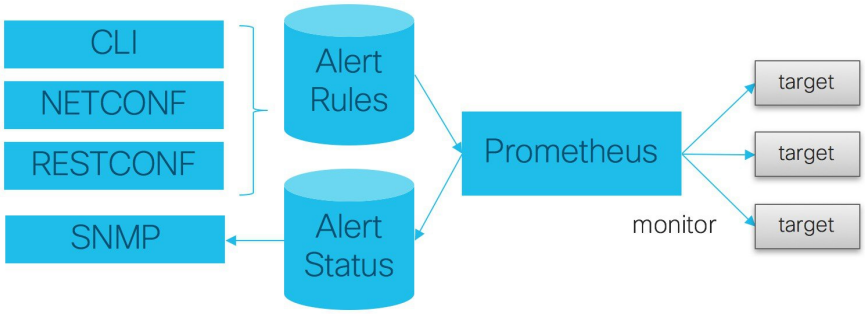
Notification and Alert

Architectural Overview

A Cisco Policy Suite (CPS) vDRA deployment comprises multiple virtual machines (VMs) with multiple running containers deployed for scaling and high availability (HA) purposes. The monitoring and alerting system of the CPS vDRA deployment is centered around alert definition, metric gathering, and SNMP trap forwarding. The high-level architecture is shown below:

Figure 1: High-Level Architecture



Major Components

Alert Definition

Alert definition occurs when an end user (or external system) configures the system via CLI, NETCONF, or RESTCONF interfaces with Alert rules. The system takes these alert rules and pushes the definitions into the Prometheus processes running within the cluster. The system does not provide a fixed set of alerts but provides a sample list of common alerts an operator may want to configure.

Metric Gathering

At the core of the alerting framework, the system runs multiple Prometheus processes (http://prometheus.io) which monitors the system and track metrics which can be used for triggering alerts. The default Prometheus instance that monitors the system tracks metrics at a 5 second interval for 24 hours.

SNMP Trap Forwarding

Once an alert is triggered the Prometheus server forwards that alert to the active control/Cluster Manager node. These alerts are forwarded based on configuration to external NMS systems using either SNMPv2 or SNMPv3.

Technical Architecture

Cisco Policy Suite is deployed as a distributed virtual appliance. The standard architecture uses Hypervisor virtualization. Multiple 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

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 alert notifications. Standard SNMP notifications (traps) are used throughout the infrastructure.

Alerts are triggered from either the Cluster Manager or Control virtual machines if the Cluster Manager is not active.

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 the 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 include structures and codes.
BORADHOP-NOTIFICATION-MIB.mib	Defines Notifications/Traps available.

SNMP Notifications

SNMP Notifications in the form of traps (one-way) are provided by the infrastructure. CPS notifications do not require acknowledgments. The traps provide both:

- Proactive alerts that the predetermined thresholds have been passed. For example, a disk is nearing capacity or CPU load is too high.
- 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 markers.

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

These objects can be used to identify where the issue lies and the Facility (system layer) and the Severity (importance) of the reported issue.

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

Number	Facility	Description
3	Operating System	Linux OS
4	Application	Application (CPS Session Manager, CPS Binding Database, and so on)
5	Process	Specific process

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.
4	Warning	Warning conditions.
5	Notice	Normal but significant condition.
6	Info	Informational message.
7	Debug	Lower level debug message.
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 failed.	Possible but in an HA configuration very unlikely.
Hardware.Debug	A hardware component has sent a NA 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. This is primarily driven by the fact that the alert rules can be configured to meet each operator's environment. 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, alerts should only be defined with an Emergency-severity trap if 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.

Notifications and Alerting

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).

Component Notifications

Components are devices that make up the CPS system. These are systems level traps. They are generated when some predefined thresholds is crossed and are defined in the alerting configuration of the system. User can modify and change these using the alert definition commands.

