CPS SNMP, Alarms, and Clearing Procedures Guide, Release 19.3.0

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Preface

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About This Guide

This document is a part of the Cisco Policy Suite documentation set.

For information about available documentation, see the *CPS Documentation Map* for this release at Cisco.com.

Audience

This guide is best used by these readers:

- Network administrators
- Network engineers
- Network operators
- System administrators

This document assumes a general understanding of network architecture, configuration, and operations.

Additional Support

For further documentation and support:

- Contact your Cisco Systems, Inc. technical representative.
- Call the Cisco Systems, Inc. technical support number.
- Write to Cisco Systems, Inc. at support@cisco.com.

- Refer to support matrix at https://www.cisco.com/c/en/us/support/index.html and to other documents related to Cisco Policy Suite.

Conventions (all documentation)

This document uses the following conventions.

Conventions	Indication
bold font	Commands and keywords and user-entered text appear in **bold** font.
italic font	Document titles, new or emphasized terms, and arguments for which you supply values are in *italic* font.
[ ]	Elements in square brackets are optional.
{x | y | z }	Required alternative keywords are grouped in braces and separated by vertical bars.
[x | y | z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
courier font	Terminal sessions and information the system displays appear in courier font.
< >	Nonprinting characters such as passwords are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Note Means reader take note. Notes contain helpful suggestions or references to material not covered in the manual.

Caution Means reader be careful. In this situation, you might perform an action that could result in equipment damage or loss of data.

Warning IMPORTANT SAFETY INSTRUCTIONS.

Means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.

SAVE THESE INSTRUCTIONS

Note Regulatory: Provided for additional information and to comply with regulatory and customer requirements.

Communications, Services, and Additional Information

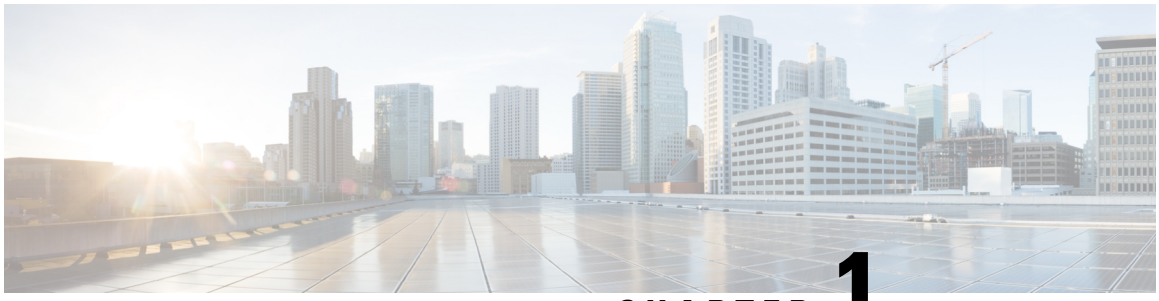
- To receive timely, relevant information from Cisco, sign up at Cisco Profile Manager.
- To get the business impact you're looking for with the technologies that matter, visit Cisco Services.
- To submit a service request, visit Cisco Support.
- To discover and browse secure, validated enterprise-class apps, products, solutions and services, visit Cisco Marketplace.
- To obtain general networking, training, and certification titles, visit Cisco Press.
- To find warranty information for a specific product or product family, access Cisco Warranty Finder.

Cisco Bug Search Tool

Cisco Bug Search Tool (BST) is a web-based tool that acts as a gateway to the Cisco bug tracking system that maintains a comprehensive list of defects and vulnerabilities in Cisco products and software. BST provides you with detailed defect information about your products and software.

Important Notes

Important Any feature or GUI functionality that is not documented may not be supported in this release or may be customer specific, and must not be used without consulting your Cisco Account representative.



CHAPTER 1

Monitoring and Alert Notification

- Architectural Overview, on page 1
- Technical Architecture, on page 2
- SNMP System and Application KPIs, on page 7
- Notifications and Alerting (Traps), on page 10
- Configuration and Usage, on page 39
- Troubleshooting, on page 52

Architectural Overview

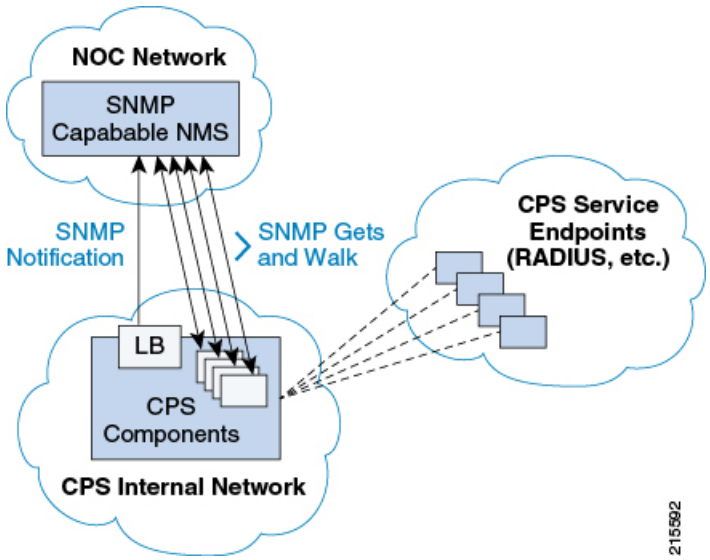
A Cisco Policy Suite (CPS) deployment comprises multiple virtual machines (VMs) deployed for scaling and High Availability (HA) purposes. All VMs present in the system should have an IP address which is a routable IP to the Network Management System (NMS). The NMS can monitor each VM using this routable IP address.

Note The IP addresses do not need to be routable if the NMS has an interface on the same internal network as the CPS VMs.

During runtime any number of VMs can be added to the system and the NMS can monitor them using their routable IP address which makes the system more scalable. The notification alerting from the entire system derives from a single point.

When CPS is deployed in a High Availability (HA) alerting endpoints are deployed as HA as well as shown in the following illustration.

Figure 1: HA Deployment



Technical Architecture

Cisco Policy Suite is deployed as a distributed virtual appliance. The standard architecture uses hypervisor virtualization. Multiple physical hardware host components run Hypervisors and each host runs several virtual machines. Within each virtual machine one-to-many internal CPS components can run. CPS monitoring and alert notification infrastructure simplifies the virtual physical and redundant aspects of the architecture.

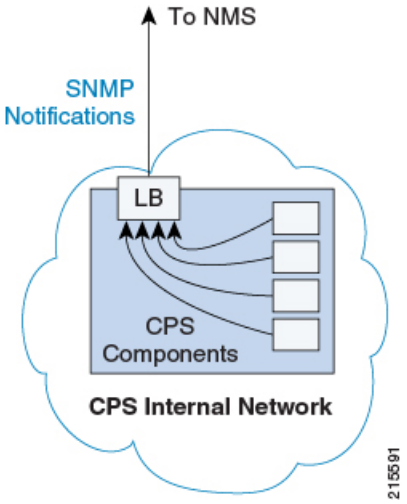
Protocols and Query Endpoints

The CPS monitoring and alert notification infrastructure provides a simple standards-based interface for network administrators and NMS (Network Management System). SNMP is the underlying protocol for all monitoring and alert notifications. Standard SNMP gets and notifications (traps) are used throughout the infrastructure.

At any point of time only one version of SNMP (either SNMPv2 or SNMPv3) will work. By default SNMPv3 is disabled. For information on configuring SNMPv3 refer to the *CPS Installation Guide for VMware* or to the *CPS Installation Guide for OpenStack* for this release.

The following illustration shows the aggregation and mapping on the SNMP endpoint (Policy Director (LB)).

Figure 2: SNMP Endpoint



SNMP Object Identifier and Management Information Base

Cisco has a registered private enterprise Object Identifier (OID) of 26878. This OID is the base from which all aggregated CPS metrics are exposed at the SNMP endpoint. The Cisco OID is fully specified and made human-readable through a set of Cisco Management Information Base (MIB-II) files.

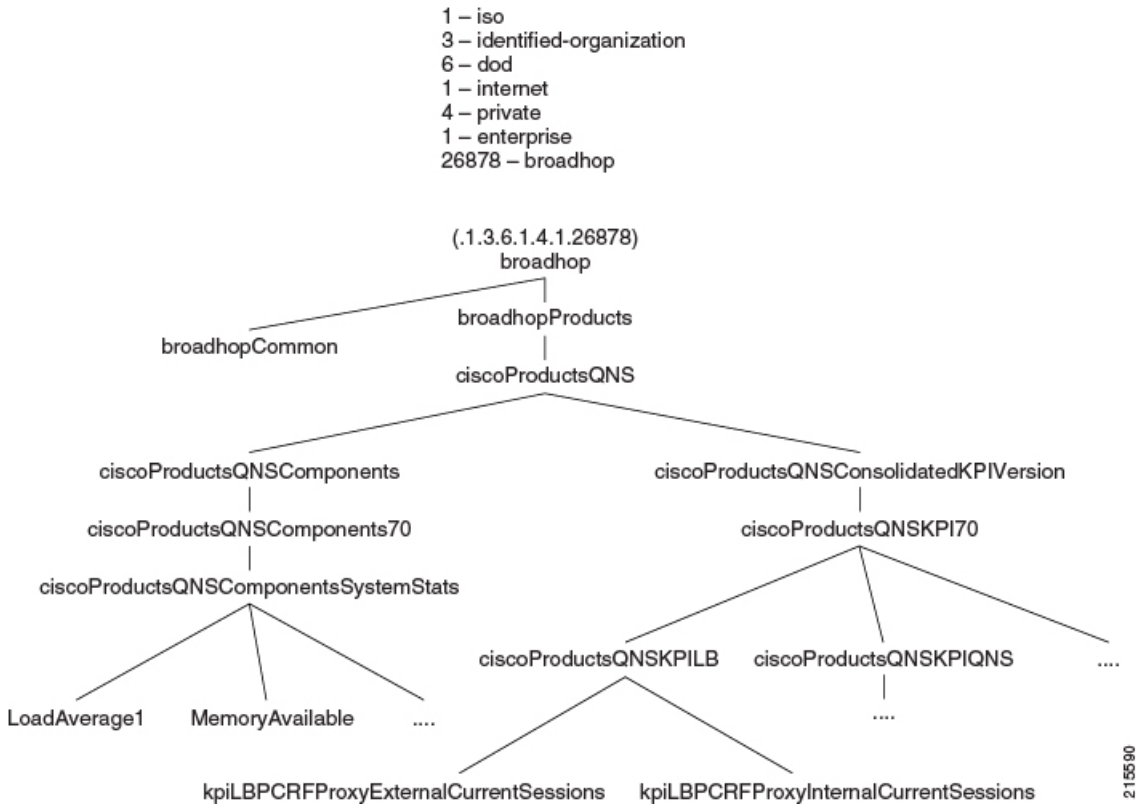
The current MIBs are defined as follows:

Table 1: MIBs

MIB Filename	Purpose
BROADHOP-MIB.mib	Defines the main structure including structures and codes.
CISCO-QNS-MIB.mib	Defines the retrievable statistics and KPI.
BROADHOP-NOTIFICATION-MIB.mib	Defines Notifications/Traps available.

A graphical overview of the CPS OID and MIB structure is shown in the next figure.

Figure 3: SNMP Notifications



Note that in the above illustration the entire tree is not shown.

SNMP Data and Notifications

The Monitoring and Alert Notification infrastructure provides standard SNMP get and getnext access to the CPS system. This provides access to targeted metrics to trend and view Key Performance Indicators (KPIs). Metrics available through this part of the infrastructure are as general as component load and as specific as transactions processed per second.

SNMP Notifications in the form of traps (one-way) are also provided by the infrastructure. CPS notifications do not require acknowledgments. These provide both proactive alerts that predetermined thresholds have been passed (for example a disk is nearing capacity or CPU load is too high) and reactive alerting when system components fail or are in a degraded state (for example a process died or network connectivity outage has occurred).

Notifications and traps are categorized by a methodology similar to UNIX System Logging (syslog) with both Severity and Facility markers. All event notifications (traps) contain these items

- Facility
- Severity
- Source (device name)
- Device time

These objects enable Network Operations Center (NOC) staff to identify where the issue lies the Facility (system layer) and the Severity (importance) of the reported issue.

Note For more information on CPS statistics, refer to CPS Statistics chapter in *CPS Operations Guide* for this release. For more information on CPS logging, refer to Logging chapter in *CPS Troubleshooting Guide* for this release.

Facility

The generic syslog facility has the following definitions.

Note Facility defines a system layer starting with physical hardware and progressing to a process running in a particular application.

Table 2: Syslog Facility

Number	Facility	Description
0	Hardware	Physical Hardware – Servers SAN NIC Switch and so on.
1	Networking	Connectivity in the OSI (TCP/IP) model.
2	Virtualization	VMware ESXi (or other) Virtualization
3	Operating System	Linux Microsoft Windows and so on.
4	Application	Apache httpd load balancer CPS Cisco sessionmgr and so on.
5	Process	Particular httpd process CPS qns01_A and so on.

There may be overlaps in the Facility value as well as gaps if a particular SNMP agent does not have full view into an issue. The Facility reported is always shown as viewed from the reporting SNMP agent.

Severity

In addition to Facility each notification has a Severity measure. The defined severities are directly from UNIX syslog and defined as follows:

Table 3: Severity Levels

Number	Severity	Description
0	Emergency	System is unusable.
1	Alert	Action must be taken immediately.
2	Critical	Critical conditions.
3	Error	Error conditions.

Number	Severity	Description
4	Warning	Warning conditions.
5	Notice	Normal but significant condition.
6	Info	Informational message.
7	Debug	Lower level debug messages.
8	None	Indicates no severity.
9	Clear	The occurred condition has been cleared.

For the purposes of the CPS Monitoring and Alert Notifications system, Severity levels of Notice Info and Debug are usually not used.

Warning conditions are often used for proactive threshold monitoring (for example Disk usage or CPU Load) which requires some action on the part of administrators but not immediately.

Conversely, Emergency severity indicates that some major component of the system has failed and that either core policy processing session management or major system functionality is impacted.

Categorization

Combinations of Facility and Severity create many possibilities of notifications (traps) that might be sent. However some combinations are more likely than others. The following table lists some Facility and Severity categorizations.

Table 4: Severity Categorization

Facility.Severity	Categorization	Possibility
Process.Emergency	A single part of an application has dramatically failed.	Possible but in an HA configuration very unlikely.
Hardware.Debug	A hardware component has sent a debug message.	NA
Operating System.Alert	An Operating System (kernel or resource level) fault has occurred.	Possible as a recoverable kernel fault (on a vNIC for instance).
Application.Emergency	An entire application component has failed.	Unlikely but possible (load balancers failing for instance).

It is not possible to quantify every Facility and Severity combination. However greater experience with CPS leads to better diagnostics. The CPS Monitoring and Alert Notification infrastructure provides a baseline for event definition and notification by an experienced engineer.

Emergency Severity Note

Caution Emergency severities are very important! As a general principle CPS does not throw an Emergency-severity trap unless the system becomes inaccessible or unusable in some way. An unusable

system is rare but might occur if multiple failures occur in the operating system virtualization networking or hardware facilities.

SNMP System and Application KPIs

Many CPS system statistics and Key Performance Indicators (KPI) are available via SNMP gets and walks. Both system device level information and application level information is available. This information is documented in the CISCO-QNS-MIB. A summary of the information available is provided in the following sections.

SNMP System KPIs

In this table the system KPI information is provided.

Table 5: SNMP System KPIs

Component	Information
LB01/LB02 PCRFClient01/PCRFClient02 SessionMgr01/SessionMgr02 QNS01/QNS02/QNS03/QNS04	CpuUser CpuSystem CpuIdle LoadAverage1 LoadAverage5 LoadAverage15 MemoryTotal MemoryAvailable SwapTotal SwapAvailable

Note Except for an AIO (All-In-One) deployment all components or devices are VMs.

Details of SNMP System KPIs

The following information is available and is listed per component. The root of these KPIs is .1.3.6.1.4.1.26878.200.3.2.70. MIB documentation provides units of measure.

```
+--ciscoProductsQNSComponents70 (70) |
 +--ciscoProductsQNSComponentsSystemStats (1) |
    +-- -R-- Integer32 componentCpuUser(1) |
    +-- -R-- Integer32 componentCpuSystem(2) |
    +-- -R-- Integer32 componentCpuIdle(3) |
    +-- -R-- Integer32 componentLoadAverage1(4) |
    +-- -R-- Integer32 componentLoadAverage5(5) |
    +-- -R-- Integer32 componentLoadAverage15(6) |
```

```
+-- -R-- Integer32 componentMemoryTotal(7) |
+-- -R-- Integer32 componentMemoryAvailable(8) |
+-- -R-- Integer32 componentSwapTotal(9) |
+-- -R-- Integer32 componentSwapAvailable(10) |
```

SNMP Application KPIs

Current version Key Performance Indicators (KPI) information is available at the OID root of:

```
.1.3.6.1.4.1.26878.200.3.3.70
```

This corresponds to an MIB of:

```
.iso
.identified-organization
.dod
.internet
.private
.enterprise
.broadhop
.broadhopProducts
.ciscoProductsQNS
.ciscoProductsQNSConsolidatedKPIVersion
.ciscoProductsQNSKPI70
```

Summary of SNMP Application KPIs

The following application KPIs are available for monitoring on each node using SNMP Get and Walk utilities:

Table 6: SNMP Application KPIs - Summary

Component	Information
Policy Director (lb01/lb02)	**PCRFProxyExternalCurrentSessions:** It is the total number of active sessions (open connections) which are connected to lbvip01:8443 from external system (lbvip01 has public IP address). It is an active session counter (not cumulative) and as such there is no limit on active sessions. **PCRFProxyInternalCurrentSessions:** It is the total number of active sessions (open connections) which are connected to lbvip02:8080 (lbvip02 has private IP address) from internal VMs such as Policy Server (QNS), sessionmgr, OAM (pcrfclient) and so on. It is an active session counter (not cumulative) and as such there is no limit on active sessions.
OAM (pcrfclient01/pcrfclient02)	----------
Session Manager (sessionmgr01/sessionmgr02)	----------

Component	Information
Policy Server (qns01/qns02/qns03/qns04)	**PolicyCount:** It is the total number of processed policy messages by an individual Policy Server (QNS) VM. There is no limit on policy message processing. **QueueSize:** The number of entries in the processing queue. The default queue size is 500, and is configurable in Policy Builder. You can also see the number of dropped messages in the statistics files. There is a separate queue for each Policy Server (QNS) VM. **FailedEnqueueCount:** Each Policy Server (QNS) VM maintains a queue where it keeps policy messages to be processed in last-in-first-out order. This counter will be incremented when Policy Server (QNS) process fails to add policy message into policy message processing queue. **ErrorCount:** It is the total number of policy messages which got error while processing by an individual Policy Server (QNS) VM. **AggregateSessionCount:** This is the consolidated active subscriber sessions in CPS. The maximum limit of sessions will be based on installed license. It is only active session count not cumulative count. AggregateSessionCount is the consolidated active subscriber sessions in CPS and kpiLBPCRFProxyInternalCurrentSessions is the open connection to lbvip02:8080. FreeMemory

Details of Supported KPIs

The following information is available and is supported in current release. MIB documentation provides units of measure.

```
+--ciscoProductsQNSKPILB(11)
| |
| +-- -R-- String kpiLBPCRFProxyExternalCurrentSessions(1)
| |      Textual Convention DisplayString
| |      Size 0..255
| +-- -R-- String kpiLBPCRFProxyInternalCurrentSessions(2)
|        Textual Convention DisplayString
|        Size 0..255

+--ciscoProductsQNSKPISessionMgr(14)
+--ciscoProductsQNSKPIQNS(15)
| |
| +-- -R-- Integer32 kpiQNSPolicyCount(20)
| +-- -R-- Integer32 kpiQNSQueueSize(21)
| +-- -R-- Integer32 kpiQNSFailedEnqueueCount(22)
| +-- -R-- Integer32 kpiQNSErrorCount(23)
```

```
| +-- -R-- Integer32 kpiQNSAggregateSessionCount(24)
| +-- -R-- Integer32 kpiQNSFreeMemory(25)
```

Threshold based KPI Alarms

CPS can generate SNMP alarms for KPIs after they have reached threshold values. The threshold values are configured in the `/etc/broadhop/kpi_threshold.conf` file. The `kpi_threshold.conf` configuration file contains all the KPI configurations and must be configured to generate the KPI traps. The configuration file must be present on all VMs.

