                                                                                 |
|             | File: all selected log events are directed to a file on the CSM's compact flash disk                                                                                                                                                                     |

| Label   | Description                                                               |
|---------|---------------------------------------------------------------------------|
|         | Memory: all selected log events are directed to an in-memory storage area |
| Dest ID | The event log stream destination                                          |
| Size    | The allocated memory size for the log                                     |

### Memory or File Event Log Contents Output Example

```
A:gal171# show log log-id 99
=====
Event Log 99
=====
Description : Default System Log
Memory Log contents [size=500 next event=3722 (wrapped)]

3721 2008/02/07 09:14:06.69 UTC WARNING: SYSTEM #2006 Base LOGGER
"Log File Id 2 configuration modified"

3720 2008/02/07 09:13:18.86 UTC WARNING: SYSTEM #2006 Base LOGGER
"Log File Id 2 configuration modified"

3719 2008/02/01 11:54:15.67 UTC MINOR: IP #2004 management PIP MANAGEMENT
"ARP information overwritten for 10.120.52.253 by 00:e0:52:d4:a5:00"

3718 2008/02/01 11:54:15.40 UTC MINOR: IP #2004 management PIP MANAGEMENT
"ARP information overwritten for 10.120.52.253 by 00:e0:5e:00:a5:00"
...
=====
A:gal171
```

## snmp-trap-group

### Syntax

```
snmp-trap-group [log-id]
```

### Context

```
show>log
```

### Description

This command displays SNMP trap group configuration information.

### Parameters

*log-id*

displays only SNMP trap group information for the specified trap group log ID

**Values** 1 to 100

## Output

The following output is an example of SNMP trap group information, and [Table 55: SNMP Trap Group Field Descriptions](#) describes the fields.

### Output Example

```
*A:ALU-48>config>log# show log snmp-trap-group
```

```
=====
```

```
SNMP Trap Groups
```

```
=====
```

```
id name
port address
```

```

```

```
29 name
162 10.20.30.10
```

```
=====
```

```
*A:ALU-48>config>log#
```

```
*A:ALU-48>config>log# show log snmp-trap-group 90
```

```
=====
```

```
SNMP Trap Group 90
```

```
=====
```

```
Description : none
```

```

```

```
Name : 10.121.107.98:162
Address : 10.121.107.98
Port : 162
Version : v2c
Community : private
Sec. Level : none
Replay : disabled
First replay : n/a
Last replay : never
```

```
=====
```

```
*A:ALU-48>config>log#
```

*Table 55: SNMP Trap Group Field Descriptions*

| Label      | Description                                                                                                     |
|------------|-----------------------------------------------------------------------------------------------------------------|
| Name       | The log destination ID for an event stream                                                                      |
| Address    | The IP address of the trap receiver                                                                             |
| Port       | The destination UDP port used for sending traps to the destination, expressed as a decimal integer              |
| Version    | Specifies the SNMP version format to use for traps sent to the trap receiver. Valid values are v1, v2c, and v3. |
| Community  | The community string required by snmpv1 or snmpv2c trap receivers                                               |
| Sec. Level | The required authentication and privacy security levels required to access the views on this node               |

| Label        | Description                                                                                                                                                                                                                                          |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Replay       | Indicates whether the replay parameter has been configured for the trap-target address: enabled or disabled                                                                                                                                          |
| First replay | Indicates the sequence ID of the first missed notification that will be replayed when a route by which the trap-target address can be reached is added to the routing table. If no notifications are waiting to be replayed, this field shows "n/a". |
| Last replay  | Indicates the last time that missed events were replayed to the trap-target address. If no events have ever been replayed, this field shows "never".                                                                                                 |

## syslog

### Syntax

**syslog** [*syslog-id*]

### Context

show>log

### Description

This command displays syslog event log destination summary information or detailed information about a specific syslog destination.

### Parameters

*syslog-id*

displays detailed information about the specified syslog event log destination

**Values** 1 to 10

### Output

The following output is an example of syslog event log destination summary information, and [Table 56: Syslog Field Descriptions](#) describes the fields.

### Output Example

```
*A:ALU-48>config>log# show log syslog
```

```
=====
```

```
Syslog Target Hosts
```

```
=====
```

| Id | Ip Address       | Port     | Sev Level |
|----|------------------|----------|-----------|
|    | Below Level Drop | Facility | Pfx Level |
| 2  | unknown          | 514      | info      |
|    | 0                | local7   | yes       |
| 3  | unknown          | 514      | info      |
|    | 0                | mail     | yes       |

```
=====
```

```
*A:ALU-48>config>log#

*A:ALU-48>config>log# show log syslog 1
=====
Syslog Target 1
=====
IP Address : 192.168.15.22
Port : 514
Log-ids : none
Prefix : Sr12
Facility : mail
Severity Level : info
Prefix Level : yes
Below Level Drop : 0
Description : Linux Station Springsteen
=====
*A:ALU-48>config>log#
```

Table 56: Syslog Field Descriptions

| Label               | Description                                                                                                                                                                            |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syslog ID           | The syslog ID number for the syslog destination                                                                                                                                        |
| IP Address          | The IP address of the syslog target host                                                                                                                                               |
| Port                | The configured UDP port number used when sending syslog messages                                                                                                                       |
| Facility            | The facility code for messages sent to the syslog target host                                                                                                                          |
| Severity Level      | The syslog message severity level threshold                                                                                                                                            |
| Below Level Dropped | A count of messages not sent to the syslog collector target because the severity level of the message was above the configured severity. The higher the level, the lower the severity. |
| Prefix Present      | Yes: a log prefix was prepended to the syslog message sent to the syslog host                                                                                                          |
|                     | No: a log prefix was not prepended to the syslog message sent to the syslog host                                                                                                       |
| Description         | A text description stored in the configuration file for a configuration context                                                                                                        |
| LogPrefix           | The prefix string prepended to the syslog message                                                                                                                                      |
| Log-id              | Events are directed to this destination                                                                                                                                                |

### 5.12.2.3 Clear Commands

## log-id

### Syntax

**log-id** *log-id*

### Context

clear>log

### Description

This command reinitializes or rolls over the specified memory log or log file. Memory logs are reinitialized and cleared of contents. Log files are manually rolled over.

This command is only applicable to event logs that are directed to file destinations and memory destinations.

SNMP, syslog, and console/session logs are not affected by this command.

### Parameters

*log-id*

the event log ID to be reinitialized or rolled over

**Values** 1 to 100

## event-handling

### Syntax

**event-handling**

### Context

clear>log

### Description

This command enables the context to clear Event Handling System (EHS) information.

