Thresholding Configuration Guide, StarOS Release 21.25

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CONTENTS

About this Guide

Note Control and User Plane Separation (CUPS) represents a significant architectural change in the way StarOS-based products are deployed in the 3G, 4G, and 5G networks. Unless otherwise specified, it should not be assumed that any constructs (including, but not limited to, commands, statistics, attributes, MIB objects, alarms, logs, services) referenced in this document imply functional parity with CUPS products. References to any CUPS products or features are for informational purposes only. Please contact your Cisco Account or Support representative for any questions about parity between this product and any CUPS products.

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This preface describes the *Thresholding Configuration Guide* and its document conventions.

This document provides descriptive information on StarOS thresholds and thresholding mechanism, used to monitor all StarOS functions and services for conditions and events that could potentially cause errors or outages.

Refer to the *Thresholding Overview* section for more information about the structure and content of this reference.

• Contacting Customer Support , on page xiv

About this Guide

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Refer to the *Thresholding Overview* section for more information about the structure and content of this reference.

Conventions Used

The following tables describe the conventions used throughout this documentation.

Notice Type	Description
Information Note	Provides information about important features or instructions.
Caution	Alerts you of potential damage to a program, device, or system.

Notice Type	Description
Warning	Alerts you of potential personal injury or fatality. May also alert you of potential electrical hazards.

Typeface Conventions	Description
Text represented as a `screen display`	This typeface represents displays that appear on your terminal screen, for example: `Login:`
Text represented as **commands**	This typeface represents commands that you enter, for example: **show ip access-list** This document always gives the full form of a command in lowercase letters. Commands are not case sensitive.
Text represented as a **command** *variable*	This typeface represents a variable that is part of a command, for example: **show card** *slot_number* *slot_number* is a variable representing the desired chassis slot number.
Text represented as menu or sub-menu names	This typeface represents menus and sub-menus that you access within a software application, for example: Click the **File** menu, then click **New**

Supported Documents and Resources

Related Documentation

The most up-to-date information for this product is available in the product *Release Notes* provided with each software release.

The following related product documents are also available:

- *AAA Interface Administration and Reference*
- *ASR 5500 Installation Guide*
- *Command Line Interface Reference*
- *GTPP Interface Administration and Reference*
- *IPSec Reference*
- Platform-specific System Administration Guides

- Product-specific Administration Guides
- *Release Change Reference*
- *SNMP MIB Reference*
- *Statistics and Counters Reference*
- *Statistics and Counters Reference - Bulk Statistics Descriptions*

Obtaining Documentation

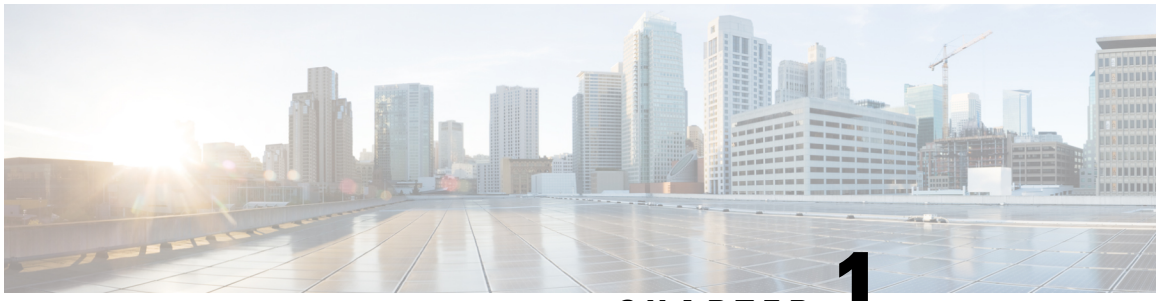
The most current Cisco documentation is available on the following website:

http://www.cisco.com/cisco/web/psa/default.html

Contacting Customer Support

Use the information in this section to contact customer support.

Refer to the support area of http://www.cisco.com for up-to-date product documentation or to submit a service request. A valid username and password are required to access this site. Please contact your Cisco sales or service representative for additional information.



CHAPTER 1

Thresholding Overview

Thresholding Overview

Thresholding on the system is used to monitor the system for conditions that could potentially cause errors or outage. Typically, these conditions are temporary (i.e. high CPU utilization, or packet collisions on a network) and are quickly resolved. However, continuous or large numbers of these error conditions within a specific time interval may be indicative of larger, more severe issues. The purpose of thresholding is to help identify potentially severe conditions so that immediate action can be taken to minimize and/or avoid system downtime.

The following thresholding models are supported by the system:

- **Alert:** A value is monitored and an alert condition occurs when the value reaches or exceeds the configured high threshold within the specified polling interval. The alert is then generated and/or sent at the end of the polling interval.

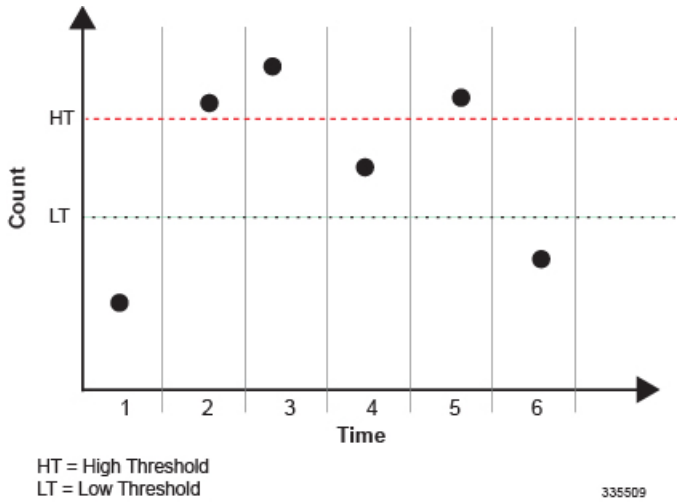
  In the example shown in the figure below, this model generates alerts during period 2, 3, and 5 at the point where the count exceeded HT.

- **Alarm:** Both high and low thresholds are defined for a value. An alarm condition occurs when the value reaches or exceeds the configured high threshold within the specified polling interval. The alert is then generated and/or sent at the end of the polling interval.

  The alarm is cleared at the end of the first interval where the measured value is below the low threshold.

  In the example shown in in the figure below, this model generates an alarm during period 2 when the count exceeds HT. A second alarm is generated in period 6 when the count falls beneath LT. The second alarm indicates a "clear" condition.

Figure 1: Example of Thresholding Model



Note Note that for certain values, the alert or alarm serves to warn of low quantities (i.e. memory, session licenses, etc.). In these cases, the low threshold is the condition that must be met or exceeded within the polling interval to generate the alert or alarm. Once the high threshold is exceeded during an interval, the low quantity condition is cleared.

Thresholding functionality on the system can be configured to monitor the following values:

- AAA:
  - Archive size
  - Number of authentication failures
  - Authentication failure rate
  - Number of accounting failures
  - Accounting failure rate
  - Retry rate
  - AAA Manager request queue usage
- Call setup:
  - Number of calls setup
  - Number of call setup failures
  - PPP setup failure rate
  - Number of calls rejected due to no processing resources being available
- PAC/PSC CPU resource availability:
  - 10 second sample utilization

    - Percent utilization
    - Available memory
    - Load
    - Memory usage
    - Session throughput
- SPC/SMC CPU resource availability:
    - Memory usage
    - Percent utilization
    - ORBS software task utilization
- IP address pool utilization
- Licensed session utilization
- Packet processing:
    - Number of packets filtered/dropped
    - Number of packets forwarded to CPU
- Per-service session count
- Port utilization:
    - High activity
    - Transmit utilization
    - Receive utilization
- Subscriber number:
    - Total number
    - Number active
- Total session count
- SPC/SMC CompactFlash memory utilization

Thresholding reports conditions using one of the following mechanisms:

- **SNMP traps:** SNMP traps have been created that indicate the condition (high threshold crossing and/or clear) of each of the monitored values. Complete descriptions and other information pertaining to these traps is located in the SNMP MIB Reference.

  The generation of specific traps can be enabled or disabled on the system allowing you to view only those traps that are most important to you.

- **Logs:** The system provides a facility called threshold for which active and event logs can be generated. As with other system facilities, logs are generated Log messages pertaining to the condition of a monitored value are generated with a severity level of WARNING.

  Refer to the System Administration Guide for additional information on system logging functionality.

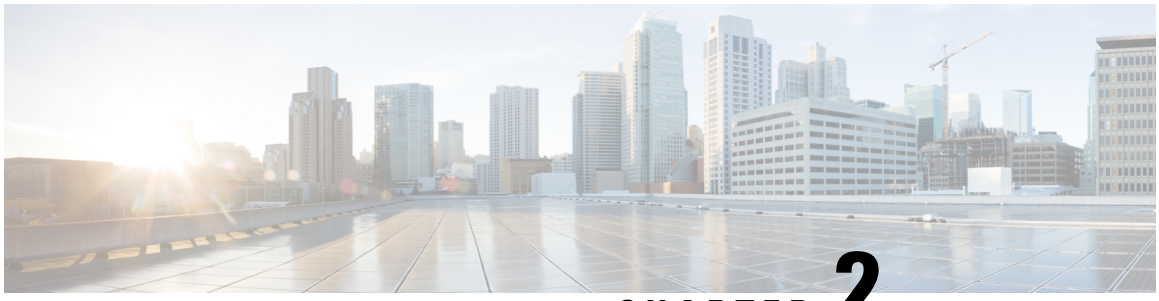
- **Alarm System:** High threshold alarms generated within the specified polling interval are considered "outstanding" until a the condition no longer exists and/or a condition clear alarm is generated.

  "Outstanding" alarms are reported to through the system\'s alarm subsystem and are viewable through the system\'s CLI.

The following table indicates the reporting mechanisms supported by each of the above models.

Table 1: Thresholding Reporting Mechanisms by Model

Model	SNMP Traps	Logs	Alarm System
Alert	X	X	
Alarm	X	X	X



CHAPTER 2

AAA Thresholds

AAA Thresholds

Threshold monitoring can be enabled for the AAA-related values described in the following table.

Value	Description
Archive size	Enables the generation of alerts or alarms based on the number of AAA (RADIUS and/or GTPP) accounting messages archived during the polling interval.
Archive Queue size	Enables the generation of alerts or alarms per Session Manager instance based on the queue size for AAA (RADIUS and/or GTPP) accounting messages being archived during the polling interval.
Accounting Failures	Enables the generation of alerts or alarms based on the number of failed AAA accounting requests that occur during the polling interval.
Accounting Failure Rate	Enables the generation of alerts or alarms based on the percentage of AAA accounting requests that failed during the polling interval.
Authentication Failures	Enables the generation of alerts or alarms based on the number of failed AAA authentication requests that occur during the polling interval.

Value	Description
Authentication Failure Rate	Enables the generation of alerts or alarms based on the percentage of AAA authentication requests that failed during the polling interval.
Retry Rate	Enables the generation of alerts or alarms based on the percentage of AAA requests (both accounting and authentication) that were re-tried during the polling interval.
AAA Manager Request Queue Usage	Enables the generation of alarms or alerts when the AAA Manager request queue usage reaches a specified percentage level.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

AAA Accounting Message Archive Size Thresholds

In the event that the system cannot communicate with configured AAA accounting servers (RADIUS), either due to the server being busy or loss of network connectivity, the system buffers, or archives, the accounting messages.

Accounting message archive size thresholds generate alerts or alarms based on the number of AAA accounting messages buffered in the archive during the specified polling interval. Accounting requests are counted for all AAA accounting servers that the system is configured to communicate with.

Alerts or alarms are triggered for accounting message archive size threshold based on the following rules:

- **Enter condition:** Actual number of archived messages > or = High Threshold
- **Clear condition:** Actual number of archived messages < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring AAA Accounting Message Archive Size Threshold

Use the following example to configure the accounting message archive size threshold:

```
configure
 threshold aaa-acct-archive-size <high_thresh> [ clear <low_thresh> ]
 threshold poll aaa-acct-archive-size interval  <time>
 threshold monitoring aaa-acct-archive-size
 end
```

AAA Accounting Message Archive Queue Size Thresholds

The Session Manager can buffer around 26400 CDRs per Session Manager instance in ASR 5500. Once the above limit is breached the oldest CDRs will be purged to make room for the new CDRs. Since purging can happen as soon as the Session Manager queue size reaches the maximum allowed limit, there is a need for the alarms to be generated during this scenario.

Accounting message archive queue size thresholds generate alerts or alarms per Session Manager instance based on the queue percentage of accounting messages archived in the buffer. The alarm will typically be generated when the message archival begins, and as and when the buffer is filled up to say, 25, 50 and 90 during the specified polling interval.

Note AcctArchiveStarted trap will be generated if the queue size exceeds 15 of the maximum number of session manager items per instance. The queue size is indicative of the maximum of ACS manager queue size and session manager queue size.

Alerts or alarms are triggered for accounting message archive queue size thresholds based on the following rules:

- **Enter condition:** Actual queue percentage of archived messages > or = High Threshold
- **Clear condition:** Actual queue percentage of archived messages < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring AAA Accounting Message Archive Queue Size Threshold

Use the following example to configure the accounting message archive queue size threshold:

```
configure
 threshold aaa-acct-archive-queue-size1 <high_thresh> [ clear <low_thresh> ]
 threshold aaa-acct-archive-queue-size2 <high_thresh> [ clear <low_thresh> ]
 threshold aaa-acct-archive-queue-size3 <high_thresh> [ clear <low_thresh> ]
 threshold monitoring aaa-acct-archive-queue
 threshold poll aaa-acct-archive-queue-size1 interval  <time>
 threshold poll aaa-acct-archive-queue-size2 interval  <time>
 threshold poll aaa-acct-archive-queue-size3 interval  <time>
 end
```

AAA Accounting Failure Thresholds

Accounting failure thresholds generate alerts or alarms based on the number of failed AAA accounting message requests that occur during the specified polling interval. Accounting requests are counted for all AAA accounting servers that the system is configured to communicate with.

Alerts or alarms are triggered for accounting failures based on the following rules:

- **Enter condition:** Actual number of failures > or = High Threshold

- **Clear condition:** Actual number of failures < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring AAA Accounting Failure Threshold

Use the following example to configure AAA accounting failure threshold:

```
configure
 threshold aaa-acct-failure <high_thresh> [ clear <low_thresh> ]
 threshold poll aaa-acct-failure interval  <time>
 threshold monitoring aaa-acct-failure
 end
```

AAA Accounting Failure Rate Thresholds

Accounting failure rate thresholds generate alerts or alarms based on the percentage of AAA accounting message requests that failed during the specified polling interval. Accounting requests are counted for all AAA accounting servers that the system is configured to communicate with.

