External Service Nodes for AppQoE Services

Table 1: Feature History

Feature Name	Release Information	Description
Support for Multiple, External AppQoE Service Nodes	Cisco IOS XE Catalyst SD-WAN Release 17.4.1a Cisco vManage Release 20.4.1	This feature allows you to configure multiple AppQoE service nodes that are external to the intercepting edge routers or AppQoE service controllers. It extends AppQoE support to edge routers in which AppQoE can't run as an integrated service node. This feature also allows AppQoE to scale, where integrated AppQoE has limitations on the throughput and number of connections. The ability to configure multiple AppQoE service nodes help meet the scale and throughput requirements of large enterprise sites, such as data centers.
Support for Additional Platforms as Controllers for AppQoE Service Nodes	Cisco IOS XE Catalyst SD-WAN Release 17.5.1a Cisco vManage Release 20.5.1	This release extends the service controller role to additional device models—C8500L-8S4X and ASR1006-X.
Support for Automated MTU Setting for Tunnel Adjacency	Cisco IOS XE Catalyst SD-WAN Release 17.5.1a	This feature enables a programmatic setting of the maximum transmission unit (MTU) size to 1500 for the network connecting the service controllers and service nodes. This automation prevents broken communication due to packet fragmentation that can bring down the throughput requirements.
IPv6 Support for AppQoE Services	Cisco IOS XE Catalyst SD-WAN Release 17.14.1a Cisco Catalyst SD-WAN Manager Release 20.14.1	This feature allows AppQoE clusters to handle both IPv4 and IPv6 traffic.

Supported Devices for AppQoE Controllers and External Service Nodes

Devices Supported as Service Controllers

Release	Supported Devices

Cisco IOS XE Catalyst SD-WAN Release 17.4.1a and later	• **Cisco ASR 1000 Series Aggregation Services Routers**
	  • ASR1001X
	  • ASR1002X
	  • ASR1001-HX
	  • ASR1002-HX
	• **Cisco Catalyst 8500 Series Edge Platforms:**
	  • C8500-12X4QC
	  • C8500-12X
	• Cisco Catalyst 8000V Edge Software (Cisco Catalyst 8000V)
	  Note If you configure Cisco Catalyst 8000V as a service controller, you cannot use the same instance as a service node.

Cisco IOS XE Catalyst SD-WAN Release 17.5.1a and later	• **Cisco Catalyst 8500 Series Edge Platforms**
	  • C8500L-8S4X
	• **Cisco ASR 1000 Series Aggregation Services Routers**
	  • ASR1006-X

Cisco IOS XE Catalyst SD-WAN Release 17.10.1a	**Cisco Catalyst 8500 Series Edge Platforms** • C8500-20X6C—Cisco Catalyst 8500 Series 20-port SFP+, 6-port QSFP+

Devices Supported as External Service Nodes

Release	Supported Platforms
Cisco IOS XE Catalyst SD-WAN Release 17.4.1a and later	• Cisco Catalyst 8000V • **Minimum RAM Requirement:** 16 GB, to be configured as service plane heavy • **Minimum CPU:** 8 Core **Note** If you configure Cisco Catalyst 8000V as a service node, you cannot use the same instance as a service controller.

Note If you configure Cisco Catalyst 8000V as a service node, you cannot use the same instance as a service controller.

Note For information on platforms supported as external service nodes for Data Redundancy Elimination (DRE), see Traffic Optimization with DRE.

Restrictions for External AppQoE Service Nodes

- Only Cisco Catalyst 8000V instances can be configured with the service node role.
- When Cisco Catalyst 8000V is configured as a service node, it can't act as a service controller, even though Cisco Catalyst 8000V supports the service controller role.
- Only one service cluster is supported per site.
- Only one service controller group is supported per site and a service controller group can have up to eight service controllers. A maximum of eight service controllers is supported per site, and each service controller can have up to 64 service nodes.
- Only one service node group is supported per AppQoE cluster.
- VRRP is not supported for service controller to service node connectivity.
- A dedicated VRF needs to be setup for the service nodes and service controllers.
- Although handling of asymmetrical flows isn't built into AppQoE, you must configure flow symmetry for all stateful features in Cisco SD-WAN Manager.
- If a service controller fails, the flows handled by that service controller are reset.
- AppQoE Service Nodes is not supported for Cisco Catalyst 8000V when deployed on Cisco Enterprise Network Function Virtualization Infrastructure Software (NFVIS) on CSP devices.
- Ensure that the bootstrap configuration for the Cisco Catalyst 8000V instance being configured as the AppQoE service node is modified as follows:

- Exclude any controller groups from the TLOC interfaces (**exclude-controller-group** *0*)
- Ensure that the configuration includes **omp shutdown**

Note This configuration prevents the AppQoE service node from participating in the SD-WAN data plane. The absence of this modification in the bootstrap configuration leads to generation of alarms indicating that OMP and Control Connections are down in Cisco SD-WAN Manager. However, the alarms are harmless and can be ignored if the recommended configuration is absent from bootstrap configuration.

Restrictions for AppQoE Services with IPv6 Addresses

Minimum supported releases: Cisco IOS XE Catalyst SD-WAN Release 17.14.1a and Cisco Catalyst SD-WAN Manager Release 20.14.1

The restrictions for AppQoE service nodes with IPv6 addresses are:

- The control plane of an AppQoE cluster operates on either IPv4 or IPv6 traffic.
- The control plane of an AppQoE cluster that operates on IPv6 traffic supports only external service nodes.
- IPv6 traffic on Internal Service Nodes (ISN) does not support UTD.

Information about External AppQoE Service Nodes

Overview of External AppQoE Service Nodes

The support for configuring multiple, external Application Quality of Experience (AppQoE) service nodes provides high availability for TCP and DRE optimization. When AppQoE service nodes are external to the edge router acting as the service controller, the dependency on this intercepting router is reduced. Prior to the release of this feature, AppQoE service instances had to be configured on the service controller itself. You can now configure supported devices with the AppQoE service node role to optimize traffic based on sites and applications. This solution addresses the requirement of larger enterprises to have higher throughput and more number of connections.

Note The maximum Application Optimization Interconnect Manager (AOIM) peers supported is 255. The MAX number of peers that DRE nodes can connect to is 255.

IPv6 Support for AppQoE Services

From Cisco IOS XE Catalyst SD-WAN Release 17.14.1a and Cisco Catalyst SD-WAN Manager Release 20.14.1, any AppQoE cluster (integrated-service-node, external-service-node, and hybrid-service-node) supports IPv6 traffic.

Components of AppQoE Solution with External Service Nodes

- **AppQoE Cluster:** An AppQoE controller and a group of AppQoE service nodes at a site.

  Typically, data centers or regional data center sites, which require higher aggregated throughput, have an AppQoE cluster with external service nodes for TCP and DRE optimization.

- **AppQoE Controller:** A supported Cisco IOS XE Catalyst SD-WAN device that intercepts network traffic. Based on the AppQoE policy, the device distributes that traffic to one or more AppQoE service nodes.

- **AppQoE Service Nodes:** Devices that are configured as AppQoE service nodes are TCP optimization instances that optimize and accelerate traffic. The optimization is based on the configuration in control policies.

  From Cisco IOS XE Catalyst SD-WAN Release 17.5.1a, the service nodes can also run the DRE feature to eliminate data redundancy and reduce bandwidth usage. For more information, see Traffic Optimization with DRE .

How External Service Nodes and Standalone Controllers Work

With Cisco Catalyst SD-WAN supporting the creation of external service nodes from Cisco IOS XE Catalyst SD-WAN Release 17.4.1a, service nodes are decoupled from the intercepting edge router or the service controller. You now have the option to configure supported devices as standalone service controllers and connect them to devices that are configured with the service node role.

Using Cisco SD-WAN Manager device templates, you can configure the following roles on supported devices:

