

Network Configuration Example

Configuring MX Series Universal Edge Routers for Service Convergence



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Juniper Networks, Inc.
1133 Innovation Way
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

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Network Configuration Example Configuring MX Series Universal Edge Routers for Service Convergence

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CHAPTER 1

Configuring MX Series Universal Edge Routers for Service Convergence

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- [Technical Overview—Network and Service Convergence in the Universal Edge Platform on page 6](#)
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About This Network Configuration Example

This document presents a tested, step-by-step configuration example, showing how a single MX Series edge router can be used to support both residential and business subscribers. Configuration and verification steps are included, as are troubleshooting strategies to employ if the configuration is not working properly.

Customer Use Case for a Converged Edge Combining Residential and Business Subscriber Management

A universal edge and access architecture dramatically reduces network costs by consolidating business, residential, and mobile data infrastructure. MX Series 3D Universal Edge Routers deliver the carrier-class performance, reliability, scale, and services that are required in preaggregation, metro-aggregation, and edge service applications, as well as inter- and intra-data center applications. The portfolio offers extensive fault management, traffic engineering, network, and automated service management features.

The MX Series converged edge configuration example presented here reduces the number of service creation points down to one per serving area by:

- Eliminating the Ethernet aggregation network and distributing the MX Series edge router (direct connection between access nodes and MX Series edge router)
- Integrating business, residential, video, and aggregation services on a single MX Series edge router platform

- For each subscriber, using a single VLAN for all services (1:1 CVLAN model)
- Employing dynamic, auto-sensed VLAN preprovisioning instead of static VLAN preprovisioning
- Using line ID agent circuit identifier (ACI) based authentication via PPPoE-IA information
- Limiting MX Series Edge Router to non-Ethernet services only

Technical Overview—Network and Service Convergence in the Universal Edge Platform

The Juniper Networks Broadband Edge solution enables providers to maintain traditional multiplay services with a simpler, collapsed service model that consolidates management and service activation points. The benefits of this approach include faster rollouts of differentiated service offerings and greater operational efficiency, which contribute to higher margins.

This Network Configuration Example document focuses specifically on the use case in which the MX Series Broadband Network Gateway (BNG) is deployed in a distributed fashion and consolidates a number of broadband architecture elements including residential, business, and multicast video edge routers in addition to Ethernet aggregation routers. Converging these functions onto a single MX Series Universal Edge platform delivers many CapEx and OpEx savings, discussed in more detail later in this document. The following sections provide an overview of this broadband edge solution:

- [The Challenges Faced by Service Providers in Today's Market on page 6](#)
- [Moving Toward Network Convergence on page 7](#)
- [MX Series 3D Universal Edge Router on page 7](#)

The Challenges Faced by Service Providers in Today's Market

The telecommunications market is increasingly dominated by IP packet services. The developments in this area are occurring so fast, it is difficult for service providers to keep up while staying profitable. Their business and operational models are challenged as they struggle to keep pace with exponential consumer bandwidth growth driven in large part by video consumption (OTT streaming, VOD, IP Multicast). Additionally, broadband access technology developments such as FTTH, DSL Vectoring, and 4G/LTE access offer much higher bandwidths to end users and are quickly becoming key drivers for new service developments and network designs. Future bandwidth requirements and service mix uncertainties make the choice of network and service architecture even more complicated.

Network and operational complexity do not lend themselves easily to change, yet the ability to change rapidly is critical to service provider success, and it represents a significant competitive advantage. A streamlined network architecture is needed—one that reduces both CapEx (by eliminating multiple service-specific elements) and OpEx (by significantly reducing the number of service provisioning points). A streamlined network architecture that converges residential, business, and mobile network infrastructures, and provides the agility to adapt to changing requirements is underway.

Service providers need a broadband solution, including an edge platform, that offers efficient operational scale and a broad range of business and residential services that

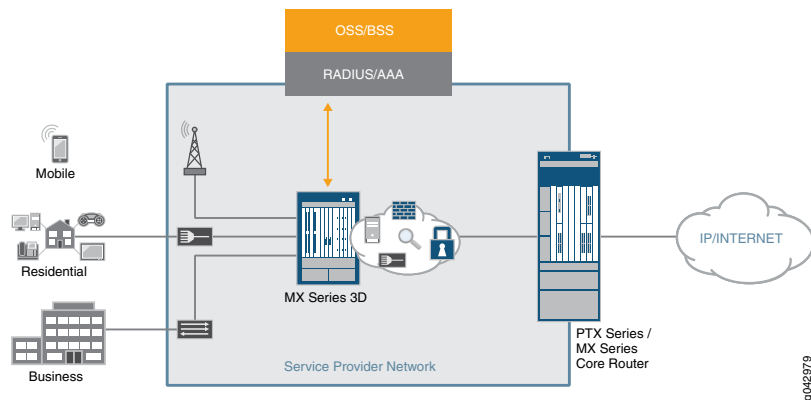
can be dynamically activated by way of RADIUS interaction. This flexible and automated service activation model is critical for mass market broadband deployments. The MX Series edge platform maintains deep insight into network policies, customer privileges, and application requirements in order to intelligently allocate resources where and when they are needed.

Moving Toward Network Convergence

It is not feasible or financially advantageous to deploy service-specific (video, residential, business, mobile backhaul) edge networks, as this approach adds significant cost and creates layers of operational inefficiency. Next-generation edge platforms like the MX Series can concurrently support edge, aggregation, residential, and business services, as well as mobile service core applications. This much more efficient approach leverages service convergence at greater scale for improved economics and experience.

[Figure 1 on page 7](#) illustrates how the MX Series Universal Router facilitates convergence.

Figure 1: Network Convergence

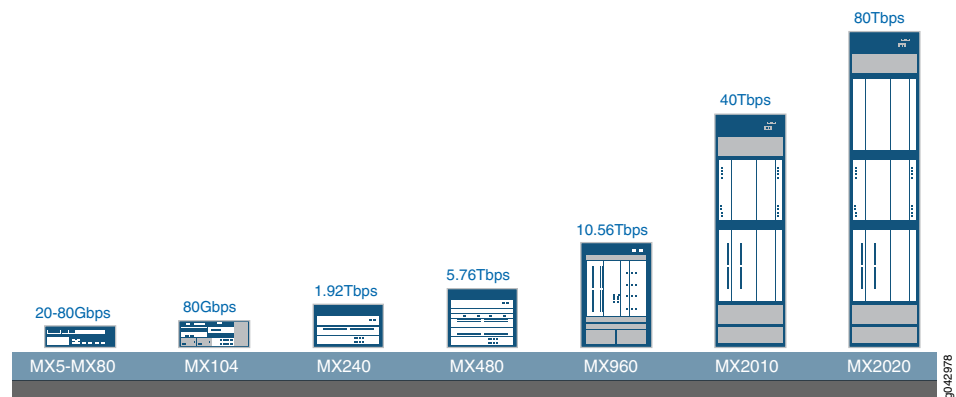


MX Series 3D Universal Edge Router

The Universal Edge capabilities of the MX Series portfolio bring service providers closer to achieving true convergence and unification across their service delivery networks. This is critical for rapid and efficient rollout of next-generation services. The SDN-ready MX Series 3D Universal Edge Router transforms economics at the network edge.

The MX Series is a family of routers (shown in [Figure 2 on page 8](#)) whose superior scale and performance enable the convergence of services on a single platform.

Figure 2: MX Series BNG Portfolio



Related Documentation

- [Solution Brief: Broadband Edge](#)
- [Reference Architecture: Broadband Edge Network Design](#)

Example: Configuring MX Series Universal Edge Routers for Service Convergence

This example details the steps required to configure Juniper Networks Unified Edge for combined residential and business subscriber management. Step-by-step instructions are provided for each type of device in the example configuration.

This section includes the following information:

- [Requirements on page 8](#)
- [Overview on page 9](#)
- [Configuration on page 12](#)
- [Verification on page 132](#)
- [Troubleshooting on page 214](#)

Requirements

[Table 1 on page 9](#) lists the role of each device in the topology of the configuration example and includes the hardware used for each device. All MX Series devices in this example were tested with Juniper Networks Junos OS Release 13.3R3, which is the minimum software version required.

Table 1: Device Hardware

Device	Hardware
R0 (BNG) primarily performs subscriber management functions. For PPPoE traffic, it terminates sessions directly. If the RADIUS AAA server system returns L2TP tunnel attributes, R0 forwards PPP session traffic to the LNS over L2TP tunnels.	Chassis: MX960
	RE0-RE1: RE-S-1800x4
	Flexible PIC Concentrators (FPC2, FPC5, FPC8, FPC11): Modular Port Concentrator (MPC) Type 2 3D EQ
R1 and R3 (core routers) are responsible for IPv4 and IPv6 traffic forwarding and for MPLS traffic switching.	Chassis: MX480
	RE0-RE1: RE-S-1800x4
	FPC 0, FPC3: MPC type 1 3D Q
	FPC 5: MPC type 2 3D EQ
R2 (LNS) terminates L2TP tunnels to provide a high-speed Internet wholesale service. It terminates IPv4/IPv6 dual-stack subscriber and forwarding traffic to or from the Internet.	Chassis: MX480
	RE0: RE-S-2000
	FR1: RE-S-2000
	FPC 0 - FPC 1: MPC Type 2 3D EQ
RADIUS server provides subscriber authentication and accounting.	FreeRADIUS Version 2.1.5 on an Intel Linux server

Overview

This configuration example supports the following functions:

- Residential BNG
 - Residential high-speed Internet
 - L2TP: L2TP access concentrator (LAC)
 - Video: video on demand (VOD), IPTV
 - VoIP
 - PPPv4 and dual-stack clients
 - IPoE sessions
 - Authentication, authorization, and accounting (AAA), and address assignment
 - Dynamic interface
 - Filters
 - Hierarchical QoS management

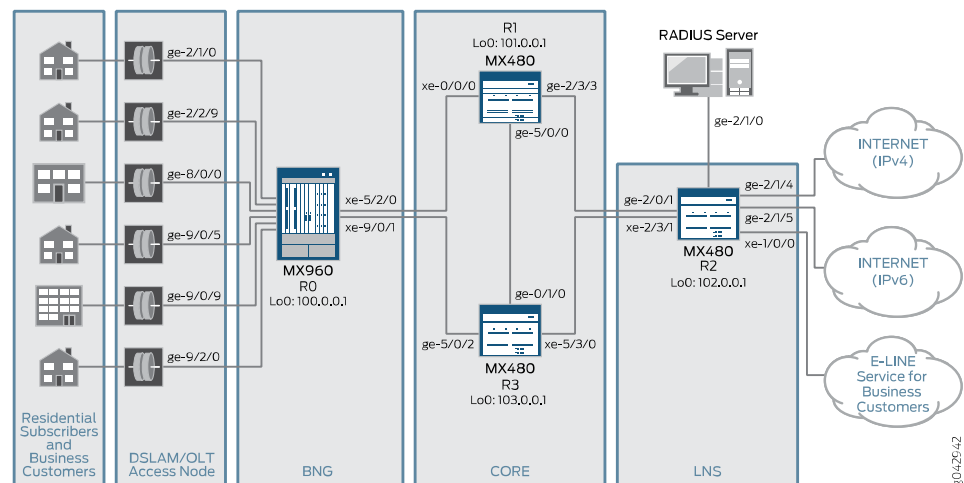
- Carrier grade home agent and resiliency: graceful Routing Engine switchover (GRES), In-Service Software Upgrade (ISSU), nonstop active routing (NSR)
- Ethernet, PPP, and DHCP Operation, Administration, and Maintenance (OAM) service and scalability
- Business Provider Edge (PE) and Label Edge Router (LER)
 - Layer 2 (L2) VPNs
 - Business high-speed Internet
 - MPLS connectivity from the access edge
 - Video PE services
- Business BNG (business subscriber management)
 - RADIUS and AAA support
 - Dynamic subscriber VLANs and services



NOTE: This configuration example uses L2 circuits in place of business subscribers (business services) for testing purposes.

Topology

Figure 1 illustrates the topology of this configuration example.



In this example, the BNG device (R0) performs subscriber management functions. For PPPoE traffic, it terminates sessions directly. If the RADIUS AAA server system returns L2TP tunnel attributes, it forwards PPP session traffic to the LNS over L2TP tunnels. The BNG also terminates DHCP (IPv6) traffic directly.

The core routers (R1 and R3) are responsible for IPv4 and IPv6 traffic forwarding and for MPLS traffic switching. The Intermediate System-to-Intermediate System (ISIS) protocol

is employed to exchange link and loopback interface information between devices. Label Distribution Protocol (LDP) is enabled to exchange MPLS label information with neighbor routers.

R2, the L2TP network server (LNS), is directly connected to the core routing system. It terminates L2TP tunnels to provide a high-speed interface wholesale service. The configuration example is simple, as it is intended only to demonstrate that the BNG can relay PPP traffic to the LNS by way of L2TP tunnels. The LNS terminates IPv4/IPv6 dual-stack subscriber and forwarding traffic en route to or from the IPv4 and IPv6 Internet.

The configuration example includes:

- Multiple routers
- PPPoE over LAC over customer-dedicated dynamic VLAN
- Dual-stack PPP subscribers over dynamic VLAN
- Subscribers that have the following service attachments:
 - Ascend Data Filter (ADF) filters for IPv4 and IPv6
 - Services attached upon login
 - QoS classes per session
- 16,000 residential PPPoE subscribers:
 - 25% L2TP
 - 0.5% lawful intercept
 - 50% IPTV customers
 - The balance are dual-stack PPPoE subscribers that are terminated on the MX Series router
- Parameterized CoS and firewall support that allow implementation of customized filters for each subscriber session
- ADF for dynamic firewall

On the core side, the configuration consists of the following:

- 800,000 IPv4 and 100,000 IPv6 routes
- 20,000 ISIS routes
- 1000 targeted LDP sessions and 8 direct LDP sessions
- 8 ISIS adjacencies with 8 uplinks
- 4 Border Gateway Protocol (BGP) adjacencies
- 500 L2 circuits in place of business subscribers for purposes of testing
- AAA, Change of Authorization (CoA), and lawful intercept validation
- Authorization
- Authentication

- Accounting
- RADIUS-initiated disconnects
- Lawful intercept CoA
- Service activation and deactivation using CoA
- ISSU

Configuration

The following sections present configuration information for the devices included in the example from left to right in the topology diagram. The sections include CLI quick configuration (for copy and paste), step-by-step instructions, and **show** command output that confirms the configuration.

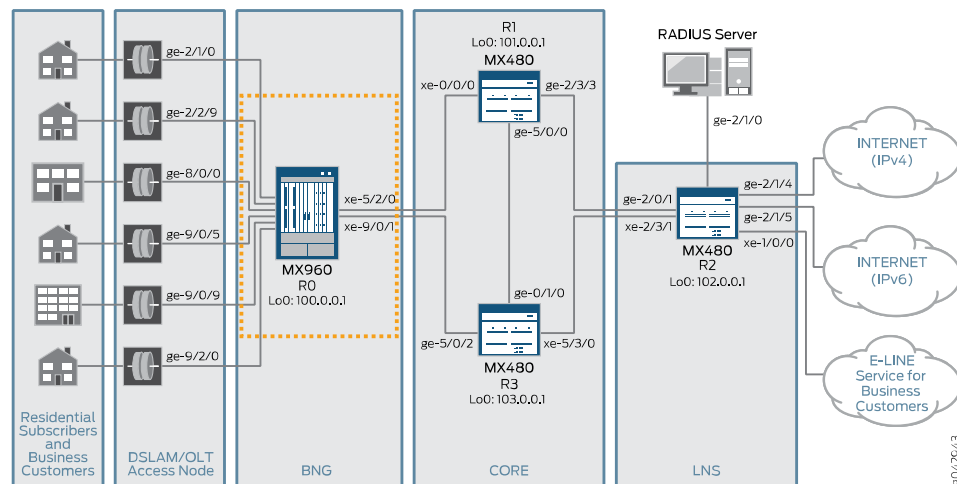
- [Configuring the BNG Router, R0 on page 12](#)
- [Configuring the Core Router, R1 on page 97](#)
- [Configuring the Second Core Router, R3 on page 103](#)
- [Configuring the LNS Device, R2 on page 110](#)
- [Configuring the Default User Profile for the RADIUS Server on page 131](#)

Configuring the BNG Router, R0

CLI Quick Configuration

Figure 3 on page 12 highlights the BNG router (R0) in the context of the reference example topology.

Figure 3: BNG Router in the Topology



To quickly configure R0 as in this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

```
set dynamic-profiles vlan-client-profile interfaces demux0 unit "$junos-interface-unit"
  no-traps
set dynamic-profiles vlan-client-profile interfaces demux0 unit "$junos-interface-unit"
  proxy-arp
set dynamic-profiles vlan-client-profile interfaces demux0 unit "$junos-interface-unit"
  vlan-tags outer "$junos-stacked-vlan-id"
set dynamic-profiles vlan-client-profile interfaces demux0 unit "$junos-interface-unit"
  vlan-tags inner "$junos-vlan-id"
set dynamic-profiles vlan-client-profile interfaces demux0 unit "$junos-interface-unit"
  demux-options underlying-interface "$junos-interface-ifd-name"
set dynamic-profiles vlan-client-profile interfaces demux0 unit "$junos-interface-unit"
  family pppoe duplicate-protection
set dynamic-profiles vlan-client-profile interfaces demux0 unit "$junos-interface-unit"
  family pppoe dynamic-profile pppoe-client-profile
set dynamic-profiles vlan-client-profile interfaces demux0 unit "$junos-interface-unit"
  family pppoe max-sessions 10
set dynamic-profiles vlan-client-profile interfaces demux0 unit "$junos-interface-unit"
  family pppoe short-cycle-protection lockout-time-min 5
set dynamic-profiles vlan-client-profile interfaces demux0 unit "$junos-interface-unit"
  family pppoe short-cycle-protection lockout-time-max 60
set dynamic-profiles pppoe-client-profile predefined-variable-defaults cos-shaping-rate
  10m
set dynamic-profiles pppoe-client-profile predefined-variable-defaults cos-scheduler-map
  schedmap_residential
set dynamic-profiles pppoe-client-profile predefined-variable-defaults input-filter
  DEFAULT_V4-IN
set dynamic-profiles pppoe-client-profile predefined-variable-defaults output-filter
  DEFAULT_V4-OUT
set dynamic-profiles pppoe-client-profile predefined-variable-defaults output-ipv6-filter
  DEFAULT_V6-OUT
set dynamic-profiles pppoe-client-profile predefined-variable-defaults input-ipv6-filter
  DEFAULT_V6-IN
set dynamic-profiles pppoe-client-profile routing-instances "$junos-routing-instance"
  interface "$junos-interface-name" any
set dynamic-profiles pppoe-client-profile routing-instances "$junos-routing-instance"
  routing-options access route $junos-framed-route-ip-address-prefix next-hop
  "$junos-framed-route-nexthop"
set dynamic-profiles pppoe-client-profile routing-instances "$junos-routing-instance"
  routing-options access route $junos-framed-route-ip-address-prefix metric
  "$junos-framed-route-cost"
set dynamic-profiles pppoe-client-profile routing-instances "$junos-routing-instance"
  routing-options access route $junos-framed-route-ip-address-prefix preference
  "$junos-framed-route-distance"
set dynamic-profiles pppoe-client-profile routing-instances "$junos-routing-instance"
  routing-options access-internal route $junos-subscriber-ip-address qualified-next-hop
  "$junos-interface-name"
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  no-traps
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  ppp-options chap challenge-length minimum 16
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  ppp-options chap challenge-length maximum 32
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  ppp-options pap
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  ppp-options authentication pap
```

```
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  ppp-options authentication chap
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  pppoe-options underlying-interface "$junos-underlying-interface"
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  pppoe-options server
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  keepalives interval 30
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet filter input "$junos-input-filter"
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet filter input precedence 240
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet filter output "$junos-output-filter"
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet filter output precedence 240
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet filter adf rule "$junos-adf-rule-v4"
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet filter adf counter
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet filter adf input-precedence 100
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet filter adf not-mandatory
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet filter adf output-precedence 100
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet unnumbered-address "$junos-loopback-interface"
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet6 filter input "$junos-input-ipv6-filter"
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet6 filter input precedence 240
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet6 filter output "$junos-output-ipv6-filter"
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet6 filter output precedence 240
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet6 filter adf rule "$junos-adf-rule-v6"
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet6 filter adf counter
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet6 filter adf input-precedence 100
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet6 filter adf not-mandatory
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet6 filter adf output-precedence 100
set dynamic-profiles pppoe-client-profile interfaces pp0 unit "$junos-interface-unit"
  family inet6 address $junos-ipv6-address
set dynamic-profiles pppoe-client-profile protocols router-advertisement interface
  "$junos-interface-name" other-stateful-configuration
set dynamic-profiles pppoe-client-profile protocols router-advertisement interface
  "$junos-interface-name" link-mtu
set dynamic-profiles pppoe-client-profile protocols router-advertisement interface
  "$junos-interface-name" prefix $junos-ipv6-ndra-prefix valid-lifetime 4294967295
set dynamic-profiles pppoe-client-profile protocols router-advertisement interface
  "$junos-interface-name" prefix $junos-ipv6-ndra-prefix on-link
```

```

set dynamic-profiles pppoe-client-profile protocols router-advertisement interface
"$junos-interface-name" prefix $junos-ipv6-ndra-prefix preferred-lifetime 4294967295
set dynamic-profiles pppoe-client-profile class-of-service traffic-control-profiles
  SessionShaper scheduler-map "$junos-cos-scheduler-map"
set dynamic-profiles pppoe-client-profile class-of-service traffic-control-profiles
  SessionShaper shaping-rate "$junos-cos-shaping-rate"
set dynamic-profiles pppoe-client-profile class-of-service traffic-control-profiles
  SessionShaper overhead-accounting frame-mode-bytes 34
set dynamic-profiles pppoe-client-profile class-of-service traffic-control-profiles
  SessionShaper overhead-accounting cell-mode-bytes 6
set dynamic-profiles pppoe-client-profile class-of-service interfaces pp0 unit
"$junos-interface-unit" output-traffic-control-profile SessionShaper
set dynamic-profiles pppoe-client-profile class-of-service interfaces pp0 unit
"$junos-interface-unit" rewrite-rules dscp residential-default
set dynamic-profiles pppoe-client-profile class-of-service interfaces pp0 unit
"$junos-interface-unit" rewrite-rules dscp-ipv6 residential-default-v6
set dynamic-profiles pppoe-client-profile class-of-service interfaces pp0 unit
"$junos-interface-unit" rewrite-rules ieee-802.1 residential-default-vlan
set dynamic-profiles pppoe-client-profile class-of-service interfaces pp0 unit
"$junos-interface-unit" rewrite-rules ieee-802.1 vlan-tag outer-and-inner
set dynamic-profiles voice variables VoiceBearBW mandatory
set dynamic-profiles voice variables voice_gateway mandatory
set dynamic-profiles voice variables voice_gateway_v6 mandatory
set dynamic-profiles voice variables filter_voice_input uid
set dynamic-profiles voice variables filter_voice_output uid
set dynamic-profiles voice variables filter_voice_input_v6 uid
set dynamic-profiles voice variables filter_voice_output_v6 uid
set dynamic-profiles voice variables voice_policer uid
set dynamic-profiles voice variables voice_policer_burst_KB equals "round($VoiceBearBW
* 0.0125)"
set dynamic-profiles voice interfaces pp0 unit "$junos-interface-unit" family inet filter
input "$filter_voice_input"
set dynamic-profiles voice interfaces pp0 unit "$junos-interface-unit" family inet filter
input precedence 100
set dynamic-profiles voice interfaces pp0 unit "$junos-interface-unit" family inet filter
output "$filter_voice_output"
set dynamic-profiles voice interfaces pp0 unit "$junos-interface-unit" family inet filter
output precedence 100
set dynamic-profiles voice interfaces pp0 unit "$junos-interface-unit" family inet6 filter
input "$filter_voice_input_v6"
set dynamic-profiles voice interfaces pp0 unit "$junos-interface-unit" family inet6 filter
input precedence 100
set dynamic-profiles voice interfaces pp0 unit "$junos-interface-unit" family inet6 filter
output "$filter_voice_output_v6"
set dynamic-profiles voice interfaces pp0 unit "$junos-interface-unit" family inet6 filter
output precedence 100
set dynamic-profiles voice firewall family inet filter "$filter_voice_input" interface-specific
set dynamic-profiles voice firewall family inet filter "$filter_voice_input" term 1 from
destination-address $voice_gateway
set dynamic-profiles voice firewall family inet filter "$filter_voice_input" term 1 then policer
"$voice_policer"
set dynamic-profiles voice firewall family inet filter "$filter_voice_input" term 1 then
service-accounting-deferred
set dynamic-profiles voice firewall family inet filter "$filter_voice_input" term 1 then
loss-priority low

```

```
set dynamic-profiles voice firewall family inet filter "$filter_voice_input" term 1 then
  forwarding-class Voice
set dynamic-profiles voice firewall family inet filter "$filter_voice_input" term 1 then
  service-filter-hit
set dynamic-profiles voice firewall family inet filter "$filter_voice_input" term 1 then accept
set dynamic-profiles voice firewall family inet filter "$filter_voice_input" term default
  then accept
set dynamic-profiles voice firewall family inet filter "$filter_voice_output" interface-specific
set dynamic-profiles voice firewall family inet filter "$filter_voice_output" term 1 from
  source-address $voice_gateway
set dynamic-profiles voice firewall family inet filter "$filter_voice_output" term 1 then
  policer "$voice_policer"
set dynamic-profiles voice firewall family inet filter "$filter_voice_output" term 1 then
  service-accounting-deferred
set dynamic-profiles voice firewall family inet filter "$filter_voice_output" term 1 then
  loss-priority low
set dynamic-profiles voice firewall family inet filter "$filter_voice_output" term 1 then
  forwarding-class Voice
set dynamic-profiles voice firewall family inet filter "$filter_voice_output" term 1 then
  service-filter-hit
set dynamic-profiles voice firewall family inet filter "$filter_voice_output" term 1 then
  accept
set dynamic-profiles voice firewall family inet filter "$filter_voice_output" term default
  then accept
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_input_v6"
  interface-specific
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_input_v6" term 1 from
  destination-address $voice_gateway_v6
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_input_v6" term 1 then
  policer "$voice_policer"
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_input_v6" term 1 then
  service-accounting-deferred
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_input_v6" term 1 then
  loss-priority low
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_input_v6" term 1 then
  forwarding-class Voice
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_input_v6" term 1 then
  service-filter-hit
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_input_v6" term 1 then
  accept
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_input_v6" term default
  then accept
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_output_v6"
  interface-specific
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_output_v6" term 1
  from source-address $voice_gateway_v6
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_output_v6" term 1
  then policer "$voice_policer"
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_output_v6" term 1
  then service-accounting-deferred
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_output_v6" term 1
  then loss-priority low
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_output_v6" term 1
  then forwarding-class Voice
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_output_v6" term 1
  then service-filter-hit
```



```

set dynamic-profiles voice firewall family inet6 filter "$filter_voice_output_v6" term 1
  then accept
set dynamic-profiles voice firewall family inet6 filter "$filter_voice_output_v6" term
  default then accept
set dynamic-profiles voice firewall policer "$voice_policer" logical-interface-policer
set dynamic-profiles voice firewall policer "$voice_policer" if-exceeding bandwidth-limit
  "$VoiceBearBW"
set dynamic-profiles voice firewall policer "$voice_policer" if-exceeding burst-size-limit
  "$voice_policer_burst_KB"
set dynamic-profiles voice firewall policer "$voice_policer" then discard
set dynamic-profiles input_qos variables policer_bandwidth mandatory
set dynamic-profiles input_qos variables policer_burst_size equals
  "round($policer_bandwidth * 0.0125)"
set dynamic-profiles input_qos variables premium_classes_hpolicer uid
set dynamic-profiles input_qos variables lowloss_class_hpolicer uid
set dynamic-profiles input_qos variables lowdelay_class_hpolicer uid
set dynamic-profiles input_qos variables besteffort_class_hpolicer uid
set dynamic-profiles input_qos variables multicast_class_hpolicer uid
set dynamic-profiles input_qos variables subscriber_hpolicer uid
set dynamic-profiles input_qos variables input_filter_name uid
set dynamic-profiles input_qos variables input_filter_v6_name uid
set dynamic-profiles input_qos interfaces pp0 unit "$junos-interface-unit" family inet
  filter input "$input_filter_name"
set dynamic-profiles input_qos interfaces pp0 unit "$junos-interface-unit" family inet
  filter input precedence 250
set dynamic-profiles input_qos interfaces pp0 unit "$junos-interface-unit" family inet6
  filter input "$input_filter_v6_name"
set dynamic-profiles input_qos interfaces pp0 unit "$junos-interface-unit" family inet6
  filter input precedence 250
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name"
  interface-specific
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 1 from
  forwarding-class Voice
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 1 from
  forwarding-class Control
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 1 then
  hierarchical-policer "$premium_classes_hpolicer"
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 1 then
  next term
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 2 from
  forwarding-class Voice
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 2 from
  forwarding-class Control
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 2 from
  forwarding-class Multicast
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 2 then
  hierarchical-policer "$multicast_class_hpolicer"
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 2 then
  force-premium
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 2 then
  next term
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 3 from
  forwarding-class Voice
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 3 from
  forwarding-class Control