Events generated by the KPI script are locally logged in pcrfclient01/02 in the `/var/log/broadhop/kpi-alarm.log` file. The following table defines the configuration parameters:

Table 7: KPI Configuration Parameters

Parameter	Description
GV_LOG_LEVEL	Log levels are as follows: • 1: DEBUG • 2: INFO • 3: WARN • 4: ERROR for example, GV_LOG_LEVEL= logging.INFO
GV_LOG_FILE	Log file path and log file name. For example, GV_LOG_FILE="/var/log/broadhop/kpi-alarm.log
GV_LOG_FILES	Number of log files to preserve. For example, GV_LOG_FILES=5
GV_LOG_SIZE	Log file size. For example, GV_LOG_SIZE=10 * 1024 * 1024 #10MB
GV_STATS_INTERVAL=300	Statistics collected during last 300 seconds.

Traps generated are logged in the `/var/log/snmp/trap` file on the active Policy Director (LB).

Notifications and Alerting (Traps)

The CPS Monitoring and Alert Notification framework provides the following SNMP notification traps (one-way). Traps are either proactive or reactive. Proactive traps are alerts based on system events or changes that require attention (for example, Disk is filling up). Reactive traps are alerts that an event has already occurred (for example, an application process failed).

For example, if a threshold is crossed snmpd throws a trap to LBVIP on the internal network on port 162. On the Policy Director (load balancer) the snmptrapd process is listening on port 162. When snmptrapd sees trap on 162 it logs it in the file `/var/log/snmp/trap` and throws it again on `corporate_nms_ip` on port 162. This corporate NMS IP is set inside `/etc/hosts` file on LB01 and LB02.

Component Notifications

Components are devices that make up the CPS system. These are systems level traps. They are generated when some predefined thresholds are crossed. User can define these thresholds in `/etc/snmp/snmpd.conf`. For example, for disk full, low memory etc. The snmpd process runs on all VMs. When the process is started, it applies the configuration from `/etc/snmp/snmpd.conf` file. In order to apply changes to snmpd.conf file, snmpd needs to be restarted by executing the following commands:

```
monit stop snmpd

monit start snmpd
```

Component notifications are defined in the BROADHOP-NOTIFICATION-MIB as follows:

```
broadhopQNSComponentNotification NOTIFICATION-TYPE
  OBJECTS { broadhopComponentName,
   broadhopComponentTime,
   broadhopComponentNotificationName,
   broadhopNotificationFacility,
   broadhopNotificationSeverity,
   broadhopComponentAdditionalInfo }
STATUS current
DESCRIPTION "
Trap from any QNS component - i.e. device.

"
::= { broadhopProductsQNSNotifications 1 }
```

Component Notifications that CPS generates are shown in the following list. Any component in the CPS system may generate these notifications.

Table 8: Component Notifications

Notification Name	Severity	Feature
DiskFull	critical	Component
	Message Text: <*diskPath*>: less than <*n*>% free (= REMAINING_DISK_SPACE%) **Description:** Current disk usage has passed a designated threshold. By default, this threshold is set to 10% of total disk space allocated for the partition. This threshold is defined in `/etc/snmp/snmpd.conf` on each VM. This situation could be a sign of logs or database files growing large. For new deployments, this alarm is generated for following file systems in different VMs: • For HA System: • pcrfclient/lb: / • sessionmgr: /, /var/data/session.1 • qns: / • For AIO System: • / For upgraded systems, this alarm is generated for following file systems in different VMs: • For HA System: • pcrf/lb: /, /var, /boot • sessionmgr: /, /home, /boot, /data, /var/data/session.1 • qns: /, /home, /var, /boot • For AIO System: • / • /boot	
	clear	Component

<table>
<tr><th>Notification Name</th><th>Severity</th><th>Feature</th></tr>
<tr><td></td><td colspan="2">Message Text: <diskPath>: clear
Description: The disk usage has recovered from the designated threshold.
For new deployments, this alarm is generated for following file systems in different VMs:
• For HA System:
• pcrfclient/lb: /
• sessionmgr: /, /var/data/session.1
• qns: /
• For AIO System:
• /
For upgraded systems, this alarm is generated for following file systems in different VMs:
• For HA System:
• pcrf/lb: /, /var, /boot
• sessionmgr: /, /home, /boot, /data, /var/data/session.1
• qns: /, /home, /var, /boot
• For AIO System:
• /
• /boot</td></tr>
<tr><td rowspan="4">LowSwap</td><td>critical</td><td>Operating System</td></tr>
<tr><td colspan="2">Message Text: Running out of swap space ($FreeAvailableSwap)
Description: Current swap usage has passed a designated threshold. This is a warning.</td></tr>
<tr><td>clear</td><td>Operating System</td></tr>
<tr><td colspan="2">Message Text: Swap space recovered
Description: Current swap usage has recovered a designated threshold.</td></tr>
</table>

Notification Name	Severity	Feature
HighLoad	warning (1 minute) warning (5 minute) alert (15 minutes)	Component
	Message Text: 1 min Load Average too high (= n.nn) 5 min Load Average too high (= n.nn) 15 min Load Average too high (=n.nn) **Description:** The load average of the system has exceeded the configured threshold for a period of 1/5/15 minutes. The default threshold value is 1.5 * Number of vCPUs (allocated to VM) for each time period as defined in `/etc/snmp/snmpd.conf` file. The value must be integer.	
	clear	Component
	Message Text: Load-1 High load recovered Load-5 High load recovered Load-15 High load recovered **Description:** The load average has recovered from more than configured threshold.	
LinkDown	alert	Operating System
	Message Text: IF-MIB::linkDown <*Interface Name*> **Description:** Not able to connect or ping to the interface. This alarm gets generated for all physical interface attached to the system.	
LinkUp	clear	Operating System
	Message Text: IF-MIB::linkUp <*Interface Name*> **Description:** Able to ping or connect to interface. This alarm gets generated for all physical interface attached to the system.	
Low Memory Alert	critical	Operating System
	Message Text: Current Available Free Memory (total free memory) is less than threshold (Threshold memory) on $HOSTNAME **Description:** The amount of free memory on the VM has dropped below the default threshold of 10% (as a percentage of total memory). To change the default threshold, see Configure Low Memory Threshold, on page 16.	

Notification Name	Severity	Feature
Low Memory Clear	clear	Operating System
	Message Text: Current Available Free Memory (total free memory) is greater than threshold (Threshold memory) on $HOSTNAME **Description:** Low memory alert has been cleared.	
ProcessDown	critical	Component
	Message Text: ${PROCESS_NAME} process is down For example, corosync process is down **Description:** This alarm is generated when the corosync process is stopped or fails. The corosync process manages the virtual IPs between the CPS load balancers in HA and GR deployments.	
ProcessUp	clear	Component
	Message Text: ${PROCESS_NAME} process is up For example, corosync process is up **Description:** The alarm is cleared whenever the corosync process that was down is brought back up.	
HIGH CPU USAGE Alert	critical	Component
	Message Text: CPU Usage is higher than threshold on `hostname`.Threshold=$Threshold%,Current_LOAD=$Current% **Description:** This trap is generated whenever CPU usage on any VM is detected to be higher than the alert threshold value. The system monitors the CPU usage at a specific instant (every 60 second by default), and not over a period of time like for the HighLoad Alert. To change the default threshold or the interval at which the CPU usage is checked, see Configure High CPU Usage Alarm Thresholds and Interval Cycle, on page 17	
HIGH CPU USAGE Clear	clear	Component
	Message Text: CPU Usage is below than lower threshold value on `hostname`.Threshold=$Threshold%,Current_LOAD=$Current% **Description:** This trap is generated whenever CPU usage on any VM is lower than the clear threshold value. It is generated only when High CPU Usage Alert was generated earlier for the VM.	

Notification Name	Severity	Feature
Critical File Operation Alert	critical	Component
	Message Text: Critical File Operation Alert: Command <Command Executed> executed by <User Name>:<Group Name> from terminal <Terminal Id> syscall <System call executed by kernel> success_status <System call success status> at <date and time for operation> **Description:** This trap is generated when critical files configured in `CriticalFiles.csv` on VMware and `critFileMonConfig:` section in OpenStack gets modified. **Note** This is a stateless alarm. There is no clear alarm for this notification.	

Each Component Notification contains:

- Name of the Notification being thrown (broadhopComponentNotificationName)
- Name of the device throwing the notification (broadhopComponentName)
- Time the notification was generated (broadhopComponentTime)
- Facility or which layer the notification came from (broadhopNotificationFacility)
- Severity of the notification (broadhopNotificationSeverity)
- Additional information about the notification, which might be a bit of log or other information.

Configure Low Memory Threshold

By default the Low Memory Alert is generated when the available memory of any CPS VM drops below 10% of the Total Memory. To change the default threshold:

Step 1 Modify the following parameter in the Configuration worksheet of the CPS Deployment template spreadsheet.

The CPS Deployment template can be found on the Cluster Manager VM:

`/var/qps/install/current/scripts/deployer/templates/QPS_deployment_config_template.xlsm`

- free_memory_per_alert: Enter a value (0.0-1.0) for the alert threshold. The system will generate an Alert trap whenever the available memory falls below this percentage of total memory for any given VM. Default 0.10 (10% free of the total memory).
- free_memory_per_clear: Enter a value (0.0-1.0) for the clear threshold. The system will generate a low memory clear trap whenever available memory for any given VM is more than 30% of total memory. Default 0.3 (30% of the total memory).

Step 2 Follow the steps in the Update the VM Configuration without Re-deploying VMs section of the *CPS Installation Guide for VMware* to push the new settings out to all CPS VMs.

Configure High CPU Usage Alarm Thresholds and Interval Cycle

To change the default threshold values and interval cycle for the High CPU Usage traps and apply the new values to all CPS VMs:

Step 1 Modify the following parameters in the Configuration worksheet of the CPS Deployment template spreadsheet.

The CPS Deployment template can be found on the Cluster Manager VM:

`/var/qps/install/current/scripts/deployer/templates/QPS_deployment_config_template.xlsm`

Note The alert threshold must be set higher than the clear threshold.

- cpu_usage_alert_threshold: Enter an integer (0-100) for the alert threshold value. The system will generate an Alert trap whenever the CPU usage is higher than this value. Default 80.
- cpu_usage_clear_threshold: Enter an integer (0-100) for the clear threshold value. The system will generate a Clear trap whenever the CPU usage is lower than this value and alert trap already generated. Default 40.
- cpu_usage_trap_interval_cycle: Enter an integer value to be used as an interval period to execute the CPU usage trap script. The interval value in seconds is calculated by multiplying 5 with the given value.

The default cpu_usage_trap_interval_cycle value is 12 which means the script will get executed every 60 seconds.

Step 2 Follow the steps in the Update the VM Configuration without Re-deploying VMs section of the *CPS Installation Guide for VMware* to push the new settings out to all CPS VMs.

Application Notifications

Applications are running processes on a component device that make up the CPS system. These are application level traps. CPS processes (starting with word java when we run "ps -ef") and some scripts (for GR traps) generates these traps.

Application notifications are defined in the BROADHOP-NOTIFICATION-MIB as follows:

```
broadhopQNSComponentNotification NOTIFICATION-TYPE
  OBJECTS { broadhopComponentName,
   broadhopComponentTime,
   broadhopComponentNotificationName,
   broadhopNotificationFacility,
   broadhopNotificationSeverity,
   broadhopComponentAdditionalInfo }
STATUS current
DESCRIPTION "
Notification Trap from any QNS component - i.e. runtime
"
::= { broadhopProductsQNSNotifications 2 }
```

Each Application Notification contains:

- Name of the Notification being thrown (broadhopComponentNotificationName)
- Name of the device throwing the notification (broadhopComponentName)
- Time the notification was generated (broadhopComponentTime)

- Facility or which layer the notification came from (broadhopNotificationFacility)
- Severity of the notification (broadhopNotificationSeverity)
- Additional information about the notification, which might be a bit of log or other information.

Important Currently, third site arbiter supports only Arbiter Down and Arbiter Up traps.

Application Notifications that CPS generates are shown in the following list. Any component in the CPS system may generate these notifications.

Table 9: Application Notifications

Notification Name	Severity	Feature
MemcachedConnectError	error critical	Application
	Message Text: ${HOSTNAME}: Memcached server is in error OR Memcached server is in error : <with exception> **Description:** Generated if attempting to connect to or write to the memcached server causes an exception.	
	clear	Application
	Message Text: ${HOSTNAME}: Memcached server is operational **Description:** Generated if successfully connect to or write to the memcached server.	
ApplicationStartError	alert	Application
	Message Text: ${HOSTNAME}: Feature %s is unable to start. Error - %s **Description:** Generated if an installed feature cannot start.	
	clear	Application
	Message Text: ${HOSTNAME}: Feature %s is Running **Description:** Generated if an installed feature successfully started.	

Notification Name	Severity	Feature
License Usage Threshold Exceeded	critical, error, notice, warning (Configurable)	Application
	Message Text: ${HOSTNAME}: Session Count License Usage at: xxx%, threshold is:xxx% **Description:** The number of sessions on the system has exceeded the configured threshold of sessions allowed by the current license. The threshold value and alarm severity of this alarm is configurable in Policy Builder: Click Fault List in the navigation pane, then create a new fault list or edit the existing fault list. By default, the threshold is set to 90%.	
	clear	Application
	Message Text: ${HOSTNAME}: Session Count License Usage at: xxx%, threshold is:xxx% **Description:** The number of sessions on the system is below the configured threshold of sessions allowed by the current license.	
LicensedSessionCreation	critical	Application
	Message Text: ${HOSTNAME}: Session creation is not allowed **Description:** A predefined threshold of sessions covered by licensing has been passed. This is a warning and should be reported. License limits may need to be increased soon. This message can be generated by an invalid license, but the AdditionalInfo portion of the notification shows root cause.	
	clear	Application
	Message Text: ${HOSTNAME}: Session creation is allowed **Description:** The number of sessions are below the predefined threshold of sessions covered by licensing.	

Notification Name	Severity	Feature
InvalidLicense	emergency	Application
	Message Text: ${HOSTNAME}: xxx license has not been verified yet **Description:** The system license currently installed is not valid. This prevents system operation until resolved. This is possible if no license is installed or if the current license does not designate values. This may also occur if any of the VMs MAC addresses change.	
	emergency	Application
	Message Text: ${HOSTNAME}: xxx license is Invalid. %s **Description:** License is invalid. For example, if RADIUS feature is installed and the license for the same is not installed, then this alarm is generated. **Note** RADIUS-based policy control is no longer supported in CPS 14.0.0 and later releases as 3GPP Gx Diameter interface has become the industry-standard policy control interface.	
	critical	Application
	Message Text: ${HOSTNAME}: xxx license is Expired. %s **Description:** License has expired.	
	error	Application
	Message Text: ${HOSTNAME}: xxx license will Expire Soon. %s **Description:** License is going to expire soon.	
	critical	Application
	Message Text: ${HOSTNAME}: xxx license has exceeded the allowed parameters. %s **Description:** License has exceeded the allowed parameters.	
	error	Application
	Message Text: ${HOSTNAME}: xxx license is nearing the allowed parameters. %s **Description:** RADIUS AAA proxy server is reachable. **Note** RADIUS-based policy control is no longer supported in CPS 14.0.0 and later releases as 3GPP Gx Diameter interface has become the industry-standard policy control interface.	
	clear	Application

Notification Name	Severity	Feature
	Message Text: ${HOSTNAME}: license is Valid **Description:** License is valid.	
PolicyConfiguration	error	Application
	Message Text: ${HOSTNAME}: Last policy configuration failed with the following message: xxx **Description:** A change to system policy structure has failed. The AdditionalInfo portion of the notification contains more information. The system typically remains in a proper state and continues core operations. Either make note of this message or investigate more fully.	
	clear	Application
	Message Text: ${HOSTNAME}: Last policy configuration was successful **Description:** A change to system policy structure has passed.	
PoliciesNotConfigured	emergency	Application
	Message Text: ${HOSTNAME}: 1001Policies not configured **Description:** The policy engine cannot find any policies to apply while starting up. This may occur on a new system, but requires immediate resolution for any system services to operate.	
	clear	Application
	Message Text: ${HOSTNAME}: 1001:Policies successfully configured **Description:** The policy engine has successfully configured all the policies while starting up.	