## handler

### Syntax

**handler** *event-handler-name*

### Context

clear>log>event-handling

## Description

This command clears the event-handler statistics for the specified event handler. These statistics are displayed in the **show log event-handling handler *handler-name*** output. The command does not clear the global or aggregate event-handling statistics.

## Parameters

*event-handler-name*

the name of the event handler

## information

## Syntax

**information**

## Context

clear>log>event-handling

## Description

This command clears global and aggregate event-handling statistics. These statistics are displayed in the **show log event-handling information** output.

## 6 List of Acronyms

Table 57: Acronyms

| Acronym  | Expansion                                       |
|----------|-------------------------------------------------|
| 2G       | second-generation wireless telephone technology |
| 3DES     | triple DES (data encryption standard)           |
| 3G       | third-generation mobile telephone technology    |
| 6VPE     | IPv6 on Virtual Private Edge Router             |
| 7705 SAR | 7705 Service Aggregation Router                 |
| 7750 SR  | 7750 Service Router                             |
| 8 PSK    | eight phase shift keying                        |
| 16 QAM   | 16-state quadrature amplitude modulation        |
| 32 QAM   | 32-state quadrature amplitude modulation        |
| 64 QAM   | 64-state quadrature amplitude modulation        |
| 128 QAM  | 128-state quadrature amplitude modulation       |
| 256 QAM  | 256-state quadrature amplitude modulation       |
| ABR      | area border router<br>available bit rate        |
| AC       | alternating current<br>attachment circuit       |
| ACK      | acknowledge                                     |
| ACL      | access control list                             |
| ACR      | adaptive clock recovery                         |
| AD       | auto-discovery                                  |
| ADM      | add/drop multiplexer                            |
| ADP      | automatic discovery protocol                    |
| AES      | advanced encryption standard                    |
| AFI      | authority and format identifier                 |

| Acronym  | Expansion                                         |
|----------|---------------------------------------------------|
| AIGP     | accumulated IGP                                   |
| AIS      | alarm indication signal                           |
| ALG      | application level gateway                         |
| AMP      | active multipath                                  |
| 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<br>autonomous system message |
| ASN      | autonomous system number                          |
| ATM      | asynchronous transfer mode                        |
| ATM PVC  | ATM permanent virtual circuit                     |
| AU       | administrative unit                               |
| AUG      | administrative unit group                         |
| B3ZS     | bipolar with three-zero substitution              |
| Batt A   | battery A                                         |
| B-bit    | beginning bit (first packet of a fragment)        |
| BBE      | background block errors                           |
| Bc       | committed burst size                              |
| Be       | excess burst size                                 |
| BECN     | backward explicit congestion notification         |
| Bellcore | Bell Communications Research                      |
| BFD      | bidirectional forwarding detection                |

| Acronym | Expansion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BGP     | border gateway protocol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| BGP-LS  | border gateway protocol link state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| BGP-LU  | border gateway protocol labeled unicast                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| BITS    | building integrated timing supply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| BTCA    | best time Transmitter clock algorithm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| BMU     | <p>broadcast, multicast, and unknown traffic</p> <p>Traffic that is not unicast. Any nature of multipoint traffic:</p> <ul style="list-style-type: none"> <li>• broadcast (that is, all 1s as the destination IP to represent all destinations within the subnet)</li> <li>• multicast (that is, traffic typically identified by the destination address, uses special destination address); for IP, the destination must be 224.0.0.0 to 239.255.255.255</li> <li>• unknown (that is, the destination is typically a valid unicast address but the destination port/interface is not yet known; therefore, traffic needs to be forwarded to all destinations; unknown traffic is treated as broadcast)</li> </ul> |
| BNM     | bandwidth notification message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| BOF     | boot options file                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| BoS     | bottom of stack                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| BPDU    | bridge protocol data unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| BRAS    | Broadband Remote Access Server                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| BSC     | Base Station Controller                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| BSM     | bootstrap message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| BSR     | bootstrap router                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| BSTA    | Broadband Service Termination Architecture                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| BTS     | base transceiver station                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| CA      | certificate authority                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| CAS     | channel associated signaling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| CBN     | common bonding networks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| CBS     | committed buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Acronym     | Expansion                                                                                                                                                                                                                 |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CC          | continuity check<br>control channel                                                                                                                                                                                       |
| CCM         | continuity check message                                                                                                                                                                                                  |
| CCTV        | closed-circuit television                                                                                                                                                                                                 |
| CE          | circuit emulation<br>customer edge                                                                                                                                                                                        |
| CEM         | circuit emulation                                                                                                                                                                                                         |
| CES         | circuit emulation services                                                                                                                                                                                                |
| CESoPSN     | circuit emulation services over packet switched network                                                                                                                                                                   |
| CFM         | connectivity fault management                                                                                                                                                                                             |
| cHDLC       | Cisco high-level data link control protocol                                                                                                                                                                               |
| CIDR        | classless inter-domain routing                                                                                                                                                                                            |
| CIR         | committed information rate                                                                                                                                                                                                |
| CLI         | command line interface                                                                                                                                                                                                    |
| CLP         | cell loss priority                                                                                                                                                                                                        |
| CMP         | certificate management protocol                                                                                                                                                                                           |
| C-multicast | customer multicast                                                                                                                                                                                                        |
| CoS         | class of service                                                                                                                                                                                                          |
| CPE         | customer premises equipment                                                                                                                                                                                               |
| Cpipe       | circuit emulation (or TDM) VLL                                                                                                                                                                                            |
| CPM         | Control and Processing Module (CPM is used instead of CSM when referring to CSM filtering to align with CLI syntax used with other SR products). CSM management ports are referred to as CPM management ports in the CLI. |
| CPROTO      | C prototype                                                                                                                                                                                                               |
| CPU         | central processing unit                                                                                                                                                                                                   |
| C/R         | command/response                                                                                                                                                                                                          |
| CRC         | cyclic redundancy check                                                                                                                                                                                                   |
| CRC-32      | 32-bit cyclic redundancy check                                                                                                                                                                                            |

| Acronym | Expansion                                             |
|---------|-------------------------------------------------------|
| 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                                     |
| CV      | connection verification<br>customer VLAN (tag)        |
| CW      | control word                                          |
| CWDM    | coarse wavelength-division multiplexing               |
| DA/FAN  | distribution automation and field area network        |
| DC      | direct current                                        |
| DC-C    | DC return - common                                    |
| DCE     | data communications equipment                         |
| DC-I    | DC return - isolated                                  |
| DCO     | digitally controlled oscillator                       |
| DCR     | differential clock recovery                           |
| DDoS    | distributed DoS                                       |
| DE      | discard eligibility                                   |
| DER     | distinguished encoding rules                          |
| DES     | data encryption standard                              |
| DF      | do not fragment<br>designated forwarder               |
| DH      | Diffie-Hellman                                        |
| DHB     | decimal, hexadecimal, or binary                       |
| DHCP    | dynamic host configuration protocol                   |
| DHCPv6  | dynamic host configuration protocol for IPv6          |