- Service Node
- Service Controller

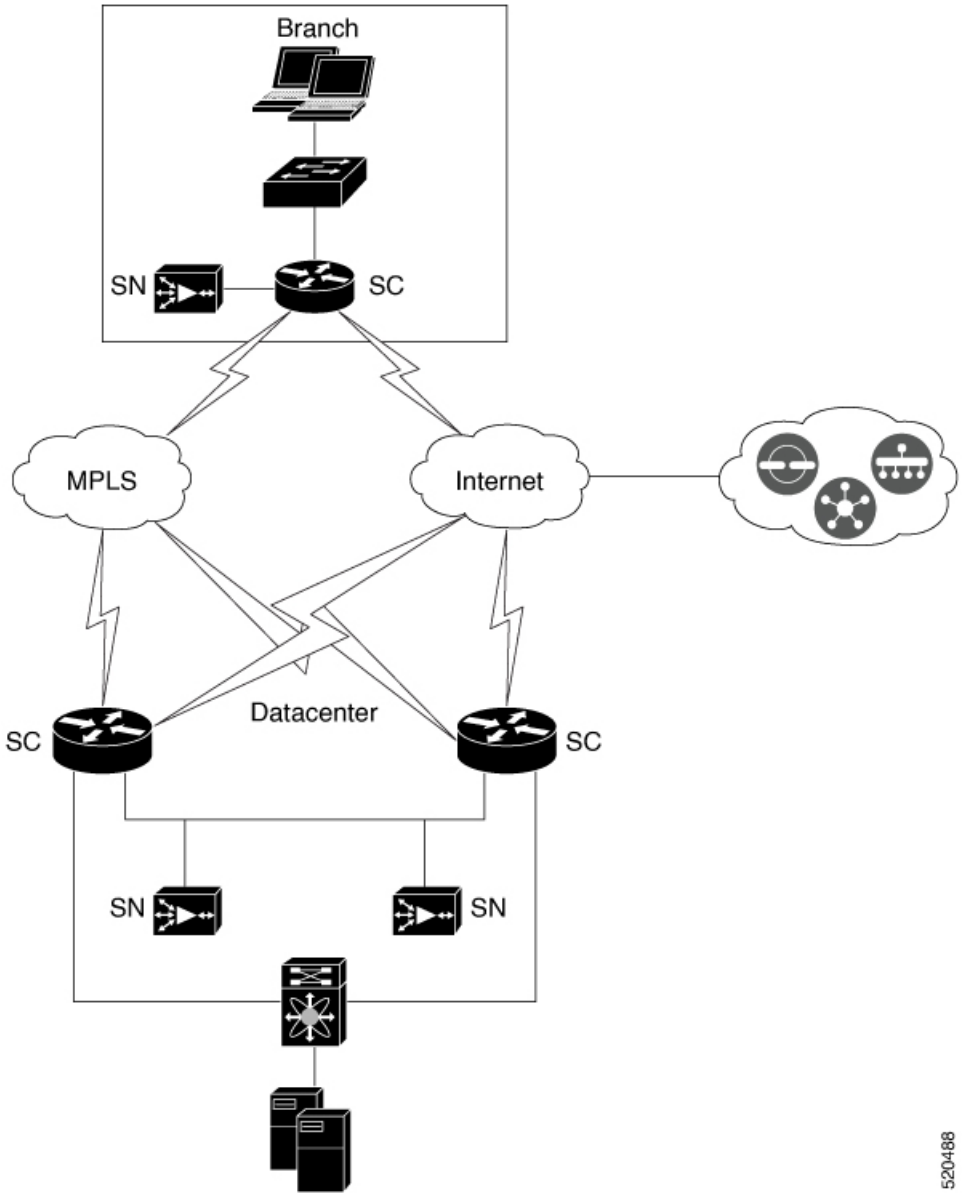
How Service Controllers and Service Nodes Interact

- In Cisco IOS XE Catalyst SD-WAN Release 17.4.1a, only Cisco Catalyst 8000V Edge Software (Cisco Catalyst 8000V) can be configured with the service node role. When you configure Cisco Catalyst 8000V instances with the service node role, a default AppQoE template is attached to them, which cannot be modified.
- Service nodes in a site and the service controllers that they are connected to form a service cluster.
- Service nodes do not communicate with each other and are not aware of the other service nodes in the cluster.
- Service controllers initiate communication with the service nodes connected to them. This configuration is set up in the AppQoE feature template associated with a device template that has the service controller role defined.
- Service controllers and service nodes can be adjacent to each other, or next or multiple hops away.
- Service controllers communicate with the service nodes through service VPNs. However, service nodes communicate with service controllers through transport VPN or VPN 0.
- Service nodes only respond to the service controller that they are connected with.

- In Cisco SD-WAN Manager, the health of each AppQoE service node is represented by the colors Green or Yellow. Only nodes with Green status are considered for distribution of new flows. Any ongoing flows to service nodes showing as Yellow are redirected.