Notification Name	Severity	Feature
DiameterPeerDown	error	Application
	Message Text: ${HOSTNAME}: 3001:Host: %s Realm: %s is down OR ${HOSTNAME}: 3001:Host: %s Realm: %s PeerIP: %s is down OR ${HOSTNAME}: 3001:Host: %s Realm: %s PeerIP: %s Interface: %s is down **Description:** Diameter peer is down.	
	clear	Application
	Message Text: ${HOSTNAME}: 3001:Host: %s Realm: %s is back up OR ${HOSTNAME}: 3001:Host: %s Realm: %s PeerIP: %s is back up OR ${HOSTNAME}: 3001:Host: %s Realm: %s PeerIP: %s Interface: %s is back up **Description:** Diameter peer is up.	
DiameterAllPeersDown	critical	Application
	Message Text: ${HOSTNAME}: 3002:Realm: %s:applicationId: %s:all peers are down **Description:** All Diameter peer connections configured in a given realm are DOWN (i.e. connection lost). The alarm identifies which realm is down. The alarm is cleared when at least one of the peers in that realm is available.	
	clear	Application
	Message Text: ${HOSTNAME}: 3002:Realm: %s:applicationId: %s:peers are up **Description:** The Diameter peer connections configured in a given realm are up.	

Notification Name	Severity	Feature
DiameterStackNotStarted	critical	Application
	Message Text: ${HOSTNAME}: 3004:Error starting diameter stack: <stack uri>. Reason: <error message> **Description:** This alarm is generated when Diameter stack cannot start on a particular policy director (load balancer) due to some configuration issues.	
	clear	Application
	Message Text: ${HOSTNAME}: 3004:Stack <stack uri> is running **Description:** The Diameter stack has started successfully.	
All DB Member of replica set Down	critical	Application
	Message Text: "${HOSTNAME}: All DB members of replica set ${SET_NAME}-SET$Loop are down" **Description:** Not able to connect to any member of the replica set.	
All DB Member of replica set Up	clear	Application
	Message Text: "${HOSTNAME}: All DB members of replica set ${SET_NAME}-SET$Loop are up" **Description:** Able to connect to all members of the replica set.	
No Primary DB Member Found	critical	Application
	Message Text: "${HOSTNAME}: Unable to find primary member for Replica-set ${SET_NAME}-SET$Loop" **Description:** Unable to find primary member for the replica-set.	
Primary DB Member Found	clear	Application
	Message Text: "${HOSTNAME}: Found primary member $member for Replica-set ${SET_NAME}-SET$Loop" **Description:** Found primary member for the replica-set.	
DB Member Down	critical	Application
	Message Text: "${HOSTNAME}: DB_Member $member of SET $SET is down" OR "${HOSTNAME}: DB_Member $member_ip:$mem_port ($mem_hostname) of SET $SET is down" **Description:** A secondary member of the replica set is down.	

Notification Name	Severity	Feature
DB Member Up	clear	Application
	Message Text: "${HOSTNAME}: DB_Member $member of SET $SET is up" OR "${HOSTNAME}: DB_Member $member_ip:$mem_port ($mem_hostname) of SET $SET is up" **Description:** A secondary member of the replica set has come back up.	
Arbiter Down	critical	Application
	Message Text: "${HOSTNAME}: Arbiter $member of SET $SET is down" OR "${HOSTNAME}: Arbiter $member_ip:$mem_port ($mem_hostname) of SET $SET is down" **Description:** The arbiter member of the replica set is not reachable.	
Arbiter Up	clear	Application
	Message Text: "${HOSTNAME}: Arbiter $member of SET $SET is up" OR "${HOSTNAME}: Arbiter $member_ip:$mem_port ($mem_hostname) of SET $SET is up" **Description:** The arbiter member of the replica set is functional.	
DB Resync is needed	critical	Application
	Message Text: "${HOSTNAME}: Resync is needed for secondary member $setRepl:$SET_NAME:$DB_MEMBER, this member is lagging behind by $SLAVE_BEHIND_SECS seconds from the primary" **Description:** The alarm is generated whenever a manual resynchronization of a database is required to recover from a failure.	

Notification Name	Severity	Feature
DB Resync is not needed	clear	Application
	Message Text: "${HOSTNAME}: Resync is not needed for member $setRepl:$SET_NAME:$DB_MEMBER" OR "${HOSTNAME}: Resync is not needed for secondary member $setRepl:$SET_NAME:$DB_MEMBER" **Description:** The alarm is cleared whenever a database changes to 'Good' state from 'Resync is needed' state, it indicates that the database's resynchronization has completed.	
Config Server Down	critical	Application
	Message Text: "${HOSTNAME}: Config_Server $member of SET $SET is down" OR "${HOSTNAME}: Config_Server $member_ip:$mem_port ($mem_hostname) of SET $SET is down" **Description:** The configuration server for the replica set is unreachable. Not valid for non-sharded replica sets.	
Config Server Up	clear	Application
	Message Text: "${HOSTNAME}: Config_Server $member of SET $SET is up" OR "${HOSTNAME}: Config_Server $member_ip:$mem_port ($mem_hostname) of SET $SET is up" **Description:** The configuration server for the replica set is reachable. Not valid for non-sharded replica sets.	
VM Down	critical	Application
	Message Text: "${HOSTNAME}: unable to connect $member_ip ($member) VM. It is not reachable" **Description:** The administrator is not able to ping the VM.	
VM Up	clear	Application
	Message Text: "${HOSTNAME}: Connected $member_ip ($member) VM. It is reachable" **Description:** The administrator is able to ping the VM.	

Notification Name	Severity	Feature
QNS Process Down	critical	Application
	Message Text: "${HOSTNAME}: $server (<qns instance id>) server on $VM_HOSTNAME vm is down" **Description:** Policy Server (qns-<instance_id>) java process on particular QNS instance is down.	
QNS Process Up	clear	Application
	Message Text: "${HOSTNAME}: $server (<qns instance id>) server on $VM_HOSTNAME vm is up" **Description:** Policy Server (qns-<instance_id>) java process on particular QNS instance is up.	
DeveloperMode	error	Application
	Message Text: ${HOSTNAME}: Using Developer mode(100 session limit).To use a license file, remove -Dcom.broadhop.developer.mode from /etc/broadhop/qns.conf **Description:** The alarm is generated if developer mode is configured in `qns.conf` file.	
	clear	Application
	Message Text: ${HOSTNAME}: -Dcom.broadhop.developer.mode is disabled **Description:** The alarm is cleared if developer mode is removed in `qns.conf` file.	
ZeroMQConnectionError	error	Application
	Message Text: ${HOSTNAME}: ZMQ Connection Down for %s **Description:** Internal services cannot connect to a required Java ZeroMQ queue. Although retry logic and recovery is available, and core system functions should continue, investigate and remedy the root cause.	
	clear	Application
	Message Text: ${HOSTNAME}: ZMQ Connection Up for %s **Description:** Internal services can connect to a required Java ZeroMQ queue.	
VirtualInterface Down	alert	Application
	Message Text: "${HOSTNAME}: unable to connect ${member}. Not reachable" **Description:**Not able to ping the virtual Interface. This alarm is generated for external VIPs. For example, lbvip01.	

Notification Name	Severity	Feature
VirtualInterface Up	clear	Application
	Message Text: "${HOSTNAME}: ${member} is up" **Description:** Successfully ping the virtual Interface. This alarm is cleared for external VIPs. For example, lbvip01.	
VirtualInterfaceDown	alert	Application
	Message Text: "unable to connect ${member}. Not reachable" **Description:** Not able to ping the internal VIPs.	
VirtualInterfaceUp	clear	Application
	Message Text: "${member} is up" **Description:** Able to ping internal VIPs.	
Site Down	alert	Application
	Message Text: "${HOSTNAME}: Site $site is down" **Description:** Site is down. This alarm is related to GR deployments.	
Site Up	clear	Application
	Message Text: "${HOSTNAME}: Site $site is up" OR "${HOSTNAME}: Site $site is up" **Description:** Site is Up. This alarm is related to GR deployments.	
LDAPAllPeersDown	error	Application
	Message Text: ${HOSTNAME}: 1201:<LocalHostname>:LDAP connection down **Description:** All LDAP peers are down.	
	clear	Application
	Message Text: ${HOSTNAME}: 1201:<LocalHostname>:LDAP connection up **Description:** LDAP connection is up.	

Notification Name	Severity	Feature
LDAPPeerDown	error	Application
	Message Text: ${HOSTNAME}: 1202:<IP Address of the LDAP server>:LDAP connection down **Description:** LDAP peer identified by the IP address is down.	
	clear	Application
	Message Text: ${HOSTNAME}: 1202:<IP Address of the LDAP server>:LDAP connection up **Description:** LDAP peer identified by the IP address is up.	
Percentage of LDAP retry threshold Exceeded	critical	Application
	Message Text: ${HOSTNAME}: Percentage of LDAP retries compared to total LDAP Queries exceeded to $CURRENT_LEVEL% on $HOST VM **Description:** This alarm is generated for LDAP search queries when LDAP retries compared to total LDAP queries exceeds 10% on qnsXX VM. Default Threshold: 10% **Note** The LDAP server Retry Count parameter must be set to a value greater than 1 for this alarm to be generated. In Policy Builder navigate to Plugin Configuration > LDAP Configuration > LDAP Server Configuration > Retry Count.	
Percentage of LDAP retry threshold Normal	clear	Application
	Message Text: ${HOSTNAME}: Percentage of LDAP retries compared to total LDAP Queries normal to $CURRENT_LEVEL% on $HOST VM **Description:** This alarm is cleared for LDAP search queries when LDAP retries copmared to total LDAP queries is normal or has fallen below the threshold value (10%) on qnsXX VM.	
LDAP Requests as percentage of CCR-I Dropped	critical	Application
	Message Text: ${HOSTNAME}: LDAP Requests as percentage of CCR-I dropped to $CURRENT_LEVEL% on $HOST VM **Description:** This alarm is generated for LDAP operations when LDAP requests as percentage of CCR-I (Gx messages) drops below 25% on qnsXX VM. Default Threshold: 25%	

Notification Name	Severity	Feature
LDAP Requests as percentage of CCR-I Normal	clear	Application
	Message Text: ${HOSTNAME}: LDAP Requests as percentage of CCR-I normal to $CURRENT_LEVEL% on $HOST VM **Description:** This alarm is cleared for LDAP operations when LDAP requests as a percentage of CCR-I messages is normal or above the 25% threshold on qnsXX VM.	
LDAP Requests Dropped	critical	Application
	Message Text: ${HOSTNAME}: LDAP Requests dropped to $CURRENT_LEVEL on $HOST VM **Description:** This alarm is generated for LDAP operations when LDAP requests drop below 0 on lbXX VM. Default Threshold: 0	
LDAP Requests Normal	clear	Application
	Message Text: ${HOSTNAME}: LDAP Requests normal to $CURRENT_LEVEL on $HOST VM **Description:** This alarm is cleared when LDAP requests are normal (above 0) on lbXX VM for LDAP operations.	
LDAP Query Result Dropped	critical	Application
	Message Text: ${HOSTNAME}: LDAP Query Result dropped to $CURRENT_LEVEL on $HOST VM **Description:** This alarm is generated when LDAP Query Result goes to 0 on qnsXX VM. Default Threshold: 0	
LDAP Query Result Normal	clear	Application
	Message Text: ${HOSTNAME}: LDAP Query Result normal to $CURRENT_LEVEL on $HOST VM **Description:** This alarm is cleared when LDAP Query Result goes above 0 (above the threshold value) on qnsXX VM.	

Notification Name	Severity	Feature
Gx Message processing Dropped	critical	Application
	Message Text: ${HOSTNAME}: Gx Message $MSG_TYPE dropped to $CURRENT_LEVEL% on $HOST_VM VM **Description:** This alarm is generated for Gx Message CCR-I, CCR-U and CCR-T when processing of messages drops below 95% on qnsXX VM. The 95% refers to the percentage of responses to the requests within a 60 second period of time. For example, in 60 sec if you receive 100 requests and send 95 responses then your percentage would be 95%. Default threshold: 95%	
Gx Message processing Normal	clear	Application
	Message Text: ${HOSTNAME}: Gx Message $MSG_TYPE normal to $CURRENT_LEVEL% on $HOST_VM VM **Description:** This alarm is cleared when the processing of messages is equal or above 95% on qnsXX VM for Gx Message CCR-I, CCR-U and CCR-T .	
Gx Average Message processing Dropped	critical	Application
	Message Text: ${HOSTNAME}: Gx average Message $MSG_TYPE processing increased to ${CURRENT_LEVEL}ms on $HOST_VM VM **Description:** This alarm is generated for Gx Message CCR-I, CCR-U and CCR-T when average message processing is above 20ms on qnsXX VM. Default Threshold: 20ms	
Gx Average Message processing Normal	clear	Application
	Message Text: ${HOSTNAME}: Gx average Message $MSG_TYPE processing normal to ${CURRENT_LEVEL}ms on $HOST_VM VM **Description:** This alarm is cleared when average message processing is equal or below 20ms on qnsXX VM for Gx Message CCR-I, CCR-U and CCR-T.	
All SMSC server connections are down	critical	Application
	Message Text: ${HOSTNAME}: 5002:<VMName>:All SMSC servers not reachable **Description:** None of the SMSC servers configured are reachable. This Critical Alarm is generated when the SMSC Server endpoints are not available to submit SMS messages thereby blocking SMS from being sent from CPS.	

Notification Name	Severity	Feature
Atleast one SMSC server connection is up	clear	Application
	Message Text: ${HOSTNAME}: 5002:<VMName>:Atleast one SMSC server is reachable **Description:** This alarm is cleared when at least one configured SMSC endpoint server is reachable after a state where none were reachable from the mconfigured list of server endpoints.	
SMSC server connection down	error	Application
	Message Text: ${HOSTNAME}: 5001:<SMSCServer Address>:<SMSC Port>:SMSC Server not reachable **Description:** SMSC Server is not reachable. This alarm is generated when any one of the configured active SMSC server endpoints is not reachable and CPS will not be able to deliver a SMS via that SMSC server.	
SMSC server connection up	clear	Application
	Message Text: ${HOSTNAME}: 5001:<SMSCServer Address>:<SMSC Port>:SMSC server reachable **Description:** This alarm is cleared when an earlier unreachable SMSC endpoint is now reachable.	
All Email servers not reachable	critical	Application
	Message Text: ${HOSTNAME}: 5004:<VMName>:All Email Servers not reachable **Description:** No email server is reachable. This alarm (Critical) is generated when all configured Email Server Endpoints are not reachable, blocking e-mails from being sent from CPS.	
At least one Email server is reachable	clear	Application
	Message Text: ${HOSTNAME}: 5004:<VMName>:At least one Email server is reachable **Description:** At least one email server is reachable.	
Email server is not reachable	error	Application
	Message Text: ${HOSTNAME}: 5003:<Mail Server Address>:<SMTP Port>Email Server not reachable **Description:** Email server is not reachable. This alarm is generated when any of the configured Email Server Endpoints are not reachable. CPS is not able to use the server to send e-mails.	

Notification Name	Severity	Feature
Email server is reachable	clear	Application
	Message Text: ${HOSTNAME}: 5003:<Mail Server Address>:<SMTP Port>Email Server reachable **Description:** Email server is reachable. This alarm is cleared when an earlier unreachable Email server endpoint is now reachable.	
Binding Not Available at Policy DRA	Critical, Error, Notice, Warning	Application
	Message Text: Binding DB not accessible or Binding Db not reachable at Policy DRA **Description:** This alarm is generated when IPv6 binding for sessions is not found at Policy DRA. Only one notification is sent out whenever this condition is detected. This is a configurable notification. You can configure whether to send or not to send the notification. For more information, refer to *PolicyDRA Health Check* under *Diameter Configuration* in *CPS Mobile Configuration Guide*.	
	clear	Application
	Message Text: Binding DB Available at Policy DRA or Binding Db reachable at Policy DRA **Description:** The alarm is cleared after the duration of Alarm Clearance Interval (configured under **Diameter Configuration** > **PolicyDRA Health Check** > **Alarm Config** > **Alarm Clearance Interval** in Policy Builder) when the above alarm was generated.	

Notification Name	Severity	Feature
SPR_DB_ALARM	error	Application
	Message Text: 6101:Remote SPR DB:Error adding remote spr db **Description:** This alarm indicates there is an issue in establishing connection to the Remote SPR Databases configured under **USuM Configuration** > **Remote Database Configuration** during CPS policy server (qns) process initialization. **Message Text:** 6101:Remote SPR DB:Primary member is down OR **Description:** The alarm is generated whenever Policy Server (QNS) node cannot connect to primary member of SPR replica set.	
	clear	Application
	Message Text: 6101:Remote SPR DB: Cleared alarm Error adding remote spr db **Description:** The issue of establishing connection to the Remote SPR database has been resolved. **Message Text:** 6101:Remote SPR DB:Cleared alarm for remote spr db primary **Description:** The alarms are cleared after starting Policy Server (qns) services.	
DiameterQnsWarmupError	error	Application
	Message Text: Diameter QNS warmup didn't start since QNS node num/SITE_ID not parsed. QNS will accept messages but call-loss expected. **Description:** The alarm is raised when the warmup feature is enabled (qns.node.warmup set to true in `qns.conf` file) and there is a problem in retrieving qns node number, site ID. Make sure `qns.node.warmup.hostname.substring` and GeoSiteName (if GR setup) in configured correctly in `qns.conf` file. **Message Text:** Diameter QNS warmup did not start due to exception. QNS will accept the messages but the call loss is expected. **Description:** The alarm is generated when the warmup feature is enabled and there is an exception while parsing the warmup dictionaries or scenario file.	
	clear	Application
	Message Text: Diameter QNS warmup alarms are cleared. **Description:** When warmup feature is enabled, the alarms are cleared when restarting the qns nodes.	