```

```
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 3 from
forwarding-class Multicast
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 3 from
forwarding-class LowDelay
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 3 then
hierarchical-policer "$slowdelay_class_hpolicer"
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 3 then
force-premium
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 3 then
next term
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 4 from
forwarding-class Voice
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 4 from
forwarding-class Control
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 4 from
forwarding-class Multicast
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 4 from
forwarding-class LowDelay
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 4 from
forwarding-class LowLoss
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 4 then
hierarchical-policer "$slowloss_class_hpolicer"
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 4 then
force-premium
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 4 then
next term
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 5 from
forwarding-class Control
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 5 from
forwarding-class Voice
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 5 from
forwarding-class Multicast
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 5 from
forwarding-class LowLoss
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 5 from
forwarding-class LowDelay
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 5 from
forwarding-class BestEffort
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 5 then
hierarchical-policer "$subscriber_hpolicer"
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 5 then
service-accounting-deferred
set dynamic-profiles input_qos firewall family inet filter "$input_filter_name" term 5 then
accept
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name"
interface-specific
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
1 from forwarding-class Voice
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
1 from forwarding-class Control
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
1 then hierarchical-policer "$premium_classes_hpolicer"
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
1 then next term
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
2 from forwarding-class Voice
```

```
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  2 from forwarding-class Control
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  2 from forwarding-class Multicast
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  2 then hierarchical-policer "$multicast_class_hpolicer"
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  2 then force-premium
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  2 then next term
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  3 from forwarding-class Voice
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  3 from forwarding-class Control
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  3 from forwarding-class Multicast
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  3 from forwarding-class LowDelay
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  3 then hierarchical-policer "$lowdelay_class_hpolicer"
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  3 then force-premium
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  3 then next term
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  4 from forwarding-class Voice
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  4 from forwarding-class Control
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  4 from forwarding-class Multicast
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  4 from forwarding-class LowDelay
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  4 from forwarding-class LowLoss
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  4 then hierarchical-policer "$lowloss_class_hpolicer"
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  4 then force-premium
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  4 then next term
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  5 from forwarding-class Control
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  5 from forwarding-class Voice
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  5 from forwarding-class Multicast
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  5 from forwarding-class LowLoss
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  5 from forwarding-class LowDelay
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  5 from forwarding-class BestEffort
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  5 then hierarchical-policer "$subscriber_hpolicer"
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  5 then service-accounting-deferred
```

```
set dynamic-profiles input_qos firewall family inet6 filter "$input_filter_v6_name" term
  5 then accept
set dynamic-profiles input_qos firewall hierarchical-policer "$premium_classes_hpolicer"
  logical-interface-policer
set dynamic-profiles input_qos firewall hierarchical-policer "$premium_classes_hpolicer"
  aggregate if-exceeding bandwidth-limit "$policer_bandwidth"
set dynamic-profiles input_qos firewall hierarchical-policer "$premium_classes_hpolicer"
  aggregate if-exceeding burst-size-limit "$policer_burst_size"
set dynamic-profiles input_qos firewall hierarchical-policer "$premium_classes_hpolicer"
  aggregate then discard
set dynamic-profiles input_qos firewall hierarchical-policer "$premium_classes_hpolicer"
  premium if-exceeding bandwidth-limit "$policer_bandwidth"
set dynamic-profiles input_qos firewall hierarchical-policer "$premium_classes_hpolicer"
  premium if-exceeding burst-size-limit "$policer_burst_size"
set dynamic-profiles input_qos firewall hierarchical-policer "$premium_classes_hpolicer"
  premium then discard
set dynamic-profiles input_qos firewall hierarchical-policer "$multicast_class_hpolicer"
  logical-interface-policer
set dynamic-profiles input_qos firewall hierarchical-policer "$multicast_class_hpolicer"
  aggregate if-exceeding bandwidth-limit "$policer_bandwidth"
set dynamic-profiles input_qos firewall hierarchical-policer "$multicast_class_hpolicer"
  aggregate if-exceeding burst-size-limit "$policer_burst_size"
set dynamic-profiles input_qos firewall hierarchical-policer "$multicast_class_hpolicer"
  aggregate then discard
set dynamic-profiles input_qos firewall hierarchical-policer "$multicast_class_hpolicer"
  premium if-exceeding bandwidth-limit "$policer_bandwidth"
set dynamic-profiles input_qos firewall hierarchical-policer "$multicast_class_hpolicer"
  premium if-exceeding burst-size-limit "$policer_burst_size"
set dynamic-profiles input_qos firewall hierarchical-policer "$multicast_class_hpolicer"
  premium then discard
set dynamic-profiles input_qos firewall hierarchical-policer "$slowdelay_class_hpolicer"
  logical-interface-policer
set dynamic-profiles input_qos firewall hierarchical-policer "$slowdelay_class_hpolicer"
  aggregate if-exceeding bandwidth-limit "$policer_bandwidth"
set dynamic-profiles input_qos firewall hierarchical-policer "$slowdelay_class_hpolicer"
  aggregate if-exceeding burst-size-limit "$policer_burst_size"
set dynamic-profiles input_qos firewall hierarchical-policer "$slowdelay_class_hpolicer"
  aggregate then discard
set dynamic-profiles input_qos firewall hierarchical-policer "$slowdelay_class_hpolicer"
  premium if-exceeding bandwidth-limit "$policer_bandwidth"
set dynamic-profiles input_qos firewall hierarchical-policer "$slowdelay_class_hpolicer"
  premium if-exceeding burst-size-limit "$policer_burst_size"
set dynamic-profiles input_qos firewall hierarchical-policer "$slowdelay_class_hpolicer"
  premium then discard
set dynamic-profiles input_qos firewall hierarchical-policer "$slowloss_class_hpolicer"
  logical-interface-policer
set dynamic-profiles input_qos firewall hierarchical-policer "$slowloss_class_hpolicer"
  aggregate if-exceeding bandwidth-limit "$policer_bandwidth"
set dynamic-profiles input_qos firewall hierarchical-policer "$slowloss_class_hpolicer"
  aggregate if-exceeding burst-size-limit "$policer_burst_size"
set dynamic-profiles input_qos firewall hierarchical-policer "$slowloss_class_hpolicer"
  aggregate then discard
set dynamic-profiles input_qos firewall hierarchical-policer "$slowloss_class_hpolicer"
  premium if-exceeding bandwidth-limit "$policer_bandwidth"
set dynamic-profiles input_qos firewall hierarchical-policer "$slowloss_class_hpolicer"
  premium if-exceeding burst-size-limit "$policer_burst_size"
```

```

set dynamic-profiles input_qos firewall hierarchical-policer "$slowloss_class_hpolicer"
  premium then discard
set dynamic-profiles input_qos firewall hierarchical-policer "$subscriber_hpolicer"
  logical-interface-policer
set dynamic-profiles input_qos firewall hierarchical-policer "$subscriber_hpolicer"
  aggregate if-exceeding bandwidth-limit "$policer_bandwidth"
set dynamic-profiles input_qos firewall hierarchical-policer "$subscriber_hpolicer"
  aggregate if-exceeding burst-size-limit "$policer_burst_size"
set dynamic-profiles input_qos firewall hierarchical-policer "$subscriber_hpolicer"
  aggregate then discard
set dynamic-profiles input_qos firewall hierarchical-policer "$subscriber_hpolicer"
  premium if-exceeding bandwidth-limit "$policer_bandwidth"
set dynamic-profiles input_qos firewall hierarchical-policer "$subscriber_hpolicer"
  premium if-exceeding burst-size-limit "$policer_burst_size"
set dynamic-profiles input_qos firewall hierarchical-policer "$subscriber_hpolicer"
  premium then discard
set dynamic-profiles video variables uc_video_bandwidth mandatory
set dynamic-profiles video variables mc_video_bandwidth mandatory
set dynamic-profiles video variables uc_video_prefix mandatory
set dynamic-profiles video variables uc_video_burst-size equals
  "round($uc_video_bandwidth * 0.0125)"
set dynamic-profiles video variables mc_video_burst-size equals
  "round($mc_video_bandwidth * 0.0125)"
set dynamic-profiles video variables video_filter_name uid
set dynamic-profiles video variables video_filter_v6_name uid
set dynamic-profiles video interfaces pp0 unit "$junos-interface-unit" family inet filter
  output "$video_filter_name"
set dynamic-profiles video interfaces pp0 unit "$junos-interface-unit" family inet filter
  output precedence 120
set dynamic-profiles video protocols igmp interface "$junos-interface-name" version 3
set dynamic-profiles video protocols igmp interface "$junos-interface-name"
  immediate-leave
set dynamic-profiles video protocols igmp interface "$junos-interface-name"
  promiscuous-mode
set dynamic-profiles video firewall family inet filter "$video_filter_name" interface-specific
set dynamic-profiles video firewall family inet filter "$video_filter_name" term bypass
  from service-filter-hit
set dynamic-profiles video firewall family inet filter "$video_filter_name" term bypass
  then accept
set dynamic-profiles video firewall family inet filter "$video_filter_name" term mc_video
  from destination-address 224.0.0.0/4
set dynamic-profiles video firewall family inet filter "$video_filter_name" term mc_video
  then service-accounting-deferred
set dynamic-profiles video firewall family inet filter "$video_filter_name" term mc_video
  then loss-priority low
set dynamic-profiles video firewall family inet filter "$video_filter_name" term mc_video
  then forwarding-class Multicast
set dynamic-profiles video firewall family inet filter "$video_filter_name" term mc_video
  then service-filter-hit
set dynamic-profiles video firewall family inet filter "$video_filter_name" term mc_video
  then accept
set dynamic-profiles video firewall family inet filter "$video_filter_name" term uc_video
  from source-address $uc_video_prefix
set dynamic-profiles video firewall family inet filter "$video_filter_name" term uc_video
  then service-accounting-deferred

```

```
set dynamic-profiles video firewall family inet filter "$video_filter_name" term uc_video
  then loss-priority low
set dynamic-profiles video firewall family inet filter "$video_filter_name" term uc_video
  then forwarding-class LowLoss
set dynamic-profiles video firewall family inet filter "$video_filter_name" term uc_video
  then service-filter-hit
set dynamic-profiles video firewall family inet filter "$video_filter_name" term uc_video
  then accept
set dynamic-profiles video firewall family inet filter "$video_filter_name" term default
  then accept
set system host-name R0
set system services dhcp-local-server dhcpv6 overrides delegated-pool
  v6_DHCPv6-PD_Pool1
set system services dhcp-local-server dhcpv6 group v6-ppp-client-0 interface pp0.0
set system services subscriber-management gres-route-flush-delay
set system services resource-monitor no-throttle
set system services resource-monitor high-threshold 85
set system commit synchronize
set system commit persist-groups-inheritance
set system ddos-protection protocols oam-lfm aggregate bandwidth 100
set system ddos-protection protocols oam-lfm aggregate burst 100
set chassis effective-shaping-rate
set chassis redundancy failover on-loss-of-keepalives
set chassis redundancy failover on-disk-failure
set chassis redundancy graceful-switchover
set chassis fpc 1 sampling-instance IPFIX-INS1
set chassis fpc 0 sampling-instance IPFIX-INS1
set chassis fpc 2 sampling-instance IPFIX-INS1
set chassis network-services enhanced-ip
set services flow-monitoring version-ipfix template v4-TEMPLATE flow-active-timeout
  60
set services flow-monitoring version-ipfix template v4-TEMPLATE template-refresh-rate
  seconds 120
set services flow-monitoring version-ipfix template v4-TEMPLATE option-refresh-rate
  seconds 120
set services flow-monitoring version-ipfix template v4-TEMPLATE ipv4-template
set services flow-monitoring version-ipfix template v6-TEMPLATE flow-active-timeout
  60
set services flow-monitoring version-ipfix template v6-TEMPLATE template-refresh-rate
  seconds 120
set services flow-monitoring version-ipfix template v6-TEMPLATE option-refresh-rate
  seconds 120
set services flow-monitoring version-ipfix template v6-TEMPLATE ipv6-template
set services l2tp weighted-load-balancing
set services l2tp failover-within-preference
set services l2tp disable-calling-number-avp
set services l2tp tx-connect-speed-method ancp
set services l2tp tunnel assignment-id-format client-server-id
set services l2tp tunnel retransmission-count-established 2
set services l2tp tunnel retransmission-count-not-established 2
set services l2tp tunnel idle-timeout 600
set services l2tp destruct-timeout 600
set access-profile Access-Profile-0
set interfaces lo0 unit 0 family inet address 100.0.0.1/32 primary
set interfaces lo0 unit 0 family inet address 100.0.0.1/32 preferred
```

```
set interfaces lo0 unit 0 family iso address
  47.0007.3000.0000.0000.0100.0001.0100.0100.1010.00
set interfaces lo0 unit 0 family inet6 address 1000:0::1/128 primary
set interfaces lo0 unit 0 family inet6 address 1000:0::1/128 preferred
set interfaces xe-5/2/0 description "To R1 - Core"
set interfaces xe-5/2/0 accounting-profile ifprofile
set interfaces xe-5/2/0 mtu 4484
set interfaces xe-5/2/0 hold-time up 1000
set interfaces xe-5/2/0 hold-time down 1000
set interfaces xe-5/2/0 no-gratuitous-arp-reply
set interfaces xe-5/2/0 no-gratuitous-arp-request
set interfaces xe-5/2/0 unit 0 family inet address 20.20.50.2/24
set interfaces xe-5/2/0 unit 0 family iso
set interfaces xe-5/2/0 unit 0 family inet6
set interfaces xe-5/2/0 unit 0 family mpls
set interfaces ge-9/0/1 description "To R3 - Core"
set interfaces ge-9/0/1 accounting-profile ifprofile
set interfaces ge-9/0/1 mtu 4484
set interfaces ge-9/0/1 hold-time up 1000
set interfaces ge-9/0/1 hold-time down 1000
set interfaces ge-9/0/1 no-gratuitous-arp-reply
set interfaces ge-9/0/1 no-gratuitous-arp-request
set interfaces ge-9/0/1 unit 0 family inet address 20.20.70.2/24
set interfaces ge-9/0/1 unit 0 family iso
set interfaces ge-9/0/1 unit 0 family inet6
set interfaces ge-9/0/1 unit 0 family mpls
set interfaces ge-2/1/0 description "To access facing port1"
set interfaces ge-2/1/0 accounting-profile ifprofile
set interfaces ge-2/1/0 hierarchical-scheduler
set interfaces ge-2/1/0 flexible-vlan-tagging
set interfaces ge-2/1/0 auto-configure stacked-vlan-ranges dynamic-profile
  vlan-client-profile accept pppoe
set interfaces ge-2/1/0 auto-configure stacked-vlan-ranges dynamic-profile
  vlan-client-profile ranges 1-4094,1-4094
set interfaces ge-2/1/0 auto-configure remove-when-no-subscribers
set interfaces ge-2/1/0 mtu 1522
set interfaces ge-2/1/0 hold-time up 0
set interfaces ge-2/1/0 hold-time down 1000
set interfaces ge-2/1/0 link-mode full-duplex
set interfaces ge-2/1/0 encapsulation flexible-ethernet-services
set interfaces ge-2/1/0 no-gratuitous-arp-reply
set interfaces ge-2/1/0 no-gratuitous-arp-request
set interfaces ge-2/1/0 unit 15000 description "HSI for Business customer"
set interfaces ge-2/1/0 unit 15000 vlan-id 4000
set interfaces ge-2/1/0 unit 15000 accounting-profile ifprofile
set interfaces ge-2/1/0 unit 15000 family inet rpf-check
set interfaces ge-2/1/0 unit 15000 family inet address 11.1.1.1/24
set interfaces ge-2/1/0 unit 1 encapsulation vlan-ccc
set interfaces ge-2/1/0 unit 1 vlan-tags outer 3101
set interfaces ge-2/1/0 unit 1 vlan-tags inner 301
set interfaces ge-2/1/0 unit 1 accounting-profile ifprofile
set interfaces ge-2/1/0 unit 2 encapsulation vlan-ccc
set interfaces ge-2/1/0 unit 2 vlan-tags outer 3101
set interfaces ge-2/1/0 unit 2 vlan-tags inner 302
set interfaces ge-2/1/0 unit 2 accounting-profile ifprofile
set interfaces ge-2/1/0 unit 3 encapsulation vlan-ccc
```

```
set interfaces ge-2/1/0 unit 3 vlan-tags outer 3101
set interfaces ge-2/1/0 unit 3 vlan-tags inner 303
set interfaces ge-2/1/0 unit 3 accounting-profile ifprofile
set interfaces ge-2/2/9 description "To access facing port2"
set interfaces ge-2/2/9 accounting-profile ifprofile
set interfaces ge-2/2/9 hierarchical-scheduler
set interfaces ge-2/2/9 flexible-vlan-tagging
set interfaces ge-2/2/9 auto-configure stacked-vlan-ranges dynamic-profile
  vlan-client-profile accept pppoe
set interfaces ge-2/2/9 auto-configure stacked-vlan-ranges dynamic-profile
  vlan-client-profile ranges 1-4094,1-4094
set interfaces ge-2/2/9 auto-configure remove-when-no-subscribers
set interfaces ge-2/2/9 mtu 1522
set interfaces ge-2/2/9 hold-time up 0
set interfaces ge-2/2/9 hold-time down 1000
set interfaces ge-2/2/9 link-mode full-duplex
set interfaces ge-2/2/9 encapsulation flexible-ethernet-services
set interfaces ge-2/2/9 no-gratuitous-arp-reply
set interfaces ge-2/2/9 no-gratuitous-arp-request
set interfaces ge-2/2/9 unit 15000 description "HSI for Business customer"
set interfaces ge-2/2/9 unit 15000 vlan-id 4000
set interfaces ge-2/2/9 unit 15000 accounting-profile ifprofile
set interfaces ge-2/2/9 unit 15000 family inet rpf-check
set interfaces ge-2/2/9 unit 15000 family inet address 12.1.2.1/24
set interfaces ge-2/2/9 unit 1 encapsulation vlan-ccc
set interfaces ge-2/2/9 unit 1 vlan-tags outer 3101
set interfaces ge-2/2/9 unit 1 vlan-tags inner 304
set interfaces ge-2/2/9 unit 1 accounting-profile ifprofile
set interfaces ge-2/2/9 unit 2 encapsulation vlan-ccc
set interfaces ge-2/2/9 unit 2 vlan-tags outer 3101
set interfaces ge-2/2/9 unit 2 vlan-tags inner 305
set interfaces ge-2/2/9 unit 2 accounting-profile ifprofile
set interfaces ge-2/2/9 unit 3 encapsulation vlan-ccc
set interfaces ge-2/2/9 unit 3 vlan-tags outer 3101
set interfaces ge-2/2/9 unit 3 vlan-tags inner 306
set interfaces ge-2/2/9 unit 3 accounting-profile ifprofile
set interfaces ge-8/0/0 description "To access facing port3"
set interfaces ge-8/0/0 accounting-profile ifprofile
set interfaces ge-8/0/0 hierarchical-scheduler
set interfaces ge-8/0/0 flexible-vlan-tagging
set interfaces ge-8/0/0 auto-configure stacked-vlan-ranges dynamic-profile
  vlan-client-profile accept pppoe
set interfaces ge-8/0/0 auto-configure stacked-vlan-ranges dynamic-profile
  vlan-client-profile ranges 1-4094,1-4094
set interfaces ge-8/0/0 auto-configure remove-when-no-subscribers
set interfaces ge-8/0/0 mtu 1522
set interfaces ge-8/0/0 hold-time up 0
set interfaces ge-8/0/0 hold-time down 1000
set interfaces ge-8/0/0 link-mode full-duplex
set interfaces ge-8/0/0 encapsulation flexible-ethernet-services
set interfaces ge-8/0/0 no-gratuitous-arp-reply
set interfaces ge-8/0/0 no-gratuitous-arp-request
set interfaces ge-8/0/0 unit 15000 description "HSI for Business customer"
set interfaces ge-8/0/0 unit 15000 vlan-id 4000
set interfaces ge-8/0/0 unit 15000 accounting-profile ifprofile
set interfaces ge-8/0/0 unit 15000 family inet rpf-check
```



```
set interfaces ge-8/0/0 unit 15000 family inet address 13.1.3.1/24
set interfaces ge-8/0/0 unit 1 encapsulation vlan-ccc
set interfaces ge-8/0/0 unit 1 vlan-tags outer 3101
set interfaces ge-8/0/0 unit 1 vlan-tags inner 307
set interfaces ge-8/0/0 unit 1 accounting-profile ifprofile
set interfaces ge-8/0/0 unit 2 encapsulation vlan-ccc
set interfaces ge-8/0/0 unit 2 vlan-tags outer 3101
set interfaces ge-8/0/0 unit 2 vlan-tags inner 308
set interfaces ge-8/0/0 unit 2 accounting-profile ifprofile
set interfaces ge-8/0/0 unit 3 encapsulation vlan-ccc
set interfaces ge-8/0/0 unit 3 vlan-tags outer 3101
set interfaces ge-8/0/0 unit 3 vlan-tags inner 309
set interfaces ge-8/0/0 unit 3 accounting-profile ifprofile
set interfaces ge-9/0/5 description "To access facing port4"
set interfaces ge-9/0/5 accounting-profile ifprofile
set interfaces ge-9/0/5 hierarchical-scheduler
set interfaces ge-9/0/5 flexible-vlan-tagging
set interfaces ge-9/0/5 auto-configure stacked-vlan-ranges dynamic-profile
    vlan-client-profile accept pppoe
set interfaces ge-9/0/5 auto-configure stacked-vlan-ranges dynamic-profile
    vlan-client-profile ranges 1-4094,1-4094
set interfaces ge-9/0/5 auto-configure remove-when-no-subscribers
set interfaces ge-9/0/5 mtu 1522
set interfaces ge-9/0/5 hold-time up 0
set interfaces ge-9/0/5 hold-time down 1000
set interfaces ge-9/0/5 link-mode full-duplex
set interfaces ge-9/0/5 encapsulation flexible-ethernet-services
set interfaces ge-9/0/5 no-gratuitous-arp-reply
set interfaces ge-9/0/5 no-gratuitous-arp-request
set interfaces ge-9/0/5 unit 15000 description "HSI for Business customer"
set interfaces ge-9/0/5 unit 15000 vlan-id 4000
set interfaces ge-9/0/5 unit 15000 accounting-profile ifprofile
set interfaces ge-9/0/5 unit 15000 family inet rpf-check
set interfaces ge-9/0/5 unit 15000 family inet address 14.1.4.1/24
set interfaces ge-9/0/5 unit 1 encapsulation vlan-ccc
set interfaces ge-9/0/5 unit 1 vlan-tags outer 3001
set interfaces ge-9/0/5 unit 1 vlan-tags inner 310
set interfaces ge-9/0/5 unit 1 accounting-profile ifprofile
set interfaces ge-9/0/5 unit 2 encapsulation vlan-ccc
set interfaces ge-9/0/5 unit 2 vlan-tags outer 3001
set interfaces ge-9/0/5 unit 2 vlan-tags inner 311
set interfaces ge-9/0/5 unit 2 accounting-profile ifprofile
set interfaces ge-9/0/5 unit 3 encapsulation vlan-ccc
set interfaces ge-9/0/5 unit 3 vlan-tags outer 3001
set interfaces ge-9/0/5 unit 3 vlan-tags inner 312
set interfaces ge-9/0/5 unit 3 accounting-profile ifprofile
set interfaces ge-9/0/9 description "To access facing port5"
set interfaces ge-9/0/9 accounting-profile ifprofile
set interfaces ge-9/0/9 hierarchical-scheduler
set interfaces ge-9/0/9 flexible-vlan-tagging
set interfaces ge-9/0/9 auto-configure stacked-vlan-ranges dynamic-profile
    vlan-client-profile accept pppoe
set interfaces ge-9/0/9 auto-configure stacked-vlan-ranges dynamic-profile
    vlan-client-profile ranges 1-4094,1-4094
set interfaces ge-9/0/9 auto-configure remove-when-no-subscribers
set interfaces ge-9/0/9 mtu 1522
```

```
set interfaces ge-9/0/9 hold-time up 0
set interfaces ge-9/0/9 hold-time down 1000
set interfaces ge-9/0/9 link-mode full-duplex
set interfaces ge-9/0/9 encapsulation flexible-ethernet-services
set interfaces ge-9/0/9 no-gratuitous-arp-reply
set interfaces ge-9/0/9 no-gratuitous-arp-request
set interfaces ge-9/0/9 unit 15000 description "HSI for Business customer"
set interfaces ge-9/0/9 unit 15000 vlan-id 4000
set interfaces ge-9/0/9 unit 15000 accounting-profile ifprofile
set interfaces ge-9/0/9 unit 15000 family inet rpf-check
set interfaces ge-9/0/9 unit 15000 family inet address 15.1.5.1/24
set interfaces ge-9/0/9 unit 1 encapsulation vlan-ccc
set interfaces ge-9/0/9 unit 1 vlan-tags outer 3101
set interfaces ge-9/0/9 unit 1 vlan-tags inner 313
set interfaces ge-9/0/9 unit 1 accounting-profile ifprofile
set interfaces ge-9/0/9 unit 2 encapsulation vlan-ccc
set interfaces ge-9/0/9 unit 2 vlan-tags outer 3101
set interfaces ge-9/0/9 unit 2 vlan-tags inner 314
set interfaces ge-9/0/9 unit 2 accounting-profile ifprofile
set interfaces ge-9/0/9 unit 3 encapsulation vlan-ccc
set interfaces ge-9/0/9 unit 3 vlan-tags outer 3101
set interfaces ge-9/0/9 unit 3 vlan-tags inner 315
set interfaces ge-9/0/9 unit 3 accounting-profile ifprofile
set interfaces ge-9/2/0 description "To access facing port6"
set interfaces ge-9/2/0 accounting-profile ifprofile
set interfaces ge-9/2/0 hierarchical-scheduler
set interfaces ge-9/2/0 flexible-vlan-tagging
set interfaces ge-9/2/0 auto-configure stacked-vlan-ranges dynamic-profile
  vlan-client-profile accept pppoe
set interfaces ge-9/2/0 auto-configure stacked-vlan-ranges dynamic-profile
  vlan-client-profile ranges 1-4094,1-4094
set interfaces ge-9/2/0 auto-configure remove-when-no-subscribers
set interfaces ge-9/2/0 mtu 1522
set interfaces ge-9/2/0 hold-time up 0
set interfaces ge-9/2/0 hold-time down 1000
set interfaces ge-9/2/0 link-mode full-duplex
set interfaces ge-9/2/0 encapsulation flexible-ethernet-services
set interfaces ge-9/2/0 no-gratuitous-arp-reply
set interfaces ge-9/2/0 no-gratuitous-arp-request
set interfaces ge-9/2/0 unit 15000 description "HSI for Business customer"
set interfaces ge-9/2/0 unit 15000 vlan-id 4000
set interfaces ge-9/2/0 unit 15000 accounting-profile ifprofile
set interfaces ge-9/2/0 unit 15000 family inet rpf-check
set interfaces ge-9/2/0 unit 15000 family inet address 16.1.6.1/24
set interfaces ge-9/2/0 unit 1 encapsulation vlan-ccc
set interfaces ge-9/2/0 unit 1 vlan-tags outer 3101
set interfaces ge-9/2/0 unit 1 vlan-tags inner 316
set interfaces ge-9/2/0 unit 1 accounting-profile ifprofile
set interfaces ge-9/2/0 unit 2 encapsulation vlan-ccc
set interfaces ge-9/2/0 unit 2 vlan-tags outer 3101
set interfaces ge-9/2/0 unit 2 vlan-tags inner 317
set interfaces ge-9/2/0 unit 2 accounting-profile ifprofile
set interfaces ge-9/2/0 unit 3 encapsulation vlan-ccc
set interfaces ge-9/2/0 unit 3 vlan-tags outer 3101
set interfaces ge-9/2/0 unit 3 vlan-tags inner 318
set interfaces ge-9/2/0 unit 3 accounting-profile ifprofile
```

```
set forwarding-options sampling instance IPFIX-INS1 input rate 1000
set forwarding-options sampling instance IPFIX-INS1 input run-length 0
set forwarding-options sampling instance IPFIX-INS1 family inet output flow-server
  100.200.0.9 port 2055
set forwarding-options sampling instance IPFIX-INS1 family inet output flow-server
  100.200.0.9 version-ipfix template v4-TEMPLATE
set forwarding-options sampling instance IPFIX-INS1 family inet output inline-jflow
  source-address 200.90.30.6
set forwarding-options sampling instance IPFIX-INS1 family inet6 output flow-server
  100.200.0.9 port 2055
set forwarding-options sampling instance IPFIX-INS1 family inet6 output flow-server
  100.200.0.9 version-ipfix template v6-TEMPLATE
set forwarding-options sampling instance IPFIX-INS1 family inet6 output inline-jflow
  source-address 200.90.30.6
set forwarding-options enhanced-hash-key family inet no-destination-port
set forwarding-options enhanced-hash-key family inet no-source-port
set forwarding-options enhanced-hash-key family inet6 no-destination-port
set forwarding-options enhanced-hash-key family inet6 no-source-port
set forwarding-options family inet filter input JFlow-Sample-IPv4
set forwarding-options family inet6 filter input JFlow-Sample-IPv6
set event-options policy LDP-ISIS events rpd_ldp_nbrdown
set event-options policy LDP-ISIS events rpd_isis_ldp_sync
set event-options policy LDP-ISIS then raise-trap
set event-options policy pem-fail events SYSTEM
set event-options policy pem-fail attributes-match SYSTEM.message matches
  "Alarm.*Feed Connection.*"
set event-options policy pem-fail then raise-trap
set event-options policy SFP-XFP-GONE events PIC
set event-options policy SFP-XFP-GONE attributes-match PIC.message matches
  .*plugged.*
set event-options policy SFP-XFP-GONE then raise-trap
set accounting-options periodic-refresh disable
set accounting-options file ifstat files 5
set accounting-options file ifstat transfer-interval 15
set accounting-options file ifstat archive-sites
  "sftp://username@hostname:/var/tmp/archive/"
set accounting-options interface-profile ifprofile file ifstat
set accounting-options interface-profile ifprofile interval 15
set accounting-options interface-profile ifprofile fields input-bytes
set accounting-options interface-profile ifprofile fields output-bytes
set accounting-options interface-profile ifprofile fields input-packets
set accounting-options interface-profile ifprofile fields output-packets
set accounting-options interface-profile ifprofile fields input-errors
set accounting-options interface-profile ifprofile fields output-errors
set accounting-options interface-profile ifprofile fields input-multicast
set accounting-options interface-profile ifprofile fields output-multicast
set accounting-options interface-profile ifprofile fields input-unicast
set accounting-options interface-profile ifprofile fields output-unicast
set accounting-options interface-profile ifprofile fields unsupported-protocol
set accounting-options interface-profile ifprofile fields rpf-check-bytes
set accounting-options interface-profile ifprofile fields rpf-check-packets
set accounting-options interface-profile ifprofile fields rpf-check6-bytes
set accounting-options interface-profile ifprofile fields rpf-check6-packets
set routing-options nonstop-routing
set routing-options nsr-phantom-holdtime 900
set routing-options router-id 100.0.0.1
```

```
set routing-options forwarding-table remnant-holdtime 900
set routing-options forwarding-table export LOAD-BALANCE-ALL
set protocols mpls no-propagate-ttl
set protocols mpls ipv6-tunneling
set protocols mpls interface lo0.0
set protocols mpls interface xe-5/2/0.0
set protocols mpls interface ge-9/0/1.0
set protocols bgp local-as 65500
set protocols bgp group Internal type internal
set protocols bgp group Internal local-address 100.0.0.1
set protocols bgp group Internal neighbor 102.0.0.1 family inet unicast
set protocols bgp group Internal neighbor 102.0.0.1 family inet6 unicast
set protocols bgp group Internal neighbor 102.0.0.1 export export-access
set protocols isis lsp-lifetime 65535
set protocols isis ignore-attached-bit
set protocols isis level 2 disable
set protocols isis level 1 authentication-key "secret key!"
set protocols isis level 1 authentication-type md5
set protocols isis level 1 wide-metrics-only
set protocols isis interface fxp0.0 disable
set protocols isis interface lo0.0 passive
set protocols isis interface xe-5/2/0.0 ldp-synchronization
set protocols isis interface xe-5/2/0.0 lsp-interval 10
set protocols isis interface xe-5/2/0.0 point-to-point
set protocols isis interface xe-5/2/0.0 link-protection
set protocols isis interface xe-5/2/0.0 level 1 metric 2000070
set protocols isis interface ge-9/0/1.0 ldp-synchronization
set protocols isis interface ge-9/0/1.0 lsp-interval 10
set protocols isis interface ge-9/0/1.0 point-to-point
set protocols isis interface ge-9/0/1.0 link-protection
set protocols isis interface ge-9/0/1.0 level 1 metric 2000070
set protocols ldp track-igp-metric
set protocols ldp strict-targeted-hellos
set protocols ldp import LDPMINPREFL32
set protocols ldp keepalive-timeout 180
set protocols ldp interface lo0.0
set protocols ldp interface xe-5/2/0.0
set protocols ldp interface ge-9/0/1.0
set protocols ldp p2mp
set protocols pim family inet6 disable
set protocols pim rp static address 102.0.0.1 version 2
set protocols pim rp static address 102.0.0.1 group-ranges 238.0.100.0/23
set protocols pim rp static address 102.0.0.1 group-ranges 238.0.102.0/23
set protocols pim rp static address 102.0.0.1 group-ranges 238.0.104.0/23
set protocols pim rp static address 102.0.0.1 group-ranges 232.0.0.0/8
set protocols pim rp static address 102.0.0.1 group-ranges 236.0.0.0/8
set protocols pim rp static address 102.0.0.1 override
set protocols pim interface xe-5/2/0.0 mode sparse
set protocols pim interface xe-5/2/0.0 version 2
set protocols pim interface ge-9/0/1.0 mode sparse
set protocols pim interface ge-9/0/1.0 version 2
set protocols pim join-load-balance
set protocols l2circuit neighbor 102.0.0.1 interface ge-2/1/0.1 virtual-circuit-id 1
set protocols l2circuit neighbor 102.0.0.1 interface ge-2/1/0.2 virtual-circuit-id 2
set protocols l2circuit neighbor 102.0.0.1 interface ge-2/1/0.3 virtual-circuit-id 3
set protocols l2circuit neighbor 102.0.0.1 interface ge-2/2/9.1 virtual-circuit-id 4
```

```

set protocols l2circuit neighbor 102.0.0.1 interface ge-2/2/9.2 virtual-circuit-id 5
set protocols l2circuit neighbor 102.0.0.1 interface ge-2/2/9.3 virtual-circuit-id 6
set protocols l2circuit neighbor 102.0.0.1 interface ge-8/0/0.1 virtual-circuit-id 7
set protocols l2circuit neighbor 102.0.0.1 interface ge-8/0/0.2 virtual-circuit-id 8
set protocols l2circuit neighbor 102.0.0.1 interface ge-8/0/0.3 virtual-circuit-id 9
set protocols l2circuit neighbor 102.0.0.1 interface ge-9/0/5.1 virtual-circuit-id 10
set protocols l2circuit neighbor 102.0.0.1 interface ge-9/0/5.2 virtual-circuit-id 11
set protocols l2circuit neighbor 102.0.0.1 interface ge-9/0/5.3 virtual-circuit-id 12
set protocols l2circuit neighbor 102.0.0.1 interface ge-9/0/9.1 virtual-circuit-id 13
set protocols l2circuit neighbor 102.0.0.1 interface ge-9/0/9.2 virtual-circuit-id 14
set protocols l2circuit neighbor 102.0.0.1 interface ge-9/0/9.3 virtual-circuit-id 15
set protocols l2circuit neighbor 102.0.0.1 interface ge-9/2/0.1 virtual-circuit-id 16
set protocols l2circuit neighbor 102.0.0.1 interface ge-9/2/0.2 virtual-circuit-id 17
set protocols l2circuit neighbor 102.0.0.1 interface ge-9/2/0.3 virtual-circuit-id 18
set policy-options prefix-list local-lo0-ipv6 apply-path "interfaces lo0 unit 0 family inet6
  address <*>"
set policy-options prefix-list backbone-ipv6 2003::/16
set policy-options policy-statement export-access term 1 from family inet
set policy-options policy-statement export-access term 1 from protocol access
set policy-options policy-statement export-access term 1 then accept
set policy-options policy-statement export-access term 2 from family inet6
set policy-options policy-statement export-access term 2 from protocol access
set policy-options policy-statement export-access term 2 from protocol access-internal
set policy-options policy-statement export-access term 2 then accept
set policy-options policy-statement LOAD-BALANCE-ALL then load-balance per-packet
set policy-options policy-statement LDPMINPREFL32 term only-32 from protocol ldp
set policy-options policy-statement LDPMINPREFL32 term only-32 from route-filter
  0.0.0.0/0 prefix-length-range /32-/32
set policy-options policy-statement LDPMINPREFL32 term only-32 then accept
set policy-options policy-statement LDPMINPREFL32 term final then reject
set class-of-service forwarding-classes class BestEffort queue-num 0
set class-of-service forwarding-classes class BestEffort priority low
set class-of-service forwarding-classes class BestEffort policing-priority normal
set class-of-service forwarding-classes class LowLoss queue-num 1
set class-of-service forwarding-classes class LowLoss priority low
set class-of-service forwarding-classes class LowLoss policing-priority normal
set class-of-service forwarding-classes class LowDelay queue-num 2
set class-of-service forwarding-classes class LowDelay priority high
set class-of-service forwarding-classes class LowDelay policing-priority normal
set class-of-service forwarding-classes class Control queue-num 3
set class-of-service forwarding-classes class Control priority high
set class-of-service forwarding-classes class Control policing-priority premium
set class-of-service forwarding-classes class Voice queue-num 4
set class-of-service forwarding-classes class Voice priority high
set class-of-service forwarding-classes class Voice policing-priority premium
set class-of-service forwarding-classes class Multicast queue-num 7
set class-of-service forwarding-classes class Multicast priority low
set class-of-service forwarding-classes class Multicast policing-priority normal
set class-of-service classifiers exp core-facing-default forwarding-class BestEffort
  loss-priority low code-points 001
set class-of-service classifiers exp core-facing-default forwarding-class BestEffort
  loss-priority high code-points 000
set class-of-service classifiers exp core-facing-default forwarding-class Voice loss-priority
  low code-points 101
set class-of-service classifiers exp core-facing-default forwarding-class LowDelay
  loss-priority high code-points 010