| Acronym | Expansion                                                                                                           |
|---------|---------------------------------------------------------------------------------------------------------------------|
| 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                                                                                                   |
| dot1p   | IEEE 802.1p bits, in Ethernet or VLAN ingress packet headers, used to map traffic to up to eight forwarding classes |
| dot1q   | IEEE 802.1q encapsulation for Ethernet interfaces                                                                   |
| DPD     | dead peer detection                                                                                                 |
| DPI     | deep packet inspection                                                                                              |
| DPLL    | digital phase locked loop                                                                                           |
| DR      | designated router                                                                                                   |
| DSA     | digital signal algorithm                                                                                            |
| DSCP    | differentiated services code point                                                                                  |
| DSL     | digital subscriber line                                                                                             |
| DSLAM   | digital subscriber line access multiplexer                                                                          |
| DTE     | data termination equipment                                                                                          |
| DU      | downstream unsolicited                                                                                              |
| DUID    | DHCP unique identifier                                                                                              |
| DUS     | do not use for synchronization                                                                                      |
| DV      | delay variation                                                                                                     |
| DVMRP   | distance vector multicast routing protocol                                                                          |
| e911    | enhanced 911 service                                                                                                |
| EAP     | Extensible Authentication Protocol                                                                                  |
| EAPOL   | EAP over LAN                                                                                                        |
| E-bit   | ending bit (last packet of a fragment)                                                                              |

| Acronym     | Expansion                                                                                                                   |
|-------------|-----------------------------------------------------------------------------------------------------------------------------|
| 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 <a href="#">RS-232</a> ) |
| EIR         | excess information rate                                                                                                     |
| EJBCA       | Enterprise Java Bean Certificate Authority                                                                                  |
| E-LAN       | Ethernet local area network                                                                                                 |
| E-Line      | Ethernet virtual private line                                                                                               |
| EL          | entropy label                                                                                                               |
| eLER        | egress label edge router                                                                                                    |
| ELI         | entropy label indicator                                                                                                     |
| E&M         | ear and mouth<br>earth and magneto<br>exchange and multiplexer                                                              |
| eMBMS       | evolved MBMS                                                                                                                |
| EOP         | end of packet                                                                                                               |
| EPC         | evolved packet core                                                                                                         |
| EPD         | early packet discard                                                                                                        |
| Epipe       | Ethernet VLL                                                                                                                |
| EPL         | Ethernet private line                                                                                                       |
| EPON        | Ethernet Passive Optical Network                                                                                            |
| EPS         | equipment protection switching                                                                                              |
| ERO         | explicit route object                                                                                                       |
| ES          | Ethernet segment<br>errored seconds                                                                                         |

| Acronym  | Expansion                                                  |
|----------|------------------------------------------------------------|
| ESD      | electrostatic discharge                                    |
| ESI      | Ethernet segment identifier                                |
| ESMC     | Ethernet synchronization message channel                   |
| ESN      | extended sequence number                                   |
| ESP      | encapsulating security payload                             |
| ESPI     | encapsulating security payload identifier                  |
| ETE      | end-to-end                                                 |
| ETH-BN   | Ethernet bandwidth notification                            |
| ETH-CFM  | Ethernet connectivity fault management (IEEE 802.1ag)      |
| EVC      | Ethernet virtual connection                                |
| EVDO     | evolution - data optimized                                 |
| EVI      | EVPN instance                                              |
| EVPL     | Ethernet virtual private link                              |
| EVPN     | Ethernet virtual private network                           |
| EXP bits | experimental bits (currently known as <a href="#">TC</a> ) |
| FC       | forwarding class                                           |
| FCS      | frame check sequence                                       |
| FD       | frequency diversity                                        |
| FDB      | forwarding database                                        |
| FDL      | facilities data link                                       |
| FEAC     | far-end alarm and control                                  |
| FEC      | forwarding equivalence class                               |
| FECN     | forward explicit congestion notification                   |
| FeGW     | far-end gateway                                            |
| FEP      | front-end processor                                        |
| FF       | fixed filter                                               |
| FFD      | fast fault detection                                       |

| Acronym    | Expansion                                                 |
|------------|-----------------------------------------------------------|
| FIB        | forwarding information base                               |
| FIFO       | first in, first out                                       |
| FIPS-140-2 | Federal Information Processing Standard publication 140-2 |
| FM         | fault management                                          |
| 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                           |
| GPRS       | general packet radio service                              |
| GPS        | Global Positioning System                                 |
| GRE        | generic routing encapsulation                             |
| GRT        | global routing table                                      |
| GSM        | Global System for Mobile Communications (2G)              |
| GTP-U      | GPRS tunneling protocol user plane                        |
| GW         | gateway                                                   |

| Acronym     | Expansion                                                            |
|-------------|----------------------------------------------------------------------|
| 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                                             |
| H-VPLS      | hierarchical virtual private line service                            |
| IANA        | Internet Assigned Numbers Authority                                  |
| IBN         | isolated bonding networks                                            |
| ICB         | inter-chassis backup                                                 |
| ICMP        | Internet control message protocol                                    |
| ICMPv6      | Internet control message protocol for IPv6                           |
| ICP         | IMA control protocol cells                                           |
| IDS         | intrusion detection system                                           |
| IDU         | indoor unit                                                          |
| IED         | intelligent end device                                               |
| IEEE        | Institute of Electrical and Electronics Engineers                    |
| IEEE 1588v2 | Institute of Electrical and Electronics Engineers standard 1588-2008 |
| IES         | Internet Enhanced Service                                            |
| IETF        | Internet Engineering Task Force                                      |
| IGMP        | Internet group management protocol                                   |
| IGP         | interior gateway protocol                                            |