Notification Name	Severity	Feature
SPRNodeNotAvailable	Error	Application
	Message Text: SPR Node not available **Description:** This alarm is generated when all the members of SPR replica-set configured under **USuM Configuration** > **Shard Configuration** are down and a master node is not available for that given replica-set.	
	clear	Application
	Message Text: SPR node is available **Description:** The alarms is cleared if at least one of the SPR replica set member became available.	
GC State	error	Application
	Message Text: {hostname}: Full GC event occurred <GC_ALARM_TRIGGER_COUNT> times on <qns_instance>(<pid>) process in last <GC_ALARM_TRIGGER_INTERVAL> seconds interval **Description:** This alarm is generated when Garbage collection on qns java process occurs three or more (configurable) times within 10 (configurable) mins of interval.	
	clear	Application
	Message Text: {hostname}: No Full GC event occurred in <GC_CLEAR_TRIGGER_INTERVAL> seconds on <qns_instance>(<pid>) process **Description:** This alarm is cleared when Garbage collection does not occur for GC_CLEAR_TRIGGER_INTERVAL seconds (15 mins).	

Notification Name	Severity	Feature
OldGen State	error	Application
	Message Text: {hostname}: Oldgen% is more than <OLD_GEN_ALARM_TRIGGER_THR> for <OLD_GEN_ALARM_TRIGGER_CONT_GC_COUNT> continuous Full GC event occurred on <qns_instance>(<pid>) process in last <GC_ALARM_TRIGGER_INTERVAL> seconds interval **Description:** This alarm is generated if Oldgen% is more than configured threshold (OLD_GEN_ALARM_TRIGGER_THR) for more than 2 (OLD_GEN_ALARM_TRIGGER_CONT_GC_COUNT) GC.	
	clear	Application
	Message Text: {hostname}: Oldgen%(<oldgen_per>) is less than <OLD_GEN_CLEAR_TRIGGER_THR> for last Full GC event occurred on <qns_instance>(<pid>) process" **Description:** This alarm is cleared when Oldgen% is less than configured threshold (OLD_GEN_CLEAR_TRIGGER_THR) after last GC event.	
SessionLimitOverload ProtectionNotSet	warning	Application
	Message Text: Session Limit Overload protection cannot be zero or negative. Change to recommended value in Policy Builder before DB crashes **Description:** If configured to 0 (default), CPS can handle infinite number of sessions but this can affect the database and can lead to application crash. **Warning** You must change the value as per your requirements.	
	clear	Application
	Message Text: Session Limit Overload protection value set to recommended value in Policy Builder **Description:** The alarm is cleared when the recommended value is set and published.	

Notification Name	Severity	Feature
SessionLimitOverload ProtectionExceeded	critical	Application
	Message Text: Current Session count exceeded Session Limit Overload Protection. Session creation not allowed to avoid DB crashes **Description:** The alarm is generated when the current session count of the system exceeds the value configured for Session Limit Overload protection.	
	clear	Application
	Message Text: Current Session count is less than Session Limit Overload protection **Description:** The alarm is cleared within 30 seconds when the current session count of the system is less than the value configured for Session Limit Overload protection.	
Stateless Alarms: Alarms which provide the information about the event occuring on the system. These alarms do not have any state. There is no clear alarm for these notifications.		
HA Failover	info	Application
	Message Text: "${HOSTNAME}: HA Failover done from $previous_member to $PRIMARYNODE of ${SET_NAME}-SET$Loop" **Description:** The primary role of the replica set has been failed over to another member.	
GR Failover	info	Application
	Message Text: "${HOSTNAME}: Geo Failover done from $previous_member to $PRIMARYNODE of ${SET_NAME}-SET$Loop" **Description:** The primary role of the replica set has been failed over to another member.	
Admin User Logged in	info	Application
	Message Text: "${HOSTNAME}: root user logged in on `hostname` terminal $terminal from machine $from_system at $dt" **Description:** root user logged in on %hostname terminal.	

Configuration to Generate Invalid License Trap

Note If you change a previously installed valid license and make it invalid, the system will not generate any trap. As system is not monitoring the license files, instead it checks the license entries present in admin database. If the database entries are correct, system will not generate any trap.

Step 1 To generate invalid license trap we need to configure the following parameter in `/etc/broadhop/qns.conf` file.

```
-Dcom.cisco.enforcementfree.mode=false
```

Note When `com.cisco.enforcementfree.mode` is configured as false in addition to license has not been verified yet/license is invalid/has exceeded the allowed parameters following traps will be generated:

- is Expired
- will expire soon
- is nearing the allowed parameters

The traps will be generated only when license expiry date is set in license file.

Step 2 After adding the above entry in `qns.conf` file execute `copytoall.sh` to synchronize the configuration changes to all VMs in the CPS cluster:

```
copytoall.sh /etc/broadhop/qns.conf /etc/broadhop/qns.conf
```

Step 3 After modifying the configuration file to make the changes permanent for future use (when any VM is redeployed or restarted) rebuild etc.tar.gz.

```
/var/qps/install/current/scripts/build/build_etc.sh
```

Step 4 Restart the CPS service.

```
/var/qps/bin/control/restartall.sh
```

Unknown Application Events

All of the alarms generated by different VMs are received by the Policy Director (load balancer) VMs.

On the Policy Director VMs a script called application_trapv1_convert processes the received alarms and generates the new alarm based on the received information and sends it to the external NMS. Unknown alarms can come when application_trapv1_convert is not able to process the received alarm. In this case it will generate one of the below seven unknown alarms.

Table 10: Unknown Application Events

Name	Severity	Facility
ApplicationEvent	None	—
DBEvent	None	—
FailoverEvent	None	—
ProcessEvent	None	—
VMEvent	None	—
None	None	Application

Name	Severity	Facility
UnKnown	None	None

Note Any unknown alarms should get reported to engineering team to take necessary action against it. Provide the alarm log (`/var/log/snmp/trap`) from the active Policy Director (load balancer) VMs with the ticket number.

Active Alarms

To get the list of active alarms, execute the `diagnostics.sh --get_active_alarms` command. Here is a sample output:

```
#diagnostics.sh --get_active_alarms

CPS Diagnostics HA Multi-Node Environment
--------------------------
Active Application Alarm Status
-------------------------------------------------------------------------------
id=1000 sub_id=3001  event_host=lb02  status=down date=2017-11-22,
10:47:34,051+0000  msg="3001:Host: site-host-gx Realm: site-gx-client.com is down"
id=1000 sub_id=3001  event_host=lb02  status=down date=2017-11-22,
10:47:34,048+0000  msg="3001:Host: site-host-sd Realm: site-sd-client.com is down"
id=1000 sub_id=3001  event_host=lb01  status=down date=2017-11-22,
10:45:17,927+0000  msg="3001:Host: site-server Realm: site-server.com is down"
id=1000 sub_id=3001  event_host=lb02  status=down date=2017-11-22,
10:47:34,091+0000  msg="3001:Host: site-host-rx Realm: site-rx-client.com is down"
id=1000 sub_id=3002  event_host=lb02  status=down date=2017-11-22,
10:47:34,111+0000  msg="3002:Realm: site-server.com:applicationId: 7:all peers are down"
Active Component Alarm Status
-------------------------------------------------------------------------------
event_host=lb02 name=ProcessDown severity=critical facility=operatingsystem
date=2017-22-11,10:13:49,310329511,+00:00 info=corosync process is down
```

Attention

- Due to the limitation of architecture of the CPS SNMP implementation, if the SNMP deamon or policy server (QNS) process on pcrfclient VM restarts, there can be gap between active alarms displayed by the `diagnostics.sh` and active alarms in NMS.
- The date printed for application alarm status is when the alarm was seen at pcrfclient VM. The time for the alarm at NMS is the time before the alarm is received from Policy Director (LB) VM. So there can be a difference in the dates for the same alarm reported in `diagnostics.sh` and in NMS.

The following table list the type of SNMP alarms:

Table 11: IDs - Type of SNMP Alarms

Alarm ID	Type
1000	Application Alarm
7100	Database Alarm

Alarm ID	Type
7200	Failover Alarm
7300	Process Alarm
7400	VM Alarm
7700	GR Alarm

Stale Component Alarms

Due to different circumstances occurring on the system (lbvip02 down, network issue, snmptrapd process on active LB down, and so on) there are chances that stale component alarm are created on the system.

If stale alarms are present on the system, then you can reinitialize the system by executing `/var/qps/install/current/scripts/upgrade/reinit.sh` command from Cluster Manager VM to clear the stale alarms.

Or

Restart the snmpd process on the VM for which the stale alarm is present by executing `monit restart snmpd` command from the VM to clear the stale alarms.

Certain component alarms such as, low memory and high CPU usage are monitored and raised by scripts executed on the VMs. The stale alarms for low memory and high CPU usage can be cleared by executing `reinit.sh`.

If after upgrade any stale alarms are created on the system, execute the following script from Cluster Manager VM to clear all the stale alarms:

```
/var/qps/bin/support/clear_stale_component_alarm.sh
```

Each VM generates approx. 20 notifications. As the system generates the clear notification for all the resource monitored by snmpd on each VM there are multiple clear notification generated. This causes the system performance to degrade during the upgrade/reinitialization of the system.

For example: If the deployment contains 80 VMs, then 1600 notifications are generated on the system during upgrade or reinitialization of the system. snmptrapd on active LB VMs takes approx. 2-3 seconds to process each notification. To process 1600 notifications, it takes approx. thirty miutes. During this period if any alarms gets generated on the systems it might get delayed by approx. thirty minutes to reach to NMS.

Note As CPS sends all the alarm notification to NMS, NMS may receive duplicate component alarm notifications.

Configuration and Usage

All access to system statistics and KPIs should be collected via SNMP gets and walks from the routable IP of the VM. NMS sends the snmpwalk or snmpget request to the routable IP of the VM and gets the response. NMS should know the routable IP addresses of all the VMs available in the setup. System Notifications are sourced from lbvip01.

User can also configure `snmpRouteLan:` parameter which contains the value of a VLAN name which can be used to access the KPIs value provided by SNMP. For more information on the parameter, refer to the *CPS Installation Guide for VMware* or in the *CPS Installation Guide for OpenStack*.

Configuration for SNMP Gets and Walks

By default, SNMPv3 gets and walks can be performed against the routable/public IP addresses of the VMs with the default read-only community string of "broadhop" using standard UDP port 161.

If you want to use SNMPv2 as gets and walks, you need to change the *snmpv3_enable* to `FALSE`.

For more information on SNMP related parameters, refer to general configuration section in the *CPS Installation Guide for VMware* or in the *CPS Installation Guide for OpenStack* for this release.

Configuration for Notifications (traps)

Notifications are logged locally on the Policy Director (load balancer) VMs in the `/var/log/snmp/trap` file as well as forwarded to the NMS destination defined during the installation of CPS.

By default traps are sent to the NMS using the SNMPv2 community string of "broadhop". The standard SNMP UDP trap port of 162 is also used. Both of these values may be changed to accommodate the upstream NMS.

Note If SNMPv3 is enabled, Component Notifications will be sent to NMS via SNMPv3. Application Notifications will be send via SNMPv2.

To change the trap community string for SNMPv2:

1. Configure the snmp_trap_community in Configuration excel sheet on the Cluster Manager VM. For more information, refer to the *Cisco Policy Suite Installation Guide for VMware* for this release. For example:

   ```
   snmp_trap_community cisco
   ```

2. Execute the following command to import csv files into the Cluster Manager VM:

   ```
   /var/qps/install/current/scripts/import/import_deploy.sh
   ```

   This script converts the data to JSON format and outputs it to `/var/qps/config/deploy/import/json/`.

3. Execute `reinit.sh` script to apply the changes to all VMs in the network.

   ```
   /var/qps/install/current/scripts/upgrade/reinit.sh
   ```

To change the destination trap port from 162:

1. To make this change the `/etc/snmp/snmptrapd.conf` file needs to be modified on both lb01 and lb02. In these files append a colon and the destination port to each line containing **`corporate_nms_ip`**. There are a total of 12 lines in each file.

   For example if the NMS destination port were 1162, the line:

   ```
   traphandle DISMAN-EVENT-MIBmteTriggerFired
   ```

   ```
   /etc/snmp/scripts/component_trap_convert corporate_nms_ip
   ```

becomes

```
traphandle DISMAN-EVENT-MIBmteTriggerFired

/etc/snmp/scripts/component_trap_convert corporate_nms_ip1162
```

2. After these changes, save the file and restart the snmptrapd service to enable changes. Run `monit restart snmptrapd` from both Policy Director VMs.

Cluster Manager KPI and SNMP Configuration

This section describes the steps to enable SNMP traps and KPI monitoring of the Cluster Manager so that the customer NMS can monitor the following KPIs:

- Memory usage
- Disk usage
- CPU
- Disk IO

KPIs are reported and recorded on the pcrfclient in the `/var/broadhop/stats` file.

SNMP traps are forwarded to lb01/lb02 and lb01/lb02 forwards the traps to the configured NMS servers in the system.

The following traps are supported for Cluster Manager:

- DiskFull
- HighLoad
- Interface Up/Down
- Swap Usage

Install NET-SNMP

To install NET-SNMP perform the following steps:

Step 1 On the Cluster Manager VM, execute the following command to install NET-SNMP package:

```
yum install --assumeyes --disablerepo=QPS-Repository --enablerepo=QPS-local net-snmp
```

Step 2 To enable run levels for SNMP, execute the following command:

```
chkconfig --level 2345 snmpd on
```

SNMPD Configuration

Note The SNMP configuration mentioned in the following sections is not supported for third site arbiter.

If firewall is configured on Cluster Manager VM, then check if it contains entries for 161 and162 ports.

If the entries for 161 and 162 ports are not there, execute the following command:

```
iptables -A INPUT -i eth0 -p udp -m multiport --ports 161,162 -m comment --comment "100
allow snmp access" -j ACCEPT
```

Check whether IPv6 tables is running and 161 and 162 ports are not there. If the ports are not displayed, then execute the following command:

```
ip6tables -A INPUT -i eth0 -p udp -m multiport --ports 161,162 -m comment --comment "100-6
allow snmp access" -j ACCEPT
```

For SNMPv2

1. Add the following content to `/etc/snmp/snmpd.conf` file on the Cluster Manager:

```
com2sec local     localhost           <snmp_trap_community>
com2sec6 local     localhost          <snmp_trap_community>
rocommunity <snmp_ro_community>
rocommunity6 <snmp_ro_community>
group MyRWGroup v1         local
group MyRWGroup v2c        local
view all    included  .1                                80
access MyRWGroup ""      any       noauth    exact  all    all    none
syslocation Unknown (edit /etc/snmp/snmpd.conf)
syscontact Root  (configure /etc/snmp/snmp.local.conf)
master agents
agentAddress udp:161,udp6:161

trapcommunity  <snmp_trap_community>
agentSecName meme
rouser meme


 # Send all traps upstream - Don't change this password or it breaks the framework.
 # v1 and v2 traps _could_ be sent for all but only need v2 trap.
 trap2sink lbvip02 <snmp_trap_community>


##########
#
# Local Stats
#
ignoreDisk /proc
ignoreDisk /proc/sys/fs/binfmt_misc
ignoreDisk /var/lib/nfs/rpc_pipefs
ignoreDisk /dev/shm
ignoreDisk /dev/pts
disk / 10%


swap 102400

load 6 6 6
```

```
#linkUpDownNotifications yes

notificationEvent  linkUpTrap    linkUp   ifIndex ifAdminStatus ifOperStatus
notificationEvent  linkDownTrap  linkDown ifIndex ifAdminStatus ifOperStatus


monitor  -S -u meme -r 60 -e linkUpTrap -o ifDescr  "Generate linkUp" ifOperStatus != 2
monitor  -u meme -r 60 -e linkDownTrap -o ifDescr "Generate linkDown" ifOperStatus == 2

# Note: alert!=0, clear==0 and messages must be unique or snmpd errors.
monitor -u meme -r 60 -o dskPath -o dskErrorMsg "DiskFullAlert" dskErrorFlag != 0
monitor -S -u meme -r 60 -o dskPath -o dskErrorMsg "DiskFullClear" dskErrorFlag == 0
monitor -u meme -r 60 -o memErrorName -o memSwapErrorMsg "LowSwapAlert" memSwapError !=
 0
monitor -S -u meme -r 60 -o memErrorName -o memSwapErrorMsg "LowSwapClear" memSwapError
 == 0
monitor -u meme -r 60 -o laNames -o laErrMessage  "HighLoadAlert" laErrorFlag != 0
monitor -S -u meme -r 60 -o laNames -o laErrMessage  "HighLoadClear" laErrorFlag == 0


##########
#
# BROADHOP-QNS-MIB Proxy Configuration
#
##########
# proxy -v <version> -c <community> <local_host> <map_to> <map_from>
#
# NOTE:  Most values are listed twice.  This is to cover the snmp get requirement
#        for scalar values.  Snmp get for scalar values (ie. not a table) is
#        required to return for both x.y OID and .x.y.0 OID values.  This only
#        effects <map_to> values.

##########
#
# System Stats
#


#
# LB
#
# User, System and Idle CPU (UCD-SNMP-MIB ss)

proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.1.0
.1.3.6.1.4.1.2021.11.9.0
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.2.0
.1.3.6.1.4.1.2021.11.10.0
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.3.0
.1.3.6.1.4.1.2021.11.11.0
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.1
.1.3.6.1.4.1.2021.11.9.0
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.2
.1.3.6.1.4.1.2021.11.10.0
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.3
.1.3.6.1.4.1.2021.11.11.0
# 1, 5 and 15 Minute Load Averages (UCD-SNMP-MIB la)
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.4
.1.3.6.1.4.1.2021.10.1.5.1
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.5
.1.3.6.1.4.1.2021.10.1.5.2
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.6
.1.3.6.1.4.1.2021.10.1.5.3
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.4.0
```

```
.1.3.6.1.4.1.2021.10.1.5.1
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.5.0
.1.3.6.1.4.1.2021.10.1.5.2
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.6.0
.1.3.6.1.4.1.2021.10.1.5.3
# Memory Total, Memory Available, Swap Total, Swap Available (UCD-SNMP-MIB mem)
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.7
.1.3.6.1.4.1.2021.4.5.0
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.8
.1.3.6.1.4.1.2021.4.6.0
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.9
.1.3.6.1.4.1.2021.4.3.0
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.10
.1.3.6.1.4.1.2021.4.4.0
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.7.0
.1.3.6.1.4.1.2021.4.5.0
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.8.0
.1.3.6.1.4.1.2021.4.6.0
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.9.0
.1.3.6.1.4.1.2021.4.3.0
proxy -v 2c -c <snmp_ro_community> localhost .1.3.6.1.4.1.26878.200.3.2.70.1.10.0
.1.3.6.1.4.1.2021.4.4.0
```

2. Replace the string in <*tag*> with the actual value. You can check the `snmpd.conf` from other VMs to get the values for tags. For example, `/etc/snmp/snmpd.conf` file on lb01.
3. You can also update the configuration parameter such as `load 6 6 6` to some other value based on number of vCPUs present on Cluster Manager.