Alerts or alarms are triggered for accounting failure rates based on the following rules:

- **Enter condition:** Actual number of failures > or = High Threshold
- **Clear condition:** Actual number of failures < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring AAA Accounting Failure Rate Threshold

Use the following example to configure AAA accounting failure rate threshold:

```
configure
 threshold aaa-acct-failure-rate <high_thresh>[ clear <low_thresh> ]
 threshold poll aaa-acct-failure-rate interval  <time>
 threshold monitoring aaa-acct-failure
 end
```

AAA Authentication Failure Thresholds

Authentication failure thresholds generate alerts or alarms based on the number of failed AAA authentication message requests that occur during the specified polling interval. Authentication requests are counted for all AAA authentication servers that the system is configured to communicate with.

Alerts or alarms are triggered for authentication failures based on the following rules:

- **Enter condition:** Actual number of failures > or = High Threshold
- **Clear condition:** Actual number of failures < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring AAA Authentication Failure Threshold

Use the following example to configure AAA authentication failure threshold:

```
configure
 threshold aaa-auth-failure <high_thresh>[ clear <low_thresh> ]
 threshold poll aaa-auth-failure interval  <time>
 threshold monitoring aaa-auth-failure
 end
```

AAA Authentication Failure Rate Thresholds

Authentication failure rate thresholds generate alerts or alarms based on the percentage of AAA authentication message requests that failed during the specified polling interval. Authentication requests are counted for all AAA authentication servers that the system is configured to communicate with.

Alerts or alarms are triggered for authentication failure rates based on the following rules:

- **Enter condition:** Actual failure percentage > or = High Threshold
- **Clear condition:** Actual failure percentage < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring AAA Authentication Failure Rate Threshold

Use the following example for configuring AAA authentication failure rate threshold:

```
configure
 threshold aaa-auth-failure-rate <high_thresh>[ clear <low_thresh> ]
 threshold poll aaa-auth-failure-rate interval  <time>
 threshold monitoring aaa-auth-failure
 end
```

AAA Request Message Retry Rate Thresholds

AAA request message retry rate thresholds generate alerts or alarms based on the percentage of request messages (both authentication and accounting) that were retried during the specified polling interval. The percentage is based on a message count taken for all AAA authentication and accounting servers that the system is configured to communicate with.

Alerts or alarms are triggered for request message retries based on the following rules:

- **Enter condition:** Actual failure percentage > or = High Threshold
- **Clear condition:** Actual failure percentage < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring AAA Authentication Failure Rate Threshold

Use the following example for configuring AAA request message retry rate threshold:

```
configure
 threshold aaa-retry-rate <high_thresh>[ clear <low_thresh> ]
 threshold poll aaa-retry-rate interval  <time>
 threshold monitoring aaa-retry-rate
 end
```

AAA Manager Request Queue Threshold

The AAA Manager request queue threshold generates an alert or alarm based on the usage percentage of the AAA Manager request queue during the specified polling interval. The percentage is based on the total number of pending requests for the AAA Manager and the total size allowed for the queue. This is polled for each AAA Manager process.

Alerts or alarms are triggered for the AAA Manager request queue threshold based on the following rules:

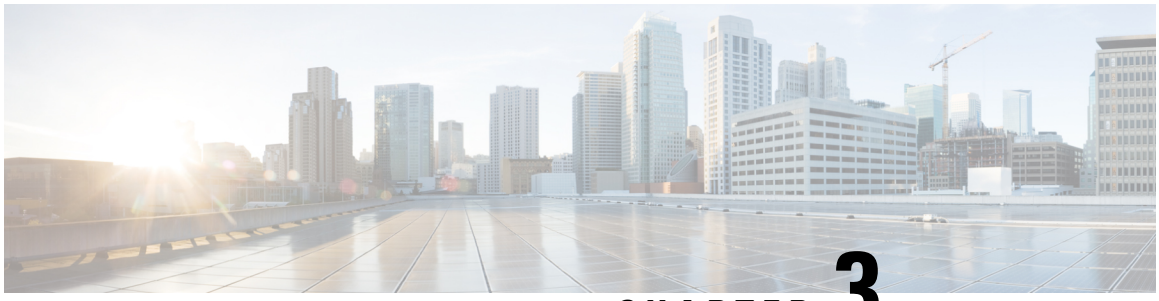
- **Enter condition:** Actual AAA Manager request queue percentage used > or = High Threshold
- **Clear condition:** Actual AAA Manager request queue percentage used < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm is not generated until the end of the polling interval.

Configuring AAA Manager Request Queue Threshold

Use the following example for configuring AAA Manager request queue threshold.

```
configure
 threshold aaamgr-request-queue <high_thresh>[ clear <low_thresh> ]
 threshold poll aaamgr-request-queue interval  <time>
 threshold monitoring aaamgr-request-queue
 end
```



CHAPTER 3

ASNGW Thresholds

ASN GW Service Thresholds

ASN GW Service thresholds generate alerts or alarms for the average number of calls setup. A threshold can be configured to report this information on entire system for ASN GW service. Thresholds can also be configured for session registration response failures, discarded interface registration requests, discarded network entry registration acknowledgments for ASN GW services.

Alerts or alarms are triggered for these ASN GW thresholds based on the following rules:

- **Enter condition:** When the actual average of call setups or actual number of failures or discards passes, or is equal to, the configured Threshold value an alert or alarm is set.
- **Clear condition:** When the actual average of call setups or actual number of failures or discards passes below the Threshold value the alert or alarm is cleared.

If a trigger condition occurs within the polling interval, the alert or alarm is not generated until the end of the polling interval.

System-Level ASN GW Service Thresholds

The system-level thresholds for ASN GW Service-Level can be configured to monitor thresholds for subscriber network entry, authentication, session registration response failures, discarded registration requests, session timeout, and hand-off denials for individual ASN GW services.

Following thresholds can be configured for the ASN GW service-level:

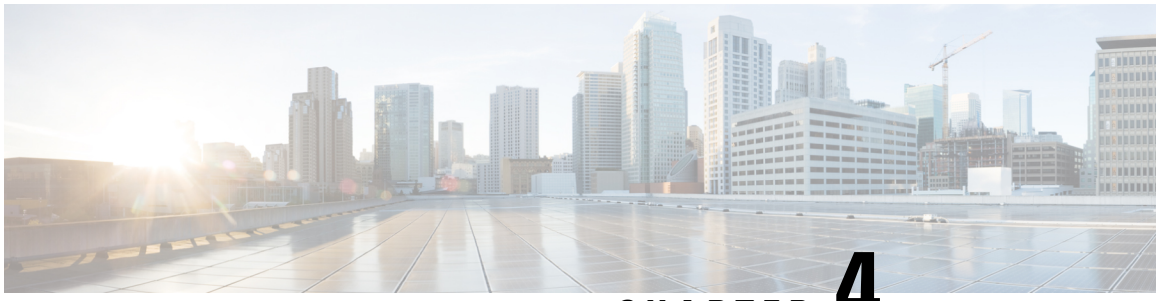
- Number of ASN GW Authentication failures
- Number of ASN GW hand-off denials
- Maximum number of EAP retries
- Number of network entry denials
- Number of Network Access Identifier (NAI) in R6 message

- ASN GW timeout duration during session setup
- ASN GW session timeout duration

Configuring System-level ASN GW Service Thresholds

Use the following example to configure and enable these thresholds:

```
configuration
 threshold asngw-auth-failure <high_thresh> [clear <low_thresh>]
 threshold asngw-handoff-denial <high_thresh> [clear <low_thresh>]
 threshold asngw-max-eap-retry <high_thresh> [clear <low_thresh>]
 threshold asngw-network-entry-denial <high_thresh> [clear       <low_thresh>]
 threshold asngw-r6-invalid-nai <high_thresh> [clear <low_thresh>]
 threshold asngw-session-setup-timeout <high_thresh> [clear       <low_thresh>]
 threshold asngw-session-timeout <high_thresh> [clear <low_thresh>]
 threshold poll asngw-auth-failure interval <time>
 threshold poll asngw-handoff-denial interval <time>
 threshold poll asngw-max-eap-retry interval <time>
 threshold poll asngw-network-entry-denial interval <time>
 threshold poll asngw-r6-invalid-nai interval <time>
 threshold poll asngw-session-setup-timeout interval <time>
 threshold poll asngw-session-timeout interval <time>     threshold
monitoring asngw      end
```



CHAPTER 4

Call Setup Thresholds

Call Setup Thresholds

Threshold monitoring can be enabled for the call setup values described in the following table.

Value	Description
Number of calls setup	Enables the generation of alerts or alarms based on the number of calls setup by the system during the polling interval.
Number of call setup failures	Enables the generation of alerts or alarms based on the number of call setup failures experienced by the system during the polling interval.
PPP setup failure rate	Enables the generation of alerts or alarms based on the rate at which PPP failures are experienced by the system during the polling interval.
Number of calls rejected due to no processing resources being available	Enables the generation of alerts or alarms based on the number of calls rejected by the system due to insufficient resources (memory and/or session licenses) during the polling interval.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

Call Setup Thresholds

Threshold monitoring can be enabled for the call setup values described in the following table.

Value	Description
Number of calls setup	Enables the generation of alerts or alarms based on the number of calls setup by the system during the polling interval.
Number of call setup failures	Enables the generation of alerts or alarms based on the number of call setup failures experienced by the system during the polling interval.
PPP setup failure rate	Enables the generation of alerts or alarms based on the rate at which PPP failures are experienced by the system during the polling interval.
Number of calls rejected due to no processing resources being available	Enables the generation of alerts or alarms based on the number of calls rejected by the system due to insufficient resources (memory and/or session licenses) during the polling interval.

Configuring Call Setup Thresholds

Use the following example to configure call setup thresholds:

```
configure
 threshold call-setup <high_thresh> [ clear <low_thresh> ]
 threshold poll call-setup interval <time>
 threshold monitoring call-setup
 end
```

Call Setup Failure Thresholds

Call setup failure thresholds generate alerts or alarms based on the total number of call setup failures experienced by the system during the specified polling interval.

Alerts or alarms are triggered for call setup failures based on the following rules:

- **Enter condition:** Actual number of call setup failures > or = High Threshold
- **Clear condition:** Actual number of call setup failures < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring Call Setup Failure Thresholds

Use the following example for configuring call setup failure thresholding:

```
configure
 threshold call-setup-failure <high_thresh> [ clear <low_thresh> ]
 threshold poll call-setup-failure interval <time>
 threshold monitoring call-setup
 end
```

PPP Setup Failure Rate Thresholds

PPP setup failure rate thresholds generate alerts or alarms based on the rate of call setup failures experienced by the system during the specified polling interval. The failure rate is the percentage of failures as determined by number of PPP setup failures divided by the total number of PPP sessions initiated.

Alerts or alarms are triggered for PPP setup failure rates based on the following rules:

- **Enter condition:** Actual number of call setup failures > or = High Threshold
- **Clear condition:** Actual number of call setup failures < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring PPP Setup Failure Rate Thresholds

Use the following example for configuring PPP setup failure rate thresholding:

```
configure
 threshold ppp-setup-fail-rate <high_thresh> [ clear <low_thresh> ]
 threshold poll ppp-setup-fail-rate interval <time>
 threshold monitoring call-setup
 end
```

No Resource Call Reject Thresholds

No resource call reject thresholds generate alerts or alarms based on the total number of calls that were rejected by the system due to insufficient or no resources (CPU, memory, etc.) during the specified polling interval.

Alerts or alarms are triggered for no-resource-rejected calls based on the following rules:

- **Enter condition:** Actual number of calls rejected due to no resources > or = High Threshold
- **Clear condition:** Actual number of calls rejected due to no resources < Low Threshold

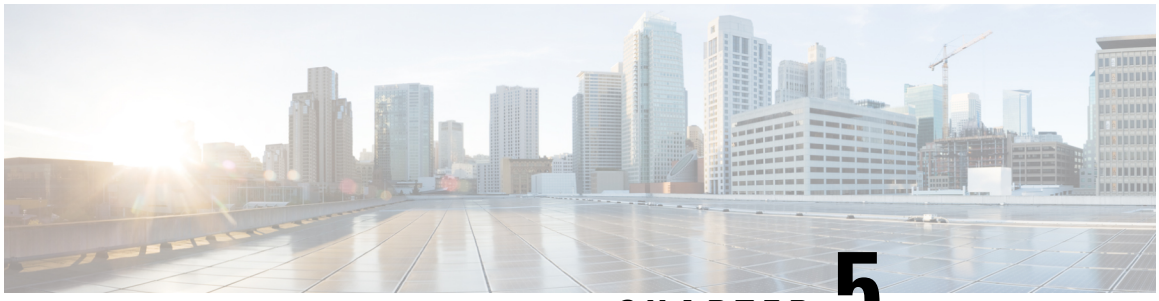
If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring No Resource Call Reject Thresholds

Use the following example for configuring no resource call reject thresholding:

```
configure
 threshold call-reject-no-resource <high_thresh> [ clear <low_thresh> ]
```

```
threshold poll call-reject-no-resource interval <time>
threshold monitoring call-setup
end
```



CHAPTER 5

Content Filtering Thresholds

Content Filtering Thresholds

Thresholds generate alerts or alarms based on either the total number of Content Filtering calls setup by the system during the specified polling interval, or on the number of currently active calls only.

Alerts or alarms are triggered for call setups based on the following rules:

- **Enter condition:** Actual number of call setups > or = High Threshold
- **Clear condition:** Actual number of call setups < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Default value is 0, which means there will be no monitoring.

The polling interval is in seconds and it is an integer between 30 and 60000. Entries will be rounded up to the nearest 30 seconds.

Configuring Content Filtering Thresholds

This section describes how to enable and configure Content Filtering thresholds.