| Acronym  | Expansion                                                 |
|----------|-----------------------------------------------------------|
| IID      | instance ID                                               |
| IKE      | Internet key exchange                                     |
| iLER     | ingress label edge router                                 |
| ILM      | incoming label map                                        |
| IMA      | inverse multiplexing over ATM                             |
| IMET-IR  | inclusive multicast Ethernet tag—ingress replication      |
| INVARP   | inverse address resolution protocol                       |
| IOM      | input/output module                                       |
| IP       | Internet Protocol                                         |
| IPCP     | Internet Protocol Control Protocol                        |
| IPIP     | IP in IP                                                  |
| Ipipe    | IP interworking VLL                                       |
| I-PMSI   | inclusive PMSI                                            |
| IPoATM   | IP over ATM                                               |
| IPS      | intrusion prevention system                               |
| IPSec    | Internet Protocol security                                |
| IR       | ingress replication                                       |
| IRB      | integrated routing and bridging                           |
| ISA      | integrated services adapter                               |
| ISAKMP   | Internet security association and key management protocol |
| IS-IS    | Intermediate System-to-Intermediate System                |
| IS-IS-TE | IS-IS-traffic engineering (extensions)                    |
| ISO      | International Organization for Standardization            |
| IW       | interworking                                              |
| JP       | join prune                                                |
| KG       | key group                                                 |
| LB       | loopback                                                  |

| 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                                 |
| LFA     | loop-free alternate                               |
| LFIB    | label forwarding information base                 |
| LIB     | label information base                            |
| LLDP    | link layer discovery protocol                     |
| LLDPDU  | link layer discovery protocol data unit           |
| LLF     | link loss forwarding                              |
| LLID    | loopback location ID                              |
| LM      | loss measurement                                  |
| LMI     | local management interface                        |
| LOS     | line-of-sight<br>loss of signal                   |
| LSA     | link-state advertisement                          |
| LSDB    | link-state database                               |
| LSP     | label switched path<br>link-state PDU (for IS-IS) |
| LSPA    | LSP attributes                                    |
| LSR     | label switch router<br>link-state request         |
| LSU     | link-state update                                 |
| LT      | linktrace                                         |
| LTE     | long term evolution                               |

| Acronym  | Expansion                                                              |
|----------|------------------------------------------------------------------------|
|          | line termination equipment                                             |
| LTM      | linktrace message                                                      |
| LTN      | LSP ID to NHLFE                                                        |
| LTR      | link trace reply                                                       |
| MA       | maintenance association                                                |
| MAC      | media access control                                                   |
| MA-ID    | maintenance association identifier                                     |
| MBB      | make-before-break                                                      |
| MBGP     | multicast BGP<br>multiprotocol BGP<br>multiprotocol extensions for BGP |
| MBMS     | multimedia broadcast multicast service                                 |
| MBS      | maximum buffer space<br>maximum burst size<br>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<br>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                                                  |
| MDT      | multicast distribution tree                                            |
| ME       | maintenance entity                                                     |

| Acronym          | Expansion                                           |
|------------------|-----------------------------------------------------|
| MED              | multi-exit discriminator                            |
| MEF              | Metro Ethernet Forum                                |
| MEG              | maintenance entity group                            |
| MEG-ID           | maintenance entity group identifier                 |
| MEN              | Metro Ethernet network                              |
| MEP              | maintenance association end point                   |
| MFC              | multi-field classification                          |
| MHD              | multi-homed device                                  |
| MHF              | MIP half function                                   |
| MHN              | multi-homed network                                 |
| MIB              | management information base                         |
| MI-IS-IS         | multi-instance IS-IS                                |
| MIR              | minimum information rate                            |
| MLD              | multicast listener discovery                        |
| mLDP             | multicast LDP                                       |
| MLPPP            | multilink point-to-point protocol                   |
| mLSP             | multicast LSP                                       |
| MoFRR            | multicast-only fast reroute                         |
| MP               | merge point<br>multilink protocol<br>multipoint     |
| MP-BGP           | multiprotocol border gateway protocol               |
| MPLS             | multiprotocol label switching                       |
| MPLSCP           | multiprotocol label switching control protocol      |
| MPP              | MPT protection protocol                             |
| MPR              | see <a href="#">Wavence</a>                         |
| MPR-e            | Microwave Packet Radio (standalone mode)            |
| MPT-HC V2/9558HC | Microwave Packet Transport, High Capacity version 2 |

| Acronym  | Expansion                                                                                               |
|----------|---------------------------------------------------------------------------------------------------------|
| MPT-HLC  | Microwave Packet Transport, High-Capacity Long-Haul Cubic (ANSI)                                        |
| MPT-HQAM | Microwave Packet Transport, High Capacity (MPT-HC-QAM) or Extended Power (MPT-XP-QAM) with 512/1024 QAM |
| MPT-MC   | Microwave Packet Transport, Medium Capacity                                                             |
| MPT-XP   | Microwave Packet Transport, High Capacity (very high power version of MPT-HC V2/9558HC)                 |
| MRAI     | minimum route advertisement interval                                                                    |
| MRRU     | maximum received reconstructed unit                                                                     |
| MRU      | maximum receive unit                                                                                    |
| MSDP     | Multicast Source Discovery Protocol                                                                     |
| MSDU     | MAC Service Data Unit                                                                                   |
| MSO      | multi-system operator                                                                                   |
| MS-PW    | multi-segment pseudowire                                                                                |
| MSS      | maximum segment size<br>Microwave Service Switch                                                        |
| MTIE     | maximum time interval error                                                                             |
| MTSO     | mobile trunk switching office                                                                           |
| MTU      | maximum transmission unit<br>multi-tenant unit                                                          |
| M-VPLS   | management virtual private line service                                                                 |
| MVPN     | multicast VPN                                                                                           |
| MVR      | multicast VPLS registration                                                                             |
| MW       | microwave                                                                                               |
| MWA      | microwave awareness                                                                                     |
| N·M      | newton meter                                                                                            |
| NAT      | network address translation                                                                             |
| NAT-T    | network address translation traversal                                                                   |
| NBMA     | non-broadcast multiple access (network)                                                                 |

| Acronym | Expansion                                                                                                        |
|---------|------------------------------------------------------------------------------------------------------------------|
| ND      | neighbor discovery                                                                                               |
| NE      | network element                                                                                                  |
| NET     | network entity title                                                                                             |
| NFM-P   | Network Functions Manager - Packet (formerly 5620 SAM)                                                           |
| NGE     | network group encryption                                                                                         |
| NG-MVPN | next generation MVPN                                                                                             |
| NH      | next hop                                                                                                         |
| NHLFE   | next hop label forwarding entry                                                                                  |
| NHOP    | next-hop                                                                                                         |
| NLOS    | non-line-of-sight                                                                                                |
| NLPID   | network level protocol identifier                                                                                |
| NLRI    | network layer reachability information                                                                           |
| NNHOP   | next next-hop                                                                                                    |
| NNI     | network-to-network interface                                                                                     |
| Node B  | similar to BTS but used in 3G networks — term is used in UMTS (3G systems) while BTS is used in GSM (2G systems) |
| NOC     | network operations center                                                                                        |
| NPAT    | network port address translation                                                                                 |
| NRC-F   | Network Resource Controller - Flow                                                                               |
| NRC-P   | Network Resource Controller - Packet                                                                             |
| NRC-T   | Network Resource Controller - Transport                                                                          |
| NRC-X   | Network Resource Controller - Cross Domain                                                                       |
| NSAP    | network service access point                                                                                     |
| NSD     | Network Services Director                                                                                        |
| NSP     | native service processing<br>Network Services Platform                                                           |
| NSSA    | not-so-stubby area                                                                                               |
| NTP     | network time protocol                                                                                            |