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 }
```

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.

The following table provides the list of supported alarms:

Table 5: Component Notifications

Notification Name	Severity	Message Text	Description
DISK_FULL	Critical	Disk filesystem / usage is more than the 90%	Disk usage is monitored.
	Clear	Disk filesystem / usage is greater than 10%	
HIGH_LOAD	Major	load average value for 5 min is greater than 3 current value is {{ $value }}	Load on the CPU is measured as per the linux operating system load.
	Clear	load average value for 5 min is lower than 3	
LINK_STATE	Critical	{{ $labels.interface }} is down on {{ $labels.instance }}	Indicates if any interface (ens***) has gone down.
	Clear	{{ $labels.interface }} is up on {{ $labels.instance }}	

Notification Name	Severity	Message Text	Description
LOW_MEMORY	Critical	Available RAM is less than 20% current value is {{ $value }}	Monitors memory usage on the VMs. When free memory goes down, the threshold alarm is raised.
	Clear	Available RAM is more than 20%	
PROCESS_STATE	Critical	{{ $labels.service_name }} instance {{ $labels.module_instance }}of module {{ $labels.module }} is in Aborted state.	Monitors process restarts.
	Clear	{{ $labels.service_name }} instance {{ $labels.module_instance }}of module {{ $labels.module }} is moved from Aborted state	
HIGH_CPU_USAGE	Critical, Major, or Minor	CPU usage in last 10 sec is more than 90% current value {{ $value }}	Monitors CPU usage.
	Clear	CPU usage in last 10 sec is lower than 90%	
QNS_JAVA_STARTED	Error	{{ $labels.service_name }} instance {{ $labels.module_instance }} of module {{ $labels.module }} is in Started state.	Indicates Java process restart.
	Clear	{{ $labels.service_name }} instance {{ $labels.module_instance }} of module {{ $labels.module }} is moved from started state	
IP_NOT_REACHABLE	Critical	VM/VIP IP {{$labels.instance }} is not reachable	When IP is not reachable, this alarm is raised. For more information, see IP Not Reachable, on page 9
	Clear	VM/VIP IP {{$labels.instance }} is reachable	

Notification Name	Severity	Message Text	Description
DIAMETER_PEER_DOWN	Error	Diameter peer is down.	Any peer connected to PAS is monitored.
	Clear	Diameter peer is up	
DRA_PROCESS_UNHEALTHY	Critical	{{ $labels.service_name }} instance {{ $labels.module_instance }} of module {{ $labels.module }} is not healthy	Process state is monitored.
	Clear	{{ $labels.service_name }} instance {{ $labels.module_instance }}of module {{ $labels.module }} is healthy	
DB_SHARD_DOWN	Critical	All DB Members of a replica set {{ $labels.shard_name }} are down	Alarm raised when both primary and secondary replica set members are down.
	Clear	All DB Members of a replica set {{ $labels.shard_name }} are not down	
NO_PRIMARY_DB	Critical	Primary {{ $labels.cluster }} {{ $labels.shard }} not running	Alarm raised when the primary database is not up.
	Clear	Primary {{ $labels.cluster }} {{ $labels.shard }} running	Alarm cleared when the primary database is up.
SECONDARY_DB_DOWN	Critical	Secondary Member {{ $labels.name }} of replica set {{ $labels.shard_name }} is down	Alarm raised when secondary database is not up.
	Clear	Secondary Member {{ $labels.name }} of replica set {{ $labels.shard_name }} is up	
LOW_SWAP	Critical	{{ $labels.instance }} has less than 80% swap memory .	Monitors the swap memory.
	Clear	{{ $labels.instance }} has greater than 80% swap memory .	

Notification Name	Severity	Message Text	Description
DOCKER_ENGINE_DOWN	Critical	Docker Engine {{ $labels.engine_id }} is down.	Monitors the docker engine status/state.
	Clear	Docker Engine {{ $labels.engine_id }} is up.	
SVN_BACKUP_ALERT	Alert	svn backup in mongo is out of sync, please check svn_audit.log	Alarm raised when SVN repos are not in sync with SVN backup stored in mongo-admin containers.
	Clear	svn backup in mongo is in sync now	
PREFERRED_PRIMARY_NOT_RUNNING	Warning	Primary of {{$labels.cluster}} {{$labels.shard}} not running on seed {{$labels.seed}}	Alarm raised when the primary is not running on server seed.
	Clear	Primary running on seed {{$labels.seed}}	Alarm cleared when the primary is running on server seed.

Note By default, no alert rules are configured in the system.

IP Not Reachable

Two things impact the generaton of an IP_NOT_REACHABLE alert if a VIP fails over.

1. VIP switchover time
2. Prometheus polling interval

VIP switchover time can vary depending on the load of the VM and traffic on the network. Metrics are polled every 5 seconds. If a VIP fails over quickly, then an IP_NOT_REACHABLE alert is not generated.

Example: IP_NOT_REACHABLE alert not generated

1. T0 Prometheus polls the Orchestrator for the probe_icmp_target metric which is set to 1 (ip reachable).
2. T1 VIP fails
3. T2
4. T3
5. T4 VIP moves to the backup VM

6. T5 Prometheus polls the Orchestrator for the probe_icmp_target metric which is set to 1 (ip reachable)

Example: IP_NOT_REACHABLE alert generated

1. T0 Prometheus polls the Orchestrator for the probe_icmp_target metric which is set to 1 (ip reachable).
2. T1
3. T2
4. T3
5. T4 VIP fails
6. T5 Prometheus polls the Orchestrator for the probe_icmp_target metric which is set to 0 (ip not reachable)
7. T6 IP_NOT_REACHABLE alert is generated.

Application Notifications

The following table describes the application notifications:

Table 6: Application Notifications

Notification Name	Severity	Message Text	Description
DRA_MESSAGE_ PROCESSING_FAILURE_ TPS_EXCEEDED	Critical	Message Processing Failure TPS exceeded, current value is {{ $value }}.	TPS of rejected messages from DRA Director (Any messages with Result code !=2001)
	Clear	Message Processing Failure TPS in control.	
DRA_DIRECTOR_ TPS_EXCEEDED	Critical	{{ $labels.instance }} Director TPS exceeded, current value is {{ $value }}.	Success TPS of Total DRA Director (ResultCode=2001)
	Clear	{{ $labels.instance }} Director TPS in control .	
DRA_WORKER_ TPS_EXCEEDED	Critical	{{ $labels.instance }} Worker TPS exceeded, current value is {{ $value }}.	TPS of Total Worker
	Clear	{{ $labels.instance }} Worker TPS in control.	
DRA_DB_ TPS_EXCEEDED	Critical	{{ $labels.instance }} Persistence DB TPS exceeded , current value is {{ $value }}.	TPS of DB TPS (Query and Update)
	Clear	{{ $labels.instance }} Persistence DB TPS in control.	

Notification Name	Severity	Message Text	Description
DIAMETER_UNABLE _TO_DELIVER_ TPS_EXCEEDED	Critical	UNABLE_TO_DELIVER TPS exceeded, current value is {{ $value }}.	TPS of Diameter 3002
	Clear	UNABLE_TO_DELIVER in control.	
DIAMETER_TRANSIENT _FAILURE_TPS_ EXCEEDED	Critical	TRANSIENT_FAILURE TPS exceeded, current value is {{ $value }}.	TPS of Diameter 4xxx
	Clear	TRANSIENT_FAILURE in control.	
DIAMETER_UNKNOWN _SESSIONS_TPS _EXCEEDED	Critical	UNKNOWN_SESSIONS TPS exceeded, current value is {{ $value }}.	TPS of Diameter 5002
	Clear	UNKNOWN_SESSIONS in control.	
MISMATCH_REQUEST _RESPONSE	Critical	{{ $labels.remote_peer }} MISMATCH_REQUEST _RESPONSE exceeded, current value is {{ $value }}.	Mismatch in Rate of Request and Response (Discrepancy in ingress and egress)
	Clear	{{ $labels.remote_peer }} MISMATCH_REQUEST _RESPONSE in control.	
KEEP_ALIVE_RAR _ROUTING_FAILURE_ TPS_EXCEEDED	Critical	Keep Alive RAR TPS exceeded, current value is {{ $value }}.	TPS of Keep Alive RAR Routing (Stale RAR)
	Clear	Keep Alive RAR TPS in control.	
EGRESS_RATE_ LIMITED_SESSION_ ERR_RESP_TPS_ EXCEEDED	Critical	{{ $labels.local_peer }} {{ $labels.remote_peer }} Egress rate limited messages with error response TPS exceeded, current value is {{ $value }}.	TPS of Rate Limited Response for Error
	Clear	{{ $labels.local_peer }} {{ $labels.remote_peer }} Egress rate limited messages with error response TPS in control.	

Notification Name	Severity	Message Text	Description
EGRESS_RATE_ LIMITED_SESSION_ REJECT_TPS_ EXCEEDED	Critical	{{ $labels.local_peer }} {{ $labels.remote_peer }} Egress rate limited messages dropped without error TPS exceeded, current value is {{ $value }}.	TPS of Rate Limited Response Rejected
	Clear	{{ $labels.local_peer }}{{ $labels.remote_peer }} Egress rate limited messages dropped without error TPS in control.	
INGRESS_RATE_ LIMITED_SESSION_ ERR_RESP_TPS_ EXCEEDED	Critical	{{ $labels.local_peer }} {{ $labels.remote_peer }} Ingress rate limited messages with error response TPS exceeded, current value is {{ $value }}.	TPS of Rate Limited Response Error - Ingress
	Clear	{{ $labels.local_peer }}{{ $labels.remote_peer }} Ingress rate limited messages with error response TPS in control.	
INGRESS_RATE_ LIMITED_SESSION_ REJECT_TPS_ EXCEEDED	Critical	{{ $labels.local_peer }} {{ $labels.remote_peer }} Ingress rate limited messages dropped without error response TPS exceeded, current value is {{ $value }}.	TPS of Rate Limited Response Rejected - Ingress
	Clear	{{ $labels.local_peer }}{{ $labels.remote_peer }} Ingress rate limited messages dropped without error response TPS in control.	
BINDING_STORAGE _ERRORS_TPS_ EXCEEDED	Critical	Binding Store Error TPS exceeded, current value is {{ $value }}.	TPS Binding Storage Errors (Binding storage failed because of high load/any other database error)
	Clear	Binding Store Error TPS in control.	
BINDING_LOOKUP_ ERROR_TPS_ EXCEEDED	Critical	Binding Lookup Error TPS exceeded, current value is {{ $value }}.	TPS Binding Lookup Errors (Binding retrieval failure because of internal error)
	Clear	Binding Lookup Error TPS in control.	
DB_ERR_ TPS_EXCEEDED	Critical	All DB Errors TPS exceeded, current value is {{ $value }}.	TPS All database errors
	Clear	All DB Errors TPS in control.	

Notification Name	Severity	Message Text	Description
DB_RESPONSE_ TIME_EXCEEDED	Critical	{{ $labels.instance }} DB Response Time exceeded, current value is {{ $value }}.	Response Time Exceeds (Database Query/Update operation time exceeds)
	Clear	{{ $labels.instance }} DB Response Time in control, current value is {{ $value }}.	
BINDING_KEY_ NOT_FOUND_IN_ AAR_TPS_ EXCEEDED	Critical	{{ labels.origin_host }} Binding Key not found in AAR TPS exceeded, current value is {{ $value }}.	TPS Binding Key Not Found in AAR (When AAR received with no "imsi+apn/msisdn/ipv6")
	Clear	{{ labels.origin_host }} Binding Key not found in AAR TPS in control.	
BINDING_KEY_ NOT_FOUND_IN_ CCR_I_TPS_ EXCEEDED	Critical	{{ labels.origin_host }} Binding Key not found in CCR(I) TPS exceeded, current value is {{ $value }}.	TPS Binding Key Not Found in CCR-I(When CCR-I received with no "imsi+apn/msisdn/ipv6"
	Clear	{{ labels.origin_host }} Binding Key not found in CCR(I) TPS in control.	
BINDING_NOT _FOUND_TPS_ EXCEEDED	Critical	{{ labels.origin_host }} Binding not found TPS exceeded, current value is {{ $value }}.	TPS Binding Not Found
	Clear	{{ labels.origin_host }} Binding not found TPS in control,.	
BINDING_DB_ INCONSISTENT_ TPS_EXCEEDED	Critical	TPS AAR with Result Code 5065 exceeded, current value is {{ $value }}.	TPS AAR with Result Code 5065