Note Formula is 1.5 * no_of_vCPUs. Consider only the integer value from the output.

Here is an sample `snmpd.conf` file configuration:

```
com2sec local     localhost           cisco123
com2sec6 local     localhost           cisco123
rocommunity cisco_ro
rocommunity6 cisco_ro
group MyRWGroup v1         local
group MyRWGroup v2c        local
view all    included  .1                                80
access MyRWGroup ""      any       noauth    exact  all    all    none
syslocation Unknown (edit /etc/snmp/snmpd.conf)
syscontact Root  (configure /etc/snmp/snmp.local.conf)
master agentx
agentAddress udp:161,udp6:161

trapcommunity  cisco123
agentSecName meme
rouser meme


 # Send all traps upstream - Don't change this password or it breaks the framework.
 # v1 and v2 traps _could_ be sent for all but only need v2 trap.
 trap2sink lbvip02 cisco123


##########
#
# Local Stats
#
```

```
ignoreDisk /proc
ignoreDisk /proc/sys/fs/binfmt_misc
ignoreDisk /var/lib/nfs/rpc_pipefs
ignoreDisk /dev/shm
ignoreDisk /dev/pts
disk / 90%


swap 102400

load 6 6 6
#linkUpDownNotifications yes

notificationEvent  linkUpTrap    linkUp   ifIndex ifAdminStatus ifOperStatus
notificationEvent  linkDownTrap  linkDown ifIndex ifAdminStatus ifOperStatus

monitor  -S -u meme -r 60 -e linkUpTrap -o ifDescr  "Generate linkUp" ifOperStatus != 2
monitor  -u meme -r 60 -e linkDownTrap -o ifDescr "Generate linkDown" ifOperStatus == 2

# Note: alert!=0, clear==0 and messages must be unique or snmpd errors.
monitor -u meme -r 60 -o dskPath -o dskErrorMsg "DiskFullAlert" dskErrorFlag != 0
monitor -S -u meme -r 60 -o dskPath -o dskErrorMsg "DiskFullClear" dskErrorFlag == 0
monitor -u meme -r 60 -o memErrorName -o memSwapErrorMsg "LowSwapAlert" memSwapError !=
 0
monitor -S -u meme -r 60 -o memErrorName -o memSwapErrorMsg "LowSwapClear" memSwapError
 == 0
monitor -u meme -r 60 -o laNames -o laErrMessage  "HighLoadAlert" laErrorFlag != 0
monitor -S -u meme -r 60 -o laNames -o laErrMessage  "HighLoadClear" laErrorFlag == 0


##########
#
# BROADHOP-QNS-MIB Proxy Configuration
#
##########
# proxy -v <version> -c <community> <local_host> <map_to> <map_from>
#
# NOTE:  Most values are listed twice.  This is to cover the snmp get requirement
#        for scalar values.  Snmp get for scalar values (ie. not a table) is
#        required to return for both x.y OID and .x.y.0 OID values.  This only
#        effects <map_to> values.

##########
#
# System Stats
#


#
# User, System and Idle CPU (UCD-SNMP-MIB ss)

proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.1.0
.1.3.6.1.4.1.2021.11.9.0
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.2.0
.1.3.6.1.4.1.2021.11.10.0
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.3.0
.1.3.6.1.4.1.2021.11.11.0
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.1
.1.3.6.1.4.1.2021.11.9.0
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.2
.1.3.6.1.4.1.2021.11.10.0
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.3
.1.3.6.1.4.1.2021.11.11.0
# 1, 5 and 15 Minute Load Averages (UCD-SNMP-MIB la)
```

```
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.4
.1.3.6.1.4.1.2021.10.1.5.1
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.5
.1.3.6.1.4.1.2021.10.1.5.2
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.6
.1.3.6.1.4.1.2021.10.1.5.3
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.4.0
.1.3.6.1.4.1.2021.10.1.5.1
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.5.0
.1.3.6.1.4.1.2021.10.1.5.2
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.6.0
.1.3.6.1.4.1.2021.10.1.5.3
# Memory Total, Memory Available, Swap Total, Swap Available (UCD-SNMP-MIB mem)
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.7
.1.3.6.1.4.1.2021.4.5.0
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.8
.1.3.6.1.4.1.2021.4.6.0
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.9
.1.3.6.1.4.1.2021.4.3.0
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.10
.1.3.6.1.4.1.2021.4.4.0
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.7.0
.1.3.6.1.4.1.2021.4.5.0
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.8.0
.1.3.6.1.4.1.2021.4.6.0
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.9.0
.1.3.6.1.4.1.2021.4.3.0
proxy -v 2c -c cisco_ro localhost .1.3.6.1.4.1.26878.200.3.2.70.1.10.0
.1.3.6.1.4.1.2021.4.4.0
```

4. After updating the `snmpd.conf` file, execute the following commands from Cluster Manager.

```
mkdir /etc/snmp/mibs;scp root@qns01:/etc/snmp/mibs/* /etc/snmp/mibs
scp root@qns01:/etc/sysconfig/snmpd /etc/sysconfig/snmpd
scp root@qns01:/etc/logrotate.d/snmpd /etc/logrotate.d/snmpd
scp root@qns01:/etc/monit.d/snmpd /etc/monit.d/
service monit restart
```

For SNMPv3

1. Add the following content to `/etc/snmp/snmpd.conf` file.

```
rouser cisco_snmpv3
rouser cisco_snmpv3_trap
com2sec local localhost cisco_snmpv3
group MyRWGroup usm local
group MyRWGroup usm cisco_snmpv3
view all included .1 80
access MyRWGroup "" any noauth exact all all none
syslocation Unknown (edit /etc/snmp/snmpd.conf)
syscontact Root (configure /etc/snmp/snmp.local.conf)
master agentx
agentSecName cisco_snmpv3_trap
trapsess -v 3 -u cisco_snmpv3_trap -a SHA -m 0xf8798c43bd2f058a14ffde26f037fbc5d44f434e
 -x AES -m
0xf8798c43bd2f058a14ffde26f037fbc5d44f434e -l authPriv lbvip02
##########
#
# Local Stats
#
ignoreDisk /proc
ignoreDisk /proc/sys/fs/binfmt_misc
ignoreDisk /var/lib/nfs/rpc_pipefs
ignoreDisk /dev/shm
```

```
ignoreDisk /dev/pts
disk / 10%
disk /var 10%
disk /boot 10%
swap 102400
#load = 1.5 * vCPUs (allocated to VM)
load 9 9 9
#linkUpDownNotifications yes
notificationEvent linkUpTrap linkUp ifIndex ifAdminStatus ifOperStatus
notificationEvent linkDownTrap linkDown ifIndex ifAdminStatus ifOperStatus
monitor -S -u cisco_snmpv3_trap -r 60 -e linkUpTrap -o ifDescr "Generate linkUp"
ifOperStatus !=
2
monitor -u cisco_snmpv3_trap -r 60 -e linkDownTrap -o ifDescr "Generate linkDown"
ifOperStatus ==
2
# Note: alert!=0, clear==0 and messages must be unique or snmpd errors.
monitor -u cisco_snmpv3_trap -r 60 -o dskPath -o dskErrorMsg "DiskFullAlert" dskErrorFlag
 != 0
monitor -S -u cisco_snmpv3_trap -r 60 -o dskPath -o dskErrorMsg "DiskFullClear"
dskErrorFlag == 0
monitor -u cisco_snmpv3_trap -r 60 -o memErrorName -o memSwapErrorMsg "LowSwapAlert"
memSwapError
!= 0
monitor -S -u cisco_snmpv3_trap -r 60 -o memErrorName -o memSwapErrorMsg "LowSwapClear"
memSwapError == 0
monitor -u cisco_snmpv3_trap -r 60 -o laNames -o laErrMessage "HighLoadAlert" laErrorFlag
 != 0
monitor -S -u cisco_snmpv3_trap -r 60 -o laNames -o laErrMessage "HighLoadClear"
laErrorFlag == 0
monitor -u cisco_snmpv3_trap -r 60 -o memAvailReal -o memTotalReal "LowMemoryAlert"
memAvailReal<
1633390
monitor -S -u cisco_snmpv3_trap -r 60 -o memAvailReal -o memTotalReal "LowMemoryClear"
memAvailReal
>= 1633390
##########
#
# System Stats
#
# User, System and Idle CPU (UCD-SNMP-MIB ss)
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.1.0 .1.3.6.1.4.1.2021.11.9.0
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.2.0 .1.3.6.1.4.1.2021.11.10.0
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.3.0 .1.3.6.1.4.1.2021.11.11.0
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.1 .1.3.6.1.4.1.2021.11.9.0
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.2 .1.3.6.1.4.1.2021.11.10.0
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
```

```
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.3 .1.3.6.1.4.1.2021.11.11.0
# 1, 5 and 15 Minute Load Averages (UCD-SNMP-MIB la)
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.4 .1.3.6.1.4.1.2021.10.1.5.1
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.5 .1.3.6.1.4.1.2021.10.1.5.2
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.6 .1.3.6.1.4.1.2021.10.1.5.3
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.4.0 .1.3.6.1.4.1.2021.10.1.5.1
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.5.0 .1.3.6.1.4.1.2021.10.1.5.2
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.6.0 .1.3.6.1.4.1.2021.10.1.5.3
# Memory Total, Memory Available, Swap Total, Swap Available (UCD-SNMP-MIB mem)
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.7 .1.3.6.1.4.1.2021.4.5.0
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.8 .1.3.6.1.4.1.2021.4.6.0
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.9 .1.3.6.1.4.1.2021.4.3.0
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.10 .1.3.6.1.4.1.2021.4.4.0
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.7.0 .1.3.6.1.4.1.2021.4.5.0
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.8.0 .1.3.6.1.4.1.2021.4.6.0
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.9.0 .1.3.6.1.4.1.2021.4.3.0
proxy -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -m
0x7a64eefbf13e918c77b41fada0b55cf8338d6cc8 -x AES -m 0x7a64eefbf13e918c77b41fada0b55cf8
 -l authPriv
localhost .1.3.6.1.4.1.26878.200.3.2.70.1.10.0 .1.3.6.1.4.1.2021.4.4.0
```

Note For snmptrap, puppet executes the script `/var/broadhop/initialize_snmpv3_trap.sh`. The script `/var/broadhop/initialize_snmpv3_trap.sh` is starting and stopping snmptrapd twice.

```
[root@lb01 broadhop]# ./initialize_snmpv3_trap.sh
Stopping monit: [ OK ]
Stopping snmpd: [ OK ]
Stopping snmptrapd: [ OK ]
Starting snmptrapd: [ OK ]
Stopping snmptrapd: [ OK ]
Starting snmptrapd: [ OK ]
Starting snmpd: [ OK ]
Starting monit: Starting Monit 5.17.1 daemon with http interface at [localhost]:2812
[ OK ]
[root@lb01 broadhop]#
```

2. Replace the string in <*tag*> with the actual value. You can check the `snmpd.conf` from other VMs to get the values for tags. For example, `/etc/snmp/snmpd.conf` file on lb01.
3. You can also update the configuration parameter such as `load 6 6 6` to some other value based on number of vCPUs present on Cluster Manager.

Note Formula is 1.5 * no_of_vCPUs. Consider only the integer value from the output.

Here is an sample `snmpd.conf` file configuration:

4. After updating the snmpd.conf file, execute the following commands from Cluster Manager.

```
mkdir /etc/snmp/mibs;scp root@qns01:/etc/snmp/mibs/* /etc/snmp/mibs
scp root@qns01:/etc/sysconfig/snmpd /etc/sysconfig/snmpd
scp root@qns01:/etc/logrotate.d/snmpd /etc/logrotate.d/snmpd
scp root@qns01:/etc/monit.d/snmpd /etc/monit.d/
service monit restart
```

Validation and Testing

This section describes the commands for validation and testing of the CPS SNMP infrastructure. You can use these commands to validate and test your system during setting up or configuring the system. Our examples use MIB values because they are more descriptive but you may use equivalent OID values if you like particularly when configuring an NMS.

The examples here use Net-SNMP snmpget snmpwalk and snmptrap programs. Detailed configuration of this application is outside the scope of this document but the examples assume that the three Cisco MIBs are installed in the locations described on the man page of snmpcmd (typically the `/etc/snmp/mibs` directories).

Run all tests from a client with network access to the Management Network or from lb01 lb02 (which are also on the Management Network).

Component Statistics

Component statistics can be obtained on a per statistic basis with snmpget. For example, to get the current available memory on pcrfclient01, use the following commands:

For SNMPv2

```
snmpget -v 2c -c broadhop -M /etc/snmp/mibs:/usr/share/snmp/mibs -m
+BROADHOP-MIB:CISCO-QNS-MIB
pcrfclient01 .1.3.6.1.4.1.26878.200.3.2.70.1.8
```

An example of the output from this command is:

```
CISCO-QNS-MIB::componentMemoryAvailable = INTEGER: 4551356
```

Interpreting this output means that 4551356 MB of memory are available on this component machine.

All available component statistics in an MIB node can be "walked" via the snmpwalk command. This is very similar to snmpget as above. For example, to see all statistics on lb01 use the command:

```
snmpwalk -v 2c -c broadhop -M /etc/snmp/mibs:/usr/share/snmp/mibs -m
+BROADHOP-MIB:CISCO-QNS-MIB
lb01 .1.3.6.1.4.1.26878.200.3.2.70
```

An example of the output from this command is:

```
CISCO-QNS-MIB::componentCpuUser = INTEGER: 34
CISCO-QNS-MIB::componentCpuUser.0 = INTEGER: 34
CISCO-QNS-MIB::componentCpuSystem = INTEGER: 3
CISCO-QNS-MIB::componentCpuSystem.0 = INTEGER: 3
CISCO-QNS-MIB::componentCpuIdle = INTEGER: 61
CISCO-QNS-MIB::componentCpuIdle.0 = INTEGER: 61
CISCO-QNS-MIB::componentLoadAverage1 = INTEGER: 102
CISCO-QNS-MIB::componentLoadAverage1.0 = INTEGER: 102
CISCO-QNS-MIB::componentLoadAverage5 = INTEGER: 101
CISCO-QNS-MIB::componentLoadAverage5.0 = INTEGER: 101
CISCO-QNS-MIB::componentLoadAverage15 = INTEGER: 109
CISCO-QNS-MIB::componentLoadAverage15.0 = INTEGER: 109
CISCO-QNS-MIB::componentMemoryTotal = INTEGER: 12198308
CISCO-QNS-MIB::componentMemoryTotal.0 = INTEGER: 12198308
CISCO-QNS-MIB::componentMemoryAvailable = INTEGER: 4518292
CISCO-QNS-MIB::componentMemoryAvailable.0 = INTEGER: 4518292
CISCO-QNS-MIB::componentSwapTotal = INTEGER: 0
CISCO-QNS-MIB::componentSwapTotal.0 = INTEGER: 0
CISCO-QNS-MIB::componentSwapAvailable = INTEGER: 0
CISCO-QNS-MIB::componentSwapAvailable.0 = INTEGER: 0
```

For SNMPv3

```
snmpwalk -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -A Cisco-12345 -x AES -X
Cisco-12345 -l
authPriv -M /etc/snmp/mibs:/usr/share/snmp/mibs -m +BROADHOP-MIB:CISCO-QNS-MIB pcrfclient01
.1.3.6.1.4.1.26878.200.3.2.70.1
snmpget -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -A Cisco-12345 -x AES -X Cisco-12345
 -l
authPriv -M /etc/snmp/mibs:/usr/share/snmp/mibs -m +BROADHOP-MIB:CISCO-QNS-MIB pcrfclient01
.1.3.6.1.4.1.26878.200.3.2.70.1.2.0
```

Application KPI

Application KPI can be obtained on a per statistic basis with snmpget in a manner much like obtaining Component Statistics. As an example to get the aggregate number of sessions currently active on qns01 use the following commands:

For SNMPv2

```
snmpget -v 2c -c broadhop -M /etc/snmp/mibs:/usr/share/mibs -m +BROADHOP-MIB:CISCO-QNS-MIB
 qns01
.1.3.6.1.4.1.26878.200.3.3.70.15.24
```

An example of the output from this command would be:

```
iso.3.6.1.4.1.26878.200.3.3.70.15.24 = STRING: "0"
```

Interpreting this output means that 0 sessions are active on qns01.

Similarly, all available KPI in an MIB node can be "walked" via the snmpwalk command. This is very similar to snmpget as above. As an example, to see all statistics on qns01, use the following command:

```
snmpwalk -v 2c -c broadhop -M /etc/snmp/mibs:/usr/share/mibs -m +BROADHOP-MIB:CISCO-QNS-MIB
 qns01
.1.3.6.1.4.1.26878.200.3.3.70.15
```

An example of the output from this command would be:

```
iso.3.6.1.4.1.26878.200.3.3.70.15.20 = STRING: "0"
iso.3.6.1.4.1.26878.200.3.3.70.15.20.0 = STRING: "0"
iso.3.6.1.4.1.26878.200.3.3.70.15.21 = STRING: "0"
iso.3.6.1.4.1.26878.200.3.3.70.15.21.0 = STRING: "0"
iso.3.6.1.4.1.26878.200.3.3.70.15.22 = STRING: "0"
iso.3.6.1.4.1.26878.200.3.3.70.15.22.0 = STRING: "0"
iso.3.6.1.4.1.26878.200.3.3.70.15.23 = STRING: "0"
iso.3.6.1.4.1.26878.200.3.3.70.15.23.0 = STRING: "0"
iso.3.6.1.4.1.26878.200.3.3.70.15.24 = STRING: "0"
iso.3.6.1.4.1.26878.200.3.3.70.15.24.0 = STRING: "0"
iso.3.6.1.4.1.26878.200.3.3.70.15.25 = STRING: "1434914488"
iso.3.6.1.4.1.26878.200.3.3.70.15.25.0 = STRING: "1434914488"
```

For SNMPv3

```
snmpwalk -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -A Cisco-12345 -x AES -X
Cisco-12345 -l
authPriv -M /etc/snmp/mibs:/usr/share/mibs -m +BROADHOP-MIB:CISCO-QNS-MIB qns01
.1.3.6.1.4.1.26878.200.3.3.70
snmpget -e 0x0102030405060708 -v 3 -u cisco_snmpv3 -a SHA -A Cisco-12345 -x AES -X Cisco-12345
 -l
authPriv -M /etc/snmp/mibs:/usr/share/mibs -m +BROADHOP-MIB:CISCO-QNS-MIB qns01
.1.3.6.1.4.1.26878.200.3.3.70.15.25.0
```

Alarm Notifications/Traps

Testing and validating alarms notifications requires slightly more skill than testing SNMP gets and walks. Recall that the overall architecture is that all components and applications in the CPS system are configured to send notifications to lb01 or lb02 via lbvip02, the Internal Network IP.