| Acronym | Expansion                                      |
|---------|------------------------------------------------|
| 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                       |
| OSPF-TE | OSPF-traffic engineering (extensions)          |
| OSS     | operations support system                      |
| OSSP    | organization specific slow protocol            |
| OTP     | one time password                              |
| OWAMP   | one-way active measurement protocol            |
| P2MP    | point to multipoint                            |
| PADI    | PPPoE active discovery initiation              |
| PADR    | PPPoE active discovery request                 |
| PAE     | port authentication entities                   |

| Acronym | Expansion                                                |
|---------|----------------------------------------------------------|
| PSB     | path state block                                         |
| PBO     | packet byte offset                                       |
| PBR     | policy-based routing                                     |
| PBX     | private branch exchange                                  |
| PCAP    | packet capture                                           |
| PCC     | Path Computation Element Client                          |
| PCE     | Path Computation Element                                 |
| PCEP    | Path Computation Element Protocol                        |
| PCM     | pulse code modulation                                    |
| PCP     | priority code point                                      |
| PCR     | proprietary clock recovery                               |
| PDU     | power distribution unit<br>protocol data units           |
| PDV     | packet delay variation                                   |
| PDVT    | packet delay variation tolerance                         |
| PE      | provider edge router                                     |
| PEAPv0  | protected extensible authentication protocol version 0   |
| PEM     | privacy enhanced mail                                    |
| PFoE    | power feed over Ethernet                                 |
| PFS     | perfect forward secrecy                                  |
| PHB     | per-hop behavior                                         |
| PHP     | penultimate hop popping                                  |
| PHY     | physical layer                                           |
| PIC     | prefix independent convergence                           |
| PID     | protocol ID                                              |
| PIM SSM | protocol independent multicast—source-specific multicast |
| PIR     | peak information rate                                    |
| PKCS    | public key cryptography standards                        |

| Acronym     | Expansion                                                    |
|-------------|--------------------------------------------------------------|
| PKI         | public key infrastructure                                    |
| PLAR        | private line automatic ringdown                              |
| PLCP        | Physical Layer Convergence Protocol                          |
| PLR         | point of local repair                                        |
| PLSP        | path LSP                                                     |
| PM          | performance monitoring                                       |
| PMSI        | P-multicast service interface                                |
| P-multicast | provider multicast                                           |
| PoE         | power over Ethernet                                          |
| PoE+        | power over Ethernet plus                                     |
| POH         | path overhead                                                |
| POI         | purge originator identification                              |
| PoP         | point of presence                                            |
| POS         | packet over SONET                                            |
| PPP         | point-to-point protocol                                      |
| PPPoE       | point-to-point protocol over Ethernet                        |
| PPS         | pulses per second                                            |
| PRC         | primary reference clock                                      |
| PRS         | primary reference source                                     |
| PRTC        | primary reference time clock                                 |
| PSE         | power sourcing equipment                                     |
| PSK         | pre-shared key                                               |
| PSN         | packet switched network                                      |
| PSNP        | partial sequence number PDU                                  |
| PTA         | PMSI tunnel attribute                                        |
| PTM         | packet transfer mode                                         |
| PTP         | performance transparency protocol<br>precision time protocol |

| Acronym | Expansion                                                                               |
|---------|-----------------------------------------------------------------------------------------|
| PuTTY   | an open-source terminal emulator, serial console, and network file transfer application |
| PVC     | permanent virtual circuit                                                               |
| PVCC    | permanent virtual channel connection                                                    |
| PW      | pseudowire                                                                              |
| PWE     | pseudowire emulation                                                                    |
| PWE3    | pseudowire emulation edge-to-edge                                                       |
| Q.922   | ITU-T Q-series Specification 922                                                        |
| QL      | quality level                                                                           |
| QoS     | quality of service                                                                      |
| QPSK    | quadrature phase shift keying                                                           |
| RADIUS  | Remote Authentication Dial In User Service                                              |
| RAN     | Radio Access Network                                                                    |
| RBS     | robbed bit signaling                                                                    |
| RD      | route distinguisher                                                                     |
| RDI     | remote defect indication                                                                |
| RED     | random early discard                                                                    |
| RESV    | reservation                                                                             |
| RIB     | routing information base                                                                |
| RIP     | routing information protocol                                                            |
| RJ45    | registered jack 45                                                                      |
| RMON    | remote network monitoring                                                               |
| RNC     | Radio Network Controller                                                                |
| RP      | rendezvous point                                                                        |
| RPF RTM | reverse path forwarding RTM                                                             |
| RPS     | radio protection switching                                                              |
| RPT     | rendezvous-point tree                                                                   |
| RR      | route reflector                                                                         |

| Acronym | Expansion                                                             |
|---------|-----------------------------------------------------------------------|
| RRO     | record route object                                                   |
| RS-232  | Recommended Standard 232 (also known as <a href="#">EIA/TIA-232</a> ) |
| RSA     | Rivest, Shamir, and Adleman (authors of the RSA encryption algorithm) |
| RSHG    | residential split horizon group                                       |
| RSTP    | rapid spanning tree protocol                                          |
| RSVP-TE | resource reservation protocol - traffic engineering                   |
| RT      | receive/transmit                                                      |
| RTC     | route target constraint                                               |
| RTM     | routing table manager                                                 |
| RTN     | battery return                                                        |
| RTP     | real-time protocol                                                    |
| R&TTE   | Radio and Telecommunications Terminal Equipment                       |
| RTU     | remote terminal unit                                                  |
| RU      | rack unit                                                             |
| r-VPLS  | routed virtual private LAN service                                    |
| SA      | security association<br>source-active                                 |
| SAA     | service assurance agent                                               |
| SAFI    | subsequent address family identifier                                  |
| SAP     | service access point                                                  |
| SAToP   | structure-agnostic TDM over packet                                    |
| SCADA   | surveillance, control and data acquisition                            |
| SC-APS  | single-chassis automatic protection switching                         |
| SCP     | secure copy                                                           |
| SCTP    | Stream Control Transmission Protocol                                  |
| SD      | signal degrade<br>space diversity                                     |