```

```
set class-of-service classifiers exp core-facing-default forwarding-class LowDelay
  loss-priority low code-points 100
set class-of-service classifiers exp core-facing-default forwarding-class LowLoss
  loss-priority low code-points 111
set class-of-service classifiers exp core-facing-default forwarding-class LowLoss
  loss-priority high code-points 110
set class-of-service host-outbound-traffic forwarding-class Control
set class-of-service host-outbound-traffic dscp-code-point 110000
set class-of-service host-outbound-traffic ieee-802.1 default 110
set class-of-service drop-profiles RED-BestEffort interpolate fill-level 40
set class-of-service drop-profiles RED-BestEffort interpolate fill-level 50
set class-of-service drop-profiles RED-BestEffort interpolate fill-level 100
set class-of-service drop-profiles RED-BestEffort interpolate drop-probability 0
set class-of-service drop-profiles RED-BestEffort interpolate drop-probability 50
set class-of-service drop-profiles RED-BestEffort interpolate drop-probability 100
set class-of-service interfaces xe-5/2/0 unit 0 classifiers exp core-facing-default
set class-of-service interfaces xe-5/2/0 unit 0 rewrite-rules exp core-facing-default
set class-of-service interfaces xe-5/2/0 unit 0 rewrite-rules inet-precedence
  core-facing-default
set class-of-service interfaces ge-9/0/1 unit 0 classifiers exp core-facing-default
set class-of-service interfaces ge-9/0/1 unit 0 rewrite-rules exp core-facing-default
set class-of-service interfaces ge-9/0/1 unit 0 rewrite-rules inet-precedence
  core-facing-default
set class-of-service rewrite-rules dscp residential-default forwarding-class BestEffort
  loss-priority low code-point 000000
set class-of-service rewrite-rules dscp residential-default forwarding-class BestEffort
  loss-priority high code-point 001000
set class-of-service rewrite-rules dscp residential-default forwarding-class LowLoss
  loss-priority low code-point 111010
set class-of-service rewrite-rules dscp residential-default forwarding-class LowLoss
  loss-priority high code-point 111010
set class-of-service rewrite-rules dscp residential-default forwarding-class LowDelay
  loss-priority low code-point 010001
set class-of-service rewrite-rules dscp residential-default forwarding-class LowDelay
  loss-priority high code-point 100001
set class-of-service rewrite-rules dscp residential-default forwarding-class Control
  loss-priority low code-point 110000
set class-of-service rewrite-rules dscp residential-default forwarding-class Control
  loss-priority high code-point 110000
set class-of-service rewrite-rules dscp residential-default forwarding-class Voice
  loss-priority low code-point 101110
set class-of-service rewrite-rules dscp residential-default forwarding-class Voice
  loss-priority high code-point 101110
set class-of-service rewrite-rules dscp residential-default forwarding-class Multicast
  loss-priority low code-point 100000
set class-of-service rewrite-rules dscp residential-default forwarding-class Multicast
  loss-priority high code-point 100001
set class-of-service rewrite-rules dscp-ipv6 residential-default-v6 forwarding-class
  BestEffort loss-priority low code-point 000000
set class-of-service rewrite-rules dscp-ipv6 residential-default-v6 forwarding-class
  BestEffort loss-priority high code-point 001000
set class-of-service rewrite-rules dscp-ipv6 residential-default-v6 forwarding-class
  LowLoss loss-priority low code-point 111010
set class-of-service rewrite-rules dscp-ipv6 residential-default-v6 forwarding-class
  LowLoss loss-priority high code-point 111010
```

```
set class-of-service rewrite-rules dscp-ipv6 residential-default-v6 forwarding-class
  LowDelay loss-priority low code-point 010001
set class-of-service rewrite-rules dscp-ipv6 residential-default-v6 forwarding-class
  LowDelay loss-priority high code-point 100001
set class-of-service rewrite-rules dscp-ipv6 residential-default-v6 forwarding-class
  Control loss-priority low code-point 110000
set class-of-service rewrite-rules dscp-ipv6 residential-default-v6 forwarding-class
  Control loss-priority high code-point 110000
set class-of-service rewrite-rules dscp-ipv6 residential-default-v6 forwarding-class Voice
  loss-priority low code-point 101110
set class-of-service rewrite-rules dscp-ipv6 residential-default-v6 forwarding-class Voice
  loss-priority high code-point 101110
set class-of-service rewrite-rules dscp-ipv6 residential-default-v6 forwarding-class
  Multicast loss-priority low code-point 100000
set class-of-service rewrite-rules dscp-ipv6 residential-default-v6 forwarding-class
  Multicast loss-priority high code-point 100001
set class-of-service rewrite-rules exp core-facing-default forwarding-class BestEffort
  loss-priority low code-point 000
set class-of-service rewrite-rules exp core-facing-default forwarding-class BestEffort
  loss-priority high code-point 000
set class-of-service rewrite-rules exp core-facing-default forwarding-class LowDelay
  loss-priority high code-point 010
set class-of-service rewrite-rules exp core-facing-default forwarding-class LowDelay
  loss-priority low code-point 100
set class-of-service rewrite-rules exp core-facing-default forwarding-class Voice
  loss-priority low code-point 101
set class-of-service rewrite-rules exp core-facing-default forwarding-class Voice
  loss-priority high code-point 101
set class-of-service rewrite-rules exp core-facing-default forwarding-class LowLoss
  loss-priority low code-point 111
set class-of-service rewrite-rules exp core-facing-default forwarding-class LowLoss
  loss-priority high code-point 110
set class-of-service rewrite-rules ieee-802.1 residential-default-vlan forwarding-class
  BestEffort loss-priority low code-point 000
set class-of-service rewrite-rules ieee-802.1 residential-default-vlan forwarding-class
  BestEffort loss-priority high code-point 001
set class-of-service rewrite-rules ieee-802.1 residential-default-vlan forwarding-class
  LowLoss loss-priority low code-point 111
set class-of-service rewrite-rules ieee-802.1 residential-default-vlan forwarding-class
  LowLoss loss-priority high code-point 111
set class-of-service rewrite-rules ieee-802.1 residential-default-vlan forwarding-class
  LowDelay loss-priority low code-point 010
set class-of-service rewrite-rules ieee-802.1 residential-default-vlan forwarding-class
  LowDelay loss-priority high code-point 100
set class-of-service rewrite-rules ieee-802.1 residential-default-vlan forwarding-class
  Control loss-priority high code-point 110
set class-of-service rewrite-rules ieee-802.1 residential-default-vlan forwarding-class
  Control loss-priority low code-point 110
set class-of-service rewrite-rules ieee-802.1 residential-default-vlan forwarding-class
  Voice loss-priority low code-point 101
set class-of-service rewrite-rules ieee-802.1 residential-default-vlan forwarding-class
  Voice loss-priority high code-point 101
set class-of-service rewrite-rules ieee-802.1 residential-default-vlan forwarding-class
  Multicast loss-priority low code-point 100
set class-of-service rewrite-rules ieee-802.1 residential-default-vlan forwarding-class
  Multicast loss-priority high code-point 100
```

```
set class-of-service rewrite-rules inet-precedence core-facing-default forwarding-class
  BestEffort loss-priority low code-point 000
set class-of-service rewrite-rules inet-precedence core-facing-default forwarding-class
  BestEffort loss-priority high code-point 000
set class-of-service rewrite-rules inet-precedence core-facing-default forwarding-class
  LowDelay loss-priority high code-point 010
set class-of-service rewrite-rules inet-precedence core-facing-default forwarding-class
  LowDelay loss-priority low code-point 100
set class-of-service rewrite-rules inet-precedence core-facing-default forwarding-class
  Voice loss-priority low code-point 101
set class-of-service rewrite-rules inet-precedence core-facing-default forwarding-class
  Voice loss-priority high code-point 101
set class-of-service rewrite-rules inet-precedence core-facing-default forwarding-class
  LowLoss loss-priority low code-point 111
set class-of-service rewrite-rules inet-precedence core-facing-default forwarding-class
  LowLoss loss-priority high code-point 110
set class-of-service scheduler-maps schedmap_residential forwarding-class BestEffort
  scheduler sched_BestEffort
set class-of-service scheduler-maps schedmap_residential forwarding-class LowLoss
  scheduler sched_LowLoss
set class-of-service scheduler-maps schedmap_residential forwarding-class LowDelay
  scheduler sched_LowDelay
set class-of-service scheduler-maps schedmap_residential forwarding-class Voice
  scheduler sched_Voice
set class-of-service scheduler-maps schedmap_residential forwarding-class Control
  scheduler sched_Control
set class-of-service scheduler-maps schedmap_residential forwarding-class Multicast
  scheduler sched_Multicast
set class-of-service schedulers sched_Voice transmit-rate percent 1
set class-of-service schedulers sched_Voice buffer-size percent 5
set class-of-service schedulers sched_Voice priority strict-high
set class-of-service schedulers sched_LowDelay transmit-rate percent 1
set class-of-service schedulers sched_LowDelay excess-rate proportion 180
set class-of-service schedulers sched_LowDelay buffer-size percent 10
set class-of-service schedulers sched_LowDelay priority medium-low
set class-of-service schedulers sched_LowDelay excess-priority high
set class-of-service schedulers sched_LowLoss excess-rate proportion 800
set class-of-service schedulers sched_LowLoss buffer-size percent 20
set class-of-service schedulers sched_LowLoss priority low
set class-of-service schedulers sched_LowLoss excess-priority low
set class-of-service schedulers sched_LowLoss drop-profile-map loss-priority any protocol
  any drop-profile RED-BestEffort
set class-of-service schedulers sched_BestEffort excess-rate proportion 180
set class-of-service schedulers sched_BestEffort buffer-size percent 30
set class-of-service schedulers sched_BestEffort priority low
set class-of-service schedulers sched_BestEffort excess-priority low
set class-of-service schedulers sched_BestEffort drop-profile-map loss-priority any
  protocol any drop-profile RED-BestEffort
set class-of-service schedulers sched_Control transmit-rate 256k
set class-of-service schedulers sched_Control excess-rate proportion 20
set class-of-service schedulers sched_Control priority high
set class-of-service schedulers sched_Control excess-priority low
set class-of-service schedulers sched_Multicast transmit-rate 100m
set class-of-service schedulers sched_Multicast excess-rate proportion 20
set class-of-service schedulers sched_Multicast buffer-size percent 10
set class-of-service schedulers sched_Multicast priority medium-high
```



```

set class-of-service schedulers sched_Multicast excess-priority high
set firewall family inet filter DEFAULT_V4-IN interface-specific
set firewall family inet filter DEFAULT_V4-IN term bypass from service-filter-hit
set firewall family inet filter DEFAULT_V4-IN term bypass then accept
set firewall family inet filter DEFAULT_V4-IN term rest then forwarding-class BestEffort
set firewall family inet filter DEFAULT_V4-OUT interface-specific
set firewall family inet filter DEFAULT_V4-OUT term bypass from service-filter-hit
set firewall family inet filter DEFAULT_V4-OUT term bypass then accept
set firewall family inet filter DEFAULT_V4-OUT term rest then forwarding-class BestEffort
set firewall family inet filter JFlow-Sample-IPv4 term All then sample
set firewall family inet filter JFlow-Sample-IPv4 term All then accept
set firewall family inet6 filter DEFAULT_V6-IN interface-specific
set firewall family inet6 filter DEFAULT_V6-IN term bypass from service-filter-hit
set firewall family inet6 filter DEFAULT_V6-IN term bypass then accept
set firewall family inet6 filter DEFAULT_V6-IN term rest then forwarding-class BestEffort
set firewall family inet6 filter DEFAULT_V6-OUT interface-specific
set firewall family inet6 filter DEFAULT_V6-OUT term bypass from service-filter-hit
set firewall family inet6 filter DEFAULT_V6-OUT term bypass then accept
set firewall family inet6 filter DEFAULT_V6-OUT term rest then forwarding-class BestEffort
set firewall family inet6 filter JFlow-Sample-IPv6 term local-v6 from prefix-list
    local-lo0-ipv6
set firewall family inet6 filter JFlow-Sample-IPv6 term local-v6 then count local-accept
set firewall family inet6 filter JFlow-Sample-IPv6 term local-v6 then sample
set firewall family inet6 filter JFlow-Sample-IPv6 term local-v6 then accept
set firewall family inet6 filter JFlow-Sample-IPv6 term from-backbone from
    source-prefix-list backbone-ipv6
set firewall family inet6 filter JFlow-Sample-IPv6 term from-backbone then count
    from-backbone-reject
set firewall family inet6 filter JFlow-Sample-IPv6 term from-backbone then discard
set firewall family inet6 filter JFlow-Sample-IPv6 term to-backbone from
    destination-prefix-list backbone-ipv6
set firewall family inet6 filter JFlow-Sample-IPv6 term to-backbone then count
    to-backbone-reject
set firewall family inet6 filter JFlow-Sample-IPv6 term to-backbone then discard
set firewall family inet6 filter JFlow-Sample-IPv6 term final then count all-accept
set firewall family inet6 filter JFlow-Sample-IPv6 term final then sample
set firewall family inet6 filter JFlow-Sample-IPv6 term final then accept
set access radius-server 9.0.0.9 port 1812
set access radius-server 9.0.0.9 accounting-port 1813
set access radius-server 9.0.0.9 secret "secret key!"
set access radius-server 9.0.0.9 timeout 30
set access radius-server 9.0.0.9 retry 3
set access radius-server 9.0.0.9 max-outstanding-requests 500
set access radius-server 9.0.0.9 source-address 100.0.0.1
set access profile Access-Profile-0 authentication-order radius
set access profile Access-Profile-0 radius authentication-server 9.0.0.9
set access profile Access-Profile-0 radius accounting-server 9.0.0.9
set access profile Access-Profile-0 radius options nas-identifier R0
set access profile Access-Profile-0 radius options nas-port-extended-format slot-width
    3
set access profile Access-Profile-0 radius options nas-port-extended-format
    adapter-width 2
set access profile Access-Profile-0 radius options nas-port-extended-format port-width
    3
set access profile Access-Profile-0 radius options nas-port-extended-format
    stacked-vlan-width 12

```

```
set access profile Access-Profile-0 radius options nas-port-extended-format vlan-width
12
set access profile Access-Profile-0 radius options nas-port-id-format nas-identifier
set access profile Access-Profile-0 radius options nas-port-id-format interface-description
set access profile Access-Profile-0 radius options nas-port-id-format agent-circuit-id
set access profile Access-Profile-0 radius options nas-port-id-format agent-remote-id
set access profile Access-Profile-0 radius options nas-port-type ethernet 4711
set access profile Access-Profile-0 radius options calling-station-id-delimiter "$"
set access profile Access-Profile-0 radius options calling-station-id-format nas-identifier
set access profile Access-Profile-0 radius options calling-station-id-format
interface-description
set access profile Access-Profile-0 radius options calling-station-id-format agent-circuit-id
set access profile Access-Profile-0 radius options calling-station-id-format
agent-remote-id
set access profile Access-Profile-0 radius options remote-circuit-id-delimiter "$"
set access profile Access-Profile-0 radius options remote-circuit-id-format agent-circuit-id
set access profile Access-Profile-0 radius options remote-circuit-id-format
agent-remote-id
set access profile Access-Profile-0 radius options remote-circuit-id-fallback
configured-calling-station-id
set access profile Access-Profile-0 radius options override calling-station-id
remote-circuit-id
set access profile Access-Profile-0 radius options accounting-session-id-format
description
set access profile Access-Profile-0 radius options vlan-nas-port-stacked-format
set access profile Access-Profile-0 radius options juniper-dsl-attributes
set access profile Access-Profile-0 radius options ip-address-change-notify message
JUNIPER_ADDRESS_SAVING
set access profile Access-Profile-0 session-options client-idle-timeout 900
set access profile Access-Profile-0 session-options client-session-timeout 86400
set access profile Access-Profile-0 accounting order radius
set access profile Access-Profile-0 accounting accounting-stop-on-failure
set access profile Access-Profile-0 accounting accounting-stop-on-access-deny
set access profile Access-Profile-0 accounting immediate-update
set access profile Access-Profile-0 accounting coa-immediate-update
set access profile Access-Profile-0 accounting address-change-immediate-update
set access profile Access-Profile-0 accounting update-interval 1440
set access profile Access-Profile-0 accounting statistics volume-time
set access profile Access-Profile-0 accounting wait-for-acct-on-ack
set access profile Access-Profile-0 accounting send-acct-status-on-config-change
set access profile Access-Profile-0 accounting ancp-speed-change-immediate-update
set access address-assignment neighbor-discovery-router-advertisement
v6_NDRA_Prefix_Pool1
set access address-assignment pool v4-pool-0 family inet network 100.0.0.0/8
set access address-assignment pool v4-pool-0 family inet range v4-range-0 low 100.16.0.1
set access address-assignment pool v4-pool-0 family inet range v4-range-0 high
100.31.255.255
set access address-assignment pool v4-pool-0 family inet dhcp-attributes
maximum-lease-time 99999
set access address-assignment pool v6_NDRA_Prefix_Pool1 family inet6 prefix
1016:0000:0000:0000:0000:0000:0000:0000/40
set access address-assignment pool v6_NDRA_Prefix_Pool1 family inet6 range v6-range-0
prefix-length 64
set access address-assignment pool v6_DHCPv6-PD_Pool1 family inet6 prefix
2016:0000:0000:0000:0000:0000:0000:0000/40
```

```

set access address-assignment pool v6_DHCPv6-PD_Pool1 family inet6 range v6-range-0
prefix-length 56
set access address-assignment pool v6_DHCPv6-PD_Pool1 family inet6 dhcp-attributes
dns-server 2015:0221::9.0.0.9
set access address-assignment pool v6_DHCPv6-PD_Pool1 family inet6 dhcp-attributes
dns-server 2015:0221::9.0.0.10
set access address-assignment pool v6_DHCPv6-PD_Pool1 family inet6 dhcp-attributes
valid-lifetime 1800
set access address-assignment pool v6_DHCPv6-PD_Pool1 family inet6 dhcp-attributes
preferred-lifetime 1440
set access address-assignment pool v6_DHCPv6-PD_Pool1 family inet6 dhcp-attributes
t1-percentage 50
set access address-assignment pool v6_DHCPv6-PD_Pool1 family inet6 dhcp-attributes
t2-percentage 80
set access address-protection
set access report-interface-descriptions
set access accounting-backup-options max-pending-accounting-stops 168000
set access accounting-backup-options max-withhold-time 1440

```

Step-by-Step Procedure The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure R0:

1. Create the VLAN dynamic client profile interface.

The VLAN dynamic profile creates dual-tag VLANs that accept any TPID values by configuring the **VLAN-tags** statement and the **\$junos-vlan-id** variable, and that accept only PPPoE encapsulation traffic.

```

[edit dynamic-profiles vlan-client-profile]
user@host-R0# set interfaces demux0 unit "$junos-interface-unit" no-traps
user@host-R0# set interfaces demux0 unit "$junos-interface-unit" proxy-arp
user@host-R0# set interfaces demux0 unit "$junos-interface-unit" vlan-tags outer
"$junos-stacked-vlan-id"
user@host-R0# set interfaces demux0 unit "$junos-interface-unit" vlan-tags inner
"$junos-vlan-id"
user@host-R0# set interfaces demux0 unit "$junos-interface-unit" demux-options
underlying-interface "$junos-interface-ifd-name"
user@host-R0# set interfaces demux0 unit "$junos-interface-unit" family pppoe
duplicate-protection
user@host-R0# set interfaces demux0 unit "$junos-interface-unit" family pppoe
dynamic-profile pppoe-client-profile
user@host-R0# set interfaces demux0 unit "$junos-interface-unit" family pppoe
max-sessions 10
user@host-R0# set interfaces demux0 unit "$junos-interface-unit" family pppoe
short-cycle-protection lockout-time-min 5
user@host-R0# set interfaces demux0 unit "$junos-interface-unit" family pppoe
short-cycle-protection lockout-time-max 60

```

2. Configure a dynamic profile that defines the attributes of the dynamic dual-stack PPPoE subscriber interface, and implements per-subscriber CoS support.