These systems log the notification locally in `/var/log/snmp/trap` and then "re-throw" the notification to the destination configured by corporate_nms_ip. Two testing and troubleshooting methods can be performed: confirming notifications are being sent properly from system components to lb01 or lb02, and confirming that notifications can be sent upstream to the NMS.

Testing Individual Traps

Chapter 1 in the *CPS Troubleshooting Guide* includes procedures to test each CPS trap individually.

Troubleshooting

Note For information about troubleshooting SNMP notifications and traps, refer to *Cisco Policy Suite Troubleshooting Guide*.

The scenarios mentioned in the following sections are applicable only for Application notifications.

Here are some scenarios:

Why the clear notifications come from different sources that the alert notification sent out from?

A: In case of alarms, CPS supports high availability by running the monitoring scripts on both the pcrfclient01 and pcrfclient02. To illustrate this point here is a sample output from pcrfclient01 and pcrfclient02.

pcrfclient01:

```
[root@pcrfclient01 ~]# monsum
The Monit daemon 5.17.1 uptime: 6h 6m

Process 'whisper'                   Running
Process 'snmpd'                     Running
Program 'kpi_trap'                  Status ok
Program 'db_trap'                   Status ok
Program 'failover_trap'             Status ok
Program 'qps_process_trap'          Status ok
Program 'admin_login_trap'          Status ok
Program 'vm_trap'                   Status ok
Program 'qps_message_trap'          Status ok
Program 'ldap_message_trap'         Status ok
```

pcrfclient02:

```
[root@pcrfclient02 ~]# monsum
The Monit daemon 5.17.1 uptime: 5h 47m

Process 'whisper'                   Running
Process 'snmpd'                     Running
Program 'kpi_trap'                  Status ok
Program 'db_trap'                   Status ok
Program 'failover_trap'             Status ok
Program 'qps_process_trap'          Status ok
Program 'admin_login_trap'          Status ok
Program 'vm_trap'                   Status ok
Program 'qps_message_trap'          Status ok
Program 'ldap_message_trap'         Status ok
```

- The monitoring scripts are responsible for detecting conditions that can lead to raising or clearing a trap.
- Once a condition that can lead to an alarm is detected by both the pcrfclients, both pcrfclient01 & pcrfclient02 individually raise an event towards HA-Proxy.
- The HA-Proxy forwards both the events to the Fault Management System(**FMS**).
- The FMS raises a trap for the first event it receives and discards the second event.
- When pcrfclient01 raises an alert, it is because the event sent by pcrfclient01 reaches the FMS first. Event sent by pcrfclient02 is ignored by FMS.

- When pcrfclient02 clears an alarm, it is because the corresponding event sent by the pcrfclient02 reaches the FMS first. Event sent by pcrfclient01 is ignored by FMS.

How to match alarm and clear for the same event, from different sources?

A: Every Alarms/Clear generated from CPS system has the following varbinds:

- **broadhopComponentName:** The broadhopComponentName object is used to provide the name of the individual system device being trapped.
- **broadhopComponentTime:** The broadhopComponentTime object is used to provide the date and time associated with the occurrence of the problem being trapped.
- **broadhopComponentNotificationName:** The broadhopComponentNotificationName object is used to provide the name of the notification.
- **broadhopNotificationFacility:** This object determines the facility or layer which notifications are sourced.
- **broadhopNotificationSeverity:** This object determines the severity or level of sourced notifications.
- **broadhopComponentAdditionalInfo:** This object is used to provide any additional information about the problem being trapped.

To match the alarm and clear from different host, user can use the following field information:

- broadhopComponentNotificationName
- broadhopNotificationSeverity
- broadhopComponentAdditionalInfo

Note Ignore the text before the first colon (:) from the additional info field.

Host Independent Alarms: Alarm and clear can come from different host.

- All DB Member of replica set Up
- All DB Member of replica set Down
- Primary DB Member Found
- No Primary DB Member Found
- VirtualInterface Up (External VIPs)
- VirtualInterface Down
- VirtualInterfaceDown (Internal VIPs)
- VirtualInterfaceUp
- License Usage Threshold Exceeded
- LicensedSessionCreation
- InvalidLicense

- PolicyConfiguration
- PoliciesNotConfigured
- DiameterAllPeersDown
- ZeroMQConnectionError
- DeveloperMode

How to match if alarm and clears coming from same source?

A: To match the alarm and clear from same host, user can use the following field information:

- broadhopComponentNotificationName
- broadhopNotificationSeverity
- broadhopComponentAdditionalInfo
- broadhopComponentName

Host Dependent Alarms: Alarm and clear come from the same host.

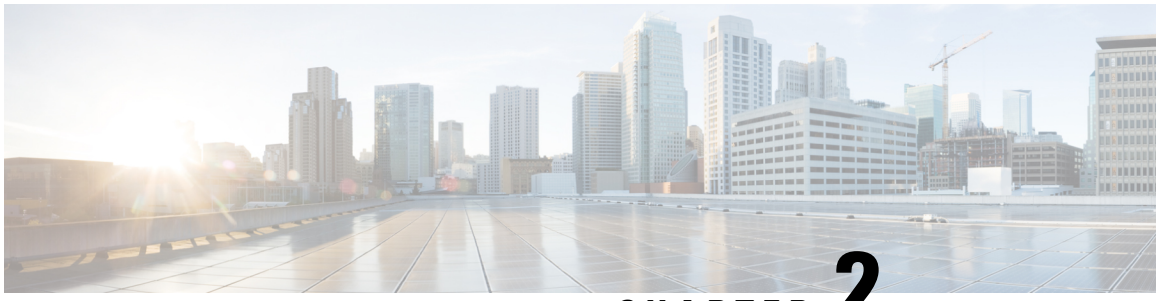
- DB Member Up
- DB Member Down
- Arbiter Up
- Arbiter Down
- Config Server Up
- Config Server Down
- DB Resync is not needed
- DB Resync is needed
- QNS Process Up
- QNS Process Down
- VM Up
- VM Down
- Site Up
- Site Down
- LDAPAllPeersDown
- LDAPPeerDown
- Percentage of LDAP retry threshold Exceeded
- Percentage of LDAP retry threshold Normal
- LDAP Requests as percentage of CCR-I Dropped

- LDAP Requests as percentage of CCR-I Normal
- LDAP Requests Dropped
- LDAP Requests Normal
- LDAP Query Result Dropped
- LDAP Query Result Normal
- Gx Message processing Dropped
- Gx Message processing Normal
- Gx Average Message processing Dropped
- Gx Average Message processing Normal
- All SMSC server connections are down
- Atleast one SMSC server connection is up
- SMSC server connection down
- SMSC server connection up
- All Email servers not reachable
- At least one Email server is reachable
- Email server is not reachable
- Email server is reachable
- MemcachedConnectError
- ApplicationStartError
- DiameterPeerDown
- DiameterStackNotStarted

Information Alarm (Alarms without clear indication)

There are no clear trap for the following alarms:

- HA Failover
- GR Failover
- Admin User Logged in
- Critical File Operation Alert



CHAPTER 2

Clearing Procedures

- Component Notifications, on page 57
- Application Notifications, on page 60

Component Notifications

The following table provides the information related to clearing procedures for component notifications:

Table 12: Component Notifications - Clearing Procedures

Notification Name	Clearing Procedure
DiskFull	**1.** Login to VM on which the alarm has generated. **2.** Check the disk space for the file system on which alarm has generated. `df -k` **3.** Check what all files are using large disk space on file system and delete some unnecessary files to make free space on disk so that the alarm gets cleared. **4.** After removing some files if the size of disk is still more than the configured threshold value and you are not able to remove any more files then consider the option of adding more disk to the VM(s) or contact your Cisco technical representative to look into the issue.

Notification Name	Clearing Procedure

LowSwap	This alarm gets generated whenever available swap memory on the VM is lower than the configure threshold value.
	1. Login to VM for which alarms has generated.
	2. Check the threshold value configured for swap memory.
	`vi /etc/snmp/snmpd.conf`
	Search for the word “swap” in `snmpd.conf` file.
	3. You can check the available free swap memory on the VM by executing the following command:
	`free -m`
	If the available free swap memory is lower than the threshold value then check for the process which takes lots of swap memory by executing the following command:
	For file in `/proc/*/status`; do
	`awk '/VmSwap|Name/{printf $2 " " $3}END{ print ""}' $file; done | sort -k 2 -n -r | less`
	4. Get the output of above command and contact your Cisco technical representative to look into the issue.

HighLoad	This alarm gets generated for load average of 1, 5,15 minutes, whenever load average of the system is more than the configure threshold value the alarm gets generated.
	1. Login to VM for which the alarm has generated.
	2. Check the configure threshold value for the load average in `/etc/snmp/snmpd.conf` file.
	`vi /etc/snmp/snmpd.conf`
	Search for the word “load” in `snmpd.conf` file.
	3. Check the current load average on the system by executing top command.
	4. If the found load average is higher than the configured threshold value, then execute the following command to get the process list currently using CPU.
	`ps aux | sort -rk 3,3 | head -n 6`
	and contact your Cisco technical representative to look into the issue.

Notification Name	Clearing Procedure

LinkDown	This alarm gets generated for all physical interface attached to the system.
	1. Login to VM from where the trap has generated.
	2. Check the status of interface by executing `ifconfig` command.
	3. If the interface found is Down then bring it Up by executing the following command:
	`ifconfig <inf_name> up`
	`service network restart`
	4. If the interface is still not Up, check for IP address assigned to it and errors if thrown any.
	5. Get the solution for the error found in above steps and restart the network service.
	6. If the problem still persist contact your Cisco technical representative to look into the issue.

LowMemory	This alarm gets generated whenever allocated RAM on the VM is higher than the configure higher threshold value.
	1. Login to VM for which alarms has generated.
	2. Check the higher and lower threshold value configured for memory:
	`vi /etc/facter/facts.d/qps_facts.txt`
	Search for the following text:
	• free_mem_per_alert
	• free_mem_per_clear
	3. You can check the available free memory on the VM by executing the following command:
	`free -m`
	If the available free memory is lower than the clear threshold value then check for the process which takes lots of memory in top command output.
	4. Get the output of the following command:
	`ps -eo pmem,pcpu,vsize,pid,cmd | sort -k 1 -nr | head -5`
	and contact your Cisco technical representative to look into the issue.

Notification Name	Clearing Procedure

ProcessDown	This alarm is generated when the corosync process is stopped or fails.
	1. Login to the Policy Director (load balancer) VM from which the alarm has generated.
	2. Check the status of corosync process by executing the following command:
	`monit status corosync`
	3. If status is Down then start the process by executing the following command:
	`monit start corosync`

HIGH CPU USAGE Alert	This trap is generated whenever CPU usage on the VM is more than the higher threshold value.
	1. Login to VM for which the trap has generated.
	2. Check the higher and lower threshold value configured for CPU.
	`vi /etc/facter/facts.d/qps_facts.txt`
	Search for the following text:
	• cpu_usage_alert_threshold
	• cpu_usage_clear_threshold
	3. The CPU usage is calculated as a sum of 9th column value of top command output/no. of vCPU present on the VM.
	If the CPU usage is more than the clear threshold value then check for the process which takes lots of CPU cycle from the top command output.
	4. Get the output of the following command:
	`ps aux | sort -rk 3,3 | head -n 6`
	and contact your Cisco technical representative to look into the issue.

Critical File Operation Alert	This trap is generated when critical files configured in `CriticalFiles.csv` on VMware and `critFileMonConfig:` section in OpenStack gets modified. Event ID: 7400; Sub-event ID: 7403 This is a notification alarm so clearing procedure is not required.

Application Notifications

The following section provides the information related to clearing procedures for application notifications:

License

- LMGRD related:

- **License Usage Threshold Exceeded**: This alarm is generated when the current number of session usage exceeds the **License Usage Threshold Percentage** value configured in the Policy Builder under **Reference Data** > **Fault List**. CPS Alarm/Trap message contains the following key words:

  "InterfaceID=" this keyword indicates the threshold value.

  "severity=" this keyword indicates severity associated to the threshold. The severity value includes:

  - CRITICAL
  - ERROR
  - NOTICE
  - WARNING

  Alarm Code: 1111 - LICENSE_THRESHOLD

  Table 13: License Usage Threshold Exceeded

Possible Cause	Corrective Action
The current number of session usage exceeds the **License Usage Threshold Percentage** value.	Option 1: Purchase a license file having larger licensed session number. Option 2: Adjust **License Usage Threshold Percentage** value configured in Policy Builder.

- **LicenseSessionCreation**: This alarm is generated when CPS does not allow new CPS session to be created.

  Alarm Code: 1104 - ERROR_SESSION_CREATION

  Table 14: LicenseSessionCreation

Possible Cause	Corrective Action
CPS is running in Developer mode and the current number of session usage is > 100.	Clear 'DeveloperMode' flag to annotate the following to make sure the consistency: 1. Remove the following line from the `/etc/broadhop/qns.conf` file: `-Dcom.broadhop.developer.mode=true.` 2. Purchase and use a license file. 3. Restart the Policy Server (QNS) process.

Possible Cause	Corrective Action
CPS "CORE" license related error: • CPS "CORE" is NOT licensed: MOBILE_CORE, FIXED_CORE or SP_CORE license is NOT found. • CPS "CORE" is licensed but the licensed session count is not set. • CPS "CORE" license date already expired. • Current session count is >= CPS "CORE" licensed session count.	1. Add CPS "CORE" license to `/etc/broadhop/license/features.properties` file. 2. Purchase a license containing CPS "CORE". 3. Purchase a license containing CPS "CORE" and larger licensed session count. 4. Make sure that the `license.lic` file contains valid CPS "CORE" expiry date.

- **InvalidLicense**: This alarm is generated when CPS license has an error. The error could be any of the followings:

  1. Core license related: CPS "Core" license error.
  2. Feature license related: CPS "Feature" license error.

  CPS Alarm/Trap message format:

  "InterfaceID=" keyword indicates the license name.

  "license_state=" keywork indicates license state.

  CPS defined license sate includes:

  - UNVERIFIED
  - INVALID
  - EXPIRED
  - EXPIRE_WARN
  - RATE_LIMITED
  - RATE_LIMIT_WARN

  Alarm Code: 1110 - ERROR_LICENSE

Table 15: InvalidLicense

Possible Cause	Corrective Action
CPS "CORE" license related error: • license_state="INVALID": CPS "CORE" is NOT licensed: MOBILE_CORE, FIXED_CORE or SP_CORE license is NOT found. CPS "CORE" is licensed but the licensed session count is not set. • license_state="EXPIRED": CPS "CORE" license date already expired. • license_state="RATE_LIMITED": Current number of session usage is > CPS "CORE" licensed session count. • license_state="RATE_LIMIT_WARN": Current number of session usage is approaching the maximum allowed. The defined maximum ratio is 80% of the licensed count. • license_state="EXPIRE_WARN": CPS "CORE" license will expire at CPS EXPIRY DATE. The defined expire date warning interval is 30 days from the expiration date.	If the message contains "InterfaceID=core", this error is related to CPS "CORE". Take the corrective action based on the "license_state=" in the message: • license_state=INVALID": CPS "CORE" is NOT licensed: MOBILE_CORE, FIXED_CORE or SP_CORE license is NOT found. Corrective action: Make sure CPS "CORE" is specified in `features.properties` file and is licensed as contained in `.lic` file. CPS "CORE" is licensed but the licensed session count is not set. Corrective action: Make sure CPS "CORE" has valid licensed session count in `.lic` file. • license_state="RATE_LIMITED": Current number of session usage is > CPS "CORE" licensed session count. Corrective action: Purchase a larger licensed session count in `.lic` file. • license_state="EXPIRED": CPS "CORE" license date already expired. Corrective action: Make sure that CPS "CORE" expiry date has not expired in `.lic` file. • license_state="RATE_LIMIT_WARN": Current number of session usage is approaching the maximum allowed limit. Corrective action: Purchase a larger licensed session count in `.lic` file. • license_state="EXPIRE_WARN": CPS "CORE" license will expire at: CORE license expiry date. Corrective action: Make sure CPS "CORE" expiry date is not approaching the defined expiry interval - 30 days in `.lic` file.

Possible Cause	Corrective Action
CPS "feature" license related error: • license_state="INVALID": CPS FeatureLicenseManager does not provide a name Or CPS feature is not licensed. • license_state="EXPIRED": CPS feature license date already expired. • license_state="RATE_LIMITED": Feature current number of session usage is > CPS "CORE" licensed session count. • license_state="EXPIRE_WARN": CPS feature license will expire at: feature license expiry date. CPS defined expire date warning interval is 30 days from the expiration date.	The message "InterfaceID=" indicate which CPS "feature"has license related error: • license_state="INVALID": CPS FeatureLicenseManager does not provide a name OR CPS feature is not licensed. Corrective action: Make sure CPS "Feature" is specified in `features.properties` file and is licensed as contained in `.lic` file. • license_state="EXPIRED": CPS feature license date already expired. Corrective action: Make sure that CPS "Feature" expiry date has not expired in `.lic` file • license_state="RATE_LIMITED": Current number of session usage is > CPS "CORE" licensed session count. Corrective action: Create a larger CPS "CORE" licensed session count in `.lic` file. • license_state="EXPIRE_WARN": CPS feature license will expire at: feature license expiry date. CPS defined expiry date warning interval is 30 days from the expiration date. Corrective action: Make sure CPS "Feature" expiry date is not approaching the CPS defined expiry interval - 30 days in `.lic` file.

- **DeveloperMode**: This alarm is generated when CPS is running in DeveloperMode. CPS keeps reminding the user that system is running in Developer Mode and instructs on how to clear the Developer Mode. CPS is running in Deveoper Mode, number of concurrent session is limited to 100.

  Alarm/Trap message: Using Developer mode (100 session limit). To use a license file, remove `-Dcom.broadhop.developer.mode` from `/etc/broadhop/qns.conf` file.