Enabling Thresholds

To enable thresholds use the following configuration:

```
configure
 threshold monitoring content-filtering
 end
```

Configuring Threshold Poll Interval

To configure threshold poll interval use the following configuration:

```
configure
 threshold poll contfilt-block interval <interval>
 threshold poll contfilt-rating interval  <interval>
 end
```

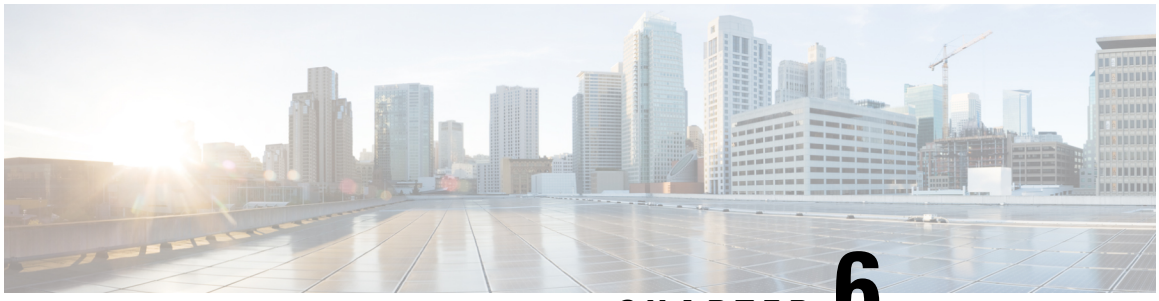
Configuring Threshold Limits

To configure threshold limits use the following configuration:

```
configure
 threshold contfilt-block <high_thresh>  [ clear <low_thresh> ]
 threshold contfilt-rating <high_thresh>  [ clear <low_thresh> ]
 end
```

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.



CHAPTER 6

CPU Resource Thresholds

CPU Resource Thresholds

Threshold monitoring can be enabled for the CPU resource values described in the following table.

Value	Description
10 second average of total processing card CPU utilization	Enables the generation of alerts or alarms based on a 10 second average of processing card CPU utilization.
Processing card CPU available memory	Enables the generation of alerts or alarms based on the amount of available memory for each processing card CPU during the polling interval.
Processing card CPU load	Enables the generation of alerts or alarms based on processing card CPU load using a 5 minute average measurement.
Processing card CPU memory usage	Enables the generation of alerts or alarms based on the percentage of total processing card CPU memory used during the polling interval.

Value	Description
Processing card CPU session throughput	Enables the generation of alerts or alarms based on the total throughput for all Session Manager tasks running on each processing card CPU during the polling interval.
Processing card CPU utilization	Enables the generation of alerts or alarms based on the utilization percentage for each processing card CPU during the polling interval.
System management card CPU memory usage	Enables the generation of alerts or alarms based on the percentage of total system management card CPU memory used during the polling interval.
System management card CPU utilization	Enables the generation of alerts or alarms based on the utilization percentage for each active system management card CPU during the polling interval.
ORBS task CPU utilization warning	Enables the generation of warning-level alerts or alarms based on the percentage CPU resources utilized by the Object Request Broker (ORB) software task.
ORBS task CPU utilization critical	Enables the generation of critical-level alerts or alarms based on the percentage CPU resources utilized by the Object Request Broker (ORB) software task.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

10-second Average of Total Processing Card CPU Utilization Thresholds

10-second average of total CPU utilization thresholds generate alerts or alarms based on a 10 second average of cpu utilization for all processing card CPUs during the specified polling interval.

Alerts or alarms are triggered for 10-second average of total CPU utilization based on the following rules:

- **Enter condition:** Average measured amount of total CPU utilization for the last 10 seconds > or = High Threshold
- **Clear condition:** Average measured amount of total CPU utilization for the last 10 seconds < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring 10-second Average of Processing Card CPU Thresholds

Use the following example for configuring 10-second average of total CPU utilization thresholding.

```
configure
 threshold 10sec-cpu-utilization <high_thresh> [ clear <low_thresh> ]
 threshold poll 10sec-cpu-utilization interval <time>
 threshold monitoring cpu-resource
 end
```

Processing Card CPU Available Memory Thresholds

CPU available memory thresholds generate alerts or alarms based on the amount of available memory for each processing card CPU during the specified polling interval. Although, a single threshold is configured for all processing card CPUs, separate alerts or alarms can be generated for each CPU. Both active and standby processing card CPUs are monitored.

Alerts or alarms are triggered for available processing card CPU memory based on the following rules:

- **Enter condition:** Average measured amount of memory/CPU for last 5 minutes = or < Low Threshold
- **Clear condition:** Average measured amount of memory/CPU for last 5 minutes > High Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring Processing Card CPU Available Memory Thresholds

Use the following example for configuring processing card CPU available memory thresholding.

```
configure
 threshold cpu-available-memory <low_thresh> [ clear <high_thresh> ]
 threshold poll cpu-available-memory interval <time>
 threshold monitoring cpu-resource
      end
```

Processing Card CPU Load Thresholds

CPU load thresholds generate alerts or alarms based on a five-minute average of processing card CPU load during the polling interval. Although, a single threshold is configured for all processing card CPUs, separate alerts or alarms can be generated for each CPU.

Alerts or alarms are triggered for CPU load based on the following rules:

- **Enter condition:** 5 minute average CPU load > or = High Threshold
- **Clear condition:** 5 minute average CPU load < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring Processing Card CPU Load Thresholds

Use the following example for configuring processing card CPU load thresholding.

```
configure
 threshold cpu-load <high_thresh> [ clear <low_thresh> ]
 threshold poll cpu-load interval <time>
 threshold monitoring cpu-resource
      end
```

Processing Card CPU Memory Usage Thresholds

CPU memory usage thresholds generate alerts or alarms based on memory usage for each processing card CPU during the polling interval. Although, a single threshold is configured for all processing card CPUs, separate alerts or alarms can be generated for each CPU.

Alerts or alarms are triggered for CPU memory usage based on the following rules:

- **Enter condition:** Actual CPU memory usage > or = High Threshold
- **Clear condition:** Actual CPU memory usage < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring Processing Card CPU Memory Usage Thresholds

Use the following example for configuring processing card CPU memory usage thresholding.

```
configure
 threshold cpu-memory-usage <high_thresh> [ clear <low_thresh> ]
 threshold poll cpu-memory-usage interval <time>
 threshold monitoring cpu-resource
      end
```

Processing Card CPU Session Throughput Thresholds

CPU session throughput thresholds generate alerts or alarms based on total throughput for all Session Manager tasks running on each processing card CPU during the polling interval. Although, a single threshold is configured for all processing card CPUs, separate alerts or alarms can be generated for each CPU.

Alerts or alarms are triggered for processing card CPU session throughput based on the following rules:

- **Enter condition:** Actual CPU session throughput > or = High Threshold
- **Clear condition:** Actual CPU session throughput < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring Processing Card CPU Session Throughput Thresholds

Use the following example for configuring processing card CPU session throughput thresholding.

```
configure
 threshold cpu-session-throughput <high_thresh> [ clear <low_thresh> ]
 threshold poll cpu-session-throughput interval <time>
 threshold monitoring cpu-session-throughput
      end
```

Processing Card CPU Utilization Thresholds

CPU utilization thresholds generate alerts or alarms based on the utilization percentage of each processing card CPU during the specified polling interval. Although, a single threshold is configured for all processing card CPUs, separate alerts or alarms can be generated for each CPU.

Alerts or alarms are triggered for processing card CPU utilization based on the following rules:

- **Enter condition:** Average measured CPU utilization for last 5 minutes > or = High Threshold
- **Clear condition:** Average measured CPU utilization for last 5 minutes < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring Processing Card CPU Utilization Thresholds

Use the following example for configuring processing card CPU utilization thresholding.

```
configure
 threshold cpu-utilization <high_thresh> [ clear <low_thresh> ]
 threshold poll cpu-utilization interval <time>
 threshold monitoring cpu-resource
      end
```

System Management Card CPU Memory Usage Thresholds

CPU memory usage thresholds generate alerts or alarms based on memory usage for the system management card CPU during the polling interval. A single threshold enables CPU monitoring for both the active and standby system management cards allowing for alerts or alarms to be generated for each CPU.

Alerts or alarms are triggered for system management card CPU memory usage based on the following rules:

- **Enter condition:** Actual CPU memory usage > or = High Threshold
- **Clear condition:** Actual CPU memory usage < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring System Management Card CPU Memory Usage Thresholds

Use the following example for configuring system management card CPU memory usage thresholding.

```
configure
 threshold mgmt-cpu-memory-usage <high_thresh> [ clear <low_thresh> ]
 threshold poll mgmt-cpu-memory-usage interval <time>
 threshold monitoring cpu-resource
      end
```

System Management Card CPU Utilization Thresholds

CPU utilization thresholds generate alerts or alarms based on the utilization percentage of each system management card CPU during the specified polling interval. Although, a single threshold is configured for both system management card CPUs, separate alerts or alarms can be generated for each CPU.

Alerts or alarms are triggered for system management card CPU utilization based on the following rules:

- **Enter condition:** Average measured CPU utilization for last 5 minutes > or = High Threshold
- **Clear condition:** Average measured CPU utilization for last 5 minutes < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring System Management Card CPU Utilization Thresholds

Use the following example for configuring system management card CPU utilization thresholding.

```
configure
 threshold mgmt-cpu-utilization <high_thresh> [ clear <low_thresh> ]
 threshold poll mgmt-cpu-utilization interval <time>
 threshold monitoring cpu-resource
      end
```

ORBS Software Task CPU Usage Warning-Level Thresholds

Object Request Broker (ORB) software task CPU utilization thresholds generate warning-level alerts or alarms based on the percentage of system management card CPU resources it is consuming at the time of polling.

Warning-level alerts or alarms are triggered for CPU usage by the ORBs software task based on the following rules:

- **Enter condition:** Actual CPU usage percentage > High Threshold
- **Clear condition:** Actual CPU usage percentage = or < Low Threshold

Configuring ORBS Software Task CPU Usage Warning-Level Thresholds

Use the following example for configuring warning-level ORB software task CPU usage thresholding.

```
configure
 threshold cpu-orbs-warn <high_thresh> [ clear <low_thresh> ]
 threshold poll cpu-orbs-warn interval <time>
 threshold monitoring cpu-resource
      end
```

ORBS Software Task CPU Usage Critical-Level Thresholds

Object Request Broker (ORB) software task CPU utilization thresholds generate critical-level alerts or alarms based on the percentage of system management card CPU resources it is consuming at the time of polling.

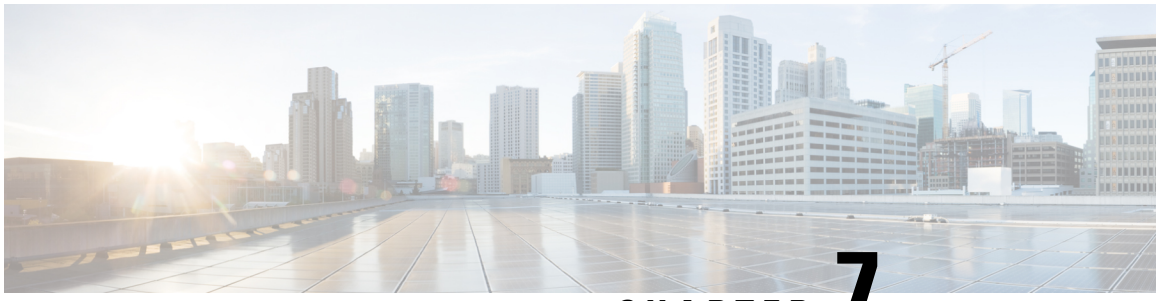
Critical-level alerts or alarms are triggered for CPU usage by the ORBs software task based on the following rules:

- **Enter condition:** Actual CPU usage percentage > High Threshold
- **Clear condition:** Actual CPU usage percentage = or < Low Threshold

Configuring ORBS Software Task CPU Usage Critical-Level Thresholds

Use the following example for configuring critical-level ORB software task CPU usage thresholding.

```
configure
 threshold cpu-orbs-crit <high_thresh> [ clear <low_thresh> ]
 threshold poll cpu-orbs-crit interval <time>
 threshold monitoring cpu-resource
      end
```



CHAPTER 7

CSCF Service Thresholds

CSCF Service thresholds generate alerts or alarms for the average number of calls setup. A threshold can be configured to report this information for an individual CSCF service. Thresholds can also be configured for several other conditions for individual CSCF services.

Alerts or alarms are triggered for these CSCF thresholds based on the following rules:

- **Enter condition:** Actual average of call setups or actual number of errors > or = High Threshold
- **Clear condition:** Actual average of call setups or actual number of errors < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm is not generated until the end of the polling interval. Polling intervals are set on a system level.

CSCF Service Thresholds

CSCF Service thresholds generate alerts or alarms for the average number of calls setup. A threshold can be configured to report this information for an individual CSCF service. Thresholds can also be configured for several other conditions for individual CSCF services.

Alerts or alarms are triggered for these CSCF thresholds based on the following rules:

- **Enter condition:** Actual average of call setups or actual number of errors > or = High Threshold
- **Clear condition:** Actual average of call setups or actual number of errors < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm is not generated until the end of the polling interval. Polling intervals are set on a system level.

Configuring CSCF Thresholds

This section describes how to enable and configure CSCF Service thresholds.

Enabling CSCF Service Thresholds

To enable threshold monitoring for a CSCF service, use the following configuration:

```
configure
 context <context_name>
 cscf-service <name>
 threshold monitoring
 end
```

Configuring CSCF Service Thresholds

The following thresholds can be configured for a CSCF Service:

- Number of CSCF call setup failures
- Number of total active CSCF calls
- Number of CSCF call setup failures due to no-resource
- Number of CSCF Presence errors
- Number of CSCF Registration Authentication failures
- Number of CSCF call setup failures due to TCP error
- Number of CSCF calls per polling interval
- Number of CSCF registrations per polling interval
- Number of total CSCF active registrations
- Maximum number of route-failures, after which the alarm/alert will be raised

Use the following example to configure these thresholds:

```
configuration
 context <context_name>
 cscf-service <name>
 threshold call-setup-failures <high_thresh> [ clear <low_thresh>]
 threshold call-total-active <high_thresh> [ clear <low_thresh> ]
 threshold error-no-resource <high_thresh> [ clear <low_thresh>]
 threshold error-presence <high_thresh> [ clear <low_thresh>]
 threshold error-reg-auth <high_thresh> [ clear <low_thresh>]
 threshold error-tcp <high_thresh> [ clear <low_thresh>]
 threshold invite-rcvd-rate <high_thresh> [ clear <low_thresh>]
 threshold reg-rcvd-rate <high_thresh> [ clear <low_thresh>]
 threshold reg-total-active <high_thresh> [ clear <low_thresh>]
 threshold route-failures <high_thresh> [ clear <low_thresh>]
 end
```

Configuring Threshold Poll Intervals

The following threshold poll intervals can be configured for the CSCF Service:

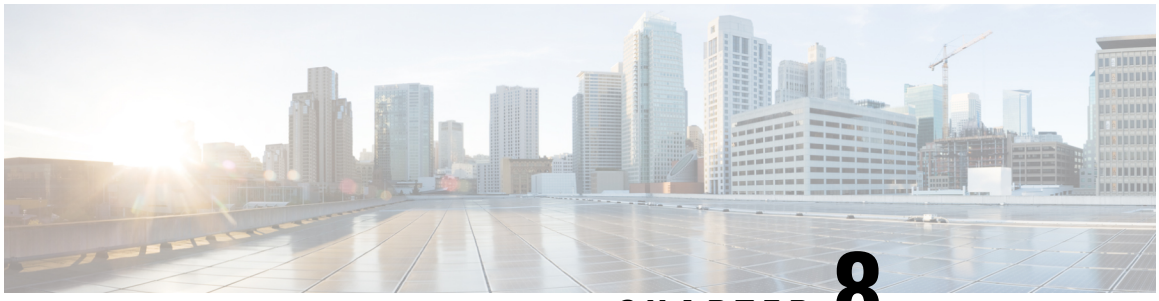
- CSCF call setup failures
- CSCF total active calls
- CSCF calls
- CSCF registrations
- CSCF service route failures
- CSCF no resource errors
- CSCF presence errors
- CSCF Reg-Auth errors
- CSCF TCP errors
- CSCF total active registrations

Use the following example to configure these threshold poll intervals:

```
configuration
 threshold poll call-setup-failures interval <dur>
 threshold poll call-total-active interval <dur>
 threshold poll cscf-invite-rcvd interval <dur>
 threshold poll cscf-reg-rcvd interval <dur>
 threshold poll cscf-service-route-failures interval <dur>
 threshold poll error-no-resource interval <dur>
 threshold poll error-presence interval <dur>
 threshold poll error-reg-auth interval <dur>
 threshold poll error-tcp interval <dur>
 threshold poll reg-total-active interval <dur>
 end
```

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.