Define the variable defaults, and configure the routing instance, interface, router advertisement, and CoS parameters.

- a. Define the dynamic PPPoE client profile variable defaults.

```
[edit dynamic-profiles pppoe-client-profile]
user@host-R0# set predefined-variable-defaults cos-shaping-rate 10m
user@host-R0# set predefined-variable-defaults cos-scheduler-map
    schedmap_residential
user@host-R0# set predefined-variable-defaults input-filter DEFAULT_V4-IN
user@host-R0# set predefined-variable-defaults output-filter DEFAULT_V4-OUT
user@host-R0# set predefined-variable-defaults output-ipv6-filter
    DEFAULT_V6-OUT
user@host-R0# set predefined-variable-defaults input-ipv6-filter
    DEFAULT_V6-IN
```

- b. Configure the dynamic PPPoE client profile routing instance parameters.

```
[edit dynamic-profiles pppoe-client-profile]
user@host-R0# set routing-instances "$junos-routing-instance" interface
    "$junos-interface-name" any
user@host-R0# set routing-instances "$junos-routing-instance" routing-options
    access route $junos-framed-route-ip-address-prefix next-hop
    "$junos-framed-route-nexthop"
user@host-R0# set routing-instances "$junos-routing-instance" routing-options
    access route $junos-framed-route-ip-address-prefix metric
    "$junos-framed-route-cost"
user@host-R0# set routing-instances "$junos-routing-instance" routing-options
    access route $junos-framed-route-ip-address-prefix preference
    "$junos-framed-route-distance"
user@host-R0# set routing-instances "$junos-routing-instance" routing-options
    access-internal route $junos-subscriber-ip-address qualified-next-hop
    "$junos-interface-name"
```

- c. Configure the dynamic PPPoE client profile interface.

```
[edit dynamic-profiles pppoe-client-profile]
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" no-traps
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" ppp-options
    chap challenge-length minimum 16
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" ppp-options
    chap challenge-length maximum 32
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" ppp-options pap
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" ppp-options
    authentication pap
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" ppp-options
    authentication chap
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" pppoe-options
    underlying-interface "$junos-underlying-interface"
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" pppoe-options
    server
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" keepalives interval
    30
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
    input "$junos-input-filter"
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
    input precedence 240
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
    output "$junos-output-filter"
```

```

user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
output precedence 240
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
adf rule "$junos-adf-rule-v4"
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
adf counter
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
adf input-precedence 100
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
adf not-mandatory
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
adf output-precedence 100
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet
unnumbered-address "$junos-loopback-interface"
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
input "$junos-input-ipv6-filter"
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
input precedence 240
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
output "$junos-output-ipv6-filter"
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
output precedence 240
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
adf rule "$junos-adf-rule-v6"
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
adf counter
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
adf input-precedence 100
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
adf not-mandatory
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
adf output-precedence 100
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6
address $junos-ipv6-address

```

- d. Configure the dynamic PPPoE client profile router advertisement.

```

[edit dynamic-profiles pppoe-client-profile]
user@host-R0# set protocols router-advertisement interface
"$junos-interface-name" other-stateful-configuration
user@host-R0# set protocols router-advertisement interface
"$junos-interface-name" link-mtu
user@host-R0# set protocols router-advertisement interface
"$junos-interface-name" prefix $junos-ipv6-ndra-prefix valid-lifetime
4294967295
user@host-R0# set protocols router-advertisement interface
"$junos-interface-name" prefix $junos-ipv6-ndra-prefix on-link
user@host-R0# set protocols router-advertisement interface
"$junos-interface-name" prefix $junos-ipv6-ndra-prefix preferred-lifetime
4294967295

```

- e. Configure the dynamic PPPoE client profile CoS parameters.

```

[edit dynamic-profiles pppoe-client-profile ]
user@host-R0# set class-of-service traffic-control-profiles SessionShaper
scheduler-map "$junos-cos-scheduler-map"

```

```

user@host-R0# set class-of-service traffic-control-profiles SessionShaper
shaping-rate "$junos-cos-shaping-rate"
user@host-R0# set class-of-service traffic-control-profiles SessionShaper
overhead-accounting frame-mode-bytes 34
user@host-R0# set class-of-service traffic-control-profiles SessionShaper
overhead-accounting cell-mode-bytes 6
user@host-R0# set class-of-service interfaces pp0 unit "$junos-interface-unit"
output-traffic-control-profile SessionShaper
user@host-R0# set class-of-service interfaces pp0 unit "$junos-interface-unit"
output-traffic-control-profile rewrite-rules dscp residential-default
user@host-R0# set class-of-service interfaces pp0 unit "$junos-interface-unit"
output-traffic-control-profile rewrite-rules dscp-ipv6 residential-default-v6
user@host-R0# set class-of-service interfaces pp0 unit "$junos-interface-unit"
output-traffic-control-profile rewrite-rules ieee-802.1 residential-default-vlan
user@host-R0# set class-of-service interfaces pp0 unit "$junos-interface-unit"
output-traffic-control-profile rewrite-rules ieee-802.1 vlan-tag outer-and-inner

```

3. Configure a dynamic service profile for filters and CoS functionality to ensure VoIP service quality.

- a. Configure voice variables.

```

[edit dynamic-profiles voice]
user@host-R0# set variables VoiceBearBW mandatory
user@host-R0# set variables voice_gateway mandatory
user@host-R0# set variables voice_gateway_v6 mandatory
user@host-R0# set variables filter_voice_input uid
user@host-R0# set variables filter_voice_output uid
user@host-R0# set variables filter_voice_input_v6 uid
user@host-R0# set variables filter_voice_output_v6 uid
user@host-R0# set variables voice_policer uid
user@host-R0# set variables voice_policer_burst_KB equals
"round($VoiceBearBW * 0.0125)"

```

- b. Configure voice interfaces.

```

[edit dynamic-profiles voice]
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
input "$filter_voice_input"
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
input precedence 100
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
output "$filter_voice_output"
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
output precedence 100
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
input "$filter_voice_input_v6"
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
input precedence 100
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
output "$filter_voice_output_v6"
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
output precedence 100

```

- c. Configure voice firewall parameters.

```

[edit dynamic-profiles voice firewall]
user@host-R0# set family inet filter "$filter_voice_input" interface-specific

```

```
user@host-R0# set family inet filter "$filter_voice_input" term 1 from
destination-address $voice_gateway
user@host-R0# set family inet filter "$filter_voice_input" term 1 then policer
"$voice_policer"
user@host-R0# set family inet filter "$filter_voice_input" term 1 then
service-accounting-deferred
user@host-R0# set family inet filter "$filter_voice_input" term 1 then loss-priority
low
user@host-R0# set family inet filter "$filter_voice_input" term 1 then
forwarding-class Voice
user@host-R0# set family inet filter "$filter_voice_input" term 1 then
service-filter-hit
user@host-R0# set family inet filter "$filter_voice_input" term 1 then accept
user@host-R0# set family inet filter "$filter_voice_input" term default then
accept
user@host-R0# set family inet filter "$filter_voice_output" interface-specific
user@host-R0# set family inet filter "$filter_voice_output" term 1 from
source-address $voice_gateway
user@host-R0# set family inet filter "$filter_voice_output" term 1 then policer
"$voice_policer"
user@host-R0# set family inet filter "$filter_voice_output" term 1 then
service-accounting-deferred
user@host-R0# set family inet filter "$filter_voice_output" term 1 then loss-priority
low
user@host-R0# set family inet filter "$filter_voice_output" term 1 then
forwarding-class Voice
user@host-R0# set family inet filter "$filter_voice_output" term 1 then
service-filter-hit
user@host-R0# set family inet filter "$filter_voice_output" term 1 then accept
user@host-R0# set family inet filter "$filter_voice_output" term default then
accept

user@host-R0# set family inet6 filter "$filter_voice_input_v6" interface-specific
user@host-R0# set family inet6 filter "$filter_voice_input_v6" term 1 from
destination-address $voice_gateway_v6
user@host-R0# set family inet6 filter "$filter_voice_input_v6" term 1 then policer
"$voice_policer"
user@host-R0# set family inet6 filter "$filter_voice_input_v6" term 1 then
service-accounting-deferred
user@host-R0# set family inet6 filter "$filter_voice_input_v6" term 1 then
loss-priority low
user@host-R0# set family inet6 filter "$filter_voice_input_v6" term 1 then
forwarding-class Voice
user@host-R0# set family inet6 filter "$filter_voice_input_v6" term 1 then
service-filter-hit
user@host-R0# set family inet6 filter "$filter_voice_input_v6" term 1 then accept
user@host-R0# set family inet6 filter "$filter_voice_input_v6" term default then
accept
user@host-R0# set family inet6 filter "$filter_voice_output_v6" interface-specific
user@host-R0# set family inet6 filter "$filter_voice_output_v6" term 1 from
source-address $voice_gateway_v6
user@host-R0# set family inet6 filter "$filter_voice_output_v6" term 1 then
policer "$voice_policer"
user@host-R0# set family inet6 filter "$filter_voice_output_v6" term 1 then
service-accounting-deferred
```

```
user@host-R0# set family inet6 filter "$filter_voice_output_v6" term 1 then
  loss-priority low
user@host-R0# set family inet6 filter "$filter_voice_output_v6" term 1 then
  forwarding-class Voice
user@host-R0# set family inet6 filter "$filter_voice_output_v6" term 1 then
  service-filter-hit
user@host-R0# set family inet6 filter "$filter_voice_output_v6" term 1 then
  accept
user@host-R0# set family inet6 filter "$filter_voice_output_v6" term default
  then accept
```

```
user@host-R0# set policer "$voice_policer" logical-interface-policer
user@host-R0# set policer "$voice_policer" if-exceeding bandwidth-limit
  "$VoiceBearBW"
user@host-R0# set policer "$voice_policer" if-exceeding burst-size-limit
  "$voice_policer_burst_KB"
user@host-R0# set policer "$voice_policer" then discard
```

4. Configure a dynamic service profile for incoming high-priority traffic that leverages hierarchical policers to ensure that the traffic is processed and forwarded to the network.
 - a. Configure input QoS variables.

```
[edit dynamic-profiles input_qos]
user@host-R0# set variables policer_bandwidth mandatory
user@host-R0# set variables policer_burst_size equals
  "round($policer_bandwidth * 0.0125)";
user@host-R0# set variables premium_classes_hpolicer uid
user@host-R0# set variables lowloss_class_hpolicer uid
user@host-R0# set variables lowdelay_class_hpolicer uid
user@host-R0# set variables besteffort_class_hpolicer uid
user@host-R0# set variables multicast_class_hpolicer uid
user@host-R0# set variables subscriber_hpolicer uid
user@host-R0# set variables input_filter_name uid
user@host-R0# set variables input_filter_v6_name uid
```

- b. Configure input QoS interfaces.

```
[edit dynamic-profiles input_qos]
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet filter
  input "$input_filter_name" precedence 250
user@host-R0# set interfaces pp0 unit "$junos-interface-unit" family inet6 filter
  input "$input_filter_v6_name" precedence 250
```

- c. Configure input QoS firewall parameters.

```
[edit dynamic-profiles input_qos firewall]
user@host-R0# set family inet filter "$input_filter_name" interface-specific
user@host-R0# set family inet filter "$input_filter_name" term 1 from
  forwarding-class Voice
user@host-R0# set family inet filter "$input_filter_name" term 1 from
  forwarding-class Control
user@host-R0# set family inet filter "$input_filter_name" term 1 then
  hierarchical-policer "$premium_classes_hpolicer"
user@host-R0# set family inet filter "$input_filter_name" term 1 then next term
```



```
user@host-R0# set family inet filter "$input_filter_name" term 2 from
forwarding-class Voice
user@host-R0# set family inet filter "$input_filter_name" term 2 from
forwarding-class Control
user@host-R0# set family inet filter "$input_filter_name" term 2 from
forwarding-class Multicast
user@host-R0# set family inet filter "$input_filter_name" term 2 then
hierarchical-policer "$multicast_class_hpolicer"
user@host-R0# set family inet filter "$input_filter_name" term 2 then
force-premium
user@host-R0# set family inet filter "$input_filter_name" term 2 then next term
```

```
user@host-R0# set family inet filter "$input_filter_name" term 3 from
forwarding-class Voice
user@host-R0# set family inet filter "$input_filter_name" term 3 from
forwarding-class Control
user@host-R0# set family inet filter "$input_filter_name" term 3 from
forwarding-class Multicast
user@host-R0# set family inet filter "$input_filter_name" term 3 from
forwarding-class LowDelay
user@host-R0# set family inet filter "$input_filter_name" term 3 then
hierarchical-policer "$slowdelay_class_hpolicer"
user@host-R0# set family inet filter "$input_filter_name" term 3 then
force-premium
user@host-R0# set family inet filter "$input_filter_name" term 3 then next term
```

```
user@host-R0# set family inet filter "$input_filter_name" term 4 from
forwarding-class Voice
user@host-R0# set family inet filter "$input_filter_name" term 4 from
forwarding-class Control
user@host-R0# set family inet filter "$input_filter_name" term 4 from
forwarding-class Multicast
user@host-R0# set family inet filter "$input_filter_name" term 4 from
forwarding-class LowDelay
user@host-R0# set family inet filter "$input_filter_name" term 4 from
forwarding-class LowLoss
user@host-R0# set family inet filter "$input_filter_name" term 4 then
hierarchical-policer "$slowloss_class_hpolicer"
user@host-R0# set family inet filter "$input_filter_name" term 4 then
force-premium
user@host-R0# set family inet filter "$input_filter_name" term 4 then next term
```

```
user@host-R0# set family inet filter "$input_filter_name" term 5 from
forwarding-class Control
user@host-R0# set family inet filter "$input_filter_name" term 5 from
forwarding-class Voice
user@host-R0# set family inet filter "$input_filter_name" term 5 from
forwarding-class Multicast
user@host-R0# set family inet filter "$input_filter_name" term 5 from
forwarding-class LowLoss
user@host-R0# set family inet filter "$input_filter_name" term 5 from
forwarding-class LowDelay
user@host-R0# set family inet filter "$input_filter_name" term 5 from
forwarding-class BestEffort
```

```
user@host-R0# set family inet filter "$input_filter_name" term 5 then
  hierarchical-policer "$subscriber_hpolicer"
user@host-R0# set family inet filter "$input_filter_name" term 5 then
  service-accounting-deferred
user@host-R0# set family inet filter "$input_filter_name" term 5 then accept
```

```
user@host-R0# set family inet6 filter "$input_filter_v6_name" interface-specific
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 1 from
  forwarding-class Voice
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 1 from
  forwarding-class Control
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 1 then
  hierarchical-policer "$premium_classes_hpolicer"
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 1 then next
  term
```

```
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 2 from
  forwarding-class Voice
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 2 from
  forwarding-class Control
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 2 from
  forwarding-class Multicast
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 2 then
  hierarchical-policer "$multicast_class_hpolicer"
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 2 then
  force-premium
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 2 then next
  term
```

```
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 3 from
  forwarding-class Voice
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 3 from
  forwarding-class Control
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 3 from
  forwarding-class Multicast
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 3 from
  forwarding-class LowDelay
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 3 then
  hierarchical-policer "$lowdelay_class_hpolicer"
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 3 then
  force-premium
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 3 then next
  term
```

```
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 4 from
  forwarding-class Voice
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 4 from
  forwarding-class Control
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 4 from
  forwarding-class Multicast
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 4 from
  forwarding-class LowDelay
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 4 from
  forwarding-class LowLoss
```

```

user@host-R0# set family inet6 filter "$input_filter_v6_name" term 4 then
  hierarchical-policer "$slowloss_class_hpolicer"
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 4 then
  force-premium
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 4 then next
  term

```

```

user@host-R0# set family inet6 filter "$input_filter_v6_name" term 5 from
  forwarding-class Control
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 5 from
  forwarding-class Voice
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 5 from
  forwarding-class Multicast
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 5 from
  forwarding-class LowLoss
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 5 from
  forwarding-class LowDelay
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 5 from
  forwarding-class BestEffort
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 5 then
  hierarchical-policer "$subscriber_hpolicer"
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 5 then
  service-accounting-deferred
user@host-R0# set family inet6 filter "$input_filter_v6_name" term 5 then accept

```

- d. Configure the hierarchical policers referenced in the QoS firewall configuration.

```

[edit dynamic-profiles input_qos firewall]
user@host-R0# set hierarchical-policer "$premium_classes_hpolicer"
  logical-interface-policer
user@host-R0# set hierarchical-policer "$premium_classes_hpolicer" aggregate
  if-exceeding bandwidth-limit "$policer_bandwidth"
user@host-R0# set hierarchical-policer "$premium_classes_hpolicer" aggregate
  if-exceeding burst-size-limit "$policer_burst_size"
user@host-R0# set hierarchical-policer "$premium_classes_hpolicer" aggregate
  then discard
user@host-R0# set hierarchical-policer "$premium_classes_hpolicer" premium
  if-exceeding bandwidth-limit "$policer_bandwidth"
user@host-R0# set hierarchical-policer "$premium_classes_hpolicer" premium
  if-exceeding burst-size-limit "$policer_burst_size"
user@host-R0# set hierarchical-policer "$premium_classes_hpolicer" premium
  then discard

```

```

user@host-R0# set hierarchical-policer "$multicast_class_hpolicer"
  logical-interface-policer
user@host-R0# set hierarchical-policer "$multicast_class_hpolicer" aggregate
  if-exceeding bandwidth-limit "$policer_bandwidth"
user@host-R0# set hierarchical-policer "$multicast_class_hpolicer" aggregate
  if-exceeding burst-size-limit "$policer_burst_size"
user@host-R0# set hierarchical-policer "$multicast_class_hpolicer" aggregate
  then discard
user@host-R0# set hierarchical-policer "$multicast_class_hpolicer" premium
  if-exceeding bandwidth-limit "$policer_bandwidth"
user@host-R0# set hierarchical-policer "$multicast_class_hpolicer" premium
  if-exceeding burst-size-limit "$policer_burst_size"

```

```
user@host-R0# set hierarchical-policer "$multicast_class_hpolicer" premium
then discard
```

```
user@host-R0# set hierarchical-policer "$slowdelay_class_hpolicer"
logical-interface-policer
user@host-R0# set hierarchical-policer "$slowdelay_class_hpolicer" aggregate
if-exceeding bandwidth-limit "$policer_bandwidth"
user@host-R0# set hierarchical-policer "$slowdelay_class_hpolicer" aggregate
if-exceeding burst-size-limit "$policer_burst_size"
user@host-R0# set hierarchical-policer "$slowdelay_class_hpolicer" aggregate
then discard
user@host-R0# set hierarchical-policer "$slowdelay_class_hpolicer" premium
if-exceeding bandwidth-limit "$policer_bandwidth"
user@host-R0# set hierarchical-policer "$slowdelay_class_hpolicer" premium
if-exceeding burst-size-limit "$policer_burst_size"
user@host-R0# set hierarchical-policer "$slowdelay_class_hpolicer" premium
then discard
```

```
user@host-R0# set hierarchical-policer "$slowloss_class_hpolicer"
logical-interface-policer
user@host-R0# set hierarchical-policer "$slowloss_class_hpolicer" aggregate
if-exceeding bandwidth-limit "$policer_bandwidth"
user@host-R0# set hierarchical-policer "$slowloss_class_hpolicer" aggregate
if-exceeding burst-size-limit "$policer_burst_size"
user@host-R0# set hierarchical-policer "$slowloss_class_hpolicer" aggregate
then discard
user@host-R0# set hierarchical-policer "$slowloss_class_hpolicer" premium
if-exceeding bandwidth-limit "$policer_bandwidth"
user@host-R0# set hierarchical-policer "$slowloss_class_hpolicer" premium
if-exceeding burst-size-limit "$policer_burst_size"
user@host-R0# set hierarchical-policer "$slowloss_class_hpolicer" premium then
discard
```

```
user@host-R0# set hierarchical-policer "$subscriber_hpolicer"
logical-interface-policer
user@host-R0# set hierarchical-policer "$subscriber_hpolicer" aggregate
if-exceeding bandwidth-limit "$policer_bandwidth"
user@host-R0# set hierarchical-policer "$subscriber_hpolicer" aggregate
if-exceeding burst-size-limit "$policer_burst_size"
user@host-R0# set hierarchical-policer "$subscriber_hpolicer" aggregate then
discard
user@host-R0# set hierarchical-policer "$subscriber_hpolicer" premium
if-exceeding bandwidth-limit "$policer_bandwidth"
user@host-R0# set hierarchical-policer "$subscriber_hpolicer" premium
if-exceeding burst-size-limit "$policer_burst_size"
user@host-R0# set hierarchical-policer "$subscriber_hpolicer" premium then
discard
```

5. Configure a dynamic service profile to guarantee unicast and multicast video services by classifying video traffic and assigning appropriate traffic forwarding classes.



NOTE: The variables defined inside the dynamic profile for unicast/multicast video traffic bandwidth are included here for example purposes only—they illustrate a method of communicating bandwidth information between the RADIUS AAA system and the BNG system.

- a. Configure video variables.

```
[edit dynamic-profiles video]
user@host-R0# set variables uc_video_bandwidth mandatory
user@host-R0# set variables mc_video_bandwidth mandatory
user@host-R0# set variables uc_video_prefix mandatory
user@host-R0# set variables uc_video_burst-size equals
    "round($uc_video_bandwidth * 0.0125)"
user@host-R0# set variables mc_video_burst-size equals
    "round($mc_video_bandwidth * 0.0125)"
user@host-R0# set variables video_filter_name uid
user@host-R0# set variables video_filter_v6_name uid
```

- b. Configure the video interface.

```
[edit dynamic-profiles video]
user@host-R0# set interface pp0 unit "$junos-interface-unit" family inet filter
    output "$video_filter_name"
user@host-R0# set interface pp0 unit "$junos-interface-unit" family inet filter
    output precedence 120
```

- c. Configure the IGMP video interface.

```
[edit dynamic-profiles video protocols]
user@host-R0# set igmp interface "$junos-interface-name" version 3
user@host-R0# set igmp interface "$junos-interface-name" immediate-leave
user@host-R0# set igmp interface "$junos-interface-name" promiscuous-mode
```

- d. Configure video firewall parameters.

```
[edit dynamic-profiles video ]
user@host-R0# set firewall family inet filter "$video_filter_name"
    interface-specific

user@host-R0# set firewall family inet filter "$video_filter_name" term bypass
    from service-filter-hit
user@host-R0# set firewall family inet filter "$video_filter_name" term bypass
    then accept

user@host-R0# set firewall family inet filter "$video_filter_name" term mc_video
    from destination-address 224.0.0.0/4
user@host-R0# set firewall family inet filter "$video_filter_name" term mc_video
    then service-accounting-deferred
user@host-R0# set firewall family inet filter "$video_filter_name" term mc_video
    then loss-priority low
user@host-R0# set firewall family inet filter "$video_filter_name" term mc_video
    then forwarding-class Multicast
user@host-R0# set firewall family inet filter "$video_filter_name" term mc_video
    then service-filter-hit
```

```
user@host-R0# set firewall family inet filter "$video_filter_name" term mc_video
then accept
```

```
user@host-R0# set firewall family inet filter "$video_filter_name" term uc_video
from source-address $uc_video_prefix
user@host-R0# set firewall family inet filter "$video_filter_name" term uc_video
then service-accounting-deferred
user@host-R0# set firewall family inet filter "$video_filter_name" term uc_video
then loss-priority low
user@host-R0# set firewall family inet filter "$video_filter_name" term uc_video
then forwarding-class LowLoss
user@host-R0# set firewall family inet filter "$video_filter_name" term uc_video
then service-filter-hit
user@host-R0# set firewall family inet filter "$video_filter_name" term uc_video
then accept
```

```
user@host-R0# set firewall family inet filter "$video_filter_name" term default
then accept
```

6. Configure system-level parameters.

a. Establish the hostname.

```
[edit system]
user@host-R0# set host-name host-R0
```

b. Configure DHCPv6 overrides, delay removal of access routes and access-internal routes after GRES, and establish a high threshold for resource monitoring.

```
[edit system]
user@host-R0# set services dhcp-local-server dhcpv6 overrides delegated-pool
v6_DHCPv6-PD_Pool1
user@host-R0# set services dhcp-local-server dhcpv6 group v6-ppp-client-0
interface pp0.0
user@host-R0# set services subscriber-management gres-route-flush-delay
user@host-R0# set services resource-monitor no-throttle
user@host-R0# set services resource-monitor high-threshold 85
```

c. Direct the active Routing Engine to synchronize its candidate configuration to the backup Routing Engine. Improve commit performance by specifying that full inheritance paths of the configuration groups are built in the database instead of in the process memory.

```
[edit system]
user@host-R0# set commit synchronize
user@host-R0# set commit persist-groups-inheritance
```

d. Configure distributed denial of service (DDoS) protection.

```
[edit system]
user@host-R0# set ddos-protection protocols oam-lfm aggregate bandwidth
100
user@host-R0# set ddos-protection protocols oam-lfm aggregate burst 100
```

7. Configure chassis-level parameters.

```
[edit chassis]
user@host-R0# set effective-shaping-rate
user@host-R0# set redundancy failover on-loss-of-keepalives
```

```

user@host-R0# set redundancy failover on-disk-failure
user@host-R0# set redundancy graceful-switchover
user@host-R0# set fpc 1 sampling-instance IPFIX-INS1
user@host-R0# set fpc 0 sampling-instance IPFIX-INS1
user@host-R0# set fpc 2 sampling-instance IPFIX-INS1
user@host-R0# set network-services enhanced-ip

```

8. Configure flow monitoring parameters.

```

[edit services]
user@host-R0# set flow-monitoring version-ipfix template v4-TEMPLATE
flow-active-timeout 60
user@host-R0# set flow-monitoring version-ipfix template v4-TEMPLATE
template-refresh-rate seconds 120
user@host-R0# set flow-monitoring version-ipfix template v4-TEMPLATE
option-refresh-rate seconds 120
user@host-R0# set flow-monitoring version-ipfix template v4-TEMPLATE
ipv4-template

```

```

user@host-R0# set flow-monitoring version-ipfix template v6-TEMPLATE
flow-active-timeout 60
user@host-R0# set flow-monitoring version-ipfix template v6-TEMPLATE
template-refresh-rate seconds 120
user@host-R0# set flow-monitoring version-ipfix template v6-TEMPLATE
option-refresh-rate seconds 120
user@host-R0# set flow-monitoring version-ipfix template v6-TEMPLATE
ipv6-template

```

9. Configure L2TP parameters.

```

[edit services]
user@host-R0# set l2tp weighted-load-balancing
user@host-R0# set l2tp failover-within-preference
user@host-R0# set l2tp disable-calling-number-avp
user@host-R0# set l2tp tx-connect-speed-method ancp
user@host-R0# set l2tp tunnel assignment-id-format client-server-id
user@host-R0# set l2tp tunnel retransmission-count-established 2
user@host-R0# set l2tp tunnel retransmission-count-not-established 2
user@host-R0# set l2tp tunnel idle-timeout 600
user@host-R0# set l2tp destruct-timeout 600

```

10. Configure an access profile.

```

[edit access-profile]
user@host-R0# set access-profile Access-Profile-0

```

11. Configure the interfaces.

- a. Configure the loopback interface.

```

[edit interfaces]
user@host-R0# set lo0 unit 0 family inet address 100.0.0.1/32 primary
user@host-R0# set lo0 unit 0 family inet address 100.0.0.1/32 preferred
user@host-R0# set lo0 unit 0 family iso address
47.0007.3000.0000.0000.0100.0001.0100.0100.1010.00
user@host-R0# set lo0 unit 0 family inet6 address 1000::1/128 primary
user@host-R0# set lo0 unit 0 family inet6 address 1000::1/128 preferred

```

- b. Configure core-facing interfaces.