  Alarm Code: 1105 - ERROR_DEVELOPER_MODE

Table 16: DeveloperMode

Possible Cause	Corrective Action
CPS is running in Developer mode and current number of session usage is <= 100.	Clear 'DeveloperMode' flag to annotate the following to make sure the consistency: 1. Remove the following line from the `/etc/broadhop/qns.conf` file: `-Dcom.broadhop.developer.mode=true.` 2. Purchase and use a license file. 3. Restart the Policy Server (QNS) process. 4. Within 5 minutes of interval, verify the generated alarm on NMS server and `/var/log/snmp/trap` of active Policy Director (load balancer).

- Smart Licensing related:
  - **License Usage Threshold Exceeded**: This alarm is generated when the current number of session usage exceeds the **License Usage Threshold Percentage** value configured in the Policy Builder under **Reference Data** > **Fault List**. CPS Alarm/Trap message contains the following key words:

    "InterfaceID=" this keyword indicates the threshold value.

    "severity=" this keywod indicates severity associated to the threshold. The severity value includes:

    - CRITICAL
    - ERROR
    - NOTICE
    - WARNING

    Alarm Code: 1111 - LICENSE_THRESHOLD

    Table 17: License Usage Threshold Exceeded

Possible Cause	Corrective Action
The current number of session usage exceeds the **License Usage Threshold Percentage** value.	Option 1: Purchase more license session count. Option 2: Adjust **License Usage Threshold Percentage** value configured in Policy Builder.

  - **LicenseSessionCreation**: This alarm is generated when CPS does not allow new CPS session to be created.

    Alarm Code: 1104 - ERROR_SESSION_CREATION

Table 18: LicenseSessionCreation

Possible Cause	Corrective Action
• CPS "CORE" is not defined in `features.properties` file. • CPS license 90 days evaluation period timeout.	1. Add CPS "CORE" license to `/etc/broadhop/license_sl_conf/features.properties` file. 2. Purchase licenses as CPS evaluation 90 days period timeout already.

- **InvalidLicense**: This alarm is generated when CPS license status is not VALID. The error could be any of the followings:

  1. Core license related: CPS "Core" license error.
  2. Feature license related: CPS "Feature" license error.

  CPS Alarm/Trap message format:

  "InterfaceID=" keyword indicates the license name.

  "license_state=" keywork indicates license state.

  CPS defined license sate includes:

  - UNVERIFIED
  - INVALID
  - RATE_LIMITED (OutOfCompliance)
  - EVAL_EXPIRED

  Alarm Code: 1110 - ERROR_LICENSE

Table 19: InvalidLicense

Possible Cause	Corrective Action
CPS "CORE" license related error: • license_state="INVALID": CPS "CORE" is NOT licensed: MOBILE_CORE, FIXED_CORE or SP_CORE license is NOT found. CPS "CORE" is licensed but the licensed session count is not set. • OutOfCompliance - license_state="RATE_LIMITED": CPS current number of session usage is > CPS "CORE" licensed session count.	If the message contains "InterfaceID=core", this error is related to CPS "CORE". Take the corrective action based on the "license_state=" in the message: • license_state=INVALID": CPS "CORE" is NOT licensed: MOBILE_CORE, FIXED_CORE or SP_CORE license is NOT found. Corrective action: Make sure CPS "CORE" is specified in `features.properties` file and is licensed as contained in `.lic` file. CPS "CORE" is licensed but the licensed session count is not set. Corrective action: Make sure CPS "CORE" has valid licensed session count in `.lic` file. • OutOfCompliance - license_state="RATE_LIMITED": CPS current number of session usage is > CPS "CORE" licensed session count. Corrective action: Purchase a larger licensed session count in .lic file. • license_state="EVAL_EXPIRED": CPS 90 days evaluation period timeout already. Corrective action: Purchase licenses as 90 days evaluation period has finished.
CPS "feature" license related error: • license_state="INVALID": CPS FeatureLicenseManager does not provide a name or CPS feature is not licensed. • OutOfCompliance - license_state="RATE_LIMITED": CPS feature current number of session usage is > CPS "CORE" licensed session count.	The message "InterfaceID=" indicate which CPS "feature"has license related error: • license_state="INVALID": CPS FeatureLicenseManager does not provide a name or CPS feature is not licensed. Corrective action: Make sure CPS "Feature" is specified in `features.properties` file and is licensed as contained in `.lic` file. • OutOfCompliance - license_state="RATE_LIMITED": CPS feature current number of session usage is > CPS "CORE" licensed session count. Corrective action: Purchase more license to support the required sessions.

- **DeveloperMode**: This alarm is generated when CPS is running in DeveloperMode. CPS keeps reminding the user that system is running in Developer Mode and instructs on how to clear the Developer Mode. CPS is running in Deveoper Mode, number of concurrent session is limited to 100.

  Alarm/Trap message: Using Developer mode (100 session limit). To use a license file, remove `-Dcom.broadhop.developer.mode` from `/etc/broadhop/qns.conf` file.

  Alarm Code: 1105 - ERROR_DEVELOPER_MODE

  Table 20: DeveloperMode

Possible Cause	Corrective Action
CPS allows new session to be created. CPS is running in DeveloperMode and CPS current session usage is <= 100. **Message**: Using Developer mode (100 session limit). To use a license file, remove `-Dcom.broadhop.developer.mode` from `/etc/broadhop/qns.conf` file.	Clear 'DeveloperMode' flag to annotate the following to make sure the consistency: 1. Remove the following line from the `/etc/broadhop/qns.conf` file: `-Dcom.broadhop.developer.mode=true.` 2. Restart the Policy Server (QNS) process. 3. Within 5 minutes of interval, verify the generated alarm on NMS server and `/var/log/snmp/trap` of active Policy Director (load balancer).

Other Alarms

- **PoliciesNotConfigured**: The alarm is generated when the policy engine cannot find any policies to apply while starting up. This may occur on a new system, but requires immediate resolution for any system services to operate.

  Alarm Code: 1001

  This alarm is generated when server is started or when Publish operation is performed. As indicated by the down status, policy configurations contains error - PB Configurations converted CPS Rules are failed. Message contains the error detail.

  Table 21: PoliciesNotConfigured - 1001

Possible Cause	Corrective Action
This event is raised when exception occurs while converting policies to policy rules. **Message**: 1001 Policies not configured. `Log file is logged with error message Exception stack trace is logged`	Corrective action needs to be taken as per the log message and corresponding configuration error needs to be corrected as mentioned in the logs.

Alarm Code: 1002

This alarm is generated when `diagnostics.sh` runs which provides last success/failure policies message.

The corresponding notification appears when Policy Builder configurations converted CPS rules are failed during validation against "validation-rules".

Corrective action needs to be taken as per the log message and diagnostic result. Corresponding configuration error needs to be corrected as mentioned in the logs and diagnostic result.

Table 22: PoliciesNotConfigured - 1002

Possible Cause	Corrective Action
This event is raised when policy engine is not initialized. **Message**: Last policy configuration failed with the message: `Policy engine is not initialized` Log file is logged with the warning message: `Policy engine is not initialized`	Make sure that policy engine is initialized.
This event occurs when non policy root object exists. **Message**: Last policy configuration failed with the message: `Policy XMI file contains non policy root object` Log file is logged with the error message: `Policy XML file contains non policy root object`.	To add policy root object in Policies.
This event occurs when policy does not contain a root blueprint. **Message**: Last policy configuration failed with the message: `Policy Builder configurations does not have any Policies configured under Policies Tab`. Log file is logged with the error message: `Policy does not contain a root blueprint. Please add one under the policies tab`.	To add configures in Policies tab.

Possible Cause	Corrective Action
The event occurs when configured blueprint is missing. **Message**: Last policy configuration failed with the message: `There is a configured blueprint <configuredBlueprintId> for which the original blueprint is not found <originalBluePrintId>. You are missing software on your server that is installed in Policy Builder.` Log file is logged with the error message: `There is a configured blueprint <configuredBlueprintId> for which the original blueprint is not found <originalBluePrintId>. You are missing software on your server that is installed in Policy Builder.`	Make sure that the blueprints are installed.
This event occurs when error was detected while converting Policy Builder configuration to CPS Rrules when the server restarts or when Publish happens. **Message**: Last policy configuration failed with the message: `exception stack trace`. Log file is logged with the error message: `Exception stack trace is logged.`	Correct policy configuration based on the exception.

- **DiameterPeerDown**: Diameter peer is down.

  Alarm Code: 3001 - DIAMETER_PEER_DOWN

Table 23: DiameterPeerDown

Possible Cause	Corrective Action
In case of a down alarm being generated but no clear alarm being generated, there could be a possibility of the peer actually being down.	Check the status of the Diameter Peer, and if found down, troubleshoot the peer to return it to service.
In case of a down alarm being generated but no clear alarm being generated, there could be a possibility of a network connectivity issue.	Check the status of the Diameter Peer, and if found UP, check the network connectivity between CPS and the Diameter Peer. It should be reachable from both sides.

Possible Cause	Corrective Action
In case of a down alarm getting generated intermittently followed by a clear alarm, there could be a possibility of an intermittent network connectivity issue.	Check the network connectivity between CPS and the Diameter Peer for intermittent issues and troubleshoot the network connection.
In case of an alarm raised after any recent PB configuration change, there may be a possibility of the PB configurations related to the Diameter Peer being accidently not configured correctly.	1. Verify the changes recently made in PB by taking the SVN diff. 2. Review all PB configurations related to the Diameter Peer (port number, realm, and so on) for any incorrect data and errors. 3. Make sure that the application on Diameter Peer is listening on the port configured in PB.

- **DiameterAllPeersDown**: All diameter peer connections configured in a given realm are DOWN (connection lost). The alarm identifies which realm is down. The alarm is cleared when at least one of the peers in that realm is available.

  Alarm Code: 3002 - DIAMETER_ALL_PEERS_DOWN

Table 24: DiameterAllPeersDown

Possible Cause	Corrective Action
In case of a down alarm being generated but no clear alarm being generated, there could be a possibility of all the peer actually being down.	Check the status of each Diameter Peer, and if found down, troubleshoot each peer to return it to service.
In case of a down alarm being generated but no clear alarm being generated, there could be a possibility of a network connectivity issue.	Check the status of the each Diameter Peer, and if found up, check the network connectivity between CPS and each Diameter Peer. It should be reachable from each side.
In case of a down alarm getting generated intermittently followed by a clear alarm, there could be a possibility of an intermittent network connectivity issue.	Check the network connectivity between CPS and the Diameter Peers for intermittent issues and troubleshoot the network connection.
In case of an alarm raised after any recent PB configuration change, there may be a possibility of the PB configurations related to the Diameter Peers being incorrect.	1. Verify the changes recently made in PB by taking the SVN diff. 2. Review all PB configurations related to each peer (port number, realm, and so on) for any incorrect data and errors. 3. Make sure that the application on each Diameter Peer is listening on the port configured in PB.

- **DiameterStackNotStarted**: This alarm is generated when Diameter stack cannot start on a particular policy director (load balancer) due to some configuration issues.

  Alarm Code: 3004 - DIAMETER_STACK_NOT_STARTED

  Table 25: DiameterStackNotStarted

Possible Cause	Corrective Action
In case of a down alarm being generated but no clear alarm being generated, Diameter stack is not configured properly or some configuration is missing.	Check the Policy Builder configuration. Specifically check for local endpoints configuration under Diameter stack. 1. Verify localhost name defined is matching the actual hostname of the policy director (load balancer) VMs. 2. Verify instance number given matches with the policy director instance running on the policy director (load balancer) VM. 3. Verify all the policy director (load balancer) VMs are added in local endpoint configuration.
In case of an alarm raised after a recent PB configuration change, there may be a possibility that the PB configurations related to the Diameter Stack has been accidently misconfigured.	1. Verify the changes recently made in PB by taking the SVN diff. 2. Review all PB configurations related to the Diameter Stack (local hostname, advertise fqdn, and so on) for any incorrect data and errors. 3. Make sure that the application is listening on the port configured in PB in CPS.

- **SMSC server connection down**: SMSC Server is not reachable. This alarm gets generated when any one of the configured active SMSC server endpoints is not reachable and CPS will not be able to deliver a SMS via that SMSC server.

  Alarm Code: 5001 - SMSC_SERVER_CONNECTION_STATUS

  Table 26: SMSC server connection down

Possible Cause	Corrective Action
In case of a down alarm being generated but no clear alarm being generated, there could be a possibility of the SMSC Server actually being down.	Check the status of the SMSC Server, and if found down, troubleshoot the server to return it to service.
In case of a down alarm being generated but no clear alarm being generated, there could be a possibility of a network connectivity issue.	Check the status of the SMSC Server, and if found up, check the network connectivity between CPS and the Server. It should be reachable from both sides.

Possible Cause	Corrective Action
In case of a down alarm getting generated intermittently followed by a clear alarm, there could be a possibility of an intermittent network connectivity issue.	Check the network connectivity between CPS and the SMSC Server for intermittent issues and troubleshoot the network connection.
In case of an alarm raised after any recent PB configuration change, there may be a possibility of the PB configurations related to the SMSC Server being incorrect.	1. Verify the changes recently made in PB by taking the SVN diff. 2. Review all PB configurations related to SMSC Server (port number, realm, and so on) for any incorrect data and errors. 3. Make sure that the application on SMSC Server is listening on the port configured in PB.

- **All SMSC server connections are down**: None of the SMSC servers configured are reachable. This Critical Alarm gets generated when the SMSC Server endpoints are not available to submit SMS messages thereby blocking SMS from being sent from CPS.

  Alarm Code: 5002 - ALL_SMSC_SERVER_CONNECTION_STATUS

  Table 27: All SMSC server connections are down

Possible Cause	Corrective Action
In case of a down alarm being generated but no clear alarm being generated, there could be a possibility of all the SMSC Servers actually being down.	Check the status of each SMSC Server, and if found down, troubleshoot the servers to return them to service.
In case of a down alarm being generated but no clear alarm being generated, there could be a possibility of a network connectivity issue.	Check the status of each SMSC Server, and if found up, check the network connectivity between CPS and each SMSC Server. It should be reachable from each side.
In case of a down alarm getting generated intermittently followed by a clear alarm, there could be a possibility of an intermittent network connectivity issue.	Check the network connectivity between CPS and the SMSC Servers for intermittent issues and troubleshoot the network connection.
In case of an alarm raised after any recent PB configuration change, there may be a possibility of the PB configurations related to the SMSC Servers being incorrect.	1. Verify the changes recently made in PB by taking the SVN diff. 2. Review all PB configurations related to SMSC Servers (port number, realm, and so on) for any incorrect data and errors. 3. Make sure that the application on each SMSC Server is listening on the respective port configured in PB.

- **Email Server not reachable**: Email server is not reachable. This alarm gets generated when any of the configured Email Server Endpoints are not reachable. CPS will not be able to use the server to send emails.

  Alarm Code: 5003 - EMAIL_SERVER_STATUS

  Table 28: Email server is not reachable

Possible Cause	Corrective Action
In case of a down alarm being generated but no clear alarm being generated, there could be a possibility of the Email Server actually being down.	Check the status of the Email Server, and if found down, troubleshoot the server to return it to service.
In case of a down alarm being generated but no clear alarm being generated, there could be a possibility of a network connectivity issue.	Check the status of Email Server, and if found up, check the network connectivity between CPS and the Email Server. It should be reachable from both sides.
In case of a down alarm getting generated intermittently followed by a clear alarm, there could be a possibility of an intermittent network connectivity issue.	Check the network connectivity between CPS and the Email Server for intermittent issues and troubleshoot the network connection.
In case of an alarm raised after any recent PB configuration change, there may be a possibility of the PB configurations related to the Email Server being incorrect.	**1.** Verify the changes recently made in PB by taking the SVN diff. **2.** Review all PB configurations related to Email Server (port number, realm, and so on) for any incorrect data and errors. **3.** Make sure that the application on Email Server is listening on the port configured in PB.

- **All Email servers not reachable**: No email server is reachable. This alarm (Critical) gets generated when all configured Email Server Endpoints are not reachable, blocking emails from being sent from CPS.

  Alarm Code: 5004 - ALL_EMAIL_SERVER_STATUS

  Table 29: All Email servers not reachable

Possible Cause	Corrective Action
In case of a down alarm being generated but no clear alarm being generated, there could be a possibility of all the Email Servers actually being down.	Check the status of each Email Server, and if found down, troubleshoot the server to return it to service.
In case of a down alarm being generated but no clear alarm being generated, there could be a possibility of a network connectivity issue.	Check the status of the each Email Server, and if found up, check the network connectivity between CPS and each Email Server. It should be reachable from each side.

Possible Cause	Corrective Action
In case of a down alarm getting generated intermittently followed by a clear alarm, there could be a possibility of an intermittent network connectivity issue.	Check the network connectivity between CPS and the Email Servers for intermittent issues and troubleshoot the network connection.
In case of an alarm raised after any recent PB configuration change, there may be a possibility of the PB configurations related to the Email Servers being incorrect.	1. Verify the changes recently made in PB by taking the SVN diff. 2. Review all PB configurations related to Email Servers (port number, realm, and so on) for any incorrect data and errors. 3. Make sure that the application on each Email Server is listening on the respective port configured in Policy Builder.

- **MemcachedConnectError**: This alarm is generated if attempting to connect to or write to the memcached server causes an exception.

  Alarm Code: 1102 - MEMCACHED_CONNECT_ERROR

Table 30: MemcachedConnectError

Possible Cause	Corrective Action
The memcached process is down on lbvip02.	Check the memcached process on lbvip02. If the process is stopped, start the process using the command `monit start memcached` assuming the monit service is already started.
The Policy Server VMs fail to reach/connect to lbvip02 or lbvip02:11211.	Check for connectivity issues from Policy Server (QNS) to lbvip02 using `ping`/`telnet` command. If the network connectivity issue is found, fix the connectivity.
The test operation to check memcached server timed out. This can happen if the memcached server is slow to respond/network delays OR if the application pauses due to GC. If the error is due to application pause due to GC, it will mostly get resolved when the next diagnostics is run.	1. Check the parameter `-DmemcacheClientTimeout` in `qns.conf` file. If the parameter is not present, the default timeout is 50 ms. So if the application pause is >= 50 ms, this issue can be seen. The pause can be monitored in `service-qns-x.log` file. The error should subside in the next diagnostics run if it was due to application GC pause. 2. Check for network delays for RTT from Policy Server to lbvip02.