	Clear	TPS AAR with Result Code 5065 in control.	
BINDING_SESSION _DB_SIZE_ EXCEEDED	Critical	{{ $labels.db }} size exceeded, current value is {{ $value }}.	Total Size of Session DB Exceeded
	Clear	{{ $labels.db }} size in control.	
BINDING_IMSI_ APN_DB_SIZE _EXCEEDED	Critical	{{ $labels.db }} size exceeded, current value is {{ $value }}.	Total Size of IMSI / APN DB Exceeded
	Clear	{{ $labels.db }} size in control.	

Notification Name	Severity	Message Text	Description
BINDING_MSISDN _APN_DB_SIZE _EXCEEDED	Critical	{{ $labels.db }} size exceeded, current value is {{ $value }}.	Total Size of MSISDN / APN DB Exceeded
	Clear	{{ $labels.db }} size in control	
BINDING_IPV6 _DB_SIZE_ EXCEEDED	Critical	{{ $labels.db }} size exceeded, current value is {{ $value }}.	Total Size of IPv6 DB Exceeded
	Clear	{{ $labels.db }} size in control	
PEER_TPS _EXCEEDED	Critical	{{ $labels.instance }} Peer Connection {{ $labels.local_peer}} {{ $labels.remote_peer }} TPS exceeded, current value is {{ $value }}.	Peer TPS Exceeded (Per peer TPS thresholds)
	Clear	{{ $labels.instance }} Peer Connection {{ $labels.local_peer}} {{ $labels.remote_peer }} TPS in control.	
NO_RESPONSE_ PEER_FOR_ ANSWER_TPS _EXCEEDED	Critical	{{ $labels.instance }} No Response From Peer Connection TPS exceeded for {{ $labels.message_type}} , current value is {{ $value }}.	TPS No Response From Peer (timeouts from PCRF/any peer)
	Clear	{{ $labels.instance }} No Response From Peer Connection TPS in control for {{ $labels.message_type}} .	
PEER_RESPONSE _TIME_EXCEEDED	Critical	message_duration_seconds {type=~"peer_.*"} [labels: type]	Peer Response Time Exceeded (Response time of peer exceeds)
	Clear	Response time in control.	
NO_PEER_GROUP _MEMBER _AVAILABLE	Critical	{{ $labels.peer_group }} not available.	Peer Group is not Available (All peers in peer_group down)
	Clear	{{ $labels.peer_group }} available.	
PCRF_NOT_CREATING _SESSIONS_TPS _EXCEEDED	Critical	Failed CCR-I TPS exceeded, current value is {{ $value }}.	TPS Rate of Failed CCR-I(ResultCode !=2001)
	Clear	Failed CCR-I TPS in control.	

Notification Name	Severity	Message Text	Description
FORWARDING_LOOP _FOUND_TPS _EXCEEDED	Critical	{{ $labels.remote_peer}} Loop Detected TPS exceeded , current value is {{ $value }}.	TPS Rate of Diameter Message Loop
	Clear	{{ $labels.remote_peer }} Loop Detected TPS in control.	
RELAY_LINK _TPS_GT_0	Critical	{{ $labels.remote_peer}} Relay Started, current value is {{ $value }}.	TPS Rate of Relay Peer > 0 (When relay peers start exchanging control plane messages)
	Clear	{{ $labels.remote_peer}} Relay Stated.	
RELAY_LINK _TPS_EXCEEDED	Critical	{{ $labels.remote_peer}} Relay Link TPS exceeded, current value is {{ $value }}.	TPS Rate of Relay Peer (TPS of relay messages)
	Clear	{{ $labels.remote_peer}} Relay Link TPS in control.	
RELAY_LINK _STATUS	Critical	{{ $labels.remote_peer }} Relay Link is Down.	Relay Link is Down (Relay link status is monitored)
	Clear	{{ $labels.remote_peer}} Relay Link is UP.	
NO_RELAY_PEER _TPS_EXCEEDED	Critical	{{ $labels.remote_peer}} Relay Peer TPS exceeded, current value is {{ $value }}.	TPS Rate of Relay Peer Failure
	Clear	{{ $labels.remote_peer}} Relay Peer TPS in control.	
SESSION_DB_ LIMIT_EXCEEDED	Alert	Session max DB limit reached	This alarm is generated when session database count crosses maximum limit configured using CLI for db-max-record-limit.
	Clear	Session max DB limit reached alarm cleared	This alarm is cleared when session database count drops below maximum limit configured using CLI for db-max-record-limit.

Notification Name	Severity	Message Text	Description
IPV6_DB_ LIMIT_EXCEEDED	Alert	IPv6 max DB limit reached	This alarm is generated when IPv6 database count crosses maximum limit configured using CLI for db-max-record-limit.
	Clear	IPv6 max DB limit reached alarm cleared	This alarm is cleared when IPv6 database count drops below maximum limit configured using CLI for db-max-record-limit.
IPV4_DB_ LIMIT_EXCEEDED	Alert	IPv4 max DB limit reached	This alarm is generated when IPv4 database count crosses maximum limit configured using CLI for db-max-record-limit.
	Clear	IPv4 max DB limit reached alarm cleared	This alarm is cleared when IPv4 database count drops below maximum limit configured using CLI for db-max-record-limit.
IMSIAPN_DB_ LIMIT_EXCEEDED	Alert	ImsiApn max DB limit reached	This alarm is generated when ImsiApn database count crosses maximum limit configured using CLI for db-max-record-limit.
	Clear	ImsiApn max DB limit reached alarm cleared	This alarm is cleared when ImsiApn database count drops below maximum limit configured using CLI for db-max-record-limit.
MSISDNAPN_DB_ LIMIT_EXCEEDED	Alert	MsisdnApn max DB limit reached	This alarm is generated when MsisdnApn database count crosses maximum limit configured using CLI for db-max-record-limit.
	Clear	MsisdnApn max DB limit reached alarm cleared	This alarm is cleared when MsisdnApn database count drops below maximum limit configured using CLI for db-max-record-limit.

Notification Name	Severity	Message Text	Description
CRD_CACHE_ LOAD_ERROR	Critical	Error when loading CRD cache	This alarm is generated when CRD is not loaded properly or CRD is loaded with an error value as “1”.
	Clear	CRD cache loaded successfully	This alarm is cleared when CRD cache is updated properly with value as “0”.
APP_SERVICE_ HEALTH_STATUS_ CRD*	Critical	{{$labels.service}} service is Unhealthy!	This alarm is generated when CRD servcie is unhealthy if value is “1”
	Clear	{{$labels.service}} service is Healthy.	This alarm is generated when CRD servcie is healthy if value is “0”
APP_SERVICE_ HEALTH_STATUS_ METADATA_DB*	Critical	{{$labels.service}} service is Unhealthy!	This alarm is generated when the Metadata DB service is unhealthy if value is “1”
	Clear	{{$labels.service}} service is Healthy.	This alarm is generated when the Metadata DB servcie is healthy if value is “0”
VIP_NOT_ACTIVE_ ON_PREFERRED*	Critical	VIP {{ $labels.vip }} active on {{ $labels.currentHost }} and not active on preferred {{ $labels.preferredHost }}	This alarm is generated when the VIP is not present in preferred director or distributor.
	Clear	VIP {{ $labels.vip }} active on preferred {{ $labels.preferredHost }}	This alarms is generated when the VIP is present in preferred director or distributor.
PEER_DYNAMIC_ RATE_LIMIT_ THROTTLING*	Critical	Dynamic Rate limit is active	This alarm is generated when any one peer connected to a director is in throttling mode. sum(peer_dynamic_rate_ limit_throttling) != 0
	Clear	Dynamic Rate limit is not active	This alarm is generated when no peer connected to a Director is in throttling mode. sum(peer_dynamic_rate_ limit_throttling) == 0

Notification Name	Severity	Message Text	Description
NO_DB_CPU_ THRESHOLD_STATUS*	Critical	{{$labels.instance}} is not receiving any threshold message	Director is not receiving any threshold status messages from Worker. sum(rate(processed_db_ cpu_control_message_ total [30s])) == 0
	Clear	{{$labels.instance}} is receiving throttling messages	Director is receiving threshold status messages from Worker. sum(rate(processed_db_ cpu_control_ message_total [30s])) != 0
QNS_LOGGING_ STOPPED*	Critical	Application logging has stopped on {{$labels.hostname}} at {{$labels.last_updated_time}} with connections closed {{$labels.tcp_closed}}	This alarm is generated when application has stopped logging consolidated-qns logs unexpectedly. **Note** If there is no activity on the system, and the alert is raised it is expected. It is resolved automatically when application activity has started.
	Clear	Application logging is successful on {{$labels.hostname}} at {{$labels.last_updated_time}}	This alarm is generated when application is successful logging consolidated-qns logs.
DRA_PCRF_ QUERY_NODE_ INACTIVE*	Critical	{{$labels.url_endpoint}} is Inactive!	This alarm is generated when PCRF REST endpoint URL hearbeat message fails if value is “1”.
	Clear	{{$labels.url_endpoint}} is Active	This alarm is generated when PCRF REST endpoint URL hearbeat message is success if value is “0”.

Notification Name	Severity	Message Text	Description
DRA_PCRF_ QUERY_TPS_ EXCEEDED*	Critical	{{$labels.instance}} Pcrf Session Query TPS exceeded, current value is {{ $value }}	This alarm is generated when PCRF REST API TPS exceeds if the value is greater than “5”.
	Clear	{{ $labels.instance }} Pcrf Session Query TPS in control	This alarm is generated when PCRF REST API TPS is under control if the value is less than “5”.
RELAY_TRAFFIC_ THRESHOLD_ EXCEEDED*	Critical	Relay traffic exceeded the threshold of 20%. Current value is {{ $value }}%	This alarm is generated if relay traffic exceeds certain % of total traffic.
	Clear	Relay traffic % is under control	This alarm is generated if relay traffic is under certain % of total traffic.
LOCAL_ PUBLISH_ STOPPED*	Critical	Local publish stopped for {{ $labels.instance }}	This alarm is generated if topology is incomplete and global end point is missing.
	Clear	Local publish started for {{ $labels.instance }}	This alarm is generated if topology is complete and global end point exists.
GLOBAL_ PUBLISH_ STOPPED*	Critical	Global publish stopped for {{ $labels.instance }}	This alarm is generated if topology is incomplete and local end point is missing.
	Clear	Global publish started for {{ $labels.instance }}	This alarm is generated if topology is complete and local end point exists.
DIAMETER_ENDPOINTS_ MISSING_ LOST_REDIS*	Critical	Diameter Endpoints missing due to Redis connection lost	This alarms is generated if Diameter endpoint is missing REDIS configuration.
	Clear	Redis connection restored. Diameter Endpoints are restored	This alarms is generated if REDIS configuration exists in Diameter endpoint.
DIAMETER_PEER_ EXPIRATIONS_ EXCEEDED*	Critical	{{$labels.origin_host}} got EXPIRED in {{$labels.system}}	This alarm is generated if any peer has expired.
	Clear	Peer expiration got reset for {{$labels.origin_host}}	This alarm is generated if the peer expiration is reset.

Notification Name	Severity	Message Text	Description
ELASTICSEARCH_NOT_ REACHABLE	Critical	Elasticsearch server is unreachable with status {{$labels.reachable_status}} with tcp connection status {{$labels.tcp_connected}}	This alarm is generated when elasticsearch is not reachable to DRA or the TCP connections are not healthy.
	Clear	Elasticsearch server is reachable now !!!	This alarms is generated when the elasticsearch is reachable to DRA or the TCP connections are healthy.
TLS_CERT_EXPIRY	Critical, Major, and Minor	certificate will expire in {{$value}} days!	This alarm monitors the expiry date for TLS certificate.

Note This alarm has not been validated for all customer deployment scenarios. Please contact your Sales Account team for support.

Alert Rules

Alert Rules Configuration

The following commands are used to configure alert rules:

```
scheduler#config

scheduler(config)# alert rule <rule_name>
```

where, <*rule_name*> is the name of the alert rule. For example, test

```
Value for 'expression' (<string>): <expression based on the stats>
```

where, <*expression based on the stats*> is the expression. For example, test>1

```
Value for 'message' (<string>): <message string to be sent in the alarm message>
```

where, <*message string to be sent in the alarm message*> is the message to be sent in the alarm. For example, testing

```
Value for 'snmp-clear-message' (<string>): <message string for clear alarm>
```

where, <*message string for clear alarm*> is the string for the clear message. For example. test clear

```
scheduler(config-rule-test)#
scheduler(config-rule-test)# snmp-facility
Possible completions:
  application  hardware  networking  os  proc  virtualization

scheduler(config-rule-test)# snmp-facility <SNMP facility to be provided for this alert>
```

where, <*SNMP facility to be provided for this alert*> is the facility to be provided for this alert. For example, application

```
scheduler(config-rule-test)# event-host-label <provide the node details>
```

where, <*provide the node details*> is used to provide node details. For example, instance

```
scheduler(config-rule-test)# snmp-severity
Possible completions:
  alert  critical  debug  emergency  error  info  none  notice  warning

scheduler(config-rule-test)# snmp-severity <SNMP severity to be send for this alert>
```

where, <*SNMP severity to be send for this alert*> is the severity level to be used for alert rule. For example, critical

```
scheduler(config-rule-test)# duration <time>
```

where, <*time*> causes Prometheus to wait for a certain duration between first encountering a new expression output vector element (like, an instance with a high HTTP error rate) and counting an alert as firing for this element. Elements that are active, but not firing yet, are in pending state.

```
scheduler(config-rule-test)# commit
Commit complete.
scheduler(config-rule-test)# end
```

Sample Configuration

The alert rules configuration is for reference only. Here is the configuration with sample values:

You can configure your alert rules based on your requirements.

```
scheduler#config
scheduler(config)# alert rule test
Value for 'expression' (<string>): test>1
Value for 'message' (<string>): testing
Value for 'snmp-clear-message' (<string>): test clear
scheduler(config-rule-test)#
scheduler(config-rule-test)# snmp-facility
Possible completions:
  application  hardware  networking  os  proc  virtualization
scheduler(config-rule-test)# snmp-facility application
scheduler(config-rule-test)# event-host-label instance
scheduler(config-rule-test)# snmp-severity
Possible completions:
  alert  critical  debug  emergency  error  info  none  notice  warning
scheduler(config-rule-test)# snmp-severity critical
scheduler(config-rule-test)# duration 30s
scheduler(config-rule-test)# commit
Commit complete.
scheduler(config-rule-test)# end
```

To display all the configured alert rules use the following command:

```
scheduler# show running-config alert | tab

                           EVENT
                           HOST                SNMP          SNMP       SNMP CLEAR
NAME  EXPRESSION  DURATION  LABEL     MESSAGE   FACILITY      SEVERITY   MESSAGE
-------------------------------------------------------------------------------------
test  test > 1    -         instance  testing   application   critical   testing clear
```

Configure Different Thresholds

You can configure thresholds parameter with threshold input as comma-separated fields at the time of alarm severity setup.

Note The **threshold** parameter is optional. This is because not all alerts have different thresholds.

Configure the following two type of alert expression:

- Ascending threshold [HIGH_CPU_USAGE]
- Descending threshold [LOW_MEMORY]

Ascending Alert:

Create an alert with different thresholds using the following example:

```
alert rule HIGH_CPU_USAGE
expresssion        "rate(node_cpu_seconds_total{mode=\"system\"} [10s])*100 > threshold"
event-host-label   instance
message            "CPU usage in last 10 sec is {{ $value }}!"
threshold      10,20,30
snmp-clear-message "CLEAR HIGH CPU  value {{ $value }}!"
!
```

For Alerts with “threshold” configured, below SNMP severity is configured by default and are not configurable.

Table 7: SNMP Severity

Alert Severity	SNMP Severity
Critical	Emergency
Major	Error
Minor	Warn

Note There should be no space between > and threshold keyword. For example, use the exact phrase as >threshold. Also, threshold defined should be in ascending order (10,20,30). Where, 10 corresponds to minor, 20 major, and more than 30 critical.

Descending Alert:

Create an alert with different thresholds using the following example:

```
expression    "node_memory_MemAvailable_bytes / node_memory_MemTotal_bytes * 100<threshold"

 duration           20s
 event-host-label   instance
 message            "ALERT HIGH Memory utilization value {{ $value }}!"
 threshold          50,40,30
 snmp-clear-message "\"CLEAR HIGH Memory utilization value {{ $value }}"
```

For Alerts with “threshold” configured, below SNMP severity is configured by default and are not configurable.

Table 8: SNMP Severity

Alert Severity	SNMP Severity
Critical	Emergency
Major	Error
Minor	Warn

Note There should be no space between > and threshold keyword. For example, use the exact phrase as >threshold. Also, threshold that is defined should be in ascending order (50,40,30). Where, 50 corresponds to minor, 40 major, and 30 critical.

Note When an alert severity changes then the previous alert is cleared and a new alert is raised with updated severity. CLI will always display the latest alert. Alert configuration is range bound and ensures that there is only one threshold value qualifying condition. Alarm is raised once criteria is met and resolved or cleared when criteria is no longer valid.

Troubleshooting: SNMP traps can be monitored to track the alert transition.

Raising and Clearing Alert Mechanism

When Alert with no threshold is configured:

- When an alert is raised, the alert status is shown as *firing* in the **show alert status**.
- SEVERITY parameter is marked as *Not Applicable*.
- SNMP trap is sent with the configured SNMP severity.
- When the alert is cleared, the alert status is shown as *resolved* in the **show alert status**.
- SNMP trap is sent with status as *cleared*.

When Alert with threshold is configured:

- A minor alert is raised and cleared.
- When an alert is raised, the alert status is shown as *firing* in the **show alert status**.
- SEVERITY parameter will be marked as *minor*.
- SNMP trap is sent with status as *warn*.
- When the alert is cleared, the alert status is shown as *resolved* in the **show alert status**.
- SNMP trap is sent with status as *cleared*.

When Alert with threshold is configured, alarms are raised and cleared based on threshold level. Alarm gets cleared if value of expression is out of configured range. And alarm is raised if it comes within the range.

- If alerts with threshold are configured, a minor alert is raised and transitioned to **Major.**

- When an alert is raised:
  - Alert status is shown as *firing* in the **show alert status**
  - SEVERITY parameter is marked as *minor*.
  - SNMP trap is sent with status as *warn*.
- When an alert is transitioned to Major:
  - Existing SNMP trap *warn* is cleared.
  - A new alert is raised as *firing* in the **show alert status**.
  - SEVERITY parameter is marked as *major*.
  - New SNMP trap is sent with severity as *error*.
- When an alert is transitioned back to Minor:
  - A new alert is raised as *firing* in the **show alert status**.
  - Existing SNMP trap *error* is cleared.
  - SNMP trap is sent with severity as *warn*.
- When the alert is cleared:
  - The alert status is shown as *resolved* in the **show alert status**.
  - SNMP trap is sent with status as *cleared*.

Configuration Restrictions

- >threshold and <threshold are keywords.
- There should be no space between {>,<} and threshold.
- When above keywords are given in expression its mandatory to provide threshold values
- Threshold values should be provided in ascending or descending as per keyword used.
- Threshold value should be provided as comma separated string with three values.

Enabling Alerts for TLS Certificate Expiration

You can enable configuration to raise alerts when the certificate expiration date meets that threshold timeline. The threshold timeline for the certificate expiration is 60 days, which is considered alert level as minor. When the threshold timeline reaches 30 days the level of an alert is Major, and when it reaches two weeks of time that is 14 days the alert is considered as Critical.

Sample Configuration:

```
alert rule TLS_CERT_EXPIRY
tls_cert_validity < threshold
           message "certificate expire in {{$value}} days!"
     threshold 14,30,60
        snmp-severity critical
           snmp-facility application
    snmp-clear-message "TLS Certificate will expire in {{ $value }} days!"
```

Sample Alert Messages

```
alert status TLS_CERT_EXPIRY system
status       firing
message      "certificate expire in 60 days!"
create-time  2022-11-22T13:33:57.997+00:00
update-time  2022-11-22T13:38:59.339+00:00
severity     "Minor"

alert status TLS_CERT_EXPIRY system
status       firing
message      "certificate expire in 29 days!"
create-time  2022-11-22T13:33:57.997+00:00
update-time  2022-11-22T13:38:59.339+00:00
severity     "Major"