CHAPTER 8

Disconnect-Reasons Thresholds

An operator can set alarms based on threshold parameters for up to 30 specific session disconnect reasons. An alarm notification and SNMP trap are generated whenever a disconnect reason threshold is exceeded.

The **show session disconnect-reasons verbose** command displays the name and associated reason number of all disconnect reasons (600+).

Alerts or alarms are triggered for a specific disconnect type based on the following rules:

- **Enter condition:** Actual number of disconnects > or = High Threshold
- **Clear condition:** Actual number of disconnects < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Disconnect-Reasons Thresholds

An operator can set alarms based on threshold parameters for up to 30 specific session disconnect reasons. An alarm notification and SNMP trap are generated whenever a disconnect reason threshold is exceeded.

The **show session disconnect-reasons verbose** command displays the name and associated reason number of all disconnect reasons (600+).

Alerts or alarms are triggered for a specific disconnect type based on the following rules:

- **Enter condition:** Actual number of disconnects > or = High Threshold
- **Clear condition:** Actual number of disconnects < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring Disconnect-Reasons Thresholds

This section describes how to enable and configure session disconnect-reason thresholds.

threshold disconnect-reason

Use the following configuration example to configure alarm and clear thresholds based on the number of disconnects per specified disconnect reason on a chassis.

```
configure
   threshold disconnect-reason disc-reason_name high_thresh [ clear  low_thresh
]
   end
```

Note The operator can configure a maximum of 30 types of disconnect reasons for monitoring. When the number of disconnects per disconnect reason crosses the threshold, a trap is generated.

threshold poll disconnect-reason

Use the following configuration example to configure a polling period for a specific disconnect reason.

```
configure
   [ default ] threshold poll disconnect-reason disc-reason_name interval
polling_interval_seconds
   end
```

polling_interval_seconds is specified as an integer divisible by 30 within the range of 300 (five minutes) to 60000 (1000 minutes).

Important The operator can configure a maximum of 30 types of disconnect reasons for monitoring. When the number of disconnects per disconnect reason crosses the threshold, a trap is generated.

threshold monitoring

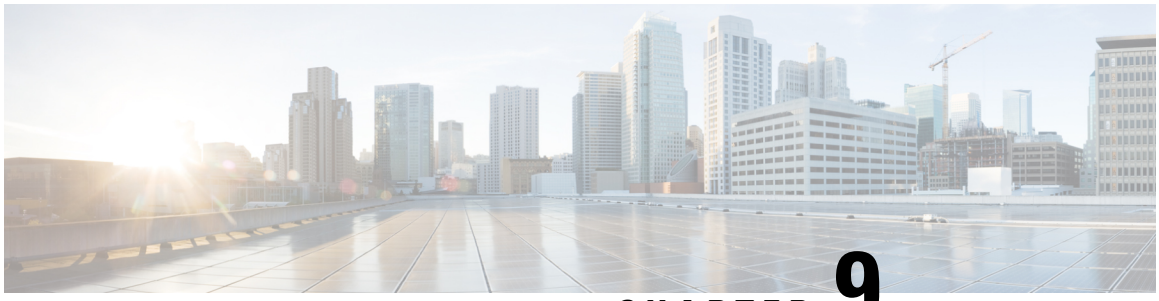
Use the following configuration example to enable or disable monitoring of disconnect reasons.

```
configure
   [ no | default ] threshold monitoring disconnect-reason
   end
```

Important The operator can configure a maximum of 30 types of disconnect reasons for monitoring. When the number of disconnects per disconnect reason crosses the threshold, a trap is generated.

Saving Your Configuration

When you configure thresholds they are not persistent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode **save configuration** command. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.



CHAPTER 9

Diameter Thresholds

Diameter Thresholds

Threshold monitoring can be enabled for the Diameter-related values described in the following table.

Threshold	Description
DCCA Bad Answers	Enables generation of alerts or alarms based on the number of times DIAMETER-BAD-ANSWER code is sent to the Diameter server during a polling interval.
DCCA Protocol Errors	Enables generation of alerts or alarms based on the number protocol error messages received from the Diameter server during a polling interval.
DCCA Rating Failure	Enables generation of alerts or alarms based on the number of times the Diameter server rejected requests for a block of credits, due to the Rating Group (content-id) being invalid during a polling interval.
DCCA Unknown Rating Group	Enables generation of alerts or alarms based on the number of times the block of credits returned by the Diameter server is rejected due to the Rating Group being unknown during a polling interval.
Diameter Retry Rate	Enables generation of alerts or alarms based on the percentage of Diameter requests that were re-tried during a polling interval.

Configuring Diameter Thresholds

This section describes how to enable and configure Diameter thresholds.

DCCA Bad Answers Threshold

DCCA Bad Answers threshold generates alerts or alarms based on the number of times DIAMETER-BAD-ANSWER code is sent to the Diameter server during the polling interval.

Alerts or alarms are triggered based on the following rules:

- **Enter condition** : Actual number of times DIAMETER-BAD-ANSWER code sent > or = High Threshold
- **Clear condition** : Actual number of times DIAMETER-BAD-ANSWER code sent < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring DCCA Bad Answers Threshold

To configure the DCCA Bad Answers threshold use the following configuration:

```
configure
 threshold dcca-bad-answers <high_thresh> [ clear  <low_thresh> ]
 threshold poll dcca-bad-answers interval <seconds>
 threshold monitoring ecs
 end
```

DCCA Protocol Errors Threshold

DCCA Protocol Errors threshold generates alerts or alarms based on the number protocol error messages received from the Diameter server during the polling interval.

Alerts or alarms are triggered based on the following rules:

- **Enter condition** : Actual number of protocol error messages received > or = High Threshold
- **Clear condition** : Actual number of protocol error messages received < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring DCCA Protocol Errors Threshold

To configure the DCCA Protocol Errors threshold use the following configuration:

```
configure
 threshold dcca-protocol-error  <high_thresh> [ clear  <low_thresh> ]
 threshold poll dcca-protocol-error interval <seconds>
 threshold monitoring ecs
 end
```

DCCA Rating Failure Threshold

DCCA Rating Failure threshold generates alerts or alarms based on the number of times the Diameter server rejected requests for a block of credits, due to the Rating Group (content-id) being invalid during the polling interval.

Alerts or alarms are triggered based on the following rules:

- **Enter condition** : Actual number of rating failures > or = High Threshold
- **Clear condition** : Actual number of rating failures < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring DCCA Rating Failure Threshold

To configure the DCCA Rating Failure threshold use the following configuration:

```
configure
 threshold dcca-rating-failed  <high_thresh> [ clear  <low_thresh> ]
 threshold poll dcca-rating-failed interval <seconds>
 threshold monitoring ecs
 end
```

DCCA Unknown Rating Group Threshold

DCCA Unknown Rating Group threshold generates alerts or alarms based on the number of times the block of credits returned by the Diameter server is rejected due to the Rating Group being unknown during the polling interval.

Alerts or alarms are triggered based on the following rules:

- **Enter condition** : Actual number of "unknown rating group" failures > or = High Threshold
- **Clear condition** : Actual number of "unknown rating group" < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring DCCA Unknown Rating Group Threshold

To configure the DCCA Unknown Rating Group threshold use the following configuration:

```
configure
 threshold dcca-unknown-rating-group <high_thresh> [ clear  <low_thresh> ]
 threshold poll dcca-unknown-rating-group interval <seconds>
 threshold monitoring ecs
 end
```

Diameter Retry Rate Threshold

Diameter Retry Rate threshold generates alerts or alarms based on the percentage of Diameter requests that were re-tried during the polling interval.

Alerts or alarms are triggered based on the following rules:

- **Enter condition**: Percentage of Diameter requests retried > or = High Threshold
- **Clear condition**: Percentage of Diameter requests retried < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

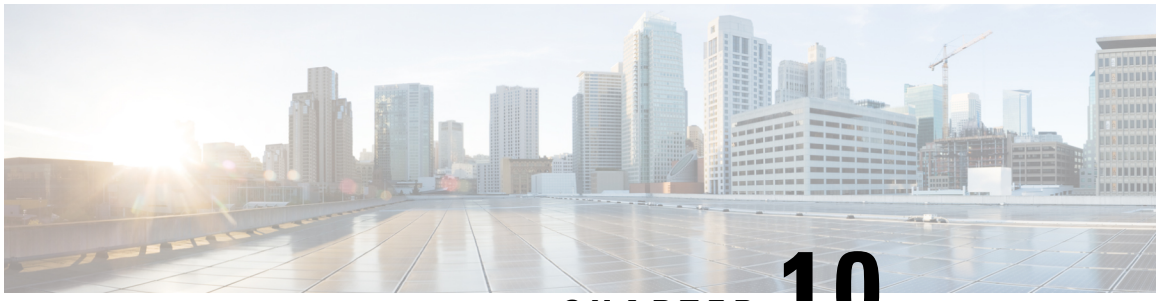
Configuring Diameter Retry Rate Threshold

To configure the Diameter Retry Rate threshold use the following configuration:

```
configure
 threshold diameter diameter-retry-rate <high_thresh> [ clear  <low_thresh> ]
 threshold poll diameter-retry-rate interval  <seconds>
 threshold monitoring diameter
 end
```

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.



CHAPTER 10

ECS Thresholds

ECS Thresholds

Threshold monitoring can be enabled for the ECS thresholds as described in the following table.

Threshold	Description
CDR File Space	Enables generation of alerts or alarms based on the percentage of total file space allocated for Charging Data Records (CDRs) used during the polling interval.
DNS-learnt IPv4 for ACS DNS Snooping feature	Enables generation of alerts or alarms based on the percentage of total DNS-learnt IPv4 entries in relation to the ACS DNS Snooping feature.
DNS-learnt IPv6 for ACS DNS Snooping feature	Enables generation of alerts or alarms based on the percentage of total DNS-learnt IPv6 entries in relation to the ACS DNS Snooping feature.
EDR File Space	Enables generation of alerts or alarms based on the percentage of total file space allocated for Event Data Records (EDRs) used during the polling interval.
Dropped EDR/UDR Flow Control	Enables generation of alerts or alarms based on the total number of Event Data Records (EDRs) and Usage Data Records (UDRs) discarded due to flow control.

Configuring ECS Thresholds

This section describes how to enable and configure ECS thresholds.

CDR File Space Threshold

CDR file space threshold generates alerts or alarms based on the percentage of total allocated CDR file space used during the polling interval.

Alerts or alarms are triggered based on the following rules:

- **Enter condition** : Actual percentage of allocated CDR file space usage is greater than or equal to the specified percentage of total CDR file space.
- **Clear condition** : Actual CDR file space used is less than the specified clear percentage of total allocated CDR file space usage.

If a trigger condition exists at the end of the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring CDR File Space Threshold

To configure the CDR File Space threshold use the following configuration:

```
configure
 threshold cdr-file-space <high_thresh> [ clear  <low_thresh> ]
 threshold poll cdr-file-space interval <seconds>
 threshold monitoring ecs
 end
```

DNS-learnt IPv4 Threshold

DNS-learnt IPv4 threshold generates alerts or alarms based on the percentage of total DNS-learnt IPv4 entries in relation to the ACS DNS Snooping feature.

Alerts or alarms are triggered based on the following rules:

- **Enter condition** : Actual percentage of total DNS-learnt IPv4 entries is greater than or equal to the specified percentage of total DNS-learnt IPv4 entries.
- **Clear condition** : Actual percentage of total DNS-learnt IPv4 entries is less than the specified clear percentage of total DNS-learnt IPv4 entries.

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring DNS-Learnt IPv4 Threshold

To configure the DNS-Learnt IPv4 threshold use the following configuration:

```
configure
 threshold dns-learnt-ipv4-max-entries  <high_thresh> [ clear  <low_thresh> ]
 threshold poll dns-learnt-ipv4-max-entries <seconds>
 threshold monitoring ecs
 end
```

DNS-learnt IPv6 Threshold

DNS-learnt IPv6 threshold generates alerts or alarms based on the percentage of total DNS-learnt IPv6 entries in relation to the ACS DNS Snooping feature.

Alerts or alarms are triggered based on the following rules:

- **Enter condition** : Actual percentage of total DNS-learnt IPv6 entries is greater than or equal to the specified percentage of total DNS-learnt IPv6 entries.
- **Clear condition** : Actual percentage of total DNS-learnt IPv6 entries is less than the specified clear percentage of total DNS-learnt IPv6 entries.

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring DNS-Learnt IPv6 Threshold

To configure the DNS-Learnt IPv6 threshold use the following configuration:

```
configure
 threshold dns-learnt-ipv6-max-entries <high_thresh> [ clear <low_thresh> ]
 threshold poll dns-learnt-ipv6-max-entries <seconds>
 threshold monitoring ecs
 end
```

EDR File Space Threshold

EDR file space threshold generates alerts or alarms based on the percentage of total allocated EDR file space used during the polling interval.