Sample Topology

Figure 1: Sample Topology with External Service Nodes



*SN: Service node (up to 64 per controller)
*SC: Service controller (up to 8 per site)

The image above shows an example of Cisco Catalyst SD-WAN deployment with service nodes that are external to the service controller. The image shows the deployment at both a branch site and a data center. Cisco IOS XE Catalyst SD-WAN devices at the data center and branches form an AppQoE cluster with service nodes at their respective sites.

Best Practices and Recommendations

- To ensure that the service nodes have sufficient capacity for AppQoE services, don't configure any other features on devices that have been configured with the service node role.
- When you create an AppQoE cluster containing service controllers and service nodes, ensure that all the cluster members have the same ID as the site.
- Ensure that service controllers and service nodes that form a cluster share the same Cisco Catalyst SD-WAN site ID. If there's a mismatch in the site IDs, the service nodes are reported as Yellow on the controller. This leads the service nodes being disregarded from the distribution of flows for optimization.
- Ensure that the maximum transmission unit (MTU) size of the network connecting the service controllers and service nodes is uniform across the complete traffic path. Otherwise, it can lead to broken communication due to packet fragmentation.

Configure AppQoE Controllers and Service Nodes in Cisco SD-WAN Manager

Configure AppQoE Service Nodes

1. From the Cisco SD-WAN Manager menu, choose **Configuration** > **Templates**.
2. Under **Device Templates**, click **Create Template** and choose **From Feature Template**.

Note In Cisco vManage Release 20.7.1 and earlier releases **Device Templates** is called **Device**.

3. In the **Device Model** field, choose **C8000v**.

Note Only Cisco Catalyst 8000V instances can be configured as AppQoE service nodes. If you choose any other device, the Service Node option isn't available in the Device Role field.

4. In the **Device Role** field, choose **Service Node** from the drop-down list.
5. Enter **Template Name** and **Description**.
6. Click **Additional Templates**. In the AppQoE field, notice that the Factory Default AppQoE External Service Node template is attached by default.

No further configuration is required for devices configured as AppQoE service nodes. Additional configuration for connecting the service nodes to a service node controller is done through the AppQoE controller configuration screens in Cisco SD-WAN Manager.

7. Attach the device template to the device.

Configure AppQoE Service Controller

1. From the Cisco SD-WAN Manager menu, choose **Configuration** > **Templates**.
2. Under **Device Templates**, click **Create Template** and choose **From Feature Template**.

Note In Cisco vManage Release 20.7.1 and earlier releases **Device Templates** is called **Device**.

3. In the **Device Model** field, choose any one of the devices that support the service controller role. See the Supported Platforms section in this chapter for a complete list of devices that support the service controller role.
4. In the **Device Role** field, choose **SDWAN Edge** from the drop-down list.

Note The **SDWAN Edge** option is only visible for devices that support the service controller role.

5. Enter **Template Name** and **Description**.
6. Click **Additional Templates**. In the AppQoE field, you can either choose an existing AppQoE feature template or create a new one. This procedure includes steps to create a new AppQoE template for the device being configured with the service controller role.
7. Click the drop-down list for the AppQoE field and then click **Create Template.**
8. In the **Template Name** and **Description** fields, enter a name and description for your template respectively.
9. In the **Controller** area, enter the requested details.
   a. **Controller IP address:** Enter the service-side interface IPv4 or **IPv6** address of the controller. This is the IP address that the controller uses to communicate with the service nodes connected to it in a service cluster.
   b. **Service VPN:** Specify the service VPN ID in which the LAN-side connections of the service nodes reside. The VPN ID can be anyone from the following ranges: from 1 through 511, or from 513 through 65527.
   c. **Service Node IP 1:** Enter the IPv4 or IPv6 of the service nodes to enable the service controllers to communicate with the service nodes.

Note Click + next to the Service Node IP field to add more service nodes. You can add up to 64 service nodes for a single service controller.

Note From Cisco IOS XE Catalyst SD-WAN Release 17.14.1a, an AppQoE cluster can either operate on IPv4 protocol or IPv6 protocol in the control plane.

Note From Cisco vManage Release 20.6.1, the AppQoE feature template allows you to configure multiple service node groups and add the external service nodes to such groups. You can configure a maximum of 32 service node groups per cluster. The name range of a service node group is SNG-APPQOE0 to SNG-APPQOE31.