[edit interfaces]

```
user@host-R0# set xe-5/2/0 description "To R1 - Core"
user@host-R0# set xe-5/2/0 accounting-profile ifprofile
user@host-R0# set xe-5/2/0 mtu 4484
user@host-R0# set xe-5/2/0 hold-time up 1000
user@host-R0# set xe-5/2/0 hold-time down 1000
user@host-R0# set xe-5/2/0 no-gratuitous-arp-reply
user@host-R0# set xe-5/2/0 no-gratuitous-arp-request
user@host-R0# set xe-5/2/0 unit 0 family inet address 20.20.50.2/24
user@host-R0# set xe-5/2/0 unit 0 family iso
user@host-R0# set xe-5/2/0 unit 0 family inet6
user@host-R0# set xe-5/2/0 unit 0 family mpls
```

```
user@host-R0# set ge-9/0/1 description "To R3 - Core"
user@host-R0# set ge-9/0/1 accounting-profile ifprofile
user@host-R0# set ge-9/0/1 mtu 4484
user@host-R0# set ge-9/0/1 hold-time up 1000
user@host-R0# set ge-9/0/1 hold-time down 1000
user@host-R0# set ge-9/0/1 no-gratuitous-arp-reply
user@host-R0# set ge-9/0/1 no-gratuitous-arp-request
user@host-R0# set ge-9/0/1 unit 0 family inet address 20.20.70.2/24
user@host-R0# set ge-9/0/1 unit 0 family iso
user@host-R0# set ge-9/0/1 unit 0 family inet6
user@host-R0# set ge-9/0/1 unit 0 family mpls
```

c. Configure access-facing interfaces.

[edit interfaces]

```
user@host-R0# set ge-2/1/0 description "To access facing port1"
user@host-R0# set ge-2/1/0 accounting-profile ifprofile
user@host-R0# set ge-2/1/0 hierarchical-scheduler
user@host-R0# set ge-2/1/0 flexible-vlan-tagging
user@host-R0# set ge-2/1/0 auto-configure stacked-vlan-ranges dynamic-profile
    vlan-client-profile accept pppoe
user@host-R0# set ge-2/1/0 auto-configure stacked-vlan-ranges dynamic-profile
    vlan-client-profile ranges 1-4094,1-4094
user@host-R0# set ge-2/1/0 auto-configure remove-when-no-subscribers
user@host-R0# set ge-2/1/0 mtu 1522
user@host-R0# set ge-2/1/0 hold-time up 0
user@host-R0# set ge-2/1/0 hold-time down 1000
user@host-R0# set ge-2/1/0 link-mode full-duplex
user@host-R0# set ge-2/1/0 encapsulation flexible-ethernet-services
user@host-R0# set ge-2/1/0 no-gratuitous-arp-reply
user@host-R0# set ge-2/1/0 no-gratuitous-arp-request
user@host-R0# set ge-2/1/0 unit 15000 description "HSI for Business customer"
user@host-R0# set ge-2/1/0 unit 15000 vlan-id 4000
user@host-R0# set ge-2/1/0 unit 15000 accounting-profile ifprofile
user@host-R0# set ge-2/1/0 unit 15000 family inet rpf-check
user@host-R0# set ge-2/1/0 unit 15000 family inet address 11.1.1.1/24
user@host-R0# set ge-2/1/0 unit 1 encapsulation vlan-ccc
user@host-R0# set ge-2/1/0 unit 1 vlan-tags outer 3101
user@host-R0# set ge-2/1/0 unit 1 vlan-tags inner 301
user@host-R0# set ge-2/1/0 unit 1 accounting-profile ifprofile
user@host-R0# set ge-2/1/0 unit 2 encapsulation vlan-ccc
user@host-R0# set ge-2/1/0 unit 2 vlan-tags outer 3101
user@host-R0# set ge-2/1/0 unit 2 vlan-tags inner 302
```



```
user@host-R0# set ge-2/1/0 unit 2 accounting-profile ifprofile
user@host-R0# set ge-2/1/0 unit 3 encapsulation vlan-ccc
user@host-R0# set ge-2/1/0 unit 3 vlan-tags outer 3101
user@host-R0# set ge-2/1/0 unit 3 vlan-tags inner 303
user@host-R0# set ge-2/1/0 unit 3 accounting-profile ifprofile
```

```
user@host-R0# set ge-2/2/9 description "To access facing port2"
user@host-R0# set ge-2/2/9 accounting-profile ifprofile
user@host-R0# set ge-2/2/9 hierarchical-scheduler
user@host-R0# set ge-2/2/9 flexible-vlan-tagging
user@host-R0# set ge-2/2/9 auto-configure stacked-vlan-ranges dynamic-profile
  vlan-client-profile accept pppoe
user@host-R0# set ge-2/2/9 auto-configure stacked-vlan-ranges dynamic-profile
  vlan-client-profile ranges 1-4094,1-4094
user@host-R0# set ge-2/2/9 auto-configure remove-when-no-subscribers
user@host-R0# set ge-2/2/9 mtu 1522
user@host-R0# set ge-2/2/9 hold-time up 0
user@host-R0# set ge-2/2/9 hold-time down 1000
user@host-R0# set ge-2/2/9 link-mode full-duplex
user@host-R0# set ge-2/2/9 encapsulation flexible-ethernet-services
user@host-R0# set ge-2/2/9 no-gratuitous-arp-reply
user@host-R0# set ge-2/2/9 no-gratuitous-arp-request
user@host-R0# set ge-2/2/9 unit 15000 description "HSI for Business customer"
user@host-R0# set ge-2/2/9 unit 15000 vlan-id 4000
user@host-R0# set ge-2/2/9 unit 15000 accounting-profile ifprofile
user@host-R0# set ge-2/2/9 unit 15000 family inet rpf-check
user@host-R0# set ge-2/2/9 unit 15000 family inet address 12.1.2.1/24
user@host-R0# set ge-2/2/9 unit 1 encapsulation vlan-ccc
user@host-R0# set ge-2/2/9 unit 1 vlan-tags outer 3101
user@host-R0# set ge-2/2/9 unit 1 vlan-tags inner 304
user@host-R0# set ge-2/2/9 unit 1 accounting-profile ifprofile
user@host-R0# set ge-2/2/9 unit 2 encapsulation vlan-ccc
user@host-R0# set ge-2/2/9 unit 2 vlan-tags outer 3101
user@host-R0# set ge-2/2/9 unit 2 vlan-tags inner 305
user@host-R0# set ge-2/2/9 unit 2 accounting-profile ifprofile
user@host-R0# set ge-2/2/9 unit 3 encapsulation vlan-ccc
user@host-R0# set ge-2/2/9 unit 3 vlan-tags outer 3101
user@host-R0# set ge-2/2/9 unit 3 vlan-tags inner 306
user@host-R0# set ge-2/2/9 unit 3 accounting-profile ifprofile
```

```
user@host-R0# set ge-8/0/0 description "To access facing port3"
user@host-R0# set ge-8/0/0 accounting-profile ifprofile
user@host-R0# set ge-8/0/0 hierarchical-scheduler
user@host-R0# set ge-8/0/0 flexible-vlan-tagging
user@host-R0# set ge-8/0/0 auto-configure stacked-vlan-ranges
  dynamic-profile vlan-client-profile accept pppoe
user@host-R0# set ge-8/0/0 auto-configure stacked-vlan-ranges
  dynamic-profile vlan-client-profile ranges 1-4094,1-4094
user@host-R0# set ge-8/0/0 auto-configure remove-when-no-subscribers
user@host-R0# set ge-8/0/0 mtu 1522
user@host-R0# set ge-8/0/0 hold-time up 0
user@host-R0# set ge-8/0/0 hold-time down 1000
user@host-R0# set ge-8/0/0 link-mode full-duplex
user@host-R0# set ge-8/0/0 encapsulation flexible-ethernet-services
user@host-R0# set ge-8/0/0 no-gratuitous-arp-reply
```

```
user@host-R0# set ge-8/0/0 no-gratuitous-arp-request
user@host-R0# set ge-8/0/0 unit 15000 description "HSI for Business customer"
user@host-R0# set ge-8/0/0 unit 15000 vlan-id 4000
user@host-R0# set ge-8/0/0 unit 15000 accounting-profile ifprofile
user@host-R0# set ge-8/0/0 unit 15000 family inet rpf-check
user@host-R0# set ge-8/0/0 unit 15000 family inet address 13.1.3.1/24
user@host-R0# set ge-8/0/0 unit 1 encapsulation vlan-ccc
user@host-R0# set ge-8/0/0 unit 1 vlan-tags outer 3101
user@host-R0# set ge-8/0/0 unit 1 vlan-tags inner 307
user@host-R0# set ge-8/0/0 unit 1 accounting-profile ifprofile
user@host-R0# set ge-8/0/0 unit 2 encapsulation vlan-ccc
user@host-R0# set ge-8/0/0 unit 2 vlan-tags outer 3101
user@host-R0# set ge-8/0/0 unit 2 vlan-tags inner 308
user@host-R0# set ge-8/0/0 unit 2 accounting-profile ifprofile
user@host-R0# set ge-8/0/0 unit 3 encapsulation vlan-ccc
user@host-R0# set ge-8/0/0 unit 3 vlan-tags outer 3101
user@host-R0# set ge-8/0/0 unit 3 vlan-tags inner 309
user@host-R0# set ge-8/0/0 unit 3 accounting-profile ifprofile
```

```
user@host-R0# set ge-9/0/5 description "To access facing port4"
user@host-R0# set ge-9/0/5 accounting-profile ifprofile
user@host-R0# set ge-9/0/5 hierarchical-scheduler
user@host-R0# set ge-9/0/5 flexible-vlan-tagging
user@host-R0# set ge-9/0/5 auto-configure stacked-vlan-ranges
    dynamic-profile vlan-client-profile accept pppoe
user@host-R0# set ge-9/0/5 auto-configure stacked-vlan-ranges
    dynamic-profile vlan-client-profile ranges 1-4094,1-4094
user@host-R0# set ge-9/0/5 auto-configure remove-when-no-subscribers
user@host-R0# set ge-9/0/5 mtu 1522
user@host-R0# set ge-9/0/5 hold-time up 0
user@host-R0# set ge-9/0/5 hold-time down 1000
user@host-R0# set ge-9/0/5 link-mode full-duplex
user@host-R0# set ge-9/0/5 encapsulation flexible-ethernet-services
user@host-R0# set ge-9/0/5 no-gratuitous-arp-reply
user@host-R0# set ge-9/0/5 no-gratuitous-arp-request
user@host-R0# set ge-9/0/5 unit 15000 description "HSI for Business customer"
user@host-R0# set ge-9/0/5 unit 15000 vlan-id 4000
user@host-R0# set ge-9/0/5 unit 15000 accounting-profile ifprofile
user@host-R0# set ge-9/0/5 unit 15000 family inet rpf-check
user@host-R0# set ge-9/0/5 unit 15000 family inet address 14.1.4.1/24
user@host-R0# set ge-9/0/5 unit 1 encapsulation vlan-ccc
user@host-R0# set ge-9/0/5 unit 1 vlan-tags outer 3101
user@host-R0# set ge-9/0/5 unit 1 vlan-tags inner 310
user@host-R0# set ge-9/0/5 unit 1 accounting-profile ifprofile
user@host-R0# set ge-9/0/5 unit 2 encapsulation vlan-ccc
user@host-R0# set ge-9/0/5 unit 2 vlan-tags outer 3101
user@host-R0# set ge-9/0/5 unit 2 vlan-tags inner 311
user@host-R0# set ge-9/0/5 unit 2 accounting-profile ifprofile
user@host-R0# set ge-9/0/5 unit 3 encapsulation vlan-ccc
user@host-R0# set ge-9/0/5 unit 3 vlan-tags outer 3101
user@host-R0# set ge-9/0/5 unit 3 vlan-tags inner 312
user@host-R0# set ge-9/0/5 unit 3 accounting-profile ifprofile
```

```
user@host-R0# set ge-9/0/9 description "To access facing port5"
user@host-R0# set ge-9/0/9 accounting-profile ifprofile
```

```
user@host-R0# set ge-9/0/9 hierarchical-scheduler
user@host-R0# set ge-9/0/9 flexible-vlan-tagging
user@host-R0# set ge-9/0/9 auto-configure stacked-vlan-ranges
    dynamic-profile vlan-client-profile accept pppoe
user@host-R0# set ge-9/0/9 auto-configure stacked-vlan-ranges
    dynamic-profile vlan-client-profile ranges 1-4094,1-4094
user@host-R0# set ge-9/0/9 auto-configure remove-when-no-subscribers
user@host-R0# set ge-9/0/9 mtu 1522
user@host-R0# set ge-9/0/9 hold-time up 0
user@host-R0# set ge-9/0/9 hold-time down 1000
user@host-R0# set ge-9/0/9 link-mode full-duplex
user@host-R0# set ge-9/0/9 encapsulation flexible-ethernet-services
user@host-R0# set ge-9/0/9 no-gratuitous-arp-reply
user@host-R0# set ge-9/0/9 no-gratuitous-arp-request
user@host-R0# set ge-9/0/9 unit 15000 description "HSI for Business customer"
user@host-R0# set ge-9/0/9 unit 15000 vlan-id 4000
user@host-R0# set ge-9/0/9 unit 15000 accounting-profile ifprofile
user@host-R0# set ge-9/0/9 unit 15000 family inet rpf-check
user@host-R0# set ge-9/0/9 unit 15000 family inet address 15.1.5.1/24
user@host-R0# set ge-9/0/9 unit 1 encapsulation vlan-ccc
user@host-R0# set ge-9/0/9 unit 1 vlan-tags outer 3101
user@host-R0# set ge-9/0/9 unit 1 vlan-tags inner 313
user@host-R0# set ge-9/0/9 unit 1 accounting-profile ifprofile
user@host-R0# set ge-9/0/9 unit 2 encapsulation vlan-ccc
user@host-R0# set ge-9/0/9 unit 2 vlan-tags outer 3101
user@host-R0# set ge-9/0/9 unit 2 vlan-tags inner 314
user@host-R0# set ge-9/0/9 unit 2 accounting-profile ifprofile
user@host-R0# set ge-9/0/9 unit 3 encapsulation vlan-ccc
user@host-R0# set ge-9/0/9 unit 3 vlan-tags outer 3101
user@host-R0# set ge-9/0/9 unit 3 vlan-tags inner 315
user@host-R0# set ge-9/0/9 unit 3 accounting-profile ifprofile

user@host-R0# set ge-9/2/0 description "To access facing port6"
user@host-R0# set ge-9/2/0 accounting-profile ifprofile
user@host-R0# set ge-9/2/0 hierarchical-scheduler
user@host-R0# set ge-9/2/0 flexible-vlan-tagging
user@host-R0# set ge-9/2/0 auto-configure stacked-vlan-ranges
    dynamic-profile vlan-client-profile accept pppoe
user@host-R0# set ge-9/2/0 auto-configure stacked-vlan-ranges
    dynamic-profile vlan-client-profile ranges 1-4094,1-4094
user@host-R0# set ge-9/2/0 auto-configure remove-when-no-subscribers
user@host-R0# set ge-9/2/0 mtu 1522
user@host-R0# set ge-9/2/0 hold-time up 0
user@host-R0# set ge-9/2/0 hold-time down 1000
user@host-R0# set ge-9/2/0 link-mode full-duplex
user@host-R0# set ge-9/2/0 encapsulation flexible-ethernet-services
user@host-R0# set ge-9/2/0 no-gratuitous-arp-reply
user@host-R0# set ge-9/2/0 no-gratuitous-arp-request
user@host-R0# set ge-9/2/0 unit 15000 description "HSI for Business customer"
user@host-R0# set ge-9/2/0 unit 15000 vlan-id 4000
user@host-R0# set ge-9/2/0 unit 15000 accounting-profile ifprofile
user@host-R0# set ge-9/2/0 unit 15000 family inet rpf-check
user@host-R0# set ge-9/2/0 unit 15000 family inet address 16.1.6.1/24
user@host-R0# set ge-9/2/0 unit 1 encapsulation vlan-ccc
user@host-R0# set ge-9/2/0 unit 1 vlan-tags outer 3101
```

```
user@host-R0# set ge-9/2/0 unit 1 vlan-tags inner 316
user@host-R0# set ge-9/2/0 unit 1 accounting-profile ifprofile
user@host-R0# set ge-9/2/0 unit 2 encapsulation vlan-ccc
user@host-R0# set ge-9/2/0 unit 2 vlan-tags outer 3101
user@host-R0# set ge-9/2/0 unit 2 vlan-tags inner 317
user@host-R0# set ge-9/2/0 unit 2 accounting-profile ifprofile
user@host-R0# set ge-9/2/0 unit 3 encapsulation vlan-ccc
user@host-R0# set ge-9/2/0 unit 3 vlan-tags outer 3101
user@host-R0# set ge-9/2/0 unit 3 vlan-tags inner 318
user@host-R0# set ge-9/2/0 unit 3 accounting-profile ifprofile
```

12. Configure forwarding options.

a. Configure sampling parameters.

```
[edit forwarding-options]
user@host-R0# set sampling instance IPFIX-INS1 input rate 1000
user@host-R0# set sampling instance IPFIX-INS1 input run-length 0
user@host-R0# set sampling instance IPFIX-INS1 family inet output flow-server
100.200.0.9 port 2055
user@host-R0# set sampling instance IPFIX-INS1 family inet output flow-server
100.200.0.9 version-ipfix template v4-TEMPLATE
user@host-R0# set sampling instance IPFIX-INS1 family inet output inline-jflow
source-address 200.90.30.6
user@host-R0# set sampling instance IPFIX-INS1 family inet6 output flow-server
100.200.0.9 port 2055
user@host-R0# set sampling instance IPFIX-INS1 family inet6 output flow-server
100.200.0.9 version-ipfix template v6-TEMPLATE
user@host-R0# set sampling instance IPFIX-INS1 family inet6 output inline-jflow
source-address 200.90.30.6
```

b. Configure hash keys.

```
[edit forwarding-options]
user@host-R0# set enhanced-hash-key family inet no-destination-port
user@host-R0# set enhanced-hash-key family inet no-source-port
user@host-R0# set enhanced-hash-key family inet6 no-destination-port
user@host-R0# set enhanced-hash-key family inet6 no-source-port
```

c. Configure filters.

```
[edit forwarding-options]
user@host-R0# set family inet filter input JFlow-Sample-IPv4
user@host-R0# set family inet6 filter input JFlow-Sample-IPv6
```

13. Configure event options.

```
[edit event-options]
user@host-R0# set policy LDP-ISIS events rpd_ldp_nbrdown
user@host-R0# set policy LDP-ISIS events rpd_isis_ldp_sync
user@host-R0# set policy LDP-ISIS then raise-trap
user@host-R0# set policy pem-fail events SYSTEM
user@host-R0# set policy pem-fail attributes-match SYSTEM.message matches
"Alarm.*Feed Connection.*"
user@host-R0# set policy pem-fail then raise-trap
user@host-R0# set policy SFP-XFP-GONE events PIC
user@host-R0# set policy SFP-XFP-GONE attributes-match PIC.message matches
.*plugged.*
user@host-R0# set policy SFP-XFP-GONE the raise-trap
```

14. Configure accounting options.

```
[edit accounting-options]
user@host-R0# set periodic-refresh disable
user@host-R0# set file ifstat files 5
user@host-R0# set file ifstat transfer-interval 15
user@host-R0# set file ifstat archive sites
"sftp://username@hostname:/var/tmp/archive/"
user@host-R0# set file interface-profile ifprofile file ifstat
user@host-R0# set file interface-profile ifprofile interval 15
user@host-R0# set file interface-profile ifprofile fields input-bytes
user@host-R0# set file interface-profile ifprofile fields output-bytes
user@host-R0# set file interface-profile ifprofile fields input-packets
user@host-R0# set file interface-profile ifprofile fields output-packets
user@host-R0# set file interface-profile ifprofile fields input-errors
user@host-R0# set file interface-profile ifprofile fields output-errors
user@host-R0# set file interface-profile ifprofile fields input-multicast
user@host-R0# set file interface-profile ifprofile fields output-multicast
user@host-R0# set file interface-profile ifprofile fields input-unicast
user@host-R0# set file interface-profile ifprofile fields output-unicast
user@host-R0# set file interface-profile ifprofile fields unsupported-protocol
user@host-R0# set file interface-profile ifprofile fields rpf-check-bytes
user@host-R0# set file interface-profile ifprofile fields rpf-check-packets
user@host-R0# set file interface-profile ifprofile fields rpf-check6-bytes
user@host-R0# set file interface-profile ifprofile fields rpf-check6-packets
```

15. Configure routing options.

```
[edit routing-options]
user@host-R0# set nonstop-routing
user@host-R0# set nsr-phantom-holdtime 900
user@host-R0# set router-id 100.0.0.1
user@host-R0# set forwarding-table remnant-holdtime 900
user@host-R0# set forwarding-table export LOAD-BALANCE-ALL
```

16. Configure and enable protocols.

a. Configure MPLS.

```
[edit protocols]
user@host-R0# set mpls no-propagate-ttl
user@host-R0# set mpls ipv6-tunneling
user@host-R0# set mpls interface lo0.0
user@host-R0# set mpls interface xe-5/2/0.0
user@host-R0# set mpls interface ge-9/0/1.0
```

b. Configure BGP.

```
[edit protocols]
user@host-R0# set bgp local-as 65500
user@host-R0# set bgp group Internal type internal
user@host-R0# set bgp group Internal local-address 100.0.0.1
user@host-R0# set bgp group Internal neighbor 102.0.0.1 family inet unicast
user@host-R0# set bgp group Internal neighbor 102.0.0.1 family inet6 unicast
user@host-R0# set bgp group Internal neighbor 102.0.0.1 export export-access
```

c. Configure IS-IS.

```
[edit protocols]
```

```

user@host-R0# set isis lsp-lifetime 65535
user@host-R0# set isis ignore-attached-bit
user@host-R0# set isis level 2 disable
user@host-R0# set isis level 1 authentication-key "secret key!"; ## SECRET-DATA
user@host-R0# set isis level 1 authentication-type md5
user@host-R0# set isis level 1 wide-metrics-only
user@host-R0# set isis interface fxp0.0 disable
user@host-R0# set isis interface lo0.0 passive
user@host-R0# set isis interface xe-5/2/0.0 ldp-synchronization
user@host-R0# set isis interface xe-5/2/0.0 lsp-interval 10
user@host-R0# set isis interface xe-5/2/0.0 point-to-point
user@host-R0# set isis interface xe-5/2/0.0 link-protection
user@host-R0# set isis interface xe-5/2/0.0 level 1 metric 2000070
user@host-R0# set isis interface ge-9/0/1.0 ldp-synchronization
user@host-R0# set isis interface ge-9/0/1.0 lsp-interval 10
user@host-R0# set isis interface ge-9/0/1.0 point-to-point
user@host-R0# set isis interface ge-9/0/1.0 link-protection
user@host-R0# set isis interface ge-9/0/1.0 level 1 metric 2000070

```

d. Configure LDP.

```

[edit protocols]
user@host-R0# set ldp track-igp-metric
user@host-R0# set ldp strict-targeted-hellos
user@host-R0# set ldp import LDPMINPREFL32
user@host-R0# set ldp keepalive-timeout 180
user@host-R0# set ldp interface lo0.0
user@host-R0# set ldp interface xe-5/2/0.0
user@host-R0# set ldp interface ge-9/0/1.0
user@host-R0# set ldp p2mp

```

e. Configure PIM.

```

[edit protocols]
user@host-R0# set pim family inet6 disable
user@host-R0# set pim rp static address 102.0.0.1 version 2
user@host-R0# set pim rp static address 102.0.0.1 group-ranges 238.0.100.0/23
user@host-R0# set pim rp static address 102.0.0.1 group-ranges 238.0.102.0/23
user@host-R0# set pim rp static address 102.0.0.1 group-ranges 238.0.104.0/23
user@host-R0# set pim rp static address 102.0.0.1 group-ranges 232.0.0.0/8
user@host-R0# set pim rp static address 102.0.0.1 group-ranges 236.0.0.0/8
user@host-R0# set pim rp static address 102.0.0.1 override
user@host-R0# set pim interface xe-5/2/0.0 mode sparse
user@host-R0# set pim interface xe-5/2/0.0 version 2
user@host-R0# set pim interface ge-9/0/1.0 mode sparse
user@host-R0# set pim interface ge-9/0/1.0 version 2
user@host-R0# set pim join-load-balance

```

f. Configure L2 circuit interfaces.

```

[edit protocols]
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-2/1/0.1
virtual-circuit-id 1
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-2/1/0.2
virtual-circuit-id 2
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-2/1/0.3
virtual-circuit-id 3

```

```

user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-2/2/9.1
virtual-circuit-id 4
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-2/2/9.2
virtual-circuit-id 5
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-2/2/9.3
virtual-circuit-id 6
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-8/0/0.1
virtual-circuit-id 7
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-8/0/0.2
virtual-circuit-id 8
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-8/0/0.3
virtual-circuit-id 9
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-9/0/5.1
virtual-circuit-id 10
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-9/0/5.2
virtual-circuit-id 12
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-9/0/5.3
virtual-circuit-id 12
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-9/0/9.1
virtual-circuit-id 13
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-9/0/9.2
virtual-circuit-id 14
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-9/0/9.3
virtual-circuit-id 15
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-9/2/0.1
virtual-circuit-id 16
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-9/2/0.2
virtual-circuit-id 17
user@host-R0# set l2circuit neighbor 102.0.0.1 interface ge-9/2/0.3
virtual-circuit-id 18

```

17. Configure policy options.

```

[edit policy-options]
user@host-R0# set prefix-list local-lo0-iov6 apply-path "interfaces lo0 unit 0 family
inet6 address <*>"
user@host-R0# set prefix-list backbone-ipv6 2003::/16
user@host-R0# set policy-statement export-access term 1 from family inet
user@host-R0# set policy-statement export-access term 1 from protocol access
user@host-R0# set policy-statement export-access term 1 then accept
user@host-R0# set policy-statement export-access term 2 from family inet6
user@host-R0# set policy-statement export-access term 2 from protocol access
user@host-R0# set policy-statement export-access term 2 from protocol
access-internal
user@host-R0# set policy-statement export-access term 2 then accept
user@host-R0# set policy-statement LOAD-BALANCE-ALL then load-balance
per-packet
user@host-R0# set policy-statement LDPMINPREFL32 term only-32 from protocol
ldp
user@host-R0# set policy-statement LDPMINPREFL32 term only-32 from route-filter
0.0.0.0/0 prefix-length-range /32-/32
user@host-R0# set policy-statement LDPMINPREFL32 term only-32 then accept
user@host-R0# set policy-statement LDPMINPREFL32 term final then reject