alert status TLS_CERT_EXPIRY system
status       firing
message      "certificate expire in 13 days!"
create-time  2022-11-22T13:33:57.997+00:00
update-time  2022-11-22T13:38:59.339+00:00
severity     "Critical"
```

Sample Alert Rules

You can configure alert rules based on your requirements. For sample configuration, refer to Sample Alert Rule Configuration.

Note *event-host-label* value is used as a key in the alarm map. So, configure the correct value based on your requirements while configuring alert rules.

Note Grafana can be used to see all the statistics generated by the system and based on these statistics alerting rules can be configured.

Note Alert SNMP command includes an optional parameter named add-vm-info that you can use to specify whether or not the VM name is prepended in the SNMP alarm in broadhopComponentName. For example, broadhopComponentName: VMName/containerName. By default, the parameter is set to true. If set to false, broadhopComponentName does not prepend VM name. For example, broadhopComponentName: containerName. The following table includes sample alert rules when add-vm-info is set to false. For more information about this parameter and the command, see the *vDRA Operations Guide*.

Table 9: Sample Alert Rules

Alarm Name	Configuration
DiskFull	broadhopComponentName: Linux host name broadhopComponentNotificationName: DISK_FULL broadhopNotificationFacility: hardware Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Disk Filesystem/usage is more than 90% Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Disk filesystem/usage is greater than 10% **Expression:** (round((node_filesystem_size_bytes{job='node_exporter'}- node_filesystem_avail_bytes{job='node_exporter'})/node_filesystem_size_bytes {job='node_exporter'}*100)) >= 70
HighLoad	broadhopComponentName: Linux host name broadhopComponentNotificationName: HIGH_LOAD broadhopNotificationFacility: hardware Alert broadhopNotificationSeverity: major Alert broadhopComponentAdditionalInfo: load average value for 5 minutes is greater than 3 current value is {{ $value }} Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: load average value for 5 minutes is lower than 3 **Expression:** node_load5 > 3
LowMemoryAlert	broadhopComponentName: Linux host name broadhopComponentNotificationName: LOW_MEMORY broadhopNotificationFacility: hardware Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Available RAM is less than 20% current value is {{ $value }} Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Available RAM is more than 20% **Expression:** round((node_memory_MemAvailable_bytes/node_memory_MemTotal_bytes)*100) < 20

Alarm Name	Configuration
High CPU Usage Alert	broadhopComponentName: Linux host name broadhopComponentNotificationName: HIGH_CPU_USAGE broadhopNotificationFacility: hardware Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: CPU usage in last 10 sec is more than 30% current value {{ $value }} Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: CPU usage in last 10 sec is lower than 30% **Expression:** rate(node_cpu_seconds_total{mode=\"system\"} [10s])*100 > 40
Link down Alert	broadhopComponentName: Linux host name broadhopComponentNotificationName: LINK_STATE broadhopNotificationFacility: networking Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: {{ $labels.interface }} is down on {{ $labels.instance }} Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: {{ $labels.interface }} is up on {{ $labels.instance }} **Expression:** link_state == 0
Process down Alert	Container Name: Linux host name broadhopComponentNotificationName: PROCESS_STATE broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: {{ $labels.service_name }} instance {{ $labels.module_instance }}of module {{ $labels.module }} is in Aborted state. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: {{ $labels.service_name }} instance {{ $labels.module_instance }}of module {{ $labels.module }} is moved from Aborted state **Expression:** docker_service_up==1 or docker_service_up==3

Alarm Name	Configuration
VM/Node Down Alert	broadhopComponentName: IP Address broadhopComponentNotificationName: IP_NOT_REACHABLE broadhopNotificationFacility: networking Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: VM/VIP IP {{$labels.instance }} is not reachable Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: VM/VIP IP {{$labels.instance }} is reachable **Expression:** probe_icmp_target==0
DiameterPeer Status	broadhopComponentName: Peer FQDN broadhopComponentNotificationName: DIAMETER_PEER_DOWN broadhopNotificationFacility: application Alert broadhopNotificationSeverity: error Alert broadhopComponentAdditionalInfo: Diameter peer is down Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Diameter peer is up. **Expression:** alert rule DIAMETER_PEER_DOWN expression "((sum(peer_connection_status{remote_peer != \"\"}) by (local_peer,remote_peer,dscp)) == 0)"
DRA Process Down (healthy) Alert	broadhopComponentName: Container Name broadhopComponentNotificationName: DRA_PROCESS_UNHEALTHY broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: {{ $labels.service_name }} instance {{ $labels.module_instance }} of module {{ $labels.module }} is not healthy Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: {{ $labels.service_name }} instance {{ $labels.module_instance }} of module {{ $labels.module }} is healthy **Expression:** docker_service_up==4

Alarm Name	Configuration
All DB Member of Replica Set Down Alert	broadhopComponentName: Shard Name broadhopComponentNotificationName: DB_SHARD_DOWN broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: All DB Members of replica set {{ $labels.shard_name }} are down Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Some DB Members of replica set {{ $labels.shard_name }} are up **Expression:** absent(mongodb_mongod_replset_member_state{shard_name="shard-1"})==1
No primary DB Member found Alert	broadhopComponentName: Shard Name broadhopComponentNotificationName: NO_PRIMARY_DB broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Primary DB member not found for replica set {{ $labels.shard_name }} Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Primary DB member found for replica set {{ $labels.shard_name }} **Expression:** absent(mongodb_mongod_replset_member_health {shard_name="shard-1",state="PRIMARY"})==1
Secondary DB Member Down Alert	broadhopComponentName: Shard Name broadhopComponentNotificationName: SECONDARY_DB_DOWN broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Secondary Member {{ $labels.name }} of replica set {{ $labels.shard_name }} is down Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Secondary Member {{ $labels.name }} of replica set {{ $labels.shard_name }} is down **Expression:** (mongodb_mongod_replset_member_state != 2) and ((mongodb_mongod_replset_member_state==8) or (mongodb_mongod_replset_member_state==6))

Alarm Name	Configuration
DRA message processing failure TPS exceeded	broadhopComponentName: System broadhopComponentNotificationName: DRA_MESSAGE_PROCESSING_FAILURE_TPS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Message Processing Failure TPS exceeded. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo Message Processing Failure TPS in control. **Expression:** rate(rejected_messages_total[5m]) > 5
Keepalive RAR routing failure - TPS exceeded	broadhopComponentName: System broadhopComponentNotificationName: KEEP_ALIVE_RAR_ROUTING_FAILURE_TPS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Keep Alive RAR TPS exceeded. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Keep Alive RAR TPS in control. **Expression:** rate(keep_alive_rar_failure[5m]) > 5
Egress rate limited session error response TPS exceeded	broadhopComponentName: Peer FQDN broadhopComponentNotificationName: EGRESS_RATE_LIMITED_SESSION_ERR_RESP_TPS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Egress rate limited messages with error response TPS exceeded. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Egress rate limited messages with error response TPS in control. **Expression:** rate(diameter_peer_egress_rate_limited_with_err_response[5m]) > 5

Alarm Name	Configuration
Egress rate limited session reject TPS exceeded	broadhopComponentName: Peer FQDN broadhopComponentNotificationName: EGRESS_RATE_LIMITED_SESSION_REJECT_TPS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Egress rate limited messages dropped without error TPS exceeded. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Egress rate limited messages dropped without error TPS in control. **Expression:** rate(diameter_peer_egress_rate_limited_without_err_response[5m]) > 5
Ingress rate limited session error response TPS exceeded	broadhopComponentName: Peer FQDN broadhopComponentNotificationName: INGRESS_RATE_LIMITED_SESSION_ERR_RESP_TPS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Ingress rate limited messages with error response TPS exceeded. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Ingress rate limited messages with error response TPS in control. **Expression:** rate(diameter_peer_ingress_rate_limited_with_err_response[5m]) > 5
Ingress rate limited session reject TPS exceeded	broadhopComponentName: Peer FQDN broadhopComponentNotificationName: INGRESS_RATE_LIMITED_SESSION_REJECT_TPS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Ingress rate limited messages dropped without error response TPS exceeded. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Ingress rate limited messages dropped without error response TPS in control. **Expression:** rate(diameter_peer_ingress_rate_limited_without_err_response[5m]) > 5

Alarm Name	Configuration
Binding key not found in AAR TPS exceeded	broadhopComponentName: System broadhopComponentNotificationName: BINDING_KEY_NOT_FOUND_IN_AAR_TPS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Binding Key not found in AAR TPS exceeded. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Binding Key not found in AAR TPS in control. **Expression:** rate(aar_bind_key_not_found_total[5m]) > 5
Binding key not found in CCR-I TPS exceeded	broadhopComponentName: System broadhopComponentNotificationName: BINDING_KEY_NOT_FOUND_IN_CCR_I_TPS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Binding Key not found in CCR(I) TPS exceeded. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Binding Key not found in CCR(I) TPS in control. **Expression:** rate(ccri_bind_key_not_found_total[5m]) > 5
Peer response time exceeded	broadhopComponentName: Peer FQDN broadhopComponentNotificationName: PEER_RESPONSE_TIME_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Peer response time exceeded. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Peer response time in control. **Expression:** rate(message_duration_seconds{type=~\"peer_.*\"}[5m]) > 5

Alarm Name	Configuration
No peer group member available	broadhopComponentName: Container Name broadhopComponentNotificationName: NO_PEER_GROUP_MEMBER_AVAILABLE broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Peer group not available. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Peer group available. **Expression:** no_active_peer_in_peer_group ==1