| Acronym | Expansion                                       |
|---------|-------------------------------------------------|
| SDH     | synchronous digital hierarchy                   |
| SDI     | serial data interface                           |
| SDN     | software defined network                        |
| SDP     | service destination point                       |
| SE      | shared explicit                                 |
| SeGW    | secure gateway                                  |
| SES     | severely errored seconds                        |
| SETS    | synchronous equipment timing source             |
| SF      | signal fail                                     |
| SFP     | small form-factor pluggable (transceiver)       |
| SFTP    | SSH file transfer protocol                      |
| (S,G)   | (source, group)                                 |
| SGT     | self-generated traffic                          |
| SHA-1   | secure hash algorithm                           |
| SHG     | split horizon group                             |
| SIR     | sustained information rate                      |
| SLA     | Service Level Agreement                         |
| SLARP   | serial line address resolution protocol         |
| SLID    | subscriber location identifier of a GPON module |
| SLM     | synthetic loss measurement                      |
| SNMP    | Simple Network Management Protocol              |
| SNPA    | subnetwork point of attachment                  |
| SNR     | signal to noise ratio                           |
| SNTP    | simple network time protocol                    |
| SONET   | synchronous optical networking                  |
| S-PE    | switching provider edge router                  |
| SPF     | shortest path first                             |

| Acronym | Expansion                                                     |
|---------|---------------------------------------------------------------|
| SPI     | security parameter index                                      |
| S-PMSI  | selective PMSI                                                |
| SPT     | shortest path tree                                            |
| SR      | service router (7750 SR)<br>segment routing                   |
| SRLG    | shared risk link group                                        |
| SRP     | stateful request parameter                                    |
| SRRP    | subscriber routed redundancy protocol                         |
| SR-ISIS | segment routing IS-IS                                         |
| SR-OSPF | segment routing OSPF                                          |
| SR-TE   | segment routing traffic engineering                           |
| SSH     | secure shell                                                  |
| SSM     | source-specific multicast<br>synchronization status messaging |
| SSU     | system synchronization unit                                   |
| S-tag   | service VLAN tag                                              |
| STM     | synchronous transport module                                  |
| STM1    | synchronous transport module, level 1                         |
| STP     | spanning tree protocol                                        |
| STS     | synchronous transport signal                                  |
| SVC     | switched virtual circuit                                      |
| SVEC    | synchronization vector                                        |
| SYN     | synchronize                                                   |
| TACACS+ | Terminal Access Controller Access-Control System Plus         |
| TC      | traffic class (formerly known as <a href="#">EXP bits</a> )   |
| TCP     | transmission control protocol                                 |
| TDA     | transmit diversity antenna                                    |
| TDEV    | time deviation                                                |

| Acronym | Expansion                                     |
|---------|-----------------------------------------------|
| TDM     | time division multiplexing                    |
| TE      | traffic engineering                           |
| TEDB    | traffic engineering database                  |
| TEID    | tunnel endpoint identifier                    |
| TEP     | tunnel endpoint                               |
| TFTP    | trivial file transfer protocol                |
| T-LDP   | targeted LDP                                  |
| TLS     | transport layer security                      |
| TLV     | type length value                             |
| TM      | traffic management                            |
| ToD     | time of day                                   |
| ToS     | type of service                               |
| T-PE    | terminating provider edge router              |
| TPID    | tag protocol identifier                       |
| TPIF    | IEEE C37.94 teleprotection interface          |
| TPMR    | two-port MAC relay                            |
| TPS     | transmission protection switching             |
| TSoP    | Transparent SDH/SONET over Packet             |
| TTL     | time to live                                  |
| TTLS    | tunneled transport layer security             |
| TTM     | tunnel table manager                          |
| TU      | tributary unit                                |
| TUG     | tributary unit group                          |
| TWAMP   | two-way active measurement protocol           |
| U-APS   | unidirectional automatic protection switching |
| UAS     | unavailable seconds                           |
| UBR     | unspecified bit rate                          |

| Acronym | Expansion                                       |
|---------|-------------------------------------------------|
| UDP     | user datagram protocol                          |
| UFD     | unidirectional forwarding detection             |
| UMH     | upstream multicast hop                          |
| UMTS    | Universal Mobile Telecommunications System (3G) |
| UNI     | user-to-network interface                       |
| uRPF    | unicast reverse path forwarding                 |
| V.11    | ITU-T V-series Recommendation 11                |
| V.24    | ITU-T V-series Recommendation 24                |
| V.35    | ITU-T V-series Recommendation 35                |
| VC      | virtual circuit                                 |
| VCB     | voice conference bridge                         |
| VCC     | virtual channel connection                      |
| VCCV    | virtual circuit connectivity verification       |
| VCI     | virtual circuit identifier                      |
| VID     | VLAN ID                                         |
| VLAN    | virtual LAN                                     |
| VLL     | virtual leased line                             |
| VM      | virtual machine                                 |
| VoIP    | voice over IP                                   |
| Vp      | peak voltage                                    |
| VP      | virtual path                                    |
| VPC     | virtual path connection                         |
| VPI     | virtual path identifier                         |
| VPLS    | virtual private LAN service                     |
| VPN     | virtual private network                         |
| VPRN    | virtual private routed network                  |
| VPWS    | virtual private wire service                    |

| Acronym | Expansion                                                                            |
|---------|--------------------------------------------------------------------------------------|
| VRF     | virtual routing and forwarding table                                                 |
| VRRP    | virtual router redundancy protocol                                                   |
| V-SAP   | virtual service access point                                                         |
| VSE     | vendor-specific extension                                                            |
| VSI     | virtual switch instance                                                              |
| VSO     | vendor-specific option                                                               |
| VT      | virtual trunk<br>virtual tributary                                                   |
| VTG     | virtual tributary group                                                              |
| Wavence | formerly 9500 MPR (Microwave Packet Radio)                                           |
| WCDMA   | wideband code division multiple access (transmission protocol used in UMTS networks) |
| WRED    | weighted random early discard                                                        |
| WTR     | wait to restore                                                                      |
| X.21    | ITU-T X-series Recommendation 21                                                     |
| XOR     | exclusive-OR                                                                         |
| XRO     | exclude route object                                                                 |

## 7 Supported Standards and Protocols

This chapter lists the 7705 SAR compliance with security and telecom standards, the protocols supported, and proprietary MIBs.