```

18. Configure CoS parameters.

a. Configure forwarding classes.

```
[edit class-of-service]
user@host-R0# set forwarding-classes class BestEffort queue-num 0
user@host-R0# set forwarding-classes class BestEffort priority low
user@host-R0# set forwarding-classes class BestEffort policing-priority normal
user@host-R0# set forwarding-classes class LowLoss queue-num 1
user@host-R0# set forwarding-classes class LowLoss priority low
user@host-R0# set forwarding-classes class LowLoss policing-priority normal
user@host-R0# set forwarding-classes class LowDelay queue-num 2
user@host-R0# set forwarding-classes class LowDelay priority high
user@host-R0# set forwarding-classes class LowDelay policing-priority normal
user@host-R0# set forwarding-classes class Control queue-num 3
user@host-R0# set forwarding-classes class Control priority high
user@host-R0# set forwarding-classes class Control policing-priority premium
user@host-R0# set forwarding-classes class Voice queue-num 4
user@host-R0# set forwarding-classes class Voice priority high
user@host-R0# set forwarding-classes class Voice policing-priority premium
user@host-R0# set forwarding-classes class Multicast queue-num 7
user@host-R0# set forwarding-classes class Multicast priority low
user@host-R0# set forwarding-classes class Multicast policing-priority normal
```

b. Configure classifiers.

```
[edit class-of-service]
user@host-R0# set classifiers exp core-facing-default forwarding-class
  BestEffort loss-priority low code-points 001
user@host-R0# set classifiers exp core-facing-default forwarding-class
  BestEffort loss-priority high code-points 000
user@host-R0# set classifiers exp core-facing-default forwarding-class Voice
  loss-priority low code-points 101
user@host-R0# set classifiers exp core-facing-default forwarding-class LowDelay
  loss-priority high code-points 010
user@host-R0# set classifiers exp core-facing-default forwarding-class LowDelay
  loss-priority low code-points 100
user@host-R0# set classifiers exp core-facing-default forwarding-class LowLoss
  loss-priority low code-points 111
user@host-R0# set classifiers exp core-facing-default forwarding-class LowLoss
  loss-priority high code-points 110
```

c. Configure outbound traffic from the host.

```
[edit class-of-service]
user@host-R0# set host-outbound-traffic forwarding-class Control
user@host-R0# set host-outbound-traffic dscp-code-point 110000
user@host-R0# set host-outbound-traffic ieee-802.1 default 110
```

d. Configure drop profiles.

```
[edit class-of-service]
user@host-R0# set drop-profiles RED-BestEffort interpolate fill-level 40
user@host-R0# set drop-profiles RED-BestEffort interpolate fill-level 50
user@host-R0# set drop-profiles RED-BestEffort interpolate fill-level 100
user@host-R0# set drop-profiles RED-BestEffort interpolate drop-probability
  0
user@host-R0# set drop-profiles RED-BestEffort interpolate drop-probability
  50
user@host-R0# set drop-profiles RED-BestEffort interpolate drop-probability
  100
```


- e. Configure CoS interfaces.

```
[edit class-of-service]
user@host-R0# set interfaces xe-5/2/0 unit 0 classifiers exp core-facing-default
user@host-R0# set interfaces xe-5/2/0 unit 0 rewrite-rules exp
  core-facing-default
user@host-R0# set interfaces xe-5/2/0 unit 0 rewrite-rules inet-precedence
  core-facing-default

user@host-R0# set interfaces ge-9/0/1 unit 0 classifiers exp core-facing-default
user@host-R0# set interfaces ge-9/0/1 unit 0 rewrite-rules exp
  core-facing-default
user@host-R0# set interfaces ge-9/0/1 unit 0 rewrite-rules inet-precedence
  core-facing-default
```

- f. Configure CoS rewrite rules.

```
[edit class-of-service]
user@host-R0# set rewrite-rules dscp residential-default forwarding-class
  BestEffort loss-priority low code-point 000000
user@host-R0# set rewrite-rules dscp residential-default forwarding-class
  BestEffort loss-priority high code-point 001000
user@host-R0# set rewrite-rules dscp residential-default forwarding-class
  LowLoss loss-priority low code-point 111010
user@host-R0# set rewrite-rules dscp residential-default forwarding-class
  LowLoss loss-priority high code-point 111010
user@host-R0# set rewrite-rules dscp residential-default forwarding-class
  LowDelay loss-priority low code-point 010001
user@host-R0# set rewrite-rules dscp residential-default forwarding-class
  LowDelay loss-priority high code-point 100001
user@host-R0# set rewrite-rules dscp residential-default forwarding-class
  Control loss-priority low code-point 110000
user@host-R0# set rewrite-rules dscp residential-default forwarding-class
  Control loss-priority high code-point 110000
user@host-R0# set rewrite-rules dscp residential-default forwarding-class Voice
  loss-priority low code-point 101110
user@host-R0# set rewrite-rules dscp residential-default forwarding-class Voice
  loss-priority high code-point 101110
user@host-R0# set rewrite-rules dscp residential-default forwarding-class
  Multicast loss-priority low code-point 100000
user@host-R0# set rewrite-rules dscp residential-default forwarding-class
  Multicast loss-priority high code-point 100001

user@host-R0# set rewrite-rules dscp-ipv6 residential-default-v6
  forwarding-class BestEffort loss-priority low code-point 000000
user@host-R0# set rewrite-rules dscp-ipv6 residential-default-v6
  forwarding-class BestEffort loss-priority high code-point 001000
user@host-R0# set rewrite-rules dscp-ipv6 residential-default-v6
  forwarding-class LowLoss loss-priority low code-point 111010
user@host-R0# set rewrite-rules dscp-ipv6 residential-default-v6
  forwarding-class LowLoss loss-priority high code-point 111010
user@host-R0# set rewrite-rules dscp-ipv6 residential-default-v6
  forwarding-class LowDelay loss-priority low code-point 010001
user@host-R0# set rewrite-rules dscp-ipv6 residential-default-v6
  forwarding-class LowDelay loss-priority high code-point 100001
```

```
user@host-R0# set rewrite-rules dscp-ipv6 residential-default-v6
  forwarding-class Control loss-priority low code-point 110000
user@host-R0# set rewrite-rules dscp-ipv6 residential-default-v6
  forwarding-class Control loss-priority high code-point 110000
user@host-R0# set rewrite-rules dscp-ipv6 residential-default-v6
  forwarding-class Voice loss-priority low code-point 101110
user@host-R0# set rewrite-rules dscp-ipv6 residential-default-v6
  forwarding-class Voice loss-priority high code-point 101110
user@host-R0# set rewrite-rules dscp-ipv6 residential-default-v6
  forwarding-class Multicast loss-priority low code-point 100000
user@host-R0# set rewrite-rules dscp-ipv6 residential-default-v6
  forwarding-class Multicast loss-priority high code-point 100001
```

```
user@host-R0# set rewrite-rules exp core-facing-default forwarding-class
  BestEffort loss-priority low code-point 000
user@host-R0# set rewrite-rules exp core-facing-default forwarding-class
  BestEffort loss-priority high code-point 000
user@host-R0# set rewrite-rules exp core-facing-default forwarding-class
  LowDelay loss-priority high code-point 010
user@host-R0# set rewrite-rules exp core-facing-default forwarding-class
  LowDelay loss-priority low code-point 100
user@host-R0# set rewrite-rules exp core-facing-default forwarding-class Voice
  loss-priority low code-point 101
user@host-R0# set rewrite-rules exp core-facing-default forwarding-class Voice
  loss-priority high code-point 101
user@host-R0# set rewrite-rules exp core-facing-default forwarding-class
  LowLoss loss-priority low code-point 111
user@host-R0# set rewrite-rules exp core-facing-default forwarding-class
  LowLoss loss-priority high code-point 110
```

```
user@host-R0# set rewrite-rules ieee-802.1 residential-default-vlan
  forwarding-class BestEffort loss-priority low code-point 000
user@host-R0# set rewrite-rules ieee-802.1 residential-default-vlan
  forwarding-class BestEffort high-priority high code-point 001
user@host-R0# set rewrite-rules ieee-802.1 residential-default-vlan
  forwarding-class LowLoss loss-priority low code-point 111
user@host-R0# set rewrite-rules ieee-802.1 residential-default-vlan
  forwarding-class LowLoss high-priority high code-point 111
user@host-R0# set rewrite-rules ieee-802.1 residential-default-vlan
  forwarding-class LowDelay loss-priority low code-point 010
user@host-R0# set rewrite-rules ieee-802.1 residential-default-vlan
  forwarding-class LowDelay high-priority high code-point 100
user@host-R0# set rewrite-rules ieee-802.1 residential-default-vlan
  forwarding-class Control loss-priority high code-point 110
user@host-R0# set rewrite-rules ieee-802.1 residential-default-vlan
  forwarding-class Control high-priority low code-point 110
user@host-R0# set rewrite-rules ieee-802.1 residential-default-vlan
  forwarding-class Voice loss-priority low code-point 101
user@host-R0# set rewrite-rules ieee-802.1 residential-default-vlan
  forwarding-class Voice high-priority high code-point 101
user@host-R0# set rewrite-rules ieee-802.1 residential-default-vlan
  forwarding-class Multicast loss-priority low code-point 100
user@host-R0# set rewrite-rules ieee-802.1 residential-default-vlan
  forwarding-class Multicast high-priority high code-point 100
```

```

user@host-R0# set rewrite-rules inet-precedence core-facing-default
forwarding-class BestEffort loss-priority low code-point 000
user@host-R0# set rewrite-rules inet-precedence core-facing-default
forwarding-class BestEffort loss-priority high code-point 000
user@host-R0# set rewrite-rules inet-precedence core-facing-default
forwarding-class LowDelay loss-priority high code-point 010
user@host-R0# set rewrite-rules inet-precedence core-facing-default
forwarding-class LowDelay loss-priority low code-point 100
user@host-R0# set rewrite-rules inet-precedence core-facing-default
forwarding-class Voice loss-priority low code-point 101
user@host-R0# set rewrite-rules inet-precedence core-facing-default
forwarding-class Voice loss-priority high code-point 101
user@host-R0# set rewrite-rules inet-precedence core-facing-default
forwarding-class LowLoss loss-priority low code-point 111
user@host-R0# set rewrite-rules inet-precedence core-facing-default
forwarding-class LowLoss loss-priority high code-point 110

```

g. Configure CoS scheduler maps.

```

[edit class-of-service]
user@host-R0# set scheduler-maps schedmap_residential forwarding-class
BestEffort scheduler sched_BestEffort
user@host-R0# set scheduler-maps schedmap_residential forwarding-class
LowLoss scheduler sched_LowLoss
user@host-R0# set scheduler-maps schedmap_residential forwarding-class
LowDelay scheduler sched_LowDelay
user@host-R0# set scheduler-maps schedmap_residential forwarding-class
Voice scheduler sched_Voice
user@host-R0# set scheduler-maps schedmap_residential forwarding-class
Control scheduler sched_Control
user@host-R0# set scheduler-maps schedmap_residential forwarding-class
Multicast scheduler sched_Multicast

```

h. Configure CoS schedulers.

```

[edit class-of-service]
user@host-R0# set schedulers sched_Voice transmit-rate percent 1
user@host-R0# set schedulers sched_Voice buffer-size percent 5
user@host-R0# set schedulers sched_Voice priority strict-high

user@host-R0# set schedulers sched_LowDelay transmit-rate percent 1
user@host-R0# set schedulers sched_LowDelay excess-rate proportion 180
user@host-R0# set schedulers sched_LowDelay buffer-size percent 10
user@host-R0# set schedulers sched_LowDelay priority medium-low
user@host-R0# set schedulers sched_LowDelay excess-priority high

user@host-R0# set schedulers sched_LowLoss excess-rate proportion 180
user@host-R0# set schedulers sched_LowLoss buffer-size percent 20
user@host-R0# set schedulers sched_LowLoss priority low
user@host-R0# set schedulers sched_LowLoss excess-priority low
user@host-R0# set schedulers sched_LowLoss drop-profile-map loss-priority
any protocol any drop-profile RED-BestEffort

user@host-R0# set schedulers sched_BestEffort excess-rate proportion 180
user@host-R0# set schedulers sched_BestEffort buffer-size percent 30
user@host-R0# set schedulers sched_BestEffort priority low

```

```
user@host-R0# set schedulers sched_BestEffort excess-priority low
user@host-R0# set schedulers sched_BestEffort drop-profile-map loss-priority
any protocol any drop-profile RED-BestEffort
```

```
user@host-R0# set schedulers sched_Control transmit-rate 256k
user@host-R0# set schedulers sched_Control excess-rate proportion 20
user@host-R0# set schedulers sched_Control priority high
user@host-R0# set schedulers sched_Control excess-priority low
```

```
user@host-R0# set schedulers sched_Multicast transmit-rate 100m
user@host-R0# set schedulers sched_Multicast excess-rate proportion 20
user@host-R0# set schedulers sched_Multicast buffer-size percent 10
user@host-R0# set schedulers sched_Multicast priority medium-high
user@host-R0# set schedulers sched_Multicast excess-priority high
```

19. Configure firewall filters.

a. Configure firewall filters for IPv4.

```
[edit firewall]
user@host-R0# set family inet filter DEFAULT_V4-IN interface-specific
user@host-R0# set family inet filter DEFAULT_V4-IN term bypass from
service-filter-hit
user@host-R0# set family inet filter DEFAULT_V4-IN term bypass then accept
user@host-R0# set family inet filter DEFAULT_V4-IN term rest then
forwarding-class BestEffort
```

```
user@host-R0# set family inet filter DEFAULT_V4-OUT interface-specific
user@host-R0# set family inet filter DEFAULT_V4-OUT term bypass from
service-filter-hit
user@host-R0# set family inet filter DEFAULT_V4-OUT term bypass then accept
user@host-R0# set family inet filter DEFAULT_V4-OUT term rest then
forwarding-class BestEffort
```

```
user@host-R0# set family inet filter JFlow-Sample-IPv4 term ALL then sample
user@host-R0# set family inet filter JFlow-Sample-IPv4 term ALL then accept
```

b. Configure firewall filters for IPv6.

```
[edit firewall]
user@host-R0# set family inet6 filter DEFAULT_V6-IN interface-specific
user@host-R0# set family inet6 filter DEFAULT_V6-IN term bypass from
service-filter-hit
user@host-R0# set family inet6 filter DEFAULT_V6-IN term bypass then accept
user@host-R0# set family inet6 filter DEFAULT_V6-IN term rest then
forwarding-class BestEffort
```

```
user@host-R0# set family inet6 filter DEFAULT_V6-OUT interface-specific
user@host-R0# set family inet6 filter DEFAULT_V6-OUT term bypass from
service-filter-hit
user@host-R0# set family inet6 filter DEFAULT_V6-OUT term bypass then accept
user@host-R0# set family inet6 filter DEFAULT_V6-OUT term rest then
forwarding-class BestEffort
```

```

user@host-R0# set family inet6 filter JFlow-Sample-IPv6 term local-v6 from
prefix-list local-lo0-ipv6
user@host-R0# set family inet6 filter JFlow-Sample-IPv6 term local-v6 then
count local-accept
user@host-R0# set family inet6 filter JFlow-Sample-IPv6 term local-v6 then
sample
user@host-R0# set family inet6 filter JFlow-Sample-IPv6 term local-v6 then
accept
user@host-R0# set family inet6 filter JFlow-Sample-IPv6 term from-backbone
from source-prefix-list backbone-ipv6
user@host-R0# set family inet6 filter JFlow-Sample-IPv6 term from-backbone
then count from-backbone-reject
user@host-R0# set family inet6 filter JFlow-Sample-IPv6 term from-backbone
then discard
user@host-R0# set family inet6 filter JFlow-Sample-IPv6 term to-backbone
from destination-prefix-list backbone-ipv6
user@host-R0# set family inet6 filter JFlow-Sample-IPv6 term to-backbone
then count to-backbone-reject
user@host-R0# set family inet6 filter JFlow-Sample-IPv6 term to-backbone
then discard
user@host-R0# set family inet6 filter JFlow-Sample-IPv6 term final then count
all-accept
user@host-R0# set family inet6 filter JFlow-Sample-IPv6 term final then sample
user@host-R0# set family inet6 filter JFlow-Sample-IPv6 term final then accept

```

20. Configure RADIUS server access parameters.

```

[edit access]
user@host-R0# set radius-server 9.0.0.9 port 1812
user@host-R0# set radius-server 9.0.0.9 accounting-port 1813
user@host-R0# set radius-server 9.0.0.9 secret "secret key!"; ## SECRET-DATA
user@host-R0# set radius-server 9.0.0.9 timeout 30
user@host-R0# set radius-server 9.0.0.9 retry 3
user@host-R0# set radius-server 9.0.0.9 max-outstanding-requests 500
user@host-R0# set radius-server 9.0.0.9 source-address 100.0.0.1

```

21. Configure access profile parameters.

a. Configure the authentication order for RADIUS.

```

[edit access]
user@host-R0# set profile Access-Profile-0 authentication-order radius

```

b. Configure RADIUS parameters.

```

[edit access]
user@host-R0# set profile Access-Profile-0 radius authentication-server 9.0.0.9
user@host-R0# set profile Access-Profile-0 radius accounting-server 9.0.0.9
user@host-R0# set profile Access-Profile-0 radius options nas-identifier R0
user@host-R0# set profile Access-Profile-0 radius options
nas-port-extended-format slot-width 3
user@host-R0# set profile Access-Profile-0 radius options
nas-port-extended-format adapter-width 2
user@host-R0# set profile Access-Profile-0 radius options
nas-port-extended-format port-width 3
user@host-R0# set profile Access-Profile-0 radius options
nas-port-extended-format stacked-vlan-width 12

```

```
user@host-R0# set profile Access-Profile-0 radius options
  nas-port-extended-format vlan-width 12
user@host-R0# set profile Access-Profile-0 radius options nas-port-id-format
  nas-identifier
user@host-R0# set profile Access-Profile-0 radius options nas-port-id-format
  interface-description
user@host-R0# set profile Access-Profile-0 radius options nas-port-id-format
  agent-circuit-id
user@host-R0# set profile Access-Profile-0 radius options nas-port-id-format
  agent-remote-id
user@host-R0# set profile Access-Profile-0 radius options nas-port-type ethernet
  4711
user@host-R0# set profile Access-Profile-0 radius options
  calling-station-id-delimiter "$"
user@host-R0# set profile Access-Profile-0 radius options
  calling-station-id-format nas-identifier
user@host-R0# set profile Access-Profile-0 radius options
  calling-station-id-format interface-description
user@host-R0# set profile Access-Profile-0 radius options
  calling-station-id-format agent-circuit-id
user@host-R0# set profile Access-Profile-0 radius options
  calling-station-id-format agent-remote-id
user@host-R0# set profile Access-Profile-0 radius options
  remote-circuit-id-delimiter "$"
user@host-R0# set profile Access-Profile-0 radius options
  remote-circuit-id-format agent-circuit-id
user@host-R0# set profile Access-Profile-0 radius options
  remote-circuit-id-format agent-remote-id
user@host-R0# set profile Access-Profile-0 radius options
  remote-circuit-id-fallback configured-calling-station-id
user@host-R0# set profile Access-Profile-0 radius options override
  calling-station-id remote-circuit-id
user@host-R0# set profile Access-Profile-0 radius options
  accounting-session-id-format description
user@host-R0# set profile Access-Profile-0 radius options
  vlan-nas-port-stacked-format
user@host-R0# set profile Access-Profile-0 radius options juniper-dsl-attributes
user@host-R0# set profile Access-Profile-0 radius options
  ip-address-change-notify message JUNIPER_ADDRESS_SAVING
```

c. Configure session options.

```
[edit access]
user@host-R0# set profile Access-Profile-0 session-options client-idle-timeout
  900
user@host-R0# set profile Access-Profile-0 session-options
  client-session-timeout 86400
```

d. Configure accounting parameters.

```
[edit access]
user@host-R0# set profile Access-Profile-0 accounting order radius
user@host-R0# set profile Access-Profile-0 accounting
  accounting-stop-on-failure
user@host-R0# set profile Access-Profile-0 accounting
  accounting-stop-on-access-deny
user@host-R0# set profile Access-Profile-0 accounting immediate-update
```

```

user@host-R0# set profile Access-Profile-0 accounting coa-immediate-update
user@host-R0# set profile Access-Profile-0 accounting
    address-change-immediate-update
user@host-R0# set profile Access-Profile-0 accounting update-interval 1440
user@host-R0# set profile Access-Profile-0 accounting statistics volume-time
user@host-R0# set profile Access-Profile-0 accounting wait-for-acct-on-ack
user@host-R0# set profile Access-Profile-0 accounting
    send-acct-status-on-config-change
user@host-R0# set profile Access-Profile-0 accounting
    ancp-speed-change-immediate-update

```

22. Configure address assignment.

```

[edit access]
user@host-R0# set address-assignment neighbor-discovery-router-advertisement
    v6_NDRA_Prefix_Pool1
user@host-R0# set address-assignment pool v4-pool-0 family inet network
    100.0.0.0/8
user@host-R0# set address-assignment pool v4-pool-0 family inet range v4-range-0
    low 100.16.0.1
user@host-R0# set address-assignment pool v4-pool-0 family inet range v4-range-0
    high 100.31.255.255
user@host-R0# set address-assignment pool v4-pool-0 family inet dhcp-attributes
    maximum-lease-time 99999
user@host-R0# set address-assignment pool v6_NDRA_Prefix_Pool1 family inet6
    prefix 1016:0000:0000:0000:0000:0000:0000/40
user@host-R0# set address-assignment pool v6_NDRA_Prefix_Pool1 family inet6
    range v6-range-0 prefix-length 64
user@host-R0# set address-assignment pool v6_DHCPv6-PD_Pool1 family inet6
    prefix 2016:0000:0000:0000:0000:0000:0000/40
user@host-R0# set address-assignment pool v6_DHCPv6-PD_Pool1 family inet6
    range v6-range-0 prefix-length 56
user@host-R0# set address-assignment pool v6_DHCPv6-PD_Pool1 family inet6
    dhcp-attributes dns-server 2015:0221::9.0.0.9
user@host-R0# set address-assignment pool v6_DHCPv6-PD_Pool1 family inet6
    dhcp-attributes dns-server 2015:0221::9.0.0.10
user@host-R0# set address-assignment pool v6_DHCPv6-PD_Pool1 family inet6
    dhcp-attributes valid-lifetime 1800
user@host-R0# set address-assignment pool v6_DHCPv6-PD_Pool1 family inet6
    dhcp-attributes preferred-lifetime 1440
user@host-R0# set address-assignment pool v6_DHCPv6-PD_Pool1 family inet6
    dhcp-attributes t1-percentage 50
user@host-R0# set address-assignment pool v6_DHCPv6-PD_Pool1 family inet6
    dhcp-attributes t2-percentage 80

```

23. Configure address protection.

```

[edit access]
user@host-R0# set address-protection

```

24. Configure report interface descriptions.

```

[edit access]
user@host-R0# set report-interface-descriptions

```

25. Configure accounting backup options.

```

[edit access]

```

```

user@host-R0# set accounting-backup-options max-pending-accounting-stops
168000
user@host-R0# set accounting-backup-options max-withhold-time 1440

```

- Results** 1. Confirm the dynamic VLAN profile interface configuration.

```

user@host-R0# show dynamic-profiles vlan-client-profile
interfaces {
  demux0 {
    unit "$junos-interface-unit" {
      no-traps;
      proxy-arp;
      vlan-tags outer "$junos-stacked-vlan-id";
      vlan-tags inner "$junos-vlan-id";
      demux-options {
        underlying-interface "$junos-interface-ifd-name";
      }
      family pppoe {
        duplicate-protection;
        dynamic-profile pppoe-client-profile;
        max-sessions 10;
        short-cycle-protection {
          lockout-time-min 5;
          lockout-time-max 60;
        }
      }
    }
  }
}

```

2. Confirm the dynamic PPPoE client profile configuration.

```

user@host-R0# show dynamic-profiles pppoe-client-profile
predefined-variable-defaults {
  cos-shaping-rate 10m;
  cos-scheduler-map schedmap_residential;
  input-filter DEFAULT_V4-IN;
  output-filter DEFAULT_V4-OUT;
  output-ipv6-filter DEFAULT_V6-OUT;
  input-ipv6-filter DEFAULT_V6-IN;
}
routing-instances {
  "$junos-routing-instance" {
    interface "$junos-interface-name" {
      any;
    }
    routing-options {
      access {
        route $junos-framed-route-ip-address-prefix {
          next-hop "$junos-framed-route-nexthop";
          metric "$junos-framed-route-cost";
          preference "$junos-framed-route-distance";
        }
      }
      access-internal {
        route $junos-subscriber-ip-address {

```



```

        qualified-next-hop "$junos-interface-name";
    }
}
}
}
}
}
interfaces {
  pp0 {
    unit "$junos-interface-unit" {
      no-traps;
      ppp-options {
        chap {
          challenge-length minimum 16 maximum 32;
        }
        pap;
        authentication [ pap chap ];
      }
      pppoe-options {
        underlying-interface "$junos-underlying-interface";
        server;
      }
      keepalives interval 30;
      family inet {
        filter {
          input "$junos-input-filter" precedence 240;
          output "$junos-output-filter" precedence 240;
          adf {
            rule "$junos-adf-rule-v4";
            counter;
            input-precedence 100;
            not-mandatory;
            output-precedence 100;
          }
        }
        unnumbered-address "$junos-loopback-interface";
      }
      family inet6 {
        filter {
          input "$junos-input-ipv6-filter" precedence 240;
          output "$junos-output-ipv6-filter" precedence 240;
          adf {
            rule "$junos-adf-rule-v6";
            counter;
            input-precedence 100;
            not-mandatory;
            output-precedence 100;
          }
        }
        address $junos-ipv6-address;
      }
    }
  }
}
}
}
}
}
protocols {
  router-advertisement {
    interface "$junos-interface-name" {

```

```

        other-stateful-configuration;
        link-mtu;
        prefix $junos-ipv6-ndra-prefix {
            valid-lifetime 4294967295;
            on-link;
            preferred-lifetime 4294967295;
        }
    }
}
}
class-of-service {
    traffic-control-profiles {
        SessionShaper {
            scheduler-map "$junos-cos-scheduler-map";
            shaping-rate "$junos-cos-shaping-rate";
            overhead-accounting frame-mode-bytes 34 cell-mode-bytes 6;
        }
    }
}
interfaces {
    pp0 {
        unit "$junos-interface-unit" {
            output-traffic-control-profile SessionShaper;
            rewrite-rules {
                dscp residential-default;
                dscp-ipv6 residential-default-v6;
                ieee-802.1 residential-default-vlan vlan-tag outer-and-inner;
            }
        }
    }
}
}
}

```

3. Confirm the voice parameter configuration.

```

user@host-R0# show dynamic-profiles voice
variables {
    VoiceBearBW mandatory;
    voice_gateway mandatory;
    voice_gateway_v6 mandatory;
    filter_voice_input uid;
    filter_voice_output uid;
    filter_voice_input_v6 uid;
    filter_voice_output_v6 uid;
    voice_policer uid;
    voice_policer_burst_KB equals "round($VoiceBearBW * 0.0125)";
}
interfaces {
    pp0 {
        unit "$junos-interface-unit" {
            family inet {
                filter {
                    input "$filter_voice_input" precedence 100;
                    output "$filter_voice_output" precedence 100;
                }
            }
            family inet6 {

```

```
filter {
    input "$filter_voice_input_v6" precedence 100;
    output "$filter_voice_output_v6" precedence 100;
}
}
}
}
}
firewall {
    family inet {
        filter "$filter_voice_input" {
            interface-specific;
            term 1 {
                from {
                    destination-address {
                        $voice_gateway;
                    }
                }
                then {
                    policer "$voice_policer";
                    service-accounting-deferred;
                    loss-priority low;
                    forwarding-class Voice;
                    service-filter-hit;
                    accept;
                }
            }
            term default {
                then accept;
            }
        }
        filter "$filter_voice_output" {
            interface-specific;
            term 1 {
                from {
                    source-address {
                        $voice_gateway;
                    }
                }
                then {
                    policer "$voice_policer";
                    service-accounting-deferred;
                    loss-priority low;
                    forwarding-class Voice;
                    service-filter-hit;
                    accept;
                }
            }
            term default {
                then accept;
            }
        }
    }
    family inet6 {
        filter "$filter_voice_input_v6" {
            interface-specific;
```

```

term 1 {
  from {
    destination-address {
      $voice_gateway_v6;
    }
  }
  then {
    policer "$voice_policer";
    service-accounting-deferred;
    loss-priority low;
    forwarding-class Voice;
    service-filter-hit;
    accept;
  }
}
term default {
  then accept;
}
}
filter "$filter_voice_output_v6" {
  interface-specific;
  term 1 {
    from {
      source-address {
        $voice_gateway_v6;
      }
    }
    then {
      policer "$voice_policer";
      service-accounting-deferred;
      loss-priority low;
      forwarding-class Voice;
      service-filter-hit;
      accept;
    }
  }
  term default {
    then accept;
  }
}
}
policer "$voice_policer" {
  logical-interface-policer;
  if-exceeding {
    bandwidth-limit "$VoiceBearBW";
    burst-size-limit "$voice_policer_burst_KB";
  }
  then discard;
}
}

```

4. Confirm the input QoS parameter configuration.

```

user@host-R0# show dynamic-profiles input_qos
variables {
  policer_bandwidth mandatory;