Alerts or alarms are triggered based on the following rules:

- **Enter condition** : Actual percentage of allocated EDR file space usage is greater than or equal to the specified percentage of total EDR file space.
- **Clear condition** : Actual EDR file space used is less than the specified clear percentage of total allocated EDR file space usage.

If a trigger condition exists at the end of the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring EDR File Space Threshold

To configure the EDR File Space threshold use the following configuration:

```
configure
 threshold edr-file-space <high_thresh> [ clear <low_thresh> ]
 threshold poll edr-file-space interval <seconds>
 threshold monitoring ecs
 end
```

Dropped EDR/UDR Flow Control Threshold

Dropped EDR/UDR Flow Control threshold generates alerts or alarms based on the total number of Event Data Records (EDRs) and Usage Data Records (UDRs) discarded due to flow control.

Alerts or alarms are triggered based on the following rules:

- **Enter condition** : Actual number of EDRs + UDRs dropped greater than or equal to the specified number of EDRs + UDRs dropped.
- **Clear condition** : Actual number of EDR + UDRs dropped is less than the specified clear number of EDRs + UDRs dropped.

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring Dropped EDR/UDR Flow Control Threshold

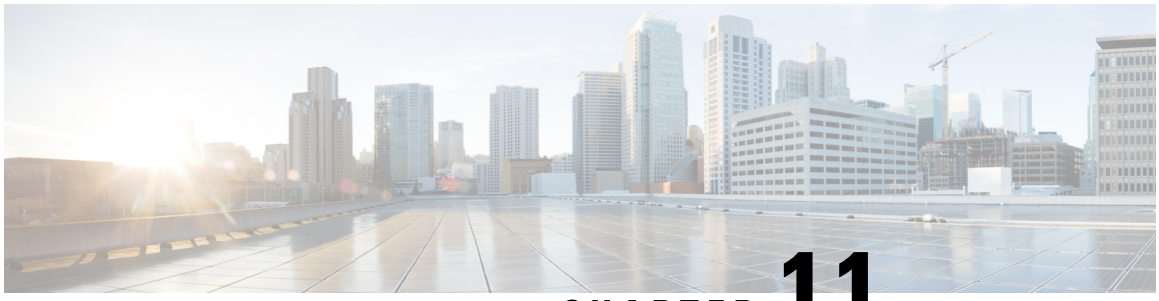
To configure the Dropped EDR/UDR Flow Control threshold use the following configuration:

```
configure
 threshold edr-udr-dropped-flow-control  <high_thresh> [ clear  <low_thresh> ]

 threshold poll edr-udr-dropped-flow-control <seconds>
 threshold monitoring ecs
 end
```

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.



CHAPTER 11

ePDG Thresholds

EPDG Thresholds

Thresholds generate alerts or alarms based on either the total number of ePDG calls setup by the system during the specified polling interval, or on the number of currently active calls only.

Alerts or alarms are triggered for call setups based on the following rules:

- **Enter condition:** Actual number of call setups > or = High Threshold
- **Clear condition:** Actual number of call setups < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Default ePDG threshold polling interval value is 5 Min.

The polling interval is in seconds and it is an integer between 30 and 60000. Entries will be rounded up to the nearest 30 seconds.

Configuring ePDG Thresholds

Use the following configuration example to enable, disable and configure ePDG threshold monitoring.

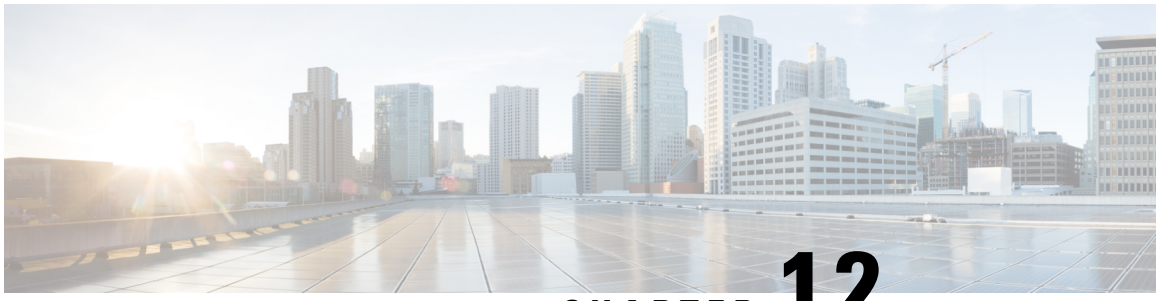
```
configure
     [ no ] threshold monitoring epdg-service
 threshold  epdg-current-sessions current_epdg_sessions_threshold clear
alarm_clear_threshold
 default threshold  epdg-current-sessions
 threshold poll epdg-current-sessions interval threshold_polling_interval
 default threshold poll epdg-current-sessions interval
      end
```

Configuring IKEv2 tunnel setup attempts

Use the following configuration example to enable, disable and configure ePDG threshold monitoring.

```
configure
        context epdg context
          epdg-service epdg_service_name
          no  threshold ikev2-setup-attempts threshold_value  clear clear_value

          exit threshold poll epdg-current-sessions interval
       exit
```



CHAPTER 12

FA Thresholds

FA Service Thresholds

An FA Service threshold generates alerts or alarms for registration reply errors for individual FA services.

Alerts or alarms are triggered for the FA threshold based on the following rules:

- **Enter condition:** Actual number of errors ≥ High Thresholds
- **Clear condition:** Actual number of errors < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm is not generated until the end of the polling interval.

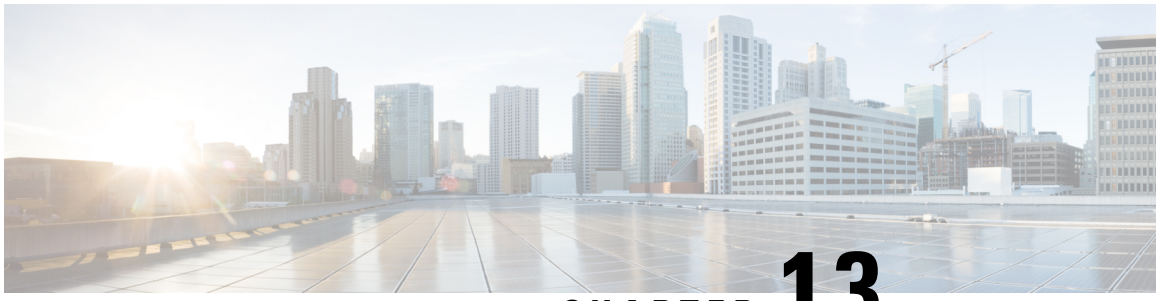
Configuring FA Service Thresholds

Use the following example to configure the threshold, set the polling interval for the threshold and enable monitoring of the threshold.

```
configure
 context <context_name>
 fa-service <name>
 threshold reg-reply-error <high_thresh> [ clear <low_thresh> ]
 exit
 exit
 threshold poll fa-reg-reply-error interval <time>
 threshold monitoring fa-service
      end
```

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.



CHAPTER 13

FNG Thresholds

FNG Thresholds

Thresholds generate alerts or alarms based on either the total number of FNG calls set up by the system during the specified polling interval, or on the number of currently active calls only.

Alerts or alarms are triggered for call setups based on the following rules:

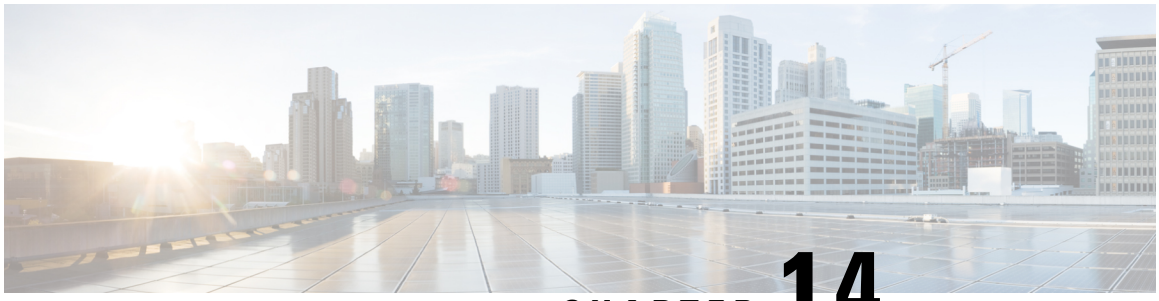
- **Enter condition:** Actual number of call setups > High Threshold
- **Clear condition:** Actual number of call setups < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

The default value is 0, which means there will be no monitoring.

The polling interval is in seconds and it is an integer between 30 and 60000. Entries will be rounded up to the nearest 30 seconds.

FNG Thresholds



CHAPTER 14

HA Thresholds

HA Service Thresholds

HA Service thresholds generate alerts or alarms for the average number of calls setup. A threshold can be configured to report this information for an entire context or for an individual HA service. Thresholds can also be configured for registration reply, re-registration reply and de-registration reply errors for individual HA services.

Alerts or alarms are triggered for these HA thresholds based on the following rules:

- **Enter condition:** Actual average of call setups or actual number of errors > or = High Threshold
- **Clear condition:** Actual average of call setups or actual number of errors < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm is not generated until the end of the polling interval.

The following table describes the possible methods for configuring HA Service thresholds:

Method	Description
Context-Level	This threshold keeps track of the average number of call setups for all HA services in a context. When the actual average of call setups per polling period meets or exceeds the set high threshold an alert or alarm is set.
HA Service-Level	HA services send and receive registration messages. The thresholds in the HA Service-Level can be configured to monitor thresholds for registration reply, re-registration reply, and de-registration reply errors.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

Context-Level HA Service Thresholds

There is only one HA service threshold that can be configured, the average number of call setups for all HA services in a context.

Configuring Context-Level HA Service Thresholds

Use the following example to configure the threshold, set the polling interval for the threshold and enable monitoring of the threshold:

```
configuration
 context <context_name>
 threshold ha-service-init-rrq-rcvd-rate <high_thresh> [ clear <low_thresh> ]
 exit
 threshold poll <threshold_name> interval <time>
 threshold monitoring ha-service
 threshold monitoring ip-sec
      end
```

HA Service-Level HA Service Thresholds

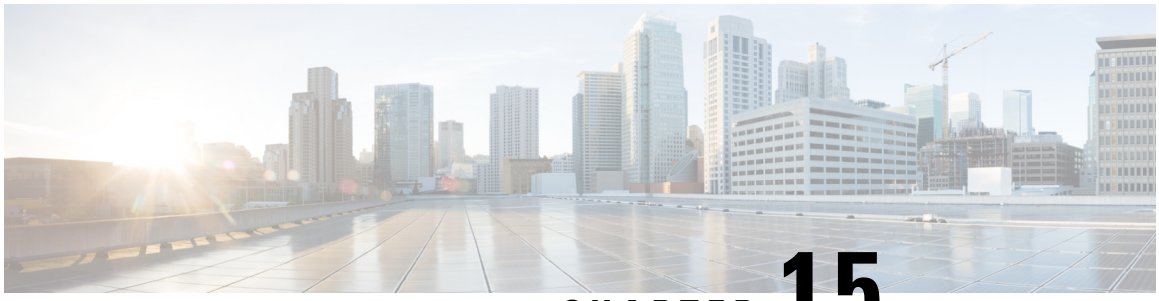
There are 10 thresholds that can be configured for the HA service-level:

- Total De-registration Reply Errors
- Average Calls Setup Per Second
- Total IPSec Call Requests Rejected
- Percentage of IPSec IKE Failures
- Total IPSec IKE Failures
- Total IPSec IKE Requests
- Total IPSec Tunnels Established
- Total IPSec tunnels Setup
- Total Registration Reply Errors
- Total Re-registration Reply Errors

Configuring HA Service-Level HA Service Thresholds

Use the following example to configure the HA service-level thresholds:

```
configure
 context <context_name>
 ha-service <name>
 threshold { dereg-reply-error | init-rrq-rcvd-rate | ipsec-call-req-rej |
 ipsec-ike-failrate | ipsec-ike-failures | ipsec-ike-requests |
ipsec-tunnels-established | ipsec-tunnels-setup | reg-reply-error |
rereg-reply-error }
 exit
 exit
 threshold poll ha-init-rrq-rcvd-rate interval <time>
 threshold poll reg-reply-error interval <time>
 threshold poll rereg-reply-error interval <time>
 threshold poll dereg-reply-error interval <time>
 threshold monitoring ha-service
      end
```



CHAPTER 15

HeNBGW Thresholds

HeNB-GW Service Thresholds

HeNB-GW Service thresholds generate alerts or alarms for the average number of calls setup. A threshold can be configured to report this information on entire system for HeNB-GW service. Thresholds can also be configured for session registration response failures, discarded interface registration requests, discarded network entry registration acknowledgments for HeNB-GW services.

Threshold counter limits are configured for HeNB-GW HeNB SCTP association, HeNB-GW UE sessions, and HeNB-GW Paging messages with poll interval value.

On reaching the threshold limits in the configured interval, if threshold monitoring is enabled for the HeNB-GW service(s), threshold notifications get generated as SNMP traps. If threshold monitoring is disabled for the HeNB-GW service(s), even on reaching the threshold limits, no notification gets generated.

Alerts or alarms are triggered for these HeNB-GW thresholds based on the following rules:

- **Enter condition:** When the actual average of call setups or actual number of failures or discards passes, or is equal to, the configured Threshold value an alert or alarm is set.
- **Clear condition:** When the actual average of call setups or actual number of failures or discards passes below the Threshold value the alert or alarm is cleared.

If a trigger condition occurs within the polling interval, the alert or alarm is not generated until the end of the polling interval.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

System-Level HeNB-GW Service Thresholds

The system-level thresholds for HeNB-GW Service-Level can be configured to monitor thresholds for HeNB-GW Paging messages.