### 7.1 Security Standards

FIPS 140-2—Federal Information Processing Standard publication 140-2, Security Requirements for Cryptographic Modules

### 7.2 Telecom Standards

ANSI/TIA/EIA-232-C—Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange

IEEE 802.1ad—IEEE Standard for Local and Metropolitan Area Networks---Virtual Bridged Local Area Networks

IEEE 802.1ag—Service Layer OAM

IEEE 802.1p/q—VLAN Tagging

IEEE 802.3—10BaseT

IEEE 802.3ab—1000BaseT

IEEE 802.3ah—Ethernet OAM

IEEE 802.3u—100BaseTX

IEEE 802.3x —Flow Control

IEEE 802.3z—1000BaseSX/LX

IEEE 802.3-2008—Revised base standard

IEEE 802.1AX-2008—Link Aggregation Task Force (transferred from IEEE 802.3ad)

IEEE C37.94-2017—N Times 64 Kilobit Per Second Optical Fiber Interfaces Between Teleprotection and Multiplexer Equipment

ITU-T G.704—Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels

ITU-T G.707—Network node interface for the Synchronous Digital Hierarchy (SDH)

ITU-T G.826—End-to-end error performance parameters and objectives for international, constant bit-rate digital paths and connections

ITU-T G.8032 — Ethernet Ring Protection Switching

ITU-T G.984.1—Gigabit-capable passive optical networks (GPON): general characteristics

ITU-T Y.1564—Ethernet service activation test methodology

ITU-T Y.1731—OAM functions and mechanisms for Ethernet-based networks

## 7.3 Protocol Support

### 7.3.1 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

### 7.3.2 BFD

RFC 7130—Bidirectional Forwarding Detection (BFD) on Link Aggregation Group (LAG) Interfaces

RFC 7881—Seamless Bidirectional Forwarding Detection (S-BFD) for IPv4, IPv6, and MPLS

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

### 7.3.3 BGP

RFC 1397—BGP Default Route Advertisement

RFC 1997—BGP Communities Attribute

RFC 2385—Protection of BGP Sessions via the TCP MD5 Signature Option

RFC 2439—BGP Route Flap Dampening

RFC 2545—Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing

RFC 2918—Route Refresh Capability for BGP-4

RFC 3107—Carrying Label Information in BGP-4  
RFC 3392—Capabilities Advertisement with BGP-4  
RFC 4271—BGP-4 (previously RFC 1771)  
RFC 4360—BGP Extended Communities Attribute  
RFC 4364—BGP/MPLS IP Virtual Private Networks (VPNs) (previously RFC 2574bis BGP/MPLS VPNs)  
RFC 4456—BGP Route Reflection: Alternative to Full-mesh IBGP (previously RFC 1966 and RFC 2796)  
RFC 4486—Subcodes for BGP Cease Notification Message  
RFC 4684—Constrained Route Distribution for Border Gateway Protocol/MultiProtocol Label Switching (BGP/MPLS) Internet Protocol (IP) Virtual Private Networks (VPNs)  
RFC 4724—Graceful Restart Mechanism for BGP - GR Helper  
RFC 4760—Multi-protocol Extensions for BGP (previously RFC 2858)  
RFC 4893—BGP Support for Four-octet AS Number Space  
RFC 6513—Multicast in MPLS/BGP IP VPNs  
RFC 6514—BGP Encodings and Procedures for Multicast in MPLS/BGP IP VPNs  
RFC 7311—The Accumulated IGP Metric Attribute for BGP  
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

### 7.3.4 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

### 7.3.5 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

### 7.3.6 Digital Data Network Management

V.35  
RS-232 (also known as EIA/TIA-232)

X.21

### 7.3.7 ECMP

RFC 2992—Analysis of an Equal-Cost Multi-Path Algorithm

### 7.3.8 Ethernet VPN (EVPN)

RFC 7432—BGP MPLS-Based Ethernet VPN

draft-ietf-bess-evpn-vpls-seamless-integ—(PBB-)EVPN Seamless Integration with (PBB-)VPLS

draft-ietf-bess-evpn-vpws—Virtual Private Wire Service support in Ethernet VPN

draft-ietf-rabadan-bess-evpn-pref-pdf—Preference-based EVPN DF Election

### 7.3.9 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

RFC 2427—Multiprotocol Interconnect over Frame Relay

### 7.3.10 GRE

RFC 2784—Generic Routing Encapsulation (GRE)

### 7.3.11 Internet Protocol (IP) – Version 4

RFC 768—User Datagram Protocol

RFC 791—Internet Protocol

RFC 792—Internet Control Message Protocol

RFC 793—Transmission Control Protocol

RFC 826—Ethernet Address Resolution Protocol

RFC 854—Telnet Protocol Specification

RFC 1350—The TFTP Protocol (Rev. 2)

RFC 1812—Requirements for IPv4 Routers

RFC 3021—Using 31-Bit Prefixes on IPv4 Point-to-Point Links

### 7.3.12 Internet Protocol (IP) – Version 6

RFC 2460—Internet Protocol, Version 6 (IPv6) Specification  
RFC 2462—IPv6 Stateless Address Autoconfiguration  
RFC 2464—Transmission of IPv6 Packets over Ethernet Networks  
RFC 3587—IPv6 Global Unicast Address Format  
RFC 3595—Textual Conventions for IPv6 Flow Label  
RFC 4007—IPv6 Scoped Address Architecture  
RFC 4193—Unique Local IPv6 Unicast Addresses  
RFC 4291—IPv6 Addressing Architecture  
RFC 4443—Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 Specification  
RFC 4649—DHCPv6 Relay Agent Remote-ID Option  
RFC 4861—Neighbor Discovery for IP version 6 (IPv6)  
RFC 5095—Deprecation of Type 0 Routing Headers in IPv6  
RFC 5952—A Recommendation for IPv6 Address Text Representation

### 7.3.13 IPsec

ITU-T X.690 (2002)—ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)  
PKCS #12 Personal Information Exchange Syntax Standard  
RFC 2315—PKCS #7: Cryptographic Message Syntax  
RFC 2409—The Internet Key Exchange (IKE)  
RFC 2986—PKCS #10: Certification Request Syntax Specification  
RFC 3706—A Traffic-Based Method of Detecting Dead Internet Key Exchange (IKE) Peers  
RFC 3947—Negotiation of NAT-Traversal in the IKE  
RFC 3948—UDP Encapsulation of IPsec ESP Packets  
RFC 4301—Security Architecture for the Internet Protocol  
RFC 4303—IP Encapsulating Security Payload (ESP)  
RFC 4210—Internet X.509 Public Key Infrastructure Certificate Management Protocol (CMP)  
RFC 4211—Internet X.509 Public Key Infrastructure Certificate Request Message Format (CRMF)  
RFC 4945—The Internet IP Security PKI Profile of IKEv1/ISAKMP, IKEv2, and PKIX  
RFC 5280—Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile  
RFC 5996—Internet Key Exchange Protocol Version 2 (IKEv2)  
RFC 7383—Internet Key Exchange Protocol Version 2 (IKEv2) Message Fragmentation