```

```

    policer_burst_size equals "round($policer_bandwidth * 0.0125)";
    premium_classes_hpolicer uid;
    lowloss_class_hpolicer uid;
    lowdelay_class_hpolicer uid;
    besteffort_class_hpolicer uid;
    multicast_class_hpolicer uid;
    subscriber_hpolicer uid;
    input_filter_name uid;
    input_filter_v6_name uid;
}
interfaces {
  pp0 {
    unit "$junos-interface-unit" {
      family inet {
        filter {
          input "$input_filter_name" precedence 250;
        }
      }
      family inet6 {
        filter {
          input "$input_filter_v6_name" precedence 250;
        }
      }
    }
  }
}
firewall {
  family inet {
    filter "$input_filter_name" {
      interface-specific;
      term 1 {
        from {
          forwarding-class [ Voice Control ];
        }
        then {
          hierarchical-policer "$premium_classes_hpolicer";
          next term;
        }
      }
      term 2 {
        from {
          forwarding-class [ Voice Control Multicast ];
        }
        then {
          hierarchical-policer "$multicast_class_hpolicer";
          force-premium;
          next term;
        }
      }
      term 3 {
        from {
          forwarding-class [ Voice Control Multicast LowDelay ];
        }
        then {
          hierarchical-policer "$lowdelay_class_hpolicer";
          force-premium;
        }
      }
    }
  }
}

```

```
        next term;
    }
}
term 4 {
    from {
        forwarding-class [ Voice Control Multicast LowDelay LowLoss ];
    }
    then {
        hierarchical-policer "$lowloss_class_hpolicer";
        force-premium;
        next term;
    }
}
term 5 {
    from {
        forwarding-class [ Control Voice Multicast LowLoss LowDelay BestEffort ];
    }
    then {
        hierarchical-policer "$subscriber_hpolicer";
        service-accounting-deferred;
        accept;
    }
}
}
family inet6 {
    filter "$input_filter_v6_name" {
        interface-specific;
        term 1 {
            from {
                forwarding-class [ Voice Control ];
            }
            then {
                hierarchical-policer "$premium_classes_hpolicer";
                next term;
            }
        }
        term 2 {
            from {
                forwarding-class [ Voice Control Multicast ];
            }
            then {
                hierarchical-policer "$multicast_class_hpolicer";
                force-premium;
                next term;
            }
        }
        term 3 {
            from {
                forwarding-class [ Voice Control Multicast LowDelay ];
            }
            then {
                hierarchical-policer "$lowdelay_class_hpolicer";
                force-premium;
                next term;
            }
        }
    }
}
```

```

    }
    term 4 {
      from {
        forwarding-class [ Voice Control Multicast LowDelay LowLoss ];
      }
      then {
        hierarchical-policer "$lowloss_class_hpolicer";
        force-premium;
        next term;
      }
    }
    term 5 {
      from {
        forwarding-class [ Control Voice Multicast LowLoss LowDelay BestEffort ];
      }
      then {
        hierarchical-policer "$subscriber_hpolicer";
        service-accounting-deferred;
        accept;
      }
    }
  }
}
hierarchical-policer "$premium_classes_hpolicer" {
  logical-interface-policer;
  aggregate {
    if-exceeding {
      bandwidth-limit "$policer_bandwidth";
      burst-size-limit "$policer_burst_size";
    }
    then {
      discard;
    }
  }
}
premium {
  if-exceeding {
    bandwidth-limit "$policer_bandwidth";
    burst-size-limit "$policer_burst_size";
  }
  then {
    discard;
  }
}
}
hierarchical-policer "$multicast_class_hpolicer" {
  logical-interface-policer;
  aggregate {
    if-exceeding {
      bandwidth-limit "$policer_bandwidth";
      burst-size-limit "$policer_burst_size";
    }
    then {
      discard;
    }
  }
}
premium {

```

```
        if-exceeding {
            bandwidth-limit "$policer_bandwidth";
            burst-size-limit "$policer_burst_size";
        }
        then {
            discard;
        }
    }
}
hierarchical-policer "$lowdelay_class_hpolicer" {
    logical-interface-policer;
    aggregate {
        if-exceeding {
            bandwidth-limit "$policer_bandwidth";
            burst-size-limit "$policer_burst_size";
        }
        then {
            discard;
        }
    }
    premium {
        if-exceeding {
            bandwidth-limit "$policer_bandwidth";
            burst-size-limit "$policer_burst_size";
        }
        then {
            discard;
        }
    }
}
hierarchical-policer "$lowloss_class_hpolicer" {
    logical-interface-policer;
    aggregate {
        if-exceeding {
            bandwidth-limit "$policer_bandwidth";
            burst-size-limit "$policer_burst_size";
        }
        then {
            discard;
        }
    }
    premium {
        if-exceeding {
            bandwidth-limit "$policer_bandwidth";
            burst-size-limit "$policer_burst_size";
        }
        then {
            discard;
        }
    }
}
hierarchical-policer "$subscriber_hpolicer" {
    logical-interface-policer;
    aggregate {
        if-exceeding {
            bandwidth-limit "$policer_bandwidth";
```



```

        burst-size-limit "$policer_burst_size";
    }
    then {
        discard;
    }
}
premium {
    if-exceeding {
        bandwidth-limit "$policer_bandwidth";
        burst-size-limit "$policer_burst_size";
    }
    then {
        discard;
    }
}
}
}
}

```

5. Confirm the video parameter configuration.

```

user@host-R0# show dynamic-profiles video
variables {
    uc_video_bandwidth mandatory;
    mc_video_bandwidth mandatory;
    uc_video_prefix mandatory;
    uc_video_burst-size equals "round($uc_video_bandwidth * 0.0125)";
    mc_video_burst-size equals "round($mc_video_bandwidth * 0.0125)";
    video_filter_name uid;
    video_filter_v6_name uid;
}
interfaces {
    pp0 {
        unit "$junos-interface-unit" {
            family inet {
                filter {
                    output "$video_filter_name" precedence 120;
                }
            }
        }
    }
}
protocols {
    igmp {
        interface "$junos-interface-name" {
            version 3;
            immediate-leave;
            promiscuous-mode;
        }
    }
}
firewall {
    family inet {
        filter "$video_filter_name" {
            interface-specific;
            term bypass {
                from {

```

```
        service-filter-hit;
    }
    then accept;
}
term mc_video {
    from {
        destination-address {
            224.0.0.0/4;
        }
    }
    then {
        service-accounting-deferred;
        loss-priority low;
        forwarding-class Multicast;
        service-filter-hit;
        accept;
    }
}
term uc_video {
    from {
        source-address {
            $uc_video_prefix;
        }
    }
    then {
        service-accounting-deferred;
        loss-priority low;
        forwarding-class LowLoss;
        service-filter-hit;
        accept;
    }
}
term default {
    then accept;
}
}
}
```

6. Confirm the system configuration.

```
user@host-R0# show system
host-name R0;
services {
    dhcp-local-server {
        dhcpv6 {
            overrides {
                delegated-pool v6_DHCPv6-PD_Pool1;
            }
            group v6-ppp-client-0 {
                interface pp0.0;
            }
        }
    }
}
subscriber-management {
    gres-route-flush-delay;
```

```

    }
    resource-monitor {
        no-throttle;
        high-threshold 85;
    }
}
commit {
    synchronize;
    persist-groups-inheritance;
}
ddos-protection {
    protocols {
        oam-lfm {
            aggregate {
                bandwidth 100;
                burst 100;
            }
        }
    }
}
}
}

```

7. Confirm the chassis level configuration.

```

user@host-R0# show chassis
effective-shaping-rate;
redundancy {
    failover {
        on-loss-of-keepalives;
        on-disk-failure;
    }
    graceful-switchover;
}
fpc 1 {
    sampling-instance IPFIX-INS1;
}
fpc 0 {
    sampling-instance IPFIX-INS1;
}
fpc 2 {
    sampling-instance IPFIX-INS1;
}
network-services enhanced-ip;

```

8. Confirm the flow monitoring configuration.

```

user@host-R0# show services flow-monitoring
version-ipfix {
    template v4-TEMPLATE {
        flow-active-timeout 60;
        template-refresh-rate {
            seconds 120;
        }
        option-refresh-rate {
            seconds 120;
        }
    }
    ipv4-template;
}

```

```
template v6-TEMPLATE {  
  flow-active-timeout 60;  
  template-refresh-rate {  
    seconds 120;  
  }  
  option-refresh-rate {  
    seconds 120;  
  }  
  ipv6-template;  
}  
}
```

9. Confirm the L2TP configuration.

```
user@host-R0# show services l2tp  
weighted-load-balancing;  
failover-within-preference;  
disable-calling-number-avp;  
tx-connect-speed-method ancp;  
tunnel {  
  assignment-id-format client-server-id;  
  retransmission-count-established 2;  
  retransmission-count-not-established 2;  
  idle-timeout 600;  
}  
destruct-timeout 600;
```

10. Confirm that the access profile was created.

```
user@host-R0# show access-profile  
access-profile Access-Profile-0;
```

11. Confirm the interface configuration.

```
user@host-R0# show interfaces  
lo0 {  
  unit 0 {  
    family inet {  
      address 100.0.0.1/32 {  
        primary;  
        preferred;  
      }  
    }  
    family iso {  
      address 47.0007.3000.0000.0000.0100.0001.0100.0100.1010.00;  
    }  
    family inet6 {  
      address 1000:0::1/128 {  
        primary;  
        preferred;  
      }  
    }  
  }  
}  
xe-5/2/0 {  
  description "To R1 - Core";  
  accounting-profile ifprofile;  
  mtu 4484;
```

```

hold-time up 1000 down 1000;
no-gratuitous-arp-reply;
no-gratuitous-arp-request;
unit 0 {
    family inet {
        address 20.20.50.2/24;
    }
    family iso;
    family inet6;
    family mpls;
}
}
ge-9/0/1 {
    description "To R3 - Core";
    accounting-profile ifprofile;
    mtu 4484;
    hold-time up 1000 down 1000;
    no-gratuitous-arp-reply;
    no-gratuitous-arp-request;
    unit 0 {
        family inet {
            address 20.20.70.2/24;
        }
        family iso;
        family inet6;
        family mpls;
    }
}
ge-2/1/0 {
    description "To access facing port1";
    accounting-profile ifprofile;
    hierarchical-scheduler;
    flexible-vlan-tagging;
    auto-configure {
        stacked-vlan-ranges {
            dynamic-profile vlan-client-profile {
                accept pppoe;
                ranges {
                    1-4094,1-4094;
                }
            }
        }
    }
    remove-when-no-subscribers;
}
mtu 1522;
hold-time up 0 down 1000;
link-mode full-duplex;
encapsulation flexible-ethernet-services;
no-gratuitous-arp-reply;
no-gratuitous-arp-request;
unit 15000 {
    description "HSI for Business customer";
    vlan-id 4000;
    accounting-profile ifprofile;
    family inet {
        rpf-check;
    }
}

```

```
        address 11.1.1.1/24;
    }
}
unit 1 {
    encapsulation vlan-ccc;
    vlan-tags outer 3101 inner 301;
    accounting-profile ifprofile;
}
unit 2 {
    encapsulation vlan-ccc;
    vlan-tags outer 3101 inner 302;
    accounting-profile ifprofile;
}
unit 3 {
    encapsulation vlan-ccc;
    vlan-tags outer 3101 inner 303;
    accounting-profile ifprofile;
}
}
ge-2/2/9 {
    description "To access facing port2";
    accounting-profile ifprofile;
    hierarchical-scheduler;
    flexible-vlan-tagging;
    auto-configure {
        stacked-vlan-ranges {
            dynamic-profile vlan-client-profile {
                accept pppoe;
                ranges {
                    1-4094,1-4094;
                }
            }
        }
    }
    remove-when-no-subscribers;
}
mtu 1522;
hold-time up 0 down 1000;
link-mode full-duplex;
encapsulation flexible-ethernet-services;
no-gratuitous-arp-reply;
no-gratuitous-arp-request;
unit 15000 {
    description "HSI for Business customer";
    vlan-id 4000;
    accounting-profile ifprofile;
    family inet {
        rpf-check;
        address 12.1.2.1/24;
    }
}
unit 1 {
    encapsulation vlan-ccc;
    vlan-tags outer 3101 inner 304;
    accounting-profile ifprofile;
}
unit 2 {
```

```

        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 305;
        accounting-profile ifprofile;
    }
    unit 3 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 306;
        accounting-profile ifprofile;
    }
}
ge-8/0/0 {
    description "To access facing port3";
    accounting-profile ifprofile;
    hierarchical-scheduler;
    flexible-vlan-tagging;
    auto-configure {
        stacked-vlan-ranges {
            dynamic-profile vlan-client-profile {
                accept pppoe;
                ranges {
                    1-4094,1-4094;
                }
            }
        }
    }
    remove-when-no-subscribers;
}
mtu 1522;
hold-time up 0 down 1000;
link-mode full-duplex;
encapsulation flexible-ethernet-services;
no-gratuitous-arp-reply;
no-gratuitous-arp-request;
unit 15000 {
    description "HSI for Business customer";
    vlan-id 4000;
    accounting-profile ifprofile;
    family inet {
        rpf-check;
        address 13.1.3.1/24;
    }
}
unit 1 {
    encapsulation vlan-ccc;
    vlan-tags outer 3101 inner 307;
    accounting-profile ifprofile;
}
unit 2 {
    encapsulation vlan-ccc;
    vlan-tags outer 3101 inner 308;
    accounting-profile ifprofile;
}
unit 3 {
    encapsulation vlan-ccc;
    vlan-tags outer 3101 inner 309;
    accounting-profile ifprofile;
}

```

```
}
ge-9/0/5 {
  description "To access facing port4";
  accounting-profile ifprofile;
  hierarchical-scheduler;
  flexible-vlan-tagging;
  auto-configure {
    stacked-vlan-ranges {
      dynamic-profile vlan-client-profile {
        accept pppoe;
        ranges {
          1-4094,1-4094;
        }
      }
    }
  }
  remove-when-no-subscribers;
}
mtu 1522;
hold-time up 0 down 1000;
link-mode full-duplex;
encapsulation flexible-ethernet-services;
no-gratuitous-arp-reply;
no-gratuitous-arp-request;
unit 15000 {
  description "HSI for Business customer";
  vlan-id 4000;
  accounting-profile ifprofile;
  family inet {
    rpf-check;
    address 14.1.4.1/24;
  }
}
}
unit 1 {
  encapsulation vlan-ccc;
  vlan-tags outer 3001 inner 310;
  accounting-profile ifprofile;
}
unit 2 {
  encapsulation vlan-ccc;
  vlan-tags outer 3001 inner 311;
  accounting-profile ifprofile;
}
unit 3 {
  encapsulation vlan-ccc;
  vlan-tags outer 3001 inner 312;
  accounting-profile ifprofile;
}
}
ge-9/0/9 {
  description "To access facing port5";
  accounting-profile ifprofile;
  hierarchical-scheduler;
  flexible-vlan-tagging;
  auto-configure {
    stacked-vlan-ranges {
      dynamic-profile vlan-client-profile {
```



```

        accept pppoe;
        ranges {
            1-4094,1-4094;
        }
    }
}
remove-when-no-subscribers;
}
mtu 1522;
hold-time up 0 down 1000;
link-mode full-duplex;
encapsulation flexible-ethernet-services;
no-gratuitous-arp-reply;
no-gratuitous-arp-request;
unit 15000 {
    description "HSI for Business customer";
    vlan-id 4000;
    accounting-profile ifprofile;
    family inet {
        rpf-check;
        address 15.1.5.1/24;
    }
}
unit 1 {
    encapsulation vlan-ccc;
    vlan-tags outer 3101 inner 313;
    accounting-profile ifprofile;
}
unit 2 {
    encapsulation vlan-ccc;
    vlan-tags outer 3101 inner 314;
    accounting-profile ifprofile;
}
unit 3 {
    encapsulation vlan-ccc;
    vlan-tags outer 3101 inner 315;
    accounting-profile ifprofile;
}
}
ge-9/2/0 {
    description "To access facing port6";
    accounting-profile ifprofile;
    hierarchical-scheduler;
    flexible-vlan-tagging;
    auto-configure {
        stacked-vlan-ranges {
            dynamic-profile vlan-client-profile {
                accept pppoe;
                ranges {
                    1-4094,1-4094;
                }
            }
        }
    }
    remove-when-no-subscribers;
}
mtu 1522;

```

```
hold-time up 0 down 1000;
link-mode full-duplex;
encapsulation flexible-ethernet-services;
no-gratuitous-arp-reply;
no-gratuitous-arp-request;
unit 15000 {
    description "HSI for Business customer";
    vlan-id 4000;
    accounting-profile ifprofile;
    family inet {
        rpf-check;
        address 16.1.6.1/24;
    }
}
unit 1 {
    encapsulation vlan-ccc;
    vlan-tags outer 3101 inner 316;
    accounting-profile ifprofile;
}
unit 2 {
    encapsulation vlan-ccc;
    vlan-tags outer 3101 inner 317;
    accounting-profile ifprofile;
}
unit 3 {
    encapsulation vlan-ccc;
    vlan-tags outer 3101 inner 318;
    accounting-profile ifprofile;
}
}
```

12. Confirm the forwarding options configuration.

```
user@host-R0# show forwarding-options
sampling {
    instance {
        IPFIX-INS1 {
            input {
                rate 1000;
                run-length 0;
            }
            family inet {
                output {
                    flow-server 100.200.0.9 {
                        port 2055;
                        version-ipfix {
                            template {
                                v4-TEMPLATE;
                            }
                        }
                    }
                }
            }
            inline-jflow {
                source-address 200.90.30.6;
            }
        }
    }
}
```

```

family inet6 {
    output {
        flow-server 100.200.0.9 {
            port 2055;
            version-ipfix {
                template {
                    v6-TEMPLATE;
                }
            }
        }
        inline-jflow {
            source-address 200.90.30.6;
        }
    }
}

enhanced-hash-key {
    family inet {
        no-destination-port;
        no-source-port;
    }
    family inet6 {
        no-destination-port;
        no-source-port;
    }
}

family inet {
    filter {
        input JFlow-Sample-IPv4;
    }
}

family inet6 {
    filter {
        input JFlow-Sample-IPv6;
    }
}

```

13. Confirm the event option configuration.

```
user@host-R0# show event-options
policy LDP-ISIS {
    events [ rpd_ldp_nbrdown rpd_isis_ldp_sync ];
    then {
        raise-trap;
    }
}

policy pem-fail {
    events SYSTEM;
    attributes-match {
        SYSTEM.message matches "Alarm.*Feed Connection.*";
    }
    then {
        raise-trap;
    }
}
```

```
}
policy SFP-XFP-GONE {
  events PIC;
  attributes-match {
    PIC.message matches .*plugged.*;
  }
  then {
    raise-trap;
  }
}
```

14. Confirm the accounting option configuration.

```
user@host-R0# show accounting-options
periodic-refresh disable;
file ifstat {
  files 5;
  transfer-interval 15;
  archive-sites {
    "sftp://username@hostname:/var/tmp/archive/";
  }
}
interface-profile ifprofile {
  file ifstat;
  interval 15;
  fields {
    input-bytes;
    output-bytes;
    input-packets;
    output-packets;
    input-errors;
    output-errors;
    input-multicast;
    output-multicast;
    input-unicast;
    output-unicast;
    unsupported-protocol;
    rpf-check-bytes;
    rpf-check-packets;
    rpf-check6-bytes;
    rpf-check6-packets;
  }
}
```

15. Confirm the routing option configuration.

```
user@host-R0# show routing-options
nonstop-routing;
nsr-phantom-holdtime 900;
router-id 100.0.0.1;
forwarding-table {
  remnant-holdtime 900;
  export LOAD-BALANCE-ALL;
}
```

16. Confirm the protocol configurations.

```
user@host-R0# show protocols
```

```
mpls {
  no-propagate-ttl;
  ipv6-tunneling;
  interface lo0.0;
  interface xe-5/2/0.0;
  interface ge-9/0/1.0;
}
bgp {
  local-as 65500;
  group Internal {
    type internal;
    local-address 100.0.0.1;
    neighbor 102.0.0.1 {
      family inet {
        unicast;
      }
      family inet6 {
        unicast;
      }
    }
    export export-access;
  }
}
isis {
  lsp-lifetime 65535;
  ignore-attached-bit;
  level 2 {
    disable;
  }
  level 1 {
    authentication-key "secret key!"; ## SECRET-DATA
    authentication-type md5;
    wide-metrics-only;
  }
  interface fxp0.0 {
    disable;
  }
  interface lo0.0 {
    passive;
  }
  interface xe-5/2/0.0 {
    ldp-synchronization;
    lsp-interval 10;
    point-to-point;
    link-protection;
    level 1 {
      metric 2000070;
    }
  }
  interface ge-9/0/1.0 {
    ldp-synchronization;
    lsp-interval 10;
    point-to-point;
    link-protection;
    level 1 {
      metric 2000070;
```

```
    }
  }
}
ldp {
  track-igp-metric;
  strict-targeted-hellos;
  import LDPMINPREFL32;
  keepalive-timeout 180;
  interface lo0.0;
  interface xe-5/2/0.0;
  interface ge-9/0/1.0;
  p2mp;
}
pim {
  family inet6 {
    disable;
  }
  rp {
    static {
      address 102.0.0.1 {
        version 2;
        group-ranges {
          238.0.100.0/23;
          238.0.102.0/23;
          238.0.104.0/23;
          232.0.0.0/8;
          236.0.0.0/8;
        }
        override;
      }
    }
  }
}
interface xe-5/2/0.0 {
  mode sparse;
  version 2;
}
interface ge-9/0/1.0 {
  mode sparse;
  version 2;
}
join-load-balance;
}
l2circuit {
  neighbor 102.0.0.1 {
    interface ge-2/1/0.1 {
      virtual-circuit-id 1;
    }
    interface ge-2/1/0.2 {
      virtual-circuit-id 2;
    }
    interface ge-2/1/0.3 {
      virtual-circuit-id 3;
    }
    interface ge-2/2/9.1 {
      virtual-circuit-id 4;
    }
  }
}
```

```

interface ge-2/2/9.2 {
  virtual-circuit-id 5;
}
interface ge-2/2/9.3 {
  virtual-circuit-id 6;
}
interface ge-8/0/0.1 {
  virtual-circuit-id 7;
}
interface ge-8/0/0.2 {
  virtual-circuit-id 8;
}
interface ge-8/0/0.3 {
  virtual-circuit-id 9;
}
interface ge-9/0/5.1 {
  virtual-circuit-id 10;
}
interface ge-9/0/5.2 {
  virtual-circuit-id 11;
}
interface ge-9/0/5.3 {
  virtual-circuit-id 12;
}
interface ge-9/0/9.1 {
  virtual-circuit-id 13;
}
interface ge-9/0/9.2 {
  virtual-circuit-id 14;
}
interface ge-9/0/9.3 {
  virtual-circuit-id 15;
}
interface ge-9/2/0.1 {
  virtual-circuit-id 16;
}
interface ge-9/2/0.2 {
  virtual-circuit-id 17;
}
interface ge-9/2/0.3 {
  virtual-circuit-id 18;
}
}
}

```

17. Confirm the policy option configuration.

```

user@host-R0# show policy-options
prefix-list local-lo0-ipv6 {
  apply-path "interfaces lo0 unit 0 family inet6 address <*>";
}
prefix-list backbone-ipv6 {
  2003::/16;
}
policy-statement export-access {
  term 1 {

```

```
        from {
            family inet;
            protocol access;
        }
        then accept;
    }
    term 2 {
        from {
            family inet6;
            protocol [ access access-internal ];
        }
        then accept;
    }
}
policy-statement LOAD-BALANCE-ALL {
    then {
        load-balance per-packet;
    }
}
policy-statement LDPMINPREFL32 {
    term only-32 {
        from {
            protocol ldp;
            route-filter 0.0.0.0/0 prefix-length-range /32-/32;
        }
        then accept;
    }
    term final {
        then reject;
    }
}
```

18. Confirm the CoS configuration.

```
user@host-R0# show class-of-service
classifiers {
    exp core-facing-default {
        forwarding-class BestEffort {
            loss-priority low code-points 001;
            loss-priority high code-points 000;
        }
        forwarding-class Voice {
            loss-priority low code-points 101;
        }
        forwarding-class LowDelay {
            loss-priority high code-points 010;
            loss-priority low code-points 100;
        }
        forwarding-class LowLoss {
            loss-priority low code-points 111;
            loss-priority high code-points 110;
        }
    }
}
host-outbound-traffic {
    forwarding-class Control;
```



```

dscp-code-point 110000;
ieee-802.1 {
    default 110;
}
}
drop-profiles {
    RED-BestEffort {
        interpolate {
            fill-level [ 40 50 100 ];
            drop-probability [ 0 50 100 ];
        }
    }
}
forwarding-classes {
    class BestEffort queue-num 0 priority low policing-priority normal;
    class LowLoss queue-num 1 priority low policing-priority normal;
    class LowDelay queue-num 2 priority high policing-priority normal;
    class Control queue-num 3 priority high policing-priority premium;
    class Voice queue-num 4 priority high policing-priority premium;
    class Multicast queue-num 7 priority low policing-priority normal;
}
interfaces {
    xe-5/2/0 {
        unit 0 {
            classifiers {
                exp core-facing-default;
            }
            rewrite-rules {
                exp core-facing-default;
                inet-precedence core-facing-default;
            }
        }
    }
}
ge-9/0/1 {
    unit 0 {
        classifiers {
            exp core-facing-default;
        }
        rewrite-rules {
            exp core-facing-default;
            inet-precedence core-facing-default;
        }
    }
}
}
rewrite-rules {
    dscp residential-default {
        forwarding-class BestEffort {
            loss-priority low code-point 000000;
            loss-priority high code-point 001000;
        }
        forwarding-class LowLoss {
            loss-priority low code-point 111010;
            loss-priority high code-point 111010;
        }
        forwarding-class LowDelay {

```

```
        loss-priority low code-point 010001;
        loss-priority high code-point 100001;
    }
    forwarding-class Control {
        loss-priority low code-point 110000;
        loss-priority high code-point 110000;
    }
    forwarding-class Voice {
        loss-priority low code-point 101110;
        loss-priority high code-point 101110;
    }
    forwarding-class Multicast {
        loss-priority low code-point 100000;
        loss-priority high code-point 100001;
    }
}
dscp-ipv6 residential-default-v6 {
    forwarding-class BestEffort {
        loss-priority low code-point 000000;
        loss-priority high code-point 001000;
    }
    forwarding-class LowLoss {
        loss-priority low code-point 111010;
        loss-priority high code-point 111010;
    }
    forwarding-class LowDelay {
        loss-priority low code-point 010001;
        loss-priority high code-point 100001;
    }
    forwarding-class Control {
        loss-priority low code-point 110000;
        loss-priority high code-point 110000;
    }
    forwarding-class Voice {
        loss-priority low code-point 101110;
        loss-priority high code-point 101110;
    }
    forwarding-class Multicast {
        loss-priority low code-point 100000;
        loss-priority high code-point 100001;
    }
}
exp core-facing-default {
    forwarding-class BestEffort {
        loss-priority low code-point 000;
        loss-priority high code-point 000;
    }
    forwarding-class LowDelay {
        loss-priority high code-point 010;
        loss-priority low code-point 100;
    }
    forwarding-class Voice {
        loss-priority low code-point 101;
        loss-priority high code-point 101;
    }
    forwarding-class LowLoss {
```

```
        loss-priority low code-point 111;
        loss-priority high code-point 110;
    }
}
ieee-802.1 residential-default-vlan {
    forwarding-class BestEffort {
        loss-priority low code-point 000;
        loss-priority high code-point 001;
    }
    forwarding-class LowLoss {
        loss-priority low code-point 111;
        loss-priority high code-point 111;
    }
    forwarding-class LowDelay {
        loss-priority low code-point 010;
        loss-priority high code-point 100;
    }
    forwarding-class Control {
        loss-priority high code-point 110;
        loss-priority low code-point 110;
    }
    forwarding-class Voice {
        loss-priority low code-point 101;
        loss-priority high code-point 101;
    }
    forwarding-class Multicast {
        loss-priority low code-point 100;
        loss-priority high code-point 100;
    }
}
inet-precedence core-facing-default {
    forwarding-class BestEffort {
        loss-priority low code-point 000;
        loss-priority high code-point 000;
    }
    forwarding-class LowDelay {
        loss-priority high code-point 010;
        loss-priority low code-point 100;
    }
    forwarding-class Voice {
        loss-priority low code-point 101;
        loss-priority high code-point 101;
    }
    forwarding-class LowLoss {
        loss-priority low code-point 111;
        loss-priority high code-point 110;
    }
}
}
scheduler-maps {
    schedmap_residential {
        forwarding-class BestEffort scheduler sched_BestEffort;
        forwarding-class LowLoss scheduler sched_LowLoss;
        forwarding-class LowDelay scheduler sched_LowDelay;
        forwarding-class Voice scheduler sched_Voice;
        forwarding-class Control scheduler sched_Control;
```

```
        forwarding-class Multicast scheduler sched_Multicast;
    }
}
schedulers {
    sched_Voice {
        transmit-rate percent 1;
        buffer-size percent 5;
        priority strict-high;
    }
    sched_LowDelay {
        transmit-rate percent 1;
        excess-rate proportion 180;
        buffer-size percent 10;
        priority medium-low;
        excess-priority high;
    }
    sched_LowLoss {
        excess-rate proportion 800;
        buffer-size percent 20;
        priority low;
        excess-priority low;
        drop-profile-map loss-priority any protocol any drop-profile RED-BestEffort;
    }
    sched_BestEffort {
        excess-rate proportion 180;
        buffer-size percent 30;
        priority low;
        excess-priority low;
        drop-profile-map loss-priority any protocol any drop-profile RED-BestEffort;
    }
    sched_Control {
        transmit-rate 256k;
        excess-rate proportion 20;
        priority high;
        excess-priority low;
    }
    sched_Multicast {
        transmit-rate 100m;
        excess-rate proportion 20;
        buffer-size percent 10;
        priority medium-high;
        excess-priority high;
    }
}
```