However, if the version of the device that you are configuring as a service controller is lower than Cisco IOS XE Catalyst SD-WAN Release 17.6.1a, and you use Cisco vManage Release 20.6.1 to configure the AppQoE template for such device, ensure that you configure only one service node group, even though the template allows you to configure multiple service node groups.

10. Attach the device template to the device.

Configure AppQoE Service Controllers and Nodes Using the CLI

This section provides example CLI configurations to configure TCP optimization using external service nodes and standalone service controllers connected to such service nodes.

Configure an External Service Node

1. Enable TCP optimization.

```
config-transaction
 sdwan appqoe tcpopt enable
 no sslproxy enable
```

2. Create a virtual port group interface.

   Starting from Cisco IOS XE Catalyst SD-WAN Release 17.14.1a AppQoE cluster handles both IPv6 and IPv4 traffic.

```
interface VirtualPortGroup virtual-port-group-number
service-insertion appqoe
ip address ip-address mask
```

3. Create a service node group.

```
service-insertion service-node-group appqoe  service-node-group-name
service-node service-node-ip-address
```

4. Configure the service node as service plane heavy.

```
platform resource service-plane-heavy
```

Note If you configure Cisco Catalyst 8000V as service-plane heavy, you need to reload it to enable the service plane..

Here's the complete configuration example for creating service nodes using IPv4 addresses:

```
sdwan appqoe tcpopt enable
 no sslproxy enable
 !

service-insertion service-node-group appqoe SNG-APPQOE

 device-role service-node
 service-node 192.168.2.2
 !

interface VirtualPortGroup1
 ip address 192.168.2.1 255.255.255.0
 service-insertion appqoe
 !

 interface GigabitEthernet 2
  description SN_LAN_Interface in VPN0
  ip address 192.0.2.1 255.255.255.0
  !

platform resource service-plane-heavy

system
 system-ip 198.51.100.1
 site-id 78200
!
```

Here's the complete configuration example for creating service nodes using IPv6 addresses:

```
sdwan appqoe tcpopt enable
 no sslproxy enable
 !

interface VirtualPortGroup2
 ip address 192.168.2.1 255.255.255.0
 ipv6 address FDF8::1/126
 service-insertion appqoe

service-insertion service-node-group appqoe SNG-APPQOE
 device-role service-node
 service-node 192.168.2.2
!
interface GigabitEthernet2
 ip address 172.16.200.35 255.255.255.0
 ipv6 address 2001:AA8:1234:200::35/64

 platform resource service-plane-heavy
```

Configure a Service Controller

1. Create a service controller and assign it to a service controller group.

```
config-transaction
service-insertion appnav-controller-group appqoe appqoe-controller-group-name
D appnav-controller controller-ip-address
```

2. Create a service node group and add service nodes to it.

```
service-insertion service-node-group appqoe service-node-group-name
service-node service-node-ip-address
```

Note You can configure multiple external service nodes in a service node group.

3. Configure service context for the controller and service node groups.

```
service-insertion service-context appqoe/1
appnav-controller-group appqoe-controller-group-name
service-node-group service-node-group-name enable
vrf default
```

Here's a complete configuration example for creating service controllers using IPv4 addresses:

```
service-insertion appnav-controller-group appqoe Test-ACgroup
 appnav-controller 198.51.100.1 vrf 200
 !

service-insertion service-node-group appqoe Test-SNGroup
 service-node 192.0.2.2
 service-node 192.0.2.3
 service-node 192.0.2.4
 service-node 192.0.2.5
 !

service-insertion service-context appqoe/1
 appnav-controller-group ACG-APPQOE
 service-node-group SNG-APPQOE
 cluster-type service-controller
 enable
 vrf default
 !

 interface GigabitEthernet 1
  description SC_To_SN_LAN_Interface in VPN200
  ip address 192.0.2.1 255.255.255.0
  vrf forwarding 200
  !

 system
  sytem-ip 198.51.100.10
  site-id 78200
  !
```

Here's a complete configuration example for creating service controllers using IPv6 addresses:

```
interface GigabitEthernet3
 vrf forwarding 2
 ip address 172.16.200.32 255.255.255.0
 ipv6 address 2001:AA8:1234:200::32/64
```

```
!

service-insertion service-node-group appqoe SNG-APPQOE
service-node 2001:AA8:1234:200::35
!
service-insertion appnav-controller-group appqoe ACG-APPQOE
 appnav-controller 2001:AA8:1234:200::32 vrf 2
!
service-insertion service-context appqoe/1
 cluster-type service-controller
 appnav-controller-group ACG-APPQOE
 service-node-group SNG-APPQOE
 vrf global
 enable
```

Monitor AppQoE Service Controllers and Nodes

Verify Device Role

Follow this procedure to verify the device role (service controller or service node) for a device after you configure the role using a device template.