### 7.3.14 IS-IS

- RFC 1142—OSI IS-IS Intra-domain Routing Protocol (ISO 10589)
- RFC 1195—Use of OSI IS-IS for routing in TCP/IP & dual environments
- RFC 2763—Dynamic Hostname Exchange for IS-IS
- RFC 2966—Domain-wide Prefix Distribution with Two-Level IS-IS
- RFC 2973—IS-IS Mesh Groups
- RFC 3373—Three-Way Handshake for Intermediate System to Intermediate System (IS-IS) Point-to-Point Adjacencies
- RFC 3567—Intermediate System to Intermediate System (IS-IS) Cryptographic Authentication
- RFC 3719—Recommendations for Interoperable Networks using IS-IS
- RFC 3784—Intermediate System to Intermediate System (IS-IS) Extensions for Traffic Engineering (TE)
- RFC 3787—Recommendations for Interoperable IP Networks
- RFC 4205 for Shared Risk Link Group (SRLG) TLV
- RFC 4971—Intermediate System to Intermediate System (IS-IS) Extensions for Advertising Router Information
- RFC 5304—IS-IS Cryptographic Authentication
- RFC 5305—IS-IS Extensions for Traffic Engineering
- RFC 5307—IS-IS Extensions in Support of Generalized Multi-Protocol Label Switching (GMPLS)
- RFC 5308—Routing IPv6 with IS-IS
- RFC 5309—Point-to-Point Operation over LAN in Link State Routing Protocols
- RFC 5310—IS-IS Generic Cryptographic Authentication
- RFC 6232—Purge Originator Identification TLV for IS-IS

### 7.3.15 LDP

- RFC 5036—LDP Specification
- RFC 5283—LDP Extension for Inter-Area Label Switched Paths
- RFC 5350—IANA Considerations for the IPv4 and IPv6 Router Alert Options
- RFC 5443—LDP IGP Synchronization
- RFC 5561—LDP Capabilities
- RFC 6388—Label Distribution Protocol Extensions for Point-to-Multipoint and Multipoint-to-Multipoint Label Switched Paths
- RFC 6512—Using Multipoint LDP When the Backbone Has No Route to the Root
- RFC 6829—Label Switched Path (LSP) Ping for Pseudowire Forwarding Equivalence Classes (FECs) Advertised over IPv6
- RFC 7552—Updates to LDP for IPv6
- draft-ietf-mpls-ldp-ip-pw-capability—Controlling State Advertisements Of Non-negotiated LDP Applications
- draft-ietf-mpls-oam-ipv6-rao—IPv6 Router Alert Option for MPLS OAM

draft-pdutta-mpls-ldp-adj-capability-00—LDP Adjacency Capabilities

draft-pdutta-mpls-ldp-v2-00—LDP Version 2

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### 7.3.16 LDP and IP FRR

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RFC 7490—Remote Loop-Free Alternate (LFA) Fast Reroute (FRR)

### 7.3.17 MPLS

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RFC 3032—MPLS Label Stack Encoding

RFC 3815—Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)

RFC 5440—Path Computation Element (PCE) Communication Protocol (PCEP)

RFC 6790—The Use of Entropy Labels in MPLS Forwarding

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RFC 8697—Path Computation Element Communication Protocol (PCEP) Extensions for Establishing Relationships between Sets of Label Switched Paths (LSPs)

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RFC 8029—Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures

### 7.3.19 Multicast

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RFC 3973—Protocol Independent Multicast - Dense Mode (PIM-DM): Protocol Specification (Revised)

RFC 4610—Anycast-RP Using Protocol Independent Multicast (PIM), which is similar to RFC 3446—Anycast Rendezvous Point (RP) mechanism using Protocol Independent Multicast (PIM) and Multicast Source Discovery Protocol (MSDP)

RFC 6514—BGP Encodings and Procedures for Multicast in MPLS/IP VPNs

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RFC 2096—IP-FORWARD-MIB

RFC 2138—RADIUS

RFC 2206—RSVP-MIB

RFC 2571—SNMP-FRAMEWORKMIB

RFC 2572—SNMP-MPD-MIB

RFC 2573—SNMP-TARGET-&-NOTIFICATION-MIB

RFC 2574—SNMP-USER-BASED-SMMIB

RFC 2575—SNMP-VIEW-BASED ACM-MIB

RFC 2576—SNMP-COMMUNITY-MIB

RFC 2588—SONET-MIB

RFC 2665—EtherLike-MIB

RFC 2819—RMON-MIB

RFC 2863—IF-MIB  
RFC 2864—INVERTED-STACK-MIB  
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RFC 3413—Simple Network Management Protocol (SNMP) Applications  
RFC 3414—User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)  
RFC 3418—SNMP MIB  
RFC 3954—Cisco Systems NetFlow Services Export Version 9  
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RFC 2740—OSPF for IPv6  
RFC 3101—OSPF NSSA Option  
RFC 3137—OSPF Stub Router Advertisement  
RFC 3509—Alternative Implementations of OSPF Area Border Routers  
RFC 3623—Graceful OSPF Restart (support for Helper mode)  
RFC 3630—Traffic Engineering (TE) Extensions to OSPF  
RFC 4203 for Shared Risk Link Group (SRLG) sub-TLV  
RFC 4577—OSPF as the Provider/Customer Edge Protocol for BGP/MPLS IP Virtual Private Networks (VPNs) (support for basic OSPF at PE-CE links)  
RFC 4915—Multi-Topology (MT) Routing in OSPF

RFC 4970—Extensions to OSPF for Advertising Optional Router Capabilities  
RFC 5185—OSPF Multi-Area Adjacency

### 7.3.22 OSPFv3

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### 7.3.23 PPP

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RFC 1570—PPP LCP Extensions  
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RFC 4446—IANA Allocation for PWE3  
RFC 4447—Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)  
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RFC 4717—Encapsulation Methods for Transport of Asynchronous Transfer Mode (ATM) over MPLS Networks  
RFC 4618—Encapsulation Methods for Transport of PPP/High-Level Data Link Control (HDLC) over MPLS Networks  
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### 7.3.27 RSVP-TE and FRR

RFC 2430—A Provider Architecture for DiffServ & TE

RFC 2702—Requirements for Traffic Engineering over MPLS

RFC 2747—RSVP Cryptographic Authentication

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RFC 3209—Extensions to RSVP for LSP Tunnels

RFC 3210—Applicability Statement for Extensions to RSVP for LSP Tunnels

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### 7.3.35 VPLS

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