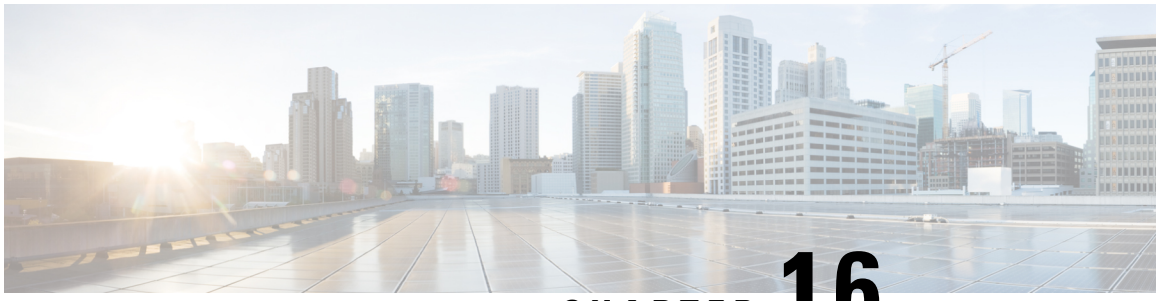
Following thresholds can be configured for the HeNB-GW service-level:

- Number of HeNB-GW Paging Messages
- Total number of subscribers threshold for HeNB-GW HeNB sessions
- Total number of subscribers threshold for HeNB-GW UE sessions

Configuring System-level HeNB-GW Service Thresholds

Use the following example to configure and enable these thresholds:

```
configuration
 threshold henbgw-paging-messages  <high_thresh> [ clear <low_thresh>]
 threshold total-henbgw-henb-sessions  <high_thresh> [ clear <low_thresh>]
 threshold total-henbgw-ue-sessions  <high_thresh> [ clear <low_thresh>]
 threshold poll henbgw-paging-messages interval <dur>
 threshold poll total-henbgw-henb-sessions interval <dur>
 threshold poll total-henbgw-ue-sessions interval <dur>
 threshold monitoring henbgw-service
 end
```



CHAPTER 16

IP Pool Thresholds

IP Pool Utilization Thresholds

When IP address pools are configured on the system, they can be assigned to a group. All configured public IP address pools that were not assigned to a group are treated as belonging to the same group (automatically named "Public IP Pools"). Individually configured static or private pools are each treated as their own group.

IP address pool thresholds can be configured for all IP pools or pool groups configured within a system context or for individual pools or groups. These thresholds generate alerts or alarms based on calculations pertaining to percent-available for pool groups and percent-free, percent-on-hold, percent-released, and percent-used for individual pools.

Alerts or alarms are triggered for IP address pool utilization based on the following rules:

- **Enter condition:** When the actual IP address utilization percentage passes, or is equal to, the configured Threshold value an alert or alarm is set.
- **Clear condition:** When the actual IP address utilization percentage passes the Threshold value the alert or alarm is cleared.

If a trigger condition occurs within the polling interval, the alert or alarm is not generated until the end of the polling interval.

The following table describes the possible methods for configuring IP pool utilization thresholds:

Method	Description
Context-level	IP Pool Group: A single percent available threshold can be configured for all IP pool groups within a given context. The threshold is based on an aggregate measurement of available IP addresses for all IP pools within each group. **NOTE:** Separate alerts or alarms are generated for each group that experiences an event.
	IP Pool: The following thresholds can be configured for all IP address pools configured within a given system context: • Percent-free; • Percent-hold; • Percent-release; • Percent-used. **NOTE:** Separate alerts or alarms are generated for each pool that experiences an event.
IP address pool-level	The following thresholds can be configured for each IP address pool: • Percent-available for the group that the IP pool belongs to; • Percent-free; • Percent-hold; • Percent-release; and • Percent-used. Thresholds configured for individual pools take precedence over the context-level threshold that would otherwise be applied (if configured). In the event that two IP address pools belonging to the same pool group are configured with different group-available thresholds, the system uses the pool configuration that has the Enter condition that would be encountered first for the entire group.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

Context-Level IP Pool and Group Thresholds

This section provides instructions for configuring a single IP address pool utilization threshold for all pools within the context. These become the default settings for all pool existing or created in this context. See IP Address Pool-Level Thresholds, on page 57 for setting thresholds for individual IP pools.

Note These instructions assume that IP address pools have been previously configured.

Configuring Context-Level IP Pool and Group Thresholds

Use the following example to configure the context-level IP Pool and group thresholds:

```
configure
 threshold poll { available-ip-pool-group | ip-pool-free | ip-pool-hold |
ip-pool-release | ip-pool-used } interval <time>
 context <context_name>
 threshold available-ip-pool-group  <low_thresh> [ clear  <high_thresh> ]
 threshold ip-pool-free <low_thresh> [ clear  <high_thresh> ]
 threshold ip-pool-hold <high_thresh> [ clear  <low_thresh> ]
 threshold ip-pool-release <high_thresh> [ clear  <low_thresh> ]
 threshold ip-pool-used  <high_thresh> [ clear  <low_thresh> ]
 threshold monitoring available-ip-pool-group
           end
```

IP Address Pool-Level Thresholds

This section provides instructions for configuring a single IP address pool utilization threshold for all pool groups within the context.

Note The IP pool-level threshold settings configured with the **ip pool** *pool_name* **alert-threshold** command take precedence over the context level IP pool threshold configuration commands.

Note These instructions also assume that IP address pools have been previously configured.

If the group-available threshold is set for individual IP pools that are a part of an IP pool group, the IP pool with the threshold that is encountered first sets the threshold for the entire group.

For example; assume there is a group named *IPGroup1*, and there are three IP pools in that group; *PoolA*, *PoolB*, and *PoolC*. Also assume that, at the IP address-pool level, the three pools have the group-available threshold set as follows:

- PoolA:

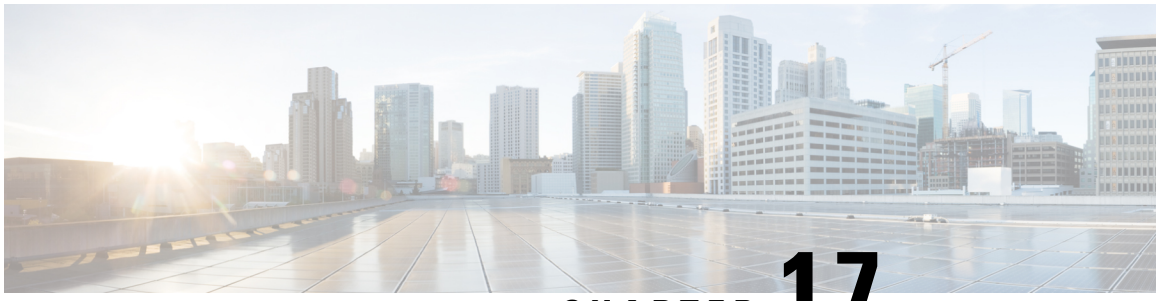
- Enter condition (low threshold) set to 40 percent
- Clear condition (high threshold) set to 60 percent

- PoolB:
  - Enter condition (low threshold) set to 30 percent
  - Clear condition (high threshold) set to 70 percent
- PoolC:
  - Enter condition (low threshold) set to 20 percent
  - Clear condition (high threshold) set to 50 percent

In this case, the Enter condition for the percentage of IP pool addresses available from the group that is encountered first is the low threshold setting for PoolA. So both the low and high threshold settings for PoolA are used for the whole group.

Configuring IP Address Pool-Level Thresholds

```
configure
 threshold poll { available-ip-pool-group | ip-pool-free | ip-pool-hold |
ip-pool-release | ip-pool-used } interval <time>
 context  <context_name>
 ip pool name alert-threshold group-available <low_thresh> [ clear <high_thresh>
 ]
 ip pool name alert-threshold pool-free <low_thresh> [ clear  <high_thresh> ]
 ip pool name alert-threshold pool-hold <high_thresh> [ clear  <low_thresh> ]
 ip pool name alert-threshold pool-release <high_thresh> [ clear <low_thresh>]
 ip pool name alert-threshold pool-used  <high_thresh> [ clear <low_thresh> ]
 exit
 threshold monitoring available-ip-pool-group
      end
```



CHAPTER 17

MME Service Thresholds

MME Service Thresholds

MME Service thresholds generate alerts or alarms for the average number of calls setup. A threshold can be configured to report this information on entire system for MME service. Thresholds can also be configured for session registration response failures, discarded interface registration requests, discarded network entry registration acknowledgments for MME services.

Alerts or alarms are triggered for these MME thresholds based on the following rules:

- **Enter condition:** When the actual average of call setups or actual number of failures or discards passes, or is equal to, the configured Threshold value an alert or alarm is set.
- **Clear condition:** When the actual average of call setups or actual number of failures or discards passes below the Threshold value the alert or alarm is cleared.

If a trigger condition occurs within the polling interval, the alert or alarm is not generated until the end of the polling interval.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

System-Level MME Service Thresholds

The system-level thresholds for MME Service-Level can be configured to monitor thresholds for MME authentication, session registration response failures, discarded registration requests for individual or all MME services.

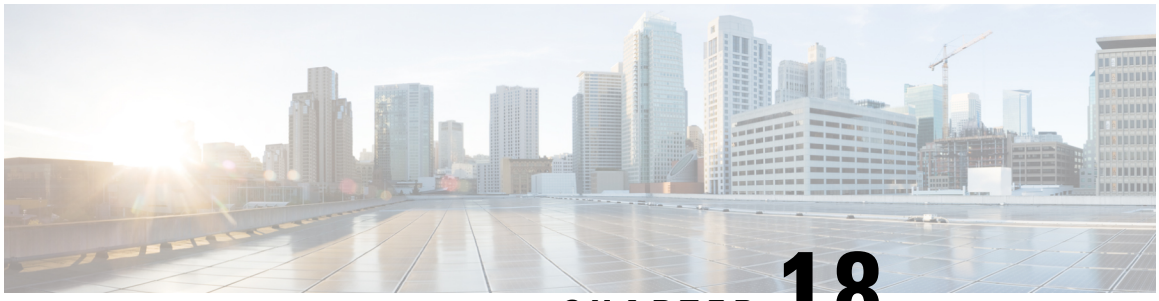
Following thresholds can be configured for the entire MME (all services together), for a configured polling period:

- Number of Sessions
- Number of MME authentication failures
- Number of MME session registration failures

Configuring System-level MME Service Thresholds

Use the following example to configure and enable these thresholds:

```
configuration
 threshold mme-auth-failure  <high_thresh> [ clear <low_thresh>]
 threshold mme-attach-failure  <high_thresh> [ clear <low_thresh> ]
 threshold total-mme-sessions  <high_thresh> [ clear <low_thresh>]
 threshold poll mme-auth-failure interval <dur>
 threshold poll mme-attach-failure interval <dur>
 threshold poll total-mme-session interval <dur>
 threshold monitoring mme-service
 end
```



CHAPTER 18

Network Address Translation Thresholds

Network Address Translation Thresholds

Thresholds generate alerts or alarms based on either the total number of Network Address Translation (NAT) calls setup by the system during the specified polling interval, or on the number of currently active calls only.

Alerts or alarms are triggered for call setups based on the following rules:

- **Enter condition:** Actual number of call setups > or = High Threshold
- **Clear condition:** Actual number of call setups < Low Threshold.

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Default value is 0, which means there will be no monitoring.

The polling interval is in seconds and it is an integer between 30 and 60000. Entries will be rounded up to the nearest 30 seconds.

Configuring NAT Thresholds

This section describes how to enable and configure NAT thresholds.

Enabling Thresholds

To enable thresholds use the following configuration:

```
configure
     threshold monitoring firewall
     context <context_name>
          threshold monitoring available-ip-pool-group
          end
```

Notes:

The **threshold monitoring available-ip-pool-group** command is required only if you are configuring IP pool thresholds. It is not required if you are only configuring NAT port-chunks usage threshold or many-to-one NAT.

Configuring Threshold Poll Interval

To configure threshold poll interval use the following configuration:

```
configure
     threshold poll ip-pool-used interval  <interval>
```

Notes:

The **threshold poll nat-port-chunks-usage interval** command is only applicable to many-to-one NAT.

Configuring Thresholds Limits

To configure threshold limits use the following configuration:

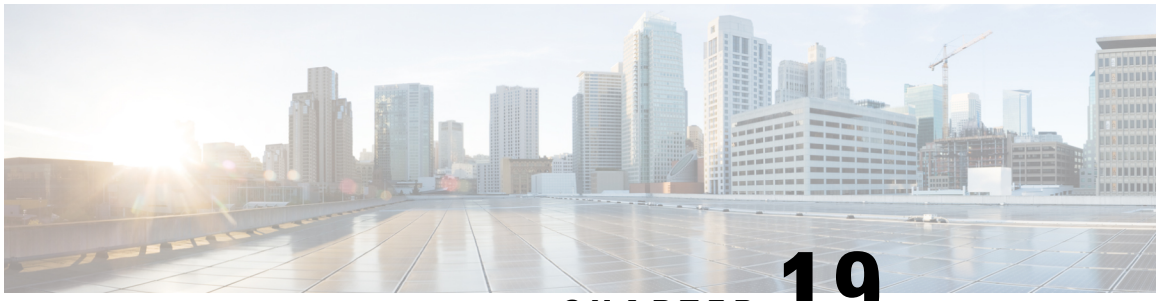
```
configure
     context <context_name>
          threshold ip-pool-free <high_thresh> [ clear <low_thresh> ]
          ip-pool-hold <high_thresh> [ clear <low_thresh> ]
          ip-pool-release <high_thresh> [ clear <low_thresh> ]
          ip-pool-used <high_thresh> [ clear <low_thresh> ]
          exit
```

Notes:

- Thresholds configured using the **threshold ip-pool-*** commands in the Context Configuration Mode apply to all IP pools in the context
- Thresholds configured using the **alert-threshold** keyword are specific to the pool that they are configured in, and will take priority, i.e. will override the context-wide configuration mentioned above.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.



CHAPTER 19

Packet Processing Thresholds

Packet Processing Thresholds

Threshold monitoring can be enabled for the packet processing values described in the following table.

Value	Description
Packets filtered/dropped	Enables the generation of alerts or alarms based on the total number of packets that were filtered or dropped based on ACL rules during the polling interval.
Packets forwarded	Enables the generation of alerts or alarms based on the total number of packets that were forwarded to the CPU during the polling interval.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

Filtered/Dropped Packet Thresholds

Filtered/dropped packet thresholds generate alerts or alarms based on the total number of packets that were filtered or dropped by the system as a result of ACL rules during the specified polling interval.

Alerts or alarms are triggered for filtered/dropped packets based on the following rules:

- **Enter condition:** Actual number of filtered/dropped packets > or = High Threshold

- **Clear condition:** Actual number of filtered/dropped packets < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Note These instructions assume that ACLs have been previously configured.

Configuring Filtered/Dropped Packet Thresholds

Use the following example to configure the filtered/dropped packet thresholds:

```
configure
 threshold packets-filtered-dropped  <high_thresh> [ clear <low_thresh>]
 threshold poll packets-filtered-dropped interval <time>
 threshold monitoring packets-filtered-dropped
      end
```

Forwarded Packet Thresholds

Forwarded packet thresholds generate alerts or alarms based on the total number of packets that were forwarded to active system CPU(s) during the specified polling interval. Packets are forwarded to active system CPUs when the NPUs do not have adequate information to properly route them.