1. From the Cisco SD-WAN Manager menu, choose **Configuration** > **Templates**.
2. Ensure that you are in the **Device Templates** area .

Note In Cisco vManage Release 20.7.1 and earlier releases **Device Templates** is called **Device**.

   A list of available device templates is displayed.

3. Check the **Device Role** column for a device to know its role. **SDWAN Edge** implies that the device is configured as a service controller.

Monitor Traffic on Service Controllers

Alarms and Events

If a cluster isn't formed or is not operational, the device sends a notification to Cisco SD-WAN Manager. You can view such event notifications from the **Monitor** page of Cisco SD-WAN Manager. For some of these events, Cisco SD-WAN Manager also generates alarms. For information on how to view alarms and events for your devices, see Alarms, Events, and Logs

Monitor AppQoE Service Controllers and Nodes Using the CLI

Use the following CLI commands to view the statistics for AppQoE service controllers, service nodes, and clusters.

Configuration Examples for AppQoE Service Controllers and Nodes on an IPv4 Address

The following sample output shows the configuration details of service node using IPv4 address in a service node group:

```
Device# show service-insertion type appqoe service-node-group
Service Node Group name : SNG-APPQOE
Service Context : appqoe/1
Member Service Node count : 2


Service Node (SN) : 10.1.1.1
Auto discovered : No
SN belongs to SNG : SNG-APPQOE
Current status of SN : Alive
System IP : 192.168.1.11
Site ID : 101
Time current status was reached : Wed Sep 23 11:01:49 2020

Cluster protocol VPATH version : 1 (Bitmap recvd: 1)
Cluster protocol incarnation number : 1
Cluster protocol last sent sequence number : 1601432656
Cluster protocol last received sequence number: 715749
Cluster protocol last received ack number : 1601432655
```

The following sample output shows the traffic statistics for service node using IPv4 address in a service node group:

```
Device# show service-insertion type appqoe statistics service-node-group
Service Node Group: SNG-APPQOE
Number of Service Node(s): 2
Member Service Nodes:
IP Address
10.1.1.1
10.1.1.2

Aggregate of statistics from all SNs of the SNG:
------------------------------------------------
Time since statistics were last reset/cleared:

Aggregate number of probe requests sent to SN : 1435070
Aggregate number of probe responses received from SN: 715915
Aggregate number of invalid probe responses received
Total : 0
Incompatible version : 0
Authentication failed : 0
Stale response : 0
Malformed response : 0
Unknown response : 0
Aggregate number of times liveliness was lost with the SN : 1
Aggregate number of times liveliness was regained with the SN:2
Aggregare number of version probes sent to SN: 719033
Aggregate number of version probes received from SN: 2
Aggregate number of healthprobes sent to SN: 716037
Aggregate number of healthprobes received from SN: 715913


Aggregate traffic distribution statistics
-----------------------------------------
Packet and byte counts-
-----------------------
Redirected Bytes : 1558757923174
Redirected Packets : 1945422189
```

```
Received Bytes : 1582477555093
Received Packets : 1908965233
```

The following sample output shows the configuration details of service controller using IPv4 address :

```
Device# show service-insertion type appqoe appnav-controller-group
All AppNav Controller Groups in service context
Appnav Controller Group : ACG-APPQOE
Member Appnav Controller Count : 1
Members:
IP Address
10.1.1.100

AppNav Controller : 99.1.1.100
Local AppNav Controller : Yes
Current status of AppNav Controller : Alive
Time current status was reached : Mon Sep 21 19:09:08 2020
Current AC View of AppNav Controller
IP Address
10.1.1.100

Current SN View of AppNav Controller
IP Address
10.1.1.1
```

Configuration Examples for AppQoE Service Controllers and Nodes on an IPv6 Address