Forwarding loop found TPS exceeded	broadhopComponentName: System broadhopComponentNotificationName: FORWARDING_LOOP_FOUND_TPS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Loop Detected TPS exceeded. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Loop Detected TPS in control. **Expression:** rate(diameter_loop_detected [5m]) > 5
No relay peer TPS exceeded	broadhopComponentName: Container Name broadhopComponentNotificationName: NO_RELAY_PEER_TPS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Relay Peer TPS exceeded. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Relay Peer TPS in control. **Expression:** rate(relay_send_nopeer[5m]) > 5

Alarm Name	Configuration
Relay link status	broadhopComponentName: Peer FQDN broadhopComponentNotificationName: RELAY_LINK_STATUS broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Relay Link is down. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Relay Link is up **Expression:** relay_peer_status == 0
Binding not found TPS exceeded	broadhopComponentName: System broadhopComponentNotificationName: BINDING_NOT_FOUND_TPS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Binding not found TPS exceeded. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Binding not found TPS in control **Expression:** rate(binding_not_found_total[5m]) > 5
Relay link TPS GT 0	broadhopComponentName: Peer FQDN broadhopComponentNotificationName: RELAY_LINK_TPS_GT_0 broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Relay started. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Relay not started. **Expression:** rate(relay_peer_messages_total[5m]) > 0
Relay link TPS exceeded	broadhopComponentName: Peer FQDN broadhopComponentNotificationName: RELAY_LINK_TPS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Relay Link TPS exceeded. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Relay Link TPS in control. **Expression:** rate(relay_peer_messages_total[5m]) > 5

Alarm Name	Configuration
SVN_BACKUP_ALERT	broadhopComponentName: Linux host name broadhopComponentNotificationName: SVN_BACKUP_ALERT broadhopNotificationFacility: application Alert broadhopNotificationSeverity: warning Alert broadhopComponentAdditionalInfo: svn backup in mongo is out of sync Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: svn backup in mongo is in sync now **Expression:** svn_alert==1
CRD_CACHE_ LOAD_ERROR	broadhopComponentName: Container Name broadhopComponentNotificationName: CRD_CACHE_LOAD_ERROR broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: CRD cache not loaded / loaded with error Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: CRD cache loaded successfully **Expression:** crd_cache_load_error==1
APP_SERVICE_HEALTH_ STATUS_CRD*	broadhopComponentName: Container Name broadhopComponentNotificationName: APP_SERVICE_HEALTH_STATUS_CRD broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: {{$labels.service}} service is Unhealthy! Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: {{$labels.service}} service is Healthy **Expression**: app_service_health_status{service="CRD"}==1

Alarm Name	Configuration
APP_SERVICE_ HEALTH_STATUS_ METADATA_DB*	broadhopComponentName: Container Name broadhopComponentNotificationName: APP_SERVICE_HEALTH_STATUS_METADATA_DB broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: {{$labels.service}} service is Unhealthy! Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: {{$labels.service}} service is Healthy **Expression**: app_service_health_status{service="METADATA_DB"}==1
VIP_NOT_ACTIVE_ ON_PREFERRED*	broadhopComponentName: Container Name broadhopComponentNotificationName: VIP_NOT_ACTIVE_ON_PREFERRED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: VIP {{ $labels.vip }} active on {{ $labels.currentHost }} and not active on preferred {{ $labels.preferredHost }} Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: VIP {{ $labels.vip }} active on preferred {{ $labels.preferredHost }} **Expression**: vip_not_active_on_preferred==1
DYNAMIC_ PEER_THROTTLING*	broadhopComponentName: Container Name broadhopComponentNotificationName: PEER_DYNAMIC_RATE_LIMIT_THROTTLING broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Dynamic Rate limit is active Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Dynamic Rate limit is not active **Expression**: sum(peer_dynamic_rate_limit_throttling) != 0

Alarm Name	Configuration
NO_DB_CPU_ THRESHOLD_STATUS*	broadhopComponentName: Container Name broadhopComponentNotificationName: NO_DB_CPU_THRESHOLD_STATUS broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: {{$labels.instance}} is not receiving any threshold message Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: {{$labels.instance}} is receiving throttling messages **Expression**: sum(rate(processed_db_cpu_control_message_total [30s])) == 0
QNS_LOGGING_ STOPPED*	broadhopComponentName: System broadhopComponentNotificationName: QNS_LOGGING_STOPPED broadhopNotificationFacility: application broadhopNotificationSeverity: critical AlertbroadhopComponentAdditionalInfo: Application logging has stopped on {{$labels.hostname}} at {{$labels.last_updated_time}} with connections closed {{$labels.tcp_closed}} ClearbroadhopNotificationSeverity: clear ClearbroadhopComponentAdditionalInfo: Application logging is successful on {{$labels.hostname}} at {{$labels.last_updated_time}} **Expression**: qns_logging_alert==1
DRA_PCRF_QUERY_ NODE_INACTIVE*	broadhopComponentName: Pcrf Rest Endpoint Url broadhopComponentNotificationName: DRA_PCRF_QUERY_NODE_INACTIVE broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: {{$labels.url_endpoint}} is Inactive! Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: {{$labels.url_endpoint}} is Active. **Expression**: (sum(rate(pcrf_http_hb_send{status="fail"}[5m])) by (url_endpoint)) > 0

Alarm Name	Configuration
DRA_PCRF_ QUERY_TPS_ EXCEEDED*	broadhopComponentName: System broadhopComponentNotificationName: DRA_PCRF_QUERY_TPS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: {{$labels.instance}} Pcrf Session Query TPS exceeded, current value is {{ $value }}. Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: {{ $labels.instance }} Pcrf Session Query TPS in control. **Expression**: rate(pcrf_binding_query_total{status="success"}[5m]) > 5
RELAY_TRAFFIC_ THRESHOLD_ EXCEEDED*	broadhopComponentName: instance broadhopComponentNotificationName: RELAY_TRAFFIC_THRESHOLD_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Relay traffic exceeded the threshold of 20%. Current value is {{ $value }}%" Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: {{ $labels.instance }} "Relay traffic % is under control" **Expression**: round(sum(irate(relay_message_total{direction=\"egress\",message_type=\"request\"}[5m])) / sum(irate(diameter_request_total[5m])) * 100) > 10
LOCAL_ PUBLISH_STOPPED*	broadhopComponentName: instance broadhopComponentNotificationName: LOCAL_PUBLISH_STOPPED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Local publish stopped for {{ $labels.instance }} Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Local publish started for {{ $labels.instance }} **Expression**: (sum(peer_connection_status) by (instance)!=0) and (sum(irate(local_control_messages_published_total{message_type=\"DraPeerUpMessage\",system=\"system-1\"}[5m])) by(instance) == 0)

Alarm Name	Configuration
GLOBAL_ PUBLISH_STOPPED*	broadhopComponentName: instance broadhopComponentNotificationName: GLOBAL_PUBLISH_STOPPED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Global publish stopped for {{ $labels.instance }} Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Global publish started for {{ $labels.instance }} **Expression**: (sum(peer_connection_status) by (instance)!=0) and (sum(irate(global_control_messages_published_total[5m])) by (instance) == 0)
DIAMETER_ENDPOINTS_ MISSING_LOST_REDIS*	broadhopComponentName: system broadhopComponentNotificationName: DIAMETER_ENDPOINTS_MISSING_LOST_REDIS broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Diameter Endpoints missing due to Redis connection lost Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Redis connection restored. Diameter Endpoints are restored **Expression**: (sum(irate(topology_update_msg_received_total[30s])) == 0)
DIAMETER_PEER_ EXPIRATIONS_ EXCEEDED*	broadhopComponentName: PEER FQDN broadhopComponentNotificationName: DIAMETER_PEER_EXPIRATIONS_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: {{$labels.origin_host}} got EXPIRED in {{$labels.system}} Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Peer expiration got reset for {{$labels.origin_host}} **Expression**: sum(irate(topology_peer_expirations_total[5m])) by (system,origin_host) > 0

Alarm Name	Configuration
ELASTICSEARCH_NOT_REACHABLE	broadhopComponentName: System broadhopComponentNotificationName: ELASTICSEARCH_NOT_REACHABLE broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Elasticsearch server is unreachable with status {{$labels.reachable_status}} with tcp connection status {{$labels.tcp_connected}} Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Elasticsearch server is reachable now !!! **Expression**: elasticsearch_server_status==1
PEER_LIMIT_FOR_SITE_EXCEEDED	broadhopComponentName: Linux host name broadhopComponentNotificationName: PEER_LIMIT_FOR_SITE_EXCEEDED broadhopNotificationFacility: application Alert broadhopNotificationSeverity: critical Alert broadhopComponentAdditionalInfo: Active peer count exceeds the threshold value Clear broadhopNotificationSeverity: clear Clear broadhopComponentAdditionalInfo: Active peer count is less than threshold value **Expression**: ((sum(avg(active_peer_count) by (app_id, system_id))) > 30000) **Note** The maximum value supported for peer-connection-count is 32000. You can configure the threshold value for alert in your environment.
NTP_SERVER_NOT_REACHABLE	Message: NTP servers are not reachable snmp-clear-message: NTP servers are reachable **Expression**: ntp_server_status >threshold **Note** Configure the threshold value based on the requirement. For example, `Threshold: 1,2,3`
SNMP_SERVER_NOT_REACHABLE	Message: SNMP servers are not reachable snmp-clear-message: SNMP servers are reachable **Expression**: snmp_server_status >threshold **Note** Configure the threshold value based on the requirement. For example, `Threshold: 1,2,3`

Alarm Name	Configuration
HIGH_CLOCK_SKEW_WITH_NTP_CLIENT	**Without Severity** event-host-label : instance Message: NTP client is having higher clock skew with NTP server [{$labels.ntp_server_ip}] with the value {{$value}} snmp-clear-message: NTP client clock skew is normal now **Expression**: ntp_client_clock_skew >10
	With Severity event-host-label : instance Message: NTP client is having higher clock skew with NTP server [{$labels.ntp_server_ip}] with the value {{$value}} snmp-clear-message: NTP client clock skew is normal now **Expression**: ntp_client_clock_skew >threshold **Note** Configure the threshold value based on the requirement. For example, `Threshold: 1,5,10`

Note This alert rule has not been validated for all customer deployment scenarios. Please contact your Sales Account team for support.

Health Status of Service

On getting the Qns Java Process State alert, the user has to access the system and check the diagnostics logs of the service to get the exact issue with the service. To access the system and check the diagnostics log, run the following command:

```
show system diagnostics | include <service_name>
```

For example:

```
scheduler# show system diagnostics | include diameter-endpoint-s1
system diagnostics diameter-endpoint-s1 serfHealth 1
system diagnostics diameter-endpoint-s1 service:cisco-policy-app 1
system diagnostics diameter-endpoint-s1 service:cisco-policy-app 2
system diagnostics diameter-endpoint-s1 service:cisco-policy-app 3
system diagnostics diameter-endpoint-s1 service:cisco-policy-app 4
 message "CLEARED: InterfaceID=diameter-endpoint-s1.weave.local;msg=\"Memcached server is
operational\""
system diagnostics diameter-endpoint-s1 service:cisco-policy-app 5
 message "CLEARED: InterfaceID=com.broadhop.server:diameter-endpoint-s1.weave.local;msg=\"
 before Feature com.broadhop.server is Running\""
system diagnostics diameter-endpoint-s1 service:cisco-policy-app 6
 message "CLEARED:
InterfaceID=com.broadhop.dra.service:diameter-endpoint-s1.weave.local;msg=\" before Feature
 com.broadhop.dra.service is Running\""
system diagnostics diameter-endpoint-s1 service:cisco-policy-app 7
 message "CLEARED:
InterfaceID=com.broadhop.common.service:diameter-endpoint-s1.weave.local;msg=\" before
```

```
Feature com.broadhop.common.service is Running\""
system diagnostics diameter-endpoint-s1 service:cisco-policy-app 8
 message "CLEARED:
InterfaceID=com.broadhop.resourcemonitor:diameter-endpoint-s1.weave.local;msg=\" before
Feature com.broadhop.resourcemonitor is Running\""
system diagnostics diameter-endpoint-s1 service:cisco-policy-app 9
 message "CLEARED:
InterfaceID=com.broadhop.microservices.control:diameter-endpoint-s1.weave.local;msg=\"
before Feature com.broadhop.microservices.control is Running\""
system diagnostics diameter-endpoint-s1 service:cisco-policy-app 10
 message "CLEARED:
InterfaceID=com.broadhop.custrefdata.service:diameter-endpoint-s1.weave.local;msg=\" before
 Feature com.broadhop.custrefdata.service is Running\""
system diagnostics diameter-endpoint-s1 service:cisco-policy-app 11
system diagnostics diameter-endpoint-s1 service:cisco-policy-jmx 1
scheduler#
```

Delete Alert Rules

The following section describes the procedure to delete an alert rule and are for reference only:

```
scheduler# config
Entering configuration mode terminal
scheduler(config)# no alert rule node_down
scheduler(config)# commit
Commit complete.
scheduler(config)# end
scheduler#
```

Alert Status

Use the following command to display the current alerts status:

```
show alert status
```

For example:

```
scheduler# show alert status
NAME                  EVENT HOST      STATUS    MESSAGE
                        UPDATE TIME
-------------------------------------------------------------------------------------------------
high_cpu_alert        system          firing    CPU usage is more than 30% current_value
is 37.05555555555597     2017-05-22T10:59:37.945+00:00
high_cpu_alert_1      control-0       resolved  CPU usage is more than 30% current_value
is 33.62500000000637     2017-05-22T17:17:38.184+00:00
high_cpu_alert_1      control-1       resolved  CPU usage is more than 30% current_value
is 35.666666666667076    2017-05-22T11:29:37.899+00:00
high_cpu_usage_alert  localhost:9090  resolved  CPU Usage for last 1 min is more than
configured threshold        2017-05-22T09:55:37.902+00:00
2017-05-22T15:39:37.811+00:00

scheduler#
```

Database Alert Expression

IMSI_MSISDN Cluster

Alert Threshold for IMSI/MSISDN:

- Capacity per Primary Shard = 145000/48 = 3020 TPS
- Alert Threshold per Shard Primary (85%) = 2500 TPS

alert rule DRA_IMSI_MSISDN_DB_TPS_EXCEEDED

expression "sum(rate(mongo_operation_total{state='primary',type='mongo',op=~'update|query|delete',cluster='IMSI_MSISDN'}[5m])) > (2500 * sum (mongo_node_state_primary {cluster='IMSI_MSISDN',type='mongo'}))"

event-host-label instance

message "{{ $labels.instance }} Persistence DB TPS exceeded , current value is {{ $value }} !"

snmp-severity critical

snmp-clear-message "{{ $labels.instance }} Persistence DB TPS in control, current value is {{ $value }} !"

Session_IPv6 Cluster

Alert Threshold for Session:

- Capacity per Primary Shard = 180000/48 = 3750 TPS
- Alert Threshold per Shard Primary (85%) = 3200 TPS

alert rule DRA_SESS_IPV6_DB_TPS_EXCEEDED

expression "sum(rate(mongo_operation_total{state='primary',type='mongo',op=~'update|query|delete',cluster=~'SES_IPV6_.*'}[5m])) > (3200 * sum(mongo_node_state_primary{cluster=~'SES_IPV6_.*',type='mongo'}))"

event-host-label instance

message "{{ $labels.instance }} Persistence DB TPS exceeded , current value is {{ $value }} !"

snmp-severity critical

snmp-clear-message "{{ $labels.instance }} Persistence DB TPS in control, current value is {{ $value }} !"

NMS Destination Configuration

The following configuration is for reference only:

You can configure the NMS destination based on your requirements.

Example: SNMPv2

```
scheduler#config
scheduler(config)# alert snmp-v2-destination "10.1.1.1"
Value for 'community' (<string>): "cisco"
scheduler(config-snmp-v2-destination-10.1.1.1)# commit
Commit complete.
scheduler(config-snmp-v2-destination-10.1.1.1)# end
```

where, "10.1.1.1" is the SNMPv2 NMS destination address.

Example: SNMPv3

```
scheduler# config
scheduler(config)# alert snmp-v3-destination <nms_ip> e.g. 10.1.1.2
Value for 'user' (<string>): <username> e.g. cis_user
Value for 'auth-password' (<string>): <password string > e.g. cisco-123
Value for 'privacy-password' (<string>): <password string> e.g. cisco-123
scheduler(config-snmp-v3-destination-10.1.1.2)# auth-proto
[MD5,SHA] (SHA): SHA
scheduler(config-snmp-v3-destination-10.1.1.2)# privacy-p
Possible completions:
  privacy-password  privacy-protocol
scheduler(config-snmp-v3-destination-10.1.1.2)# privacy-protocol
[AES,DES] (AES): AES
scheduler(config-snmp-v3-destination-10.1.1.2)# engine-id
(<string>) (0x0102030405060708): 0x0102030405060708
scheduler(config-snmp-v3-destination-10.1.1.2)# commit
Commit complete.
scheduler(config-snmp-v3-destination-10.1.1.2)# end
scheduler#
```

where, "10.1.1.2" is the SNMPv3 NMS destination address.

All the configured NMS destinations in the system can be displayed using the following command:

```
scheduler# show running-config alert | tab
NMS
ADDRESS   COMMUNITY
---------------------
10.1.1.1  cisco

alert snmp-v3-destination 10.142.148.160
 engine-id        0x0102030405060708
 user             cis_user
 auth-proto       SHA
 auth-password    cisco-123
 privacy-protocol AES
 privacy-password cisco-123
!
```