Possible Cause	Corrective Action
The test operation to check memcached server health failed with exception.	Check the exception message and if an exception is caused, during that time only, the diagnostics for memcached should pass in the next run. Check if the memcached process is up on lbvip02. Also check for network connectivity issues.

- **ZeroMQConnectionError**: Internal services cannot connect to a required Java ZeroMQ queue. Although retry logic and recovery is available, and core system functions should continue, investigate and remedy the root cause.

  Alarm Code: 3501 - ZEROMQ_CONNECTION_ERROR

  Table 31: ZeroMQConnectionError

Possible Cause	Corrective Action

Internal services cannot connect to a required Java ZeroMQ queue. Although retry logic and recovery is available, and core system functions should continue, investigate and remedy the root cause.	1. Login to the IP mentioned in the alarm and check if the Policy Server (QNS) process is up on that VM. If it is not up, start the process.
	2. Login to the IP mentioned in the alarm and check if the port mentioned in the alarm is listening using the `netstat` command).
	`netstat -apn | grep <port>`
	If not, check the Policy Server logs for any errors.
	3. Check if the VM which raised the alarm is able to connect to the mentioned socket using the `telnet` command.
	`telnet <ip> <port>`
	If it is a network issue, fix it.

- **LdapAllPeersDown**: All LDAP peers are down.

  Alarm Code: 1201 - LDAP_ALL_PEERS_DOWN

  Table 32: LdapAllPeersDown

Possible Cause	Corrective Action
All LDAP servers are down.	Check if the external LDAP servers are up and if the LDAP server processes are up. If not, bring the servers and the respective server processes up.
Connectivity issues from the LB to LDAP servers.	Check the connectivity from Policy Director (LB) to LDAP server. Check (using ping/telnet) if LDAP server is reachable from Policy Director (LB) VM. If not, fix the connectivity issues.

- **LdapPeerDown**: LDAP peer identified by the IP address is down.

  Alarm Code: 1202 - LDAP_PEER_DOWN

  Table 33: LdapPeerDown

Possible Cause	Corrective Action
The mentioned LDAP server in the alarm message is down.	Check if the mentioned external LDAP server is up and if the LDAP server process is up on that server. If not, bring the server and the server processes up.
Connectivity issues from the Policy Director (LB) to the mentioned LDAP server address in the alarm.	Check the connectivity from Policy Director (LB) to mentioned LDAP server. Check (using ping/telnet) if LDAP server is reachable from Policy Director (LB) VM. If not, fix the connectivity issues.

- **ApplicationStartError**: This alarm is generated if an installed feature cannot start.

  Alarm Code: 1103

  Table 34: ApplicationStartError

Possible Cause	Corrective Action
This alarm is generated if installed feature cannot start.	1. Check which images are installed on which CPS hosts by reading `/var/qps/images/image-map`. 2. Check which features are part of which images by reading `/etc/broadhop/<image-name>/features` file. **Note** A feature which cannot start must be in at least one of images. 3. Check if feature which cannot start has its jar in compressed image archive of all images found in above steps. 4. If jar is missing contact Cisco support for required feature. If jar is present, collect logs from `/var/log/broadhop` on VM where feature cannot start for further analysis.

- **VirtualInterface Down**: This alarm is generated when the internal Policy Director (LB) VIP virtual interface does not respond to a ping.

  Alarm Code: 7405

Table 35: VirtualInterface Down

Possible Cause	Corrective Action
This alarm is generated when the internal Policy Director (LB) VIP virtual interface does not respond to a ping. Corosync detects this and moves the VIP interface to another Policy Director (LB). The alarm then clears when the other node takes over and a ViritualInterface Up trap is sent.	No action is required since the alarm is cleared automatically as long as a working Policy Director (LB) node gets the VIP address.
This alarm is generated when the internal Policy Director (LB) VIP virtual interface does not respond to a ping and selection of a new VIP hosts fails.	1. Run `diagnostics.sh` on Cluster Manager as root user to check for any failures on the Policy Director (LB) nodes.. 2. Make sure that both policy director nodes are running. If problems are noted, refer to *CPS Troubleshooting Guide* for further steps required to restore policy director node function problem. 3. After all the policy directors are up, if the trap still does not clear, restart corosync on all policy directors using the `monit restart corosync` command.

- **VM Down**: This alarm is generated when the administrator is not able to ping the VM.

  Alarm Code: 7401

Table 36: VM Down

Possible Cause	Corrective Action
This alarm is generated when a VM listed in the `/etc/hosts` does not respond to a ping.	1. Run `diagnostics.sh` on Cluster Manager as root user to check for any failures. 2. For all VMs with FAIL, refer to *CPS Troubleshooting Guide* for further steps required to restore the VM function.

- **No Primary DB Member Found**: This alarm is generated when the system is unable to find primary member for the replica-set.

  Alarm Code: 7101

Table 37: No Primary DB Member Found

Possible Cause	Corrective Action
This alarm is generated during mongo failover or when majority of replica-set members are not available.	**1.** Login to pcrfclient01/02 VM and verify the replica-set status `diagnostics.sh --get_replica_status` **Note** If a member is shown in an unknown state, it is likely that the member is not accessible from one of other members, mostly an arbiter. In that case, you must go to that member and check its connectivity with other members. Also, you can login to mongo on that member and check its actual status. **2.** If the member is not running start the mongo process on each sessionmgr/arbiter VM For example, `/usr/bin/systemctl start sessionmgr-`*`port`* **Note** Change the port number (*port*) according to your deployment. **3.** Verify the mongo process, if the process does not come UP then verify the mongo logs for further debugging log. For example, `/var/log/mongodb-`*`port`*`.log` **Note** Change the port number (*port*) according to your deployment.

- **Arbiter Down**: This alarm is generated when the arbiter member of the replica-set is not reachable.

  Alarm Code: 7103

Table 38: Arbiter Down

Possible Cause	Corrective Action
This alarm is generate in the event of abrupt failure of arbiter VM and does not come up due to some unspecified reason (In HA - arbiter VM is pcrfclient01/02 and for GR - third site or based on deployment model).	**1.** Login to pcrfclient01/02 VM and verify the replica-set status `diagnostics.sh --get_replica_status` **Note** If a member is shown in an unknown state, it is likely that the member is not accessible from one of other members, mostly an arbiter. In that case, you must go to that member and check its connectivity with other members. Also, you can login to mongo on that member and check its actual status. **2.** Login to arbiter VM for which the alarm has generated. **3.** Check the status of mongo port for which alarm has generated. For example, `ps -ef | grep 27720` **4.** If the member is not running, start the mongo process. For example, `/usr/bin/systemctl start sessionmgr-27720` **5.** Verify the mongo process, if the process does not come UP then verify the mongo logs for further debugging log. For example, `/var/log/mongodb-`*`port`*`.log` **Note** Change the port number (*port*) according to your deployment.

- **Config Server Down**: This alarm is generated when the configuration server for the replica-set is unreachable. This alarm is not valid for non-sharded replica-sets.

  Alarm Code: 7104

Table 39: Config Server Down

Possible Cause	Corrective Action
This alarm is generated in the event of abrupt failure of configServer VM (when mongo sharding is enabled) and does not come up due to some unspecified reasons.	1. Login to pcrfclient01/02 VM and verify the shard health status `diagnostics.sh --get_shard_health <dbname>` 2. Check the status of mongo port for which alarm has generated. For example, `ps -ef | grep 27720` 3. If the member is not running, start the mongo process. For example, `/usr/bin/systemctl start sessionmgr-27720` 4. Verify the mongo process, if the process does not come UP then verify the mongo logs for further debugging log. For example, `/var/log/mongodb-port.log` **Note** Change the port number (*port*) according to your deployment.

- **All DB Member of replica set Down**: This alarm is generated when the system is not able to connect to any member of the replica-set.

  Alarm Code: 7105

Table 40: All DB Member of replica set Down

Possible Cause	Corrective Action
This alarm is generated in the event of abrupt failure of all sessionmgr VMs and does not come up due to some unspecified reason or all members are down.	**1.** Login to pcrfclient01/02 VM and verify the replica-set status `diagnostics.sh --get_replica_status` **Note** If a member is shown in an unknown state, it is likely that the member is not accessible from one of other members, mostly an arbiter. In that case, you must go to that member and check its connectivity with other members. Also, you can login to mongo on that member and check its actual status. **2.** If the member is not running start the mongo process on each sessionmgr/arbiter VM For example, `/usr/bin/systemctl start sessionmgr-`*`port`* **Note** Change the port number (*port*) according to your deployment. **3.** Verify the mongo process, if the process does not come UP then verify the mongo logs for further debugging log. For example, `/var/log/mongodb-`*`port`*`.log` **Note** Change the port number (*port*) according to your deployment.

- **DB resync is needed**: This alarm is generated whenever a manual resynchronization of a database is required to recover from a failure.

  Alarm Code: 7106

Table 41: DB resync is needed

Possible Cause	Corrective Action
This alarm is generated whenever a secondary member of replica-set of mongo database does not recover automatically after failure. For example, if sessionmgr VM is down for longer time and after recovery the secondary member does not recover.	1. Login to pcrfclient01/02 VM and verify the replica-set status `diagnostics.sh --get_replica_status` **Note** If a member is shown in an unknown state, it is likely that the member is not accessible from one of other members, mostly an arbiter. In that case, you must go to that member and check its connectivity with other members. Also, you can login to mongo on that member and check its actual status. 2. Check which member is in recovering/fatal or startup2 state. 3. Login to that sessionmgr VM and check for mongo logs. Refer to *CPS Troubleshooting Guide* for recover procedure.

- **QNS Process Down**: This alarm is generated when Policy Server (QNS) java process is down.

  Alarm Code: 7301

Table 42: QNS Process Down

Possible Cause	Corrective Action
This alarm is generated if Policy Server (QNS) process on one of the CPS VMs is down.	1. Run `diagnostics.sh` on Cluster Manager as root user to check for any failures.. 2. On VM where qns is down, run `monit summary` to check if "monit" is monitoring policy server (QNS) process. 3. Analyze logs in `/var/log/broadhop` directory for exceptions and errors.

- **Gx Message processing Dropped**: This alarm is generated for Gx Message CCR-I, CCR-U andCCR-T when processing of messages drops below 95% on qnsXX VM.

  Alarm Code: 7302

Table 43: Gx Message processing Dropped

Possible Cause	Corrective Action
1. Gx traffic to the CPS system is beyond system capacity. 2. CPU utilization is very high on qnsXX VM. 3. Mongo database performance is not optimal.	1. Login via Grafana dashboard and check for any Gx message processing trend. 2. Check CPU utilization on all the Policy Server (QNS) VMs via grafana dashboard. 3. Login to pcrfclient01/02 VM and check the mongo database health. `diagnostics.sh --get_replica_status` **Note** If a member is shown in an unknown state, it is likely that the member is not accessible from one of other members, mostly an arbiter. In that case, you must go to that member and check its connectivity with other members. Also, you can login to mongo on that member and check its actual status. 4. Check for any unusual exceptions in consolidated policy server (qns) and mongo logs.

- **Gx Average Message processing Dropped**: This alarm is generated for Gx Message CCR-I, CCR-U and CCR-T when average message processing is above 20ms on qnsXX VM.

  Alarm Code: 7303

Table 44: Average Gx Message processing Dropped

Possible Cause	Corrective Action
1. Gx traffic to the CPS system is beyond system capacity. 2. CPU utilization is very high on qnsXX VM. 3. Mongo database performance is not optimal.	1. Login via Grafana dashboard and check for any Gx message processing trend. 2. Check CPU utilization on all the Policy Server (QNS) VMs via grafana dashboard. 3. Login to pcrfclient01/02 VM and check the mongo database health. `diagnostics.sh --get_replica_status` **Note** If a member is shown in an unknown state, it is likely that the member is not accessible from one of other members, mostly an arbiter. In that case, you must go to that member and check its connectivity with other members. Also, you can login to mongo on that member and check its actual status. 4. Check for any unusual exceptions in consolidated policy server (qns) and mongo logs.

- **Percentage of LDAP retry threshold Exceeded**: This alarm is generated for LDAP search queries when LDAP retries compared to total LDAP queries exceeds 10% on qnsXX VM.

  Alarm Code: 7304

Table 45: Percentage of LDAP retry threshold Exceeded

Possible Cause	Corrective Action
Multiple LDAP servers are configured and LDAP servers are down.	1. Check connectivity between CPS and all LDAP servers configured in Policy Builder. 2. Check latency between CPS to all LDAP servers and LDAP server response time should be normal. 3. Restore connectivity if any LDAP server is down.

- **LDAP Requests as percentage of CCR-I Dropped**: This alarm is generated for LDAP operations when LDAP requests as percentage of CCR-I (Gx messages) drops below 25% on qnsXX VM.

  Alarm Code: 7305

Table 46: LDAP Requests as percentage of CCR-I Dropped

Possible Cause	Corrective Action
1. Gx traffic to the CPS system is beyond system capacity. 2. CPU utilization is very high on qnsXX VM. 3. Mongo database performance is not optimal.	1. Check connectivity between CPS and all LDAP servers configured in Policy Builder. 2. Check latency between CPS to all LDAP servers and LDAP server response time should be normal. 3. Check policy server (qns) logs on policy director (lb) VM for which alarm has been generated.

- **LDAP Query Result Dropped**: This alarm is generated when LDAP Query Result goes to 0 on qnsXX VM.

  Alarm Code: 7306

Table 47: LDAP Query Result Dropped

Possible Cause	Corrective Action
Multiple LDAP servers are configured and LDAP servers are down.	1. Check connectivity between CPS and all LDAP servers configured in Policy Builder. 2. Check latency between CPS to all LDAP servers and LDAP server response time should be normal. 3. Restore connectivity if any LDAP server is down.

- **LDAP Request Dropped**: This alarm is generated for LDAP operations when LDAP requests drop below 0 on lbXX VM.

  Alarm Code: 7307

Table 48: LDAP Request Dropped

Possible Cause	Corrective Action
Gx traffic to the CPS system is increased beyond system capacity.	1. Check connectivity between CPS and all LDAP servers configured in Policy Builder. 2. Check latency between CPS to all LDAP servers and LDAP server response time should be normal. 3. Check policy server (qns) logs on policy director (lb) VM for which alarm has been generated.

- **Binding Not Available at Policy DRA**: This alarm is generated when IPv6 binding for sessions is not found at Policy DRA. Only one notification is sent out whenever this condition is detected.

  Alarm Code: 6001

  Table 49: Binding Not Available at Policy DRA

Possible Cause	Corrective Action
Binding Not Available at Policy DRA	This alarm is generated whenever binding database at Policy DRA is down. This alarm gets cleared automatically after the time configured in Policy Builder (**Diameter Configuration** > **PolicyDRA Health Check** > **Alarm Config** > **Alarm Clearance Interval** is reached.

- **SPR_DB_ALARM**: This alarm indicates there is an issue in establishing connection to the Remote SPR Databases configured under **USuM Configuration** > **Remote Database Configuration** during CPS policy server (qns) process initialization.

  Alarm Code: 6101

  Table 50: SPR_DB_ALARM

Possible Cause	Corrective Action
A network issue/latency in establishing connection to the remote SPR databases.	Check the network connection/latency and adjust the qns.conf parameter `-DserverSelectionTimeout.remoteSpr` in consultation with Cisco Technical Representative.

- **DiameterQnsWarmupError**: The alarm is generated when the warmup feature is enabled and there is an exception in retrieving Policy Server (qns) node number, site ID, parsing the warmup dictionaries or scenario file.

  Alarm Code: 3005

  Table 51: DiameterQnsWarmupError

Possible Cause	Corrective Action
qns.node.warmup.hostname.substring parameter is not configured in qns.conf file. GeoSiteName is not configured if it is a GR setup	• If alarm contains ‘didn’t start node num/SITE_ID not parsed’, make sure that `qns.node.warmup.hostname.substring` and GeoSiteName (if it is GR setup) is configured in `qns.conf` file. Policy Server (QNS) VMs hostname must only contain number after substring parameter is configured. • If alarm contains ‘didn't start due to exception’, please consult with Cisco Technical Representative.

- **SPRNodeNotAvailable:** This alarm is generated when all the members of the SPR replica set are not available and a master node is available for that given replica-set.

  Alarm Code: 6102

Table 52: SPRNodeNotAvailable

Possible Cause	Corrective Action
SPR node is not available	When the member(s) of the replica-set are manually recovered and a master node is available for the SPR replica-set, the alarm automatically clears.

- **GC State:** This alarm is generated when Garbage collection on Policy Server (qns) java process occurs three or more (configurable) times within 10 (configurable) mins of interval.

  Alarm Code: 7311

Table 53: GC State

Possible Cause	Corrective Action
GC State	Restart the Policy Server (qns) application for which alarm was reported. After gc_alarm_trigger_interval is reached, if there is no GC triggered, the alarm gets cleared.

- **OldGen State:** This alarm is generated if Oldgen% is more than configured threshold (OLD_GEN_ALARM_TRIGGER_THR) for more than 2 (OLD_GEN_ALARM_TRIGGER_CONT_GC_COUNT) GC.

  Alarm Code: 7312

Table 54: OldGen State

Possible Cause	Corrective Action
OldGen State	Restart the Policy Server (qns) application for which alarm was reported. On restart, if oldGen value is less than configured oldgen_clear_ trigger_thr_per value, the alarm gets cleared.

- **SessionLimitOverloadProtectionNotSet:** This alarm is generated when **Session Limit Overload Protection** is configured to 0 (default). With value as 0, CPS can handle infinite number of sessions and this can affect the database and can lead to application crash.

  Alarm Code: 1112

Table 55: SessionLimitOverloadProtectionNotSet

Possible Cause	Corrective Action
SessionLimitOverload ProtectionNotSet	Go to **System** configuration in Policy Builder and set the value for **Session limit Overload Protection** to recommended value and publish it. This will clear the alarm within 30 seconds.

- **SessionLimitOverloadProtectionExceeded:**

  Alarm Code: 1113

Table 56: SessionLimitOverloadProtectionExceeded

Possible Cause	Corrective Action
SessionLimitOverload ProtectionExceeded	Increase the database capacity after consulting with Cisco representative or clear the sessions in the session database so that 'n' becomes less than 'm' (n<m). This should clear the alarm within 30 seconds.