Note Ping and/or traceroute packets are intentionally forwarded to system CPUs for processing. These packet types are included in the packet count for this threshold.

Alerts or alarms are triggered for forwarded packets based on the following rules:

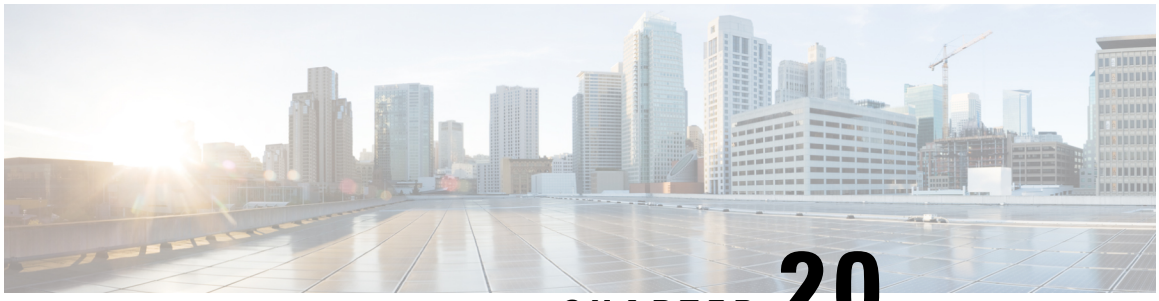
- **Enter condition:** Actual number of forwarded packets > or = High Threshold
- **Clear condition:** Actual number of forwarded packets < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring Forwarded Packet Thresholds

Use the following example to configure the forwarded packet thresholds:

```
configure
 threshold packets-forwarded-to-cpu  <high_thresh> [ clear <low_thresh> ]
 threshold poll packets-forwarded-to-cpu interval <time>
 threshold monitoring packets-forwarded-to-cpu
      end
```



CHAPTER 20

PDG/TTG Thresholds

PDG/TTG Thresholds

Thresholds generate alerts or alarms based on either the total number of PDG/TTG calls set up by the system during the specified polling interval, or on the number of currently active calls only.

Alerts or alarms are triggered for call setups based on the following rules:

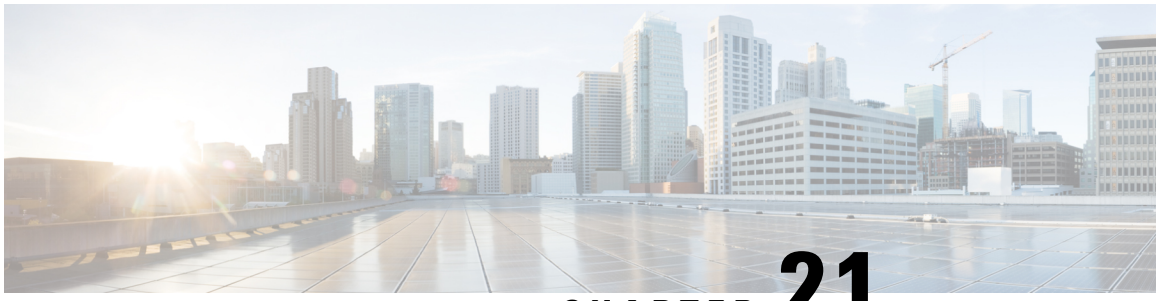
- **Enter condition:** Actual number of call setups > High Threshold
- **Clear condition:** Actual number of call setups < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Default value is 0, which means there will be no monitoring.

The polling interval is in seconds and it is an integer between 30 and 60000. Entries will be rounded up to the nearest 30 seconds.

PDG/TTG Thresholds



CHAPTER 21

PDIF Thresholds

PDIF Thresholds

Thresholds generate alerts or alarms based on either the total number of PDIF calls setup by the system during the specified polling interval, or on the number of currently active calls only.

Alerts or alarms are triggered for call setups based on the following rules:

- **Enter condition:** Actual number of call setups > or = High Threshold
- **Clear condition:** Actual number of call setups < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Default value is 0, which means there will be no monitoring.

The polling interval is in seconds and it is an integer between 30 and 60000. Entries will be rounded up to the nearest 30 seconds.

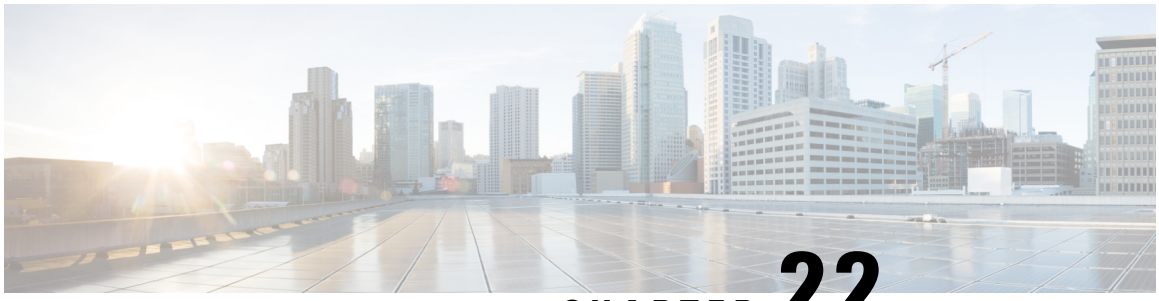
Configuring PDIF Thresholds

Use the following configuration example to enable, disable and configure PDIF threshold monitoring.

```
configure
     [ no ] threshold monitoring pdif
 threshold pdif-current-sessions high_thresh [ clear <low_thresh> ]
 threshold pdif-current-active-sessions [ <high_thresh> clear <low_thresh> ]
 default threshold { pdif-current-sessions | pdif-current-active-sessions
 }
 threshold poll { pdif-current-sessions | pdif-current-active-sessions }
interval <time>
 default threshold poll { pdif-current-sessions |
pdif-current-active-sessions }
      end
```

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.



CHAPTER 22

PDSN Thresholds

PDSN Service Thresholds

PDSN Service thresholds generate alerts or alarms for the average number of calls setup. A threshold can be configured to report this information for an entire context or for an individual PDSN service. Thresholds can also be configured for A11 registration response failures, discarded A11 registration requests, discarded A11 registration acknowledgments, and discarded PPP send packets for individual PDSN services.

Alerts or alarms are triggered for these PDSN thresholds based on the following rules:

- **Enter condition:** When the actual average of call setups or actual number of failures or discards passes, or is equal to, the configured Threshold value an alert or alarm is set.
- **Clear condition:** When the actual average of call setups or actual number of failures or discards passes below the Threshold value the alert or alarm is cleared.

If a trigger condition occurs within the polling interval, the alert or alarm is not generated until the end of the polling interval.

The following table describes the possible methods for configuring PDSN Service thresholds:

Method	Description
Context-Level	This threshold keeps track of the average number of call setups for all PDSN services in a context. When the actual average of call setups per polling period meets or exceeds the set high threshold an alert or alarm is set.

Method	Description
PDSN Service-Level	PDSN services send and receive A11 registration messages and PPP packets. The thresholds in the PDSN Service-Level can be configured to monitor thresholds for A11 registration response failures, discarded A11 registration requests, discarded A11 registration acknowledgments, and discarded PPP send packets for individual PDSN services.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

Context-Level PDSN Service Thresholds

This threshold keeps track of the average number of call setups for all PDSN services in a context. When the actual average of call setups per polling period meets or exceeds the set high threshold an alert or alarm is set.

Configuring Context-Level PDSN Service Thresholds

Use the following example to configure the threshold for monitoring the average number of calls setup per second for the context, set the polling interval for the threshold and enable monitoring of the threshold.

```
configure
 context <context_name>
 threshold pdsn-service init-rrq-rcvd-rate  <high_thresh> [ clear <low_thresh>]

 exit
 threshold poll pdsn-init-rrq-rcvd-rate interval <time>
 threshold monitoring pdsn-service
      end
```

PDSN Service-Level PDSN Service Thresholds

PDSN services send and receive A11 registration messages and PPP packets. The thresholds in the PDSN Service-Level can be configured to monitor thresholds for A11 registration response failures, discarded A11 registration requests, discarded A11 registration acknowledgments, and discarded PPP send packets for individual PDSN services.

There are five thresholds that can be configured for the PDSN service-level:

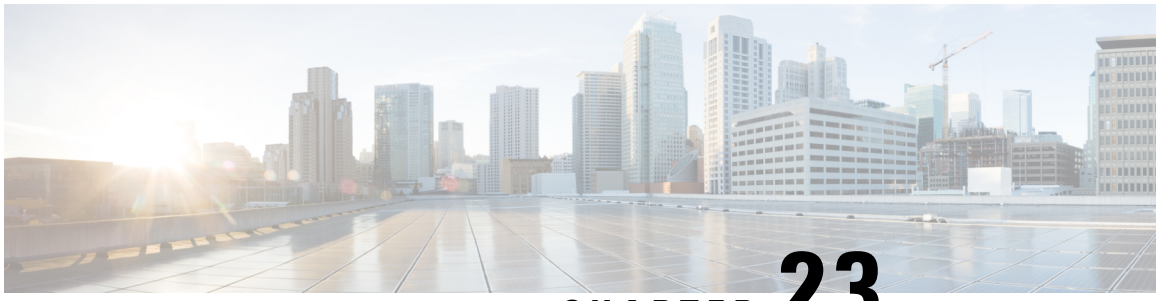
- Average Calls Setup Per Second

- Total A11 Registration Response Failures
- Total A11 Registration Request Messages Discarded
- Total A11 Registration Acknowledgement Messages Discarded
- Total Packets PPP Protocol Processing Layer Discarded on Transmit

Configuring PDSN Service-Level PDSN Service Thresholds

Use the following example to configure and enable these thresholds:

```
configuration
 context  <context_name>
 pdsn-service <name>
 threshold init-rrq-rcvd-rate <high_thresh> [ clear <low_thresh>]
 threshold a11-rrp-failure <high_thresh> [ clear <low_thresh>]
 threshold a11-rrq-msg-discard <high_thresh> [ clear  <low_thresh>]
 threshold a11-rac-msg-discard  <high_thresh> [ clear  <low_thresh>]
 threshold all-ppp-send-discard <high_thresh> [ clear <low_thresh>]
 exit
 exit
 threshold poll pdsn-init-rrq-rcvd-rate interval <time>
 threshold poll a11-rrp-failure interval <time>
 threshold poll a11-rrq-msg-discard interval <time>
 threshold poll a11-rac-msg-discard interval <time>
 threshold poll a11-ppp-send-discard interval <time>
     threshold monitoring pdsn-service
      end
```



CHAPTER 23

Per-Service Session Thresholds

Per-service Session Thresholds

Threshold monitoring can be enabled for the per-service session counts described in the following table.

Value	Description
LNS Services	Enables the generation of alerts or alarms based on the number of sessions facilitated by any LNS service counted during the polling interval.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

Per-LNS Service Thresholds

Per-LNS service thresholds generate alerts or alarms based on the total number of sessions facilitated by any LNS service configured on the system during the specified polling interval.

Alerts or alarms are triggered for sessions per-LNS service based on the following rules:

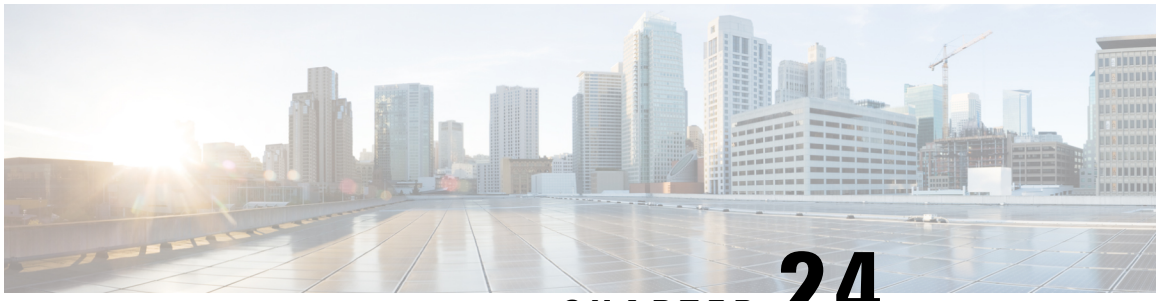
- **Enter condition:** Actual total number of sessions > or = High Threshold
- **Clear condition:** Actual total number of sessions < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring Per-LNS Service Thresholds

Use the following example to configure the per-LNS service thresholds:

```
configure
 threshold per-service-lns-sessions <high_thresh> [ clear <low_thresh> ]
 threshold poll per-service-lns-sessions interval <time>
 threshold monitoring subscriber
      end
```



CHAPTER 24

Port Utilization Thresholds

Port Utilization Thresholds

Threshold monitoring can be enabled for the port utilization values described in the following table.

Value	Description
Receive port utilization	Enables the generation of alerts or alarms based on the port utilization percentage for data received during the polling interval.
Transmit port utilization	Enables the generation of alerts or alarms based on the port utilization percentage for data transmitted during the polling interval.
High port activity	Enables the generation of alerts or alarms based on the overall port utilization percentage during the polling interval.

Note Ports configured for half-duplex do not differentiate between data received and data transmitted. (The transmitted and received percentages are combined.) Therefore, to avoid redundant alarms, it is recommended that only the receive **or** transmit utilization threshold be configured.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network

location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

Receive Port Utilization Thresholds

Receive port utilization thresholds generate alerts or alarms based on the utilization percentage of each configured port in relation to data received during the specified polling interval. This threshold is configured on a per-port basis.

Alerts or alarms are triggered for receive port utilization based on the following rules:

- **Enter condition:** Actual percent utilization of a port for received data > or = High Threshold
- **Clear condition:** Actual percent utilization of a port for received data < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring Receive Port Utilization Thresholds

Use the following example to configure the polling interval over which to measure receive port utilization

```
configure
 threshold poll port-rx-utilization interval <seconds>
 port  <port-type> <slot/port>
 threshold rx-utilization <high_thresh_> [ clear <low_thresh_> ]
 threshold monitoring
            end
```

Transmit Port Utilization Thresholds

Transmit port utilization thresholds generate alerts or alarms based on the utilization percentage of each configured port in relation to data transmitted during the specified polling interval. This threshold is configured on a per-port basis.

Alerts or alarms are triggered for transmit port utilization based on the following rules:

- **Enter condition:** Actual percent utilization of a port for transmit data > or = High Threshold
- **Clear condition:** Actual percent utilization of a port for transmit data < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring Transmit Port Utilization Thresholds

Use the following example to configure the polling interval over which to measure transmit port utilization:

```
configure
 threshold poll port-tx-utilization interval  <seconds>
 port <port-type> <slot/port>
```

```
threshold tx-utilization <high_thresh_> [ clear <low_thresh_> ]
threshold monitoring
           end
```

High Port Activity Thresholds

High port activity thresholds generate alerts or alarms based on the peak utilization percentage of each configured port during the specified polling interval. This threshold is configured on a per-port basis.