The following sample output shows the configuration details of service nodes using IPv6 addresses in a service node group:

```
Device# show service-insertion type appqoe service-node-group
Service Node Group name : SNG-APPQOE
Service Context : appqoe/1
Member Service Node count : 2


Service Node (SN) : 2001:DB8:1::1
Auto discovered : No
SN belongs to SNG : SNG-APPQOE
Current status of SN : Alive
System IP : 192.168.1.11
Site ID : 101
Time current status was reached : Wed Sep 23 11:01:49 2020

Cluster protocol VPATH version : 1 (Bitmap recvd: 1)
Cluster protocol incarnation number : 1
Cluster protocol last sent sequence number : 1601432656
Cluster protocol last received sequence number: 715749
Cluster protocol last received ack number : 1601432655
```

The following sample output shows the traffic statistics for service nodes using IPv6 addresses in a service node group:

```
Device# show service-insertion type appqoe statistics service-node-group
Service Node Group: SNG-APPQOE
Number of Service Node(s): 2
Member Service Nodes:
IP Address
2001:DB8:1::1
2001:DB8:0:ABCD::1

Aggregate of statistics from all SNs of the SNG:
------------------------------------------------
Time since statistics were last reset/cleared:
```

```
Aggregate number of probe requests sent to SN : 1435070
Aggregate number of probe responses received from SN: 715915
Aggregate number of invalid probe responses received
Total : 0
Incompatible version : 0
Authentication failed : 0
Stale response : 0
Malformed response : 0
Unknown response : 0
Aggregate number of times liveliness was lost with the SN : 1
Aggregate number of times liveliness was regained with the SN:2
Aggregare number of version probes sent to SN: 719033
Aggregate number of version probes received from SN: 2
Aggregate number of healthprobes sent to SN: 716037
Aggregate number of healthprobes received from SN: 715913


Aggregate traffic distribution statistics
-----------------------------------------
Packet and byte counts-
----------------------
Redirected Bytes : 1558757923174
Redirected Packets : 1945422189
Received Bytes : 1582477555093
Received Packets : 1908965233
```

The following sample output shows the configuration details of service controllers using IPv6 addresses in a controller group:

```
Device# show service-insertion type appqoe appnav-controller-group
All AppNav Controller Groups in service context
Appnav Controller Group : ACG-APPQOE
Member Appnav Controller Count : 1
Members:
IP Address
2001:DB8:0:ABCD::1

AppNav Controller : 99.1.1.100
Local AppNav Controller : Yes
Current status of AppNav Controller : Alive
Time current status was reached : Mon Sep 21 19:09:08 2020
Current AC View of AppNav Controller
IP Address
2001:DB8:0:ABCD::1

Current SN View of AppNav Controller
IP Address
2001:DB8:0:ABCD::1
```

The following sample output shows the configuration details of service nodes using IPv6 addresses in an AppQoE cluster :

```
Device# show service-insertion type appqoe cluster-summary
Service Context                              : appqoe/1
 Enabled                                     : TRUE
 Cluster type                                : Service-controller

 Service Controller Group      : ACG-APPQOE
   Service Controller IP       : 2001:40:92::1   VRF : 5
   Service Controller System IP: 192.168.1.11
   Service Controller Site ID  : 220

 Service Node Group : SNG-APPQOE ID: 32
```

```
 ------------------------------------------------------------------------------------------
|   Service Node IP    |    System IP    |  Site Id  |  Status |         Error           |
 ------------------------------------------------------------------------------------------
| 2001:40:92::5        | 192.168.1.11  | 220       | GREEN   |                         |
 ------------------------------------------------------------------------------------------
```

The following sample output provides information about AppQoE services that are using IPv6 addresses:

```
Device# show service-insertion type appqoe service-context
Service Context                              : appqoe/1
Cluster protocol VPATH version               : 2
Time service context was enabled             : Sun Dec 17 18:47:51 2023
Current FSM state                            : Operational
Time FSM entered current state               : Sun Jan  7 18:27:08 2024
Last FSM state                               : Converging
Time FSM entered last state                  : Sun Jan  7 18:26:58 2024
Cluster operational state                    : Operational
Tunnel interface GRE                         : Tunnel2000000001
Tunnel interface VxLAN                       : Tunnel2000000002

Stable AppNav controller View:
   2001:40:92::1

Stable SN View:
   2001:40:92::5

Current AppNav Controller View:
   2001:40:92::1

Current SN View:
   2001:40:92::5
```