Alerts or alarms are triggered for high port activity based on the following rules:

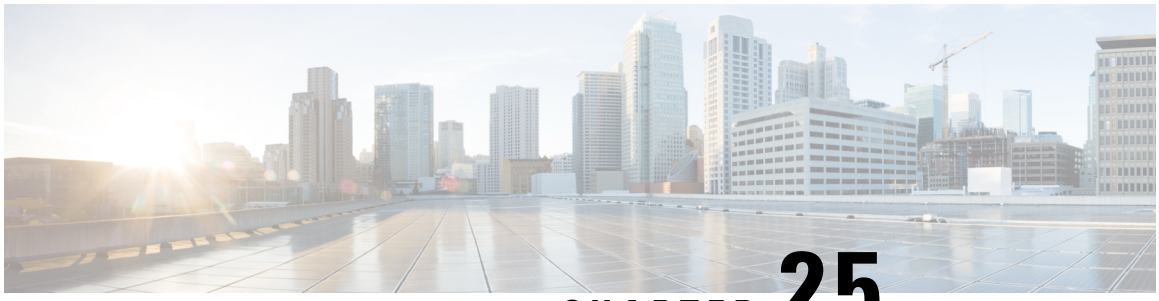
- **Enter condition:** Actual percent peak utilization of a port > or = High Threshold
- **Clear condition:** Actual percent peak utilization of a port < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring High Port Activity Thresholds

Use the following example to configure the polling interval over which to measure for high port activity:

```
configure
 threshold poll port-high-activity interval  <time>
 port  <port-type>  <slot/port>
 threshold high-activity <high_thresh_> [ clear  <low_thresh_> ]
 threshold monitoring
           end
```



CHAPTER 25

SaMOG Thresholds

SaMOG Thresholds

Per-samog-service threshold generate alerts or alarms based on either the total number of SaMOG sessions facilitated by any samog-service configured on the system duringf the specified polling interval

Alerts or alarms are triggered for sessions per-samog-service based on the following rules:

- **Enter Condition:** Actual total number of SaMOG sessions > or = High Threshold
- **Clear Condition:** Actual total number of SaMOG sessions < Low Threshold

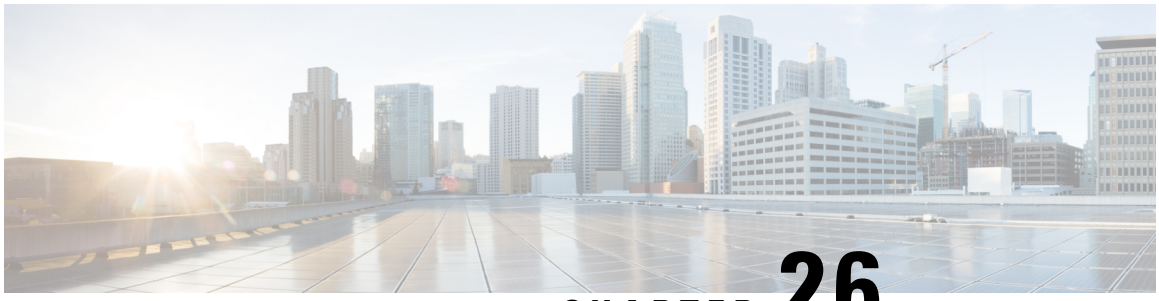
Configuring SaMOG Thresholds

Use the following configuration example for the samog-service session count threshold crossing alerts:

```
configure
 threshold per-service-samog-sessions <high_thresh> [ clear <low_thresh> ]
 threshold poll per-service-samog-sessions interval <dur>
 threshold monitoring subscriber
 end
```

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration** For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.



CHAPTER 26

Session License Utilization Thresholds

Session License Utilization Thresholds

Session license utilization thresholds generate alerts or alarms based on the utilization percentage of all session capacity licenses during the specified polling interval.

The system uses session capacity licenses to dictate the maximum number of simultaneous sessions that can be supported. There are multiple session types that require licenses (i.e. Simple IP, Mobile IP, L2TP, etc.). Although, a single threshold is configured for all session types, alerts or alarms can be generated for each type.

Alerts or alarms are triggered for session license utilization based on the following rules:

- **Enter condition:** Actual session license utilization percentage per session type < Low Threshold
- **Clear condition:** Actual session license utilization percentage per session type > High Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

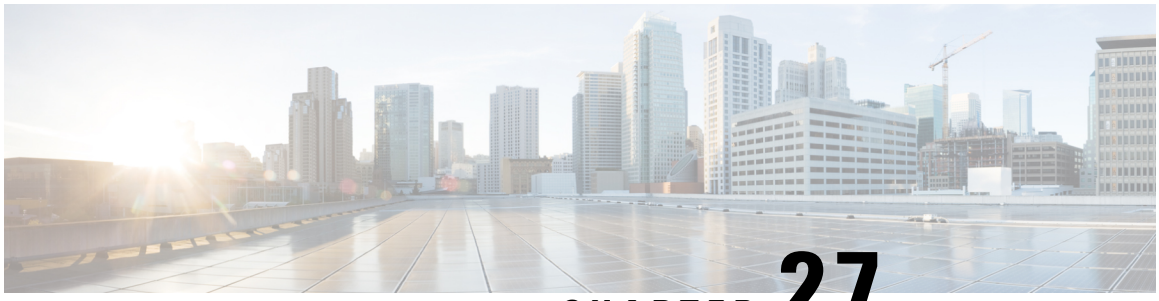
Configuring Session License Utilization Thresholds

Use the following example to configure the thresholds for session license utilization:

```
configure
 threshold license-remaining-sessions <low_thresh> [ clear        <high_thresh>
 ]
 threshold poll license-remaining-sessions interval <time>
 threshold monitoring license
      end
```

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.



CHAPTER 27

Stateful Firewall Thresholds

Stateful Firewall Thresholds

Thresholds generate alerts or alarms based on either the total number of Stateful Firewall calls setup by the system during the specified polling interval, or on the number of currently active calls only.

Alerts or alarms are triggered for call setups based on the following rules:

- **Enter condition:** Actual number of call setups > or = High Threshold
- **Clear condition:** Actual number of call setups < Low Threshold.

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Default value is 0, which means there will be no monitoring.

The polling interval is in seconds and it is an integer between 30 and 60000. Entries will be rounded up to the nearest 30 seconds.

Configuring Stateful Firewall Thresholds

This section describes how to enable and configure Stateful Firewall thresholds.

Enabling Thresholds

To enable thresholds use the following configuration:

```
configure
 threshold monitoring firewall
 end
```

Configuring Threshold Polling Intervals

To configure threshold poll interval use the following configuration:

```
configure
 threshold poll fw-deny-rule interval <interval>
 threshold poll fw-dos-attack interval <interval>
 threshold poll fw-drop-packet interval <interval>
 threshold poll fw-no-rule interval <interval>
 end
```

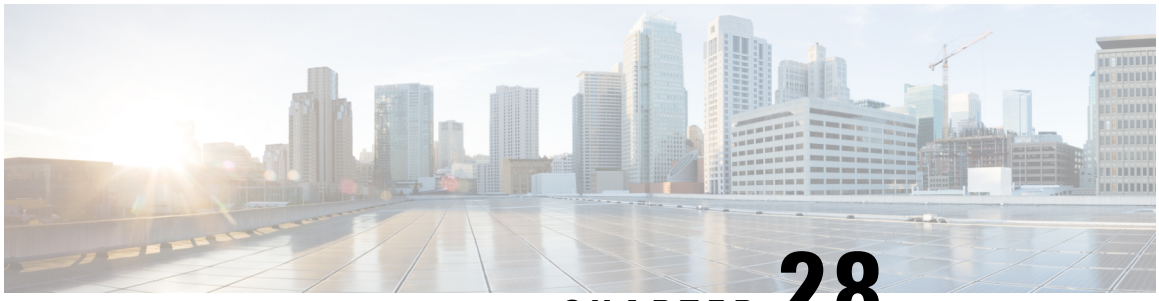
Configuring Thresholds Limits

To configure threshold limits use the following configuration:

```
configure
 threshold fw-deny-rule <high_thresh> [ clear <low_thresh> ]
 threshold fw-dos-attack <high_thresh> [ clear <low_thresh> ]
 threshold fw-drop-packet <high_thresh> [ clear <low_thresh> ]
 threshold fw-no-rule <high_thresh> [ clear <low_thresh> ]
 end
```

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.



CHAPTER 28

Subscriber Thresholds

Subscriber Thresholds

Threshold monitoring can be enabled for the subscriber values described in the following table.

Value	Description
Total subscribers	Enables the generation of alerts or alarms based on the total number subscriber sessions (active and dormant) counted during the polling interval.
Active subscribers	Enables the generation of alerts or alarms based on the total number of subscribers with active sessions counted during the polling interval.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

Total Subscriber Thresholds

Total subscriber thresholds generate alerts or alarms based on the total number of subscriber sessions (active and dormant) facilitated by the system during the specified polling interval.

Alerts or alarms are triggered for subscriber totals based on the following rules:

- **Enter condition:** Actual total number of subscriber sessions > or = High Threshold

- **Clear condition:** Actual total number of subscriber sessions < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

This section provides instructions for configuring total subscriber thresholding. These instructions assume that you are at the prompt for the Global Configuration mode:

Configuring Total Subscriber Thresholds

Use the following example to configure the total subscriber thresholds:

```
configure
 threshold subscriber total <high_thresh> [ clear  <low_thresh> ]
 threshold poll total-subscriber interval <time>
 threshold monitoring subscriber
      end
```

Active Subscriber Thresholds

Active subscriber thresholds generate alerts or alarms based on the total number of active subscriber sessions facilitated by the system during the specified polling interval.

Alerts or alarms are triggered for active subscriber totals based on the following rules:

- **Enter condition:** Actual total number of active subscriber sessions > or = High Threshold
- **Clear condition:** Actual total number of active subscriber sessions < Low Threshold

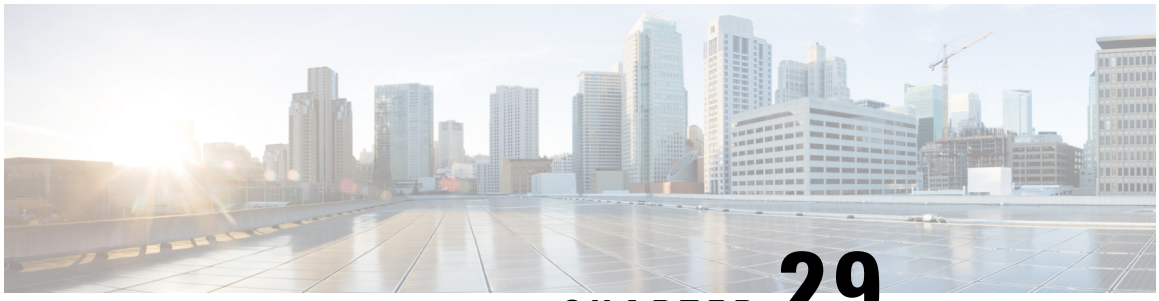
If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

This section provides instructions for configuring active subscriber thresholding. These instructions assume that you are at the prompt for the Global Configuration mode:

Configuring Active Subscriber Thresholds

Use the following example to configure the active subscriber thresholds:

```
configure
 threshold subscriber active <high_thresh> [ clear  <low_thresh> ]
 threshold poll active-subscriber interval <time>
 threshold monitoring subscriber
      end
```



CHAPTER 29

System Management Card CompactFlash Memory Thresholds

System Management Card CompactFlash Memory Thresholds

System management card CompactFlash memory utilization thresholds generate alerts or alarms based on the percentage of memory used for the CompactFlash during the polling interval. A single threshold enables memory utilization monitoring for both the active and standby system management cards allowing for alerts or alarms to be generated for each CompactFlash.

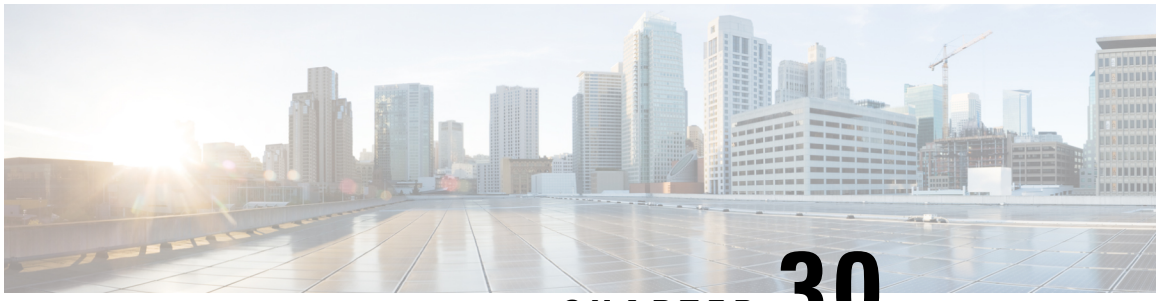
Alerts or alarms are triggered for CompactFlash memory utilization based on the following rules:

- **Enter condition:** Actual percentage memory utilization > or = High Threshold
- **Clear condition:** Actual percentage memory utilization < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.



CHAPTER 30

Total Session Thresholds

Total Session Thresholds

Threshold monitoring can be enabled for the total session counts described in the following table.

Value	Description
LNS Services	Enables the generation of alerts or alarms based on the total number of sessions facilitated by all LNS services counted during the polling interval.

Saving Your Configuration

When you configure thresholds they are not permanent unless you save the changes. When you have completed configuring thresholds, save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.

Total LNS Session Thresholds

Total LNS session thresholds generate alerts or alarms based on the total number of sessions facilitated by all LNS services configured on the system during the specified polling interval.

Alerts or alarms are triggered for the total of all LNS sessions based on the following rules:

- **Enter condition:** Actual total number of sessions > or = High Threshold
- **Clear condition:** Actual total number of sessions < Low Threshold

If a trigger condition occurs within the polling interval, the alert or alarm will not be generated until the end of the polling interval.

Configuring Total LNS Session Thresholds

Use the following example to configure the total LNS session thresholds:

```
configure
      threshold total-lns-sessions <high_thresh> [ clear <low_thresh> ]
      threshold poll total-lns-sessions interval <time>
      threshold monitoring subscriber
      end
```