19. Confirm the firewall configuration.

```
user@host-R0# show firewall
family inet {
    filter DEFAULT_V4-IN {
        interface-specific;
        term bypass {
            from {
                service-filter-hit;
            }
            then accept;
        }
    }
}
```

```
    }
    term rest {
        then forwarding-class BestEffort;
    }
}
filter DEFAULT_V4-OUT {
    interface-specific;
    term bypass {
        from {
            service-filter-hit;
        }
        then accept;
    }
    term rest {
        then forwarding-class BestEffort;
    }
}
filter JFlow-Sample-IPv4 {
    term All {
        then {
            sample;
            accept;
        }
    }
}
}
family inet6 {
    filter DEFAULT_V6-IN {
        interface-specific;
        term bypass {
            from {
                service-filter-hit;
            }
            then accept;
        }
        term rest {
            then forwarding-class BestEffort;
        }
    }
    filter DEFAULT_V6-OUT {
        interface-specific;
        term bypass {
            from {
                service-filter-hit;
            }
            then accept;
        }
        term rest {
            then forwarding-class BestEffort;
        }
    }
}
filter JFlow-Sample-IPv6 {
    term local-v6 {
        from {
            prefix-list {
                local-lo0-ipv6;
            }
        }
    }
}
```

```

    }
  }
  then {
    count local-accept;
    sample;
    accept;
  }
}
term from-backbone {
  from {
    source-prefix-list {
      backbone-ipv6;
    }
  }
  then {
    count from-backbone-reject;
    discard;
  }
}
term to-backbone {
  from {
    destination-prefix-list {
      backbone-ipv6;
    }
  }
  then {
    count to-backbone-reject;
    discard;
  }
}
term final {
  then {
    count all-accept;
    sample;
    accept;
  }
}
}
}

```

20. Confirm the RADIUS server access configuration.

```

user@host-R0# show access radius-server
9.0.0.9 {
  port 1812;
  accounting-port 1813;
  secret "secret key!"; ## SECRET-DATA
  timeout 30;
  retry 3;
  max-outstanding-requests 500;
  source-address 100.0.0.1;
}

```

21. Confirm the access profile configuration.

```

user@host-R0# show access profile Access-Profile-0
authentication-order radius;

```

```
radius {
  authentication-server 9.0.0.9;
  accounting-server 9.0.0.9;
  options {
    nas-identifier R0;
    nas-port-extended-format {
      slot-width 3;
      adapter-width 2;
      port-width 3;
      stacked-vlan-width 12;
      vlan-width 12;
    }
    nas-port-id-format {
      nas-identifier;
      interface-description;
      agent-circuit-id;
      agent-remote-id;
    }
    nas-port-type {
      ethernet 4711;
    }
    calling-station-id-delimiter "$";
    calling-station-id-format {
      nas-identifier;
      interface-description;
      agent-circuit-id;
      agent-remote-id;
    }
    remote-circuit-id-delimiter "$";
    remote-circuit-id-format {
      agent-circuit-id;
      agent-remote-id;
    }
    remote-circuit-id-fallback configured-calling-station-id;
    override calling-station-id remote-circuit-id;
    accounting-session-id-format description;
    vlan-nas-port-stacked-format;
    juniper-dsl-attributes;
    ip-address-change-notify message JUNIPER_ADDRESS_SAVING;
  }
}
session-options {
  client-idle-timeout 900;
  client-session-timeout 86400;
}
accounting {
  order radius;
  accounting-stop-on-failure;
  accounting-stop-on-access-deny;
  immediate-update;
  coa-immediate-update;
  address-change-immediate-update;
  update-interval 1440;
  statistics volume-time;
  wait-for-acct-on-ack;
  send-acct-status-on-config-change;
```

```
    ancp-speed-change-immediate-update;
}
```

22. Confirm the address assignment configuration.

```
user@host-R0# show access address-assignment
neighbor-discovery-router-advertisement v6_NDRA_Prefix_Pool1;
pool v4-pool-0 {
  family inet {
    network 100.0.0.0/8;
    range v4-range-0 {
      low 100.16.0.1;
      high 100.31.255.255;
    }
    dhcp-attributes {
      maximum-lease-time 99999;
    }
  }
}
pool v6_NDRA_Prefix_Pool1 {
  family inet6 {
    prefix 1016:0000:0000:0000:0000:0000:0000:0000/40;
    range v6-range-0 prefix-length 64;
  }
}
pool v6_DHCPv6-PD_Pool1 {
  family inet6 {
    prefix 2016:0000:0000:0000:0000:0000:0000:0000/40;
    range v6-range-0 prefix-length 56;
    dhcp-attributes {
      dns-server {
        2015:0221::9.0.0.9;
        2015:0221::9.0.0.10;
      }
      valid-lifetime 1800;
      preferred-lifetime 1440;
      t1-percentage 50;
      t2-percentage 80;
    }
  }
}
```

23. Confirm the address protection, report interface description, and accounting backup option configurations.

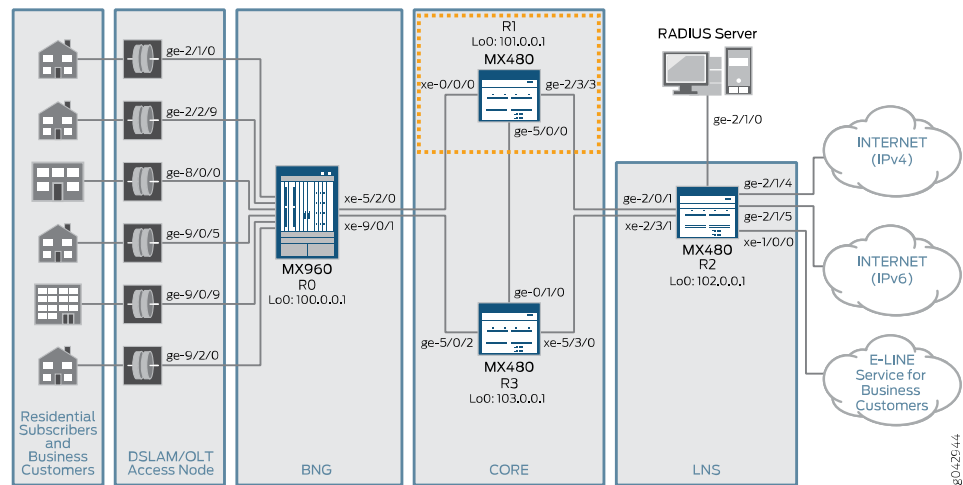
```
user@host-R0# show access
...
address-protection;
report-interface-descriptions;
accounting-backup-options {
  max-pending-accounting-stops 168000;
  max-withhold-time 1440;
}
...
```


Configuring the Core Router, R1

CLI Quick Configuration

Figure 4 on page 97 highlights the core router (R1) in the context of the reference example topology.

Figure 4: Core Router in the Topology



To quickly configure R1 as in this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the [edit] hierarchy level.

```
set system host-name R1
set interfaces lo0 unit 0 family inet address 101.0.0.1/32 primary
set interfaces lo0 unit 0 family inet address 101.0.0.1/32 preferred
set interfaces lo0 unit 0 family iso address
    47.0007.3000.0000.0000.0100.0001.0100.0100.1011.00
set interfaces lo0 unit 0 family inet6 address 1001:0::1/128 primary
set interfaces lo0 unit 0 family inet6 address 1001:0::1/128 preferred
set interfaces xe-0/0/0 description "To R0 - BNG"
set interfaces xe-0/0/0 mtu 4484
set interfaces xe-0/0/0 unit 0 family inet address 20.20.50.3/24
set interfaces xe-0/0/0 unit 0 family iso
set interfaces xe-0/0/0 unit 0 family inet6
set interfaces xe-0/0/0 unit 0 family mpls
set interfaces ge-5/0/0 description "To R3 - Core"
set interfaces ge-5/0/0 mtu 4484
set interfaces ge-5/0/0 unit 0 family inet address 20.20.90.2/24
set interfaces ge-5/0/0 unit 0 family iso
set interfaces ge-5/0/0 unit 0 family inet6
set interfaces ge-5/0/0 unit 0 family mpls
set interfaces ge-2/3/3 description "To R2 - LNS"
set interfaces ge-2/3/3 mtu 4484
set interfaces ge-2/3/3 unit 0 family inet address 20.20.60.2/24
set interfaces ge-2/3/3 unit 0 family iso
set interfaces ge-2/3/3 unit 0 family inet6
set interfaces ge-2/3/3 unit 0 family mpls
```

```
set routing-options router-id 101.0.0.1
set protocols mpls ipv6-tunneling
set protocols mpls interface lo0.0
set protocols mpls interface xe-0/0/0.0
set protocols mpls interface ge-5/0/0.0
set protocols mpls interface ge-2/3/3.0
set protocols isis lsp-lifetime 65535
set protocols isis ignore-attached-bit
set protocols isis level 2 disable
set protocols isis level 1 authentication-key "secret key!"
set protocols isis level 1 authentication-type md5
set protocols isis level 1 wide-metrics-only
set protocols isis interface lo0.0 passive
set protocols isis interface xe-0/0/0.0 ldp-synchronization
set protocols isis interface xe-0/0/0.0 lsp-interval 10
set protocols isis interface xe-0/0/0.0 point-to-point
set protocols isis interface xe-0/0/0.0 link-protection
set protocols isis interface xe-0/0/0.0 level 1 metric 2000070
set protocols isis interface ge-5/0/0.0 ldp-synchronization
set protocols isis interface ge-5/0/0.0 lsp-interval 10
set protocols isis interface ge-5/0/0.0 point-to-point
set protocols isis interface ge-5/0/0.0 link-protection
set protocols isis interface ge-5/0/0.0 level 1 metric 2000070
set protocols isis interface ge-2/3/3.0 ldp-synchronization
set protocols isis interface ge-2/3/3.0 lsp-interval 10
set protocols isis interface ge-2/3/3.0 point-to-point
set protocols isis interface ge-2/3/3.0 link-protection
set protocols isis interface ge-2/3/3.0 level 1 metric 2000070
set protocols ldp interface lo0.0
set protocols ldp interface xe-0/0/0.0
set protocols ldp interface ge-5/0/0.0
set protocols ldp interface ge-2/3/3.0
set protocols pim rp static address 102.0.0.1 version 2
set protocols pim interface xe-0/0/0.0 mode sparse
set protocols pim interface xe-0/0/0.0 version 2
set protocols pim interface ge-5/0/0.0 mode sparse
set protocols pim interface ge-5/0/0.0 version 2
set protocols pim interface ge-2/3/3.0 mode sparse
set protocols pim interface ge-2/3/3.0 version 2
set protocols pim interface all mode sparse
set protocols pim interface all version 2
set protocols pim interface fxp0.0 disable
```

Step-by-Step Procedure The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure R1:

1. Establish the hostname.

```
[edit system]
user@host-R1# set host-name host-R1
```
2. Configure the interfaces.

- a. Configure the loopback interface.

The core router system's primary address is configured under this interface.

```
[edit interfaces]
user@host-R1# set lo0 unit 0 family inet address 101.0.0.1/32 primary
user@host-R1# set lo0 unit 0 family inet address 101.0.0.1/32 preferred
user@host-R1# set lo0 unit 0 family iso address
47.0007.3000.0000.0000.0100.0001.0100.0100.1011.00
user@host-R1# set lo0 unit 0 family inet6 address 1001:0::1/128 primary
user@host-R1# set lo0 unit 0 family inet6 address 1001:0::1/128 preferred
```

- b. Configure the BNG system-facing interface.

This interface forwards and receives traffic through the core networks.

```
[edit interfaces]
user@host-R1# set xe-0/0/0 description "To R0 - BNG"
user@host-R1# set xe-0/0/0 mtu 4484
user@host-R1# set xe-0/0/0 unit 0 family inet address 20.20.50.3/24
user@host-R1# set xe-0/0/0 unit 0 family iso
user@host-R1# set xe-0/0/0 unit 0 family inet6
user@host-R1# set xe-0/0/0 unit 0 family mpls
```

- c. Configure the core router interlink.

This interface handles traffic to and from the neighbor core router.

```
[edit interfaces]
user@host-R1# set ge-5/0/0 description "To R3 - Core"
user@host-R1# set ge-5/0/0 mtu 4484
user@host-R1# set ge-5/0/0 unit 0 family inet address 20.20.90.2/24
user@host-R1# set ge-5/0/0 unit 0 family iso
user@host-R1# set ge-5/0/0 unit 0 family inet6
user@host-R1# set ge-5/0/0 unit 0 family mpls
```

- d. Configure the LNS-facing interface.

This interface handles traffic to and from retailer and ISP networks.

```
[edit interfaces]
user@host-R1# set ge-2/3/3 description "To R2 - LNS"
user@host-R1# set ge-2/3/3 mtu 4484
user@host-R1# set ge-2/3/3 unit 0 family inet address 20.20.60.2/24
user@host-R1# set ge-2/3/3 unit 0 family iso
user@host-R1# set ge-2/3/3 unit 0 family inet6
user@host-R1# set ge-2/3/3 unit 0 family mpls
```

3. Configure the router ID.

```
[edit]
user@host-R1# set routing-options router-id 101.0.0.1
```

4. Enable MPLS.

MPLS must be enabled for all interfaces connected to BNG-facing and LNS-facing ports. Because IPv6 MPLS tunneling is enabled, IPv6 routes can be resolved over an MPLS network. This is accomplished by converting LDP and RSVP routes stored in the inet.3 routing table to IPv4-mapped IPv6 addresses, which are then copied

into the inet6.3 routing table. The inet6.3 routing table can be used to resolve next hops for both inet6 and inet6-vpn routes.

```
[edit protocols]
user@host-R1# set mpls ipv6-tunneling
user@host-R1# set mpls interface lo0.0
user@host-R1# set mpls interface xe-0/0/0.0
user@host-R1# set mpls interface ge-5/0/0.0
user@host-R1# set mpls interface ge-2/3/3.0
```

5. Configure IS-IS for IGP routing.

```
[edit protocols]
user@host-R1# set isis lsp-lifetime 65535
user@host-R1# set isis ignore-attached-bit
user@host-R1# set isis level 2 disable
user@host-R1# set isis level 1 authentication-key "secret key!"
user@host-R1# set isis level 1 authentication-type md5
user@host-R1# set isis level 1 wide-metrics-only
user@host-R1# set isis interface lo0.0 passive
user@host-R1# set isis interface xe-0/0/0.0 ldp-synchronization
user@host-R1# set isis interface xe-0/0/0.0 lsp-interval 10
user@host-R1# set isis interface xe-0/0/0.0 point-to-point
user@host-R1# set isis interface xe-0/0/0.0 link-protection
user@host-R1# set isis interface xe-0/0/0.0 level 1 metric 2000070
user@host-R1# set isis interface ge-5/0/0.0 ldp-synchronization
user@host-R1# set isis interface ge-5/0/0.0 lsp-interval 10
user@host-R1# set isis interface ge-5/0/0.0 point-to-point
user@host-R1# set isis interface ge-5/0/0.0 link-protection
user@host-R1# set isis interface ge-5/0/0.0 level 1 metric 2000070
user@host-R1# set isis interface ge-2/3/3.0 ldp-synchronization
user@host-R1# set isis interface ge-2/3/3.0 lsp-interval 10
user@host-R1# set isis interface ge-2/3/3.0 point-to-point
user@host-R1# set isis interface ge-2/3/3.0 link-protection
user@host-R1# set isis interface ge-2/3/3.0 level 1 metric 2000070
```

6. Enable LDP.

LDP must be enabled for BNG-facing and LNS-facing ports.

```
[edit protocols]
user@host-R1# set ldp interface lo0.0
user@host-R1# set ldp interface xe-0/0/0.0
user@host-R1# set ldp interface ge-5/0/0.0
user@host-R1# set ldp interface ge-2/3/3.0
```

7. Enable PIM.

PIM is used for multicast group and source information exchange. Configure PIM sparse mode with all interfaces, and configure static RP.

```
[edit protocols]
user@host-R1# set pim rp static address 102.0.0.1 version 2
user@host-R1# set pim interface xe-0/0/0.0 mode sparse
user@host-R1# set pim interface xe-0/0/0.0 version 2
user@host-R1# set pim interface ge-5/0/0.0 mode sparse
user@host-R1# set pim interface ge-5/0/0.0 version 2
user@host-R1# set pim interface ge-2/3/3.0 mode sparse
user@host-R1# set pim interface ge-2/3/3.0 version 2
```

```

user@host-R1#set pim interface all mode sparse
user@host-R1#set pim interface all version 2
user@host-R1#set pim interface fxp0.0 disable

```

Results From configuration mode, confirm your configuration by entering the following **show** commands:

1. Confirm the interface configurations.

```

user@host-R1# show interfaces
lo0 {
  unit 0 {
    family inet {
      address 101.0.0.1/32 {
        primary;
        preferred;
      }
    }
    family iso {
      address 47.0007.3000.0000.0000.0100.0001.0100.0100.1011.00;
    }
    family inet6 {
      address 1001:0::1/128 {
        primary;
        preferred;
      }
    }
  }
}
xe-0/0/0 {
  description "To R0 - BNG";
  mtu 4484;
  unit 0 {
    family inet {
      address 20.20.50.3/24;
    }
    family iso;
    family inet6;
    family mpls;
  }
}
ge-5/0/0 {
  description "To R3 - Core";
  mtu 4484;
  unit 0 {
    family inet {
      address 20.20.90.2/24;
    }
    family iso;
    family inet6;
    family mpls;
  }
}
ge-2/3/3 {
  description "To R2 - LNS";
}

```

```
mtu 4484;
unit 0 {
  family inet {
    address 20.20.60.2/24;
  }
  family iso;
  family inet6;
  family mpls;
}
}
```

2. Confirm the router ID configuration.

```
user@host-R1# show routing-options
router-id 101.0.0.1;
```

3. Confirm the protocol configurations.

```
user@host-R1#show protocols
mpls {
  ipv6-tunneling;
  interface lo0.0;
  interface xe-0/0/0.0;
  interface ge-5/0/0.0;
  interface ge-2/3/3.0;
}
isis {
  lsp-lifetime 65535;
  ignore-attached-bit;
  level 2 {
    disable;
  }
  level 1 {
    authentication-key "secret key!"; ## SECRET-DATA
    authentication-type md5;
    wide-metrics-only;
  }
  interface lo0.0 {
    passive;
  }
  interface xe-0/0/0.0 {
    ldp-synchronization;
    lsp-interval 10;
    point-to-point;
    link-protection;
    level 1 {
      metric 2000070;
    }
  }
  interface ge-5/0/0.0 {
    ldp-synchronization;
    lsp-interval 10;
    point-to-point;
    link-protection;
    level 1 {
      metric 2000070;
    }
  }
}
```

```

}
interface ge-2/3/3.0 {
  ldp-synchronization;
  lsp-interval 10;
  point-to-point;
  link-protection;
  level 1 {
    metric 2000070;
  }
}
}
}
ldp {
  interface lo0.0;
  interface xe-0/0/0.0;
  interface ge-5/0/0.0;
  interface ge-2/3/3.0;
}
pim {
  rp {
    static {
      address 102.0.0.1 {
        version 2;
      }
    }
  }
}
interface xe-0/0/0.0 {
  mode sparse;
  version 2;
}
interface ge-5/0/0.0 {
  mode sparse;
  version 2;
}
interface ge-2/3/3.0 {
  mode sparse;
  version 2;
}
interface all {
  mode sparse;
  version 2;
}
interface fxp0.0 {
  disable;
}
}
}

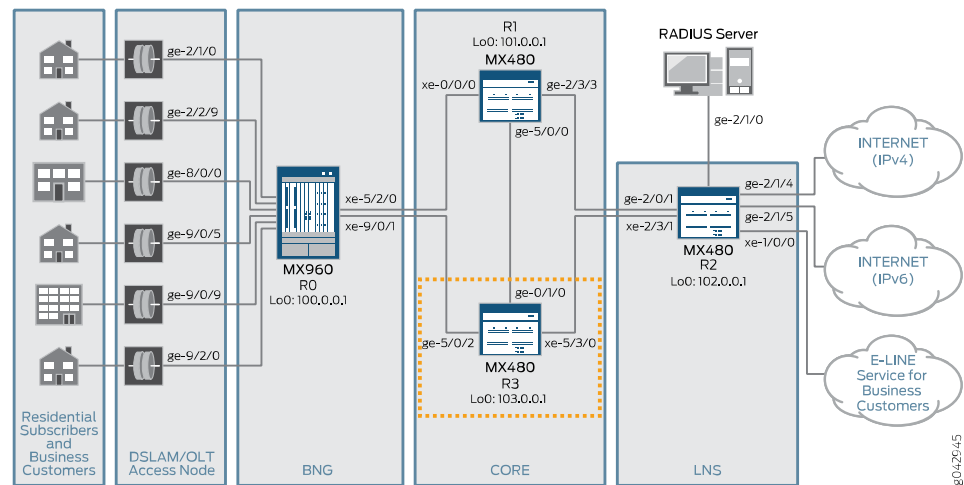
```

Configuring the Second Core Router, R3

CLI Quick Configuration

Figure 5 on page 104 highlights the second core router (R3) in the context of the reference example topology.

Figure 5: Second Core Router in the Topology



To quickly configure R3 as in this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

```

set system host-name R3
set interfaces lo0 unit 0 family inet address 103.0.0.1/32 primary
set interfaces lo0 unit 0 family inet address 103.0.0.1/32 preferred
set interfaces lo0 unit 0 family iso address
    47.0007.3000.0000.0000.0100.0001.0100.0100.1012.00
set interfaces lo0 unit 0 family inet6 address 1003::1/128 primary
set interfaces lo0 unit 0 family inet6 address 1003::1/128 preferred
set interfaces ge-5/0/2 description "To R0 - BNG"
set interfaces ge-5/0/2 mtu 4484
set interfaces ge-5/0/2 unit 0 family inet address 20.20.70.3/24
set interfaces ge-5/0/2 unit 0 family iso
set interfaces ge-5/0/2 unit 0 family inet6
set interfaces ge-5/0/2 unit 0 family mpls
set interfaces xe-5/3/0 description "To R2 - LNS"
set interfaces xe-5/3/0 mtu 4484
set interfaces xe-5/3/0 unit 0 family inet address 20.20.80.3/24
set interfaces xe-5/3/0 unit 0 family iso
set interfaces xe-5/3/0 unit 0 family inet6
set interfaces xe-5/3/0 unit 0 family mpls
set interfaces ge-0/1/0 description "To R1 - Core"
set interfaces ge-0/1/0 mtu 4484
set interfaces ge-0/1/0 unit 0 family inet address 20.20.90.3/24
set interfaces ge-0/1/0 unit 0 family iso
set interfaces ge-0/1/0 unit 0 family inet6
set interfaces ge-0/1/0 unit 0 family mpls
set routing-options router-id 103.0.0.1
set protocols mpls ipv6-tunneling
set protocols mpls interface lo0.0
set protocols mpls interface ge-5/0/2.0
set protocols mpls interface xe-5/3/0.0

```



```

set protocols mpls interface ge-0/1/0.0
set protocols isis lsp-lifetime 65535
set protocols isis ignore-attached-bit
set protocols isis level 2 disable
set protocols isis level 1 authentication-key "secret key!"
set protocols isis level 1 authentication-type md5
set protocols isis level 1 wide-metrics-only
set protocols isis interface lo0.0 passive
set protocols isis interface ge-5/0/2.0 ldp-synchronization
set protocols isis interface ge-5/0/2.0 lsp-interval 10
set protocols isis interface ge-5/0/2.0 point-to-point
set protocols isis interface ge-5/0/2.0 link-protection
set protocols isis interface ge-5/0/2.0 level 1 metric 2000070
set protocols isis interface xe-5/3/0.0 ldp-synchronization
set protocols isis interface xe-5/3/0.0 lsp-interval 10
set protocols isis interface xe-5/3/0.0 point-to-point
set protocols isis interface xe-5/3/0.0 link-protection
set protocols isis interface xe-5/3/0.0 level 1 metric 2000070
set protocols isis interface ge-0/1/0.0 ldp-synchronization
set protocols isis interface ge-0/1/0.0 lsp-interval 10
set protocols isis interface ge-0/1/0.0 point-to-point
set protocols isis interface ge-0/1/0.0 link-protection
set protocols isis interface ge-0/1/0.0 level 1 metric 2000070
set protocols ldp interface lo0.0
set protocols ldp interface ge-5/0/2.0
set protocols ldp interface xe-5/3/0.0
set protocols ldp interface ge-0/1/0.0
set protocols pim rp static address 102.0.0.1 version 2
set protocols pim interface ge-5/0/2.0 mode sparse
set protocols pim interface ge-5/0/2.0 version 2
set protocols pim interface xe-5/3/0.0 mode sparse
set protocols pim interface xe-5/3/0.0 version 2
set protocols pim interface ge-0/1/0.0 mode sparse
set protocols pim interface ge-0/1/0.0 version 2
set protocols pim interface all mode sparse
set protocols pim interface all version 2
set protocols pim interface fxp0.0 disable

```

Step-by-Step Procedure The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure R3:

1. Establish the hostname.


```
[edit system]
user@host-R3# set host-name host-R3
```
2. Configure the interfaces.
 - a. Configure the loopback interface.

The core router system's primary address is configured under this interface.

```
[edit interfaces]
user@host-R3# set lo0 unit 0 family inet address 103.0.0.1/32 primary
```

```
user@host-R3# set lo0 unit 0 family inet address 103.0.0.1/32 preferred
user@host-R3# set lo0 unit 0 family iso address
47.0007.3000.0000.0000.0100.0001.0100.0100.1012.00
user@host-R3# set lo0 unit 0 family inet6 address 1003:0::1/128 primary
user@host-R3# set lo0 unit 0 family inet6 address 1003:0::1/128 preferred
```

- b. Configure the BNG system-facing interface.

This interface forwards and receives traffic through the core networks.

```
[edit interfaces]
user@host-R3# set ge-5/0/2 description "To R0 - BNG"
user@host-R3# set ge-5/0/2 mtu 4484
user@host-R3# set ge-5/0/2 unit 0 family inet address 20.20.70.3/24
user@host-R3# set ge-5/0/2 unit 0 family iso
user@host-R3# set ge-5/0/2 unit 0 family inet6
user@host-R3# set ge-5/0/2 unit 0 family mpls
```

- c. Configure the LNS-facing interface.

This interface handles traffic to and from retailer and ISP networks.

```
[edit interfaces]
user@host-R3# set xe-5/3/0 description "To R2 - LNS"
user@host-R3# set xe-5/3/0 mtu 4484
user@host-R3# set xe-5/3/0 unit 0 family inet address 20.20.80.3/24
user@host-R3# set xe-5/3/0 unit 0 family iso
user@host-R3# set xe-5/3/0 unit 0 family inet6
user@host-R3# set xe-5/3/0 unit 0 family mpls
```

- d. Configure the core router interlink.

This interface handles traffic to and from the neighboring core router.

```
[edit interfaces]
user@host-R3# set ge-0/1/0 description "To R1 - Core"
user@host-R3# set ge-0/1/0 mtu 4484
user@host-R3# set ge-0/1/0 unit 0 family inet address 20.20.90.3/24
user@host-R3# set ge-0/1/0 unit 0 family iso
user@host-R3# set ge-0/1/0 unit 0 family inet6
user@host-R3# set ge-0/1/0 unit 0 family mpls
```

3. Configure the router ID.

```
[edit]
user@host-R3# set routing-options router-id 103.0.0.1
```

4. Enable MPLS.

MPLS must be enabled for all interfaces connected to BNG-facing and LNS-facing ports. Because IPv6 MPLS tunneling is enabled, IPv6 routes can be resolved over an MPLS network. This is accomplished by converting LDP and RSVP routes stored in the inet.3 routing table to IPv4-mapped IPv6 addresses, which are then copied into the inet6.3 routing table. The inet6.3 routing table can be used to resolve next hops for both inet6 and inet6-vpn routes.

```
[edit protocols]
user@host-R3# set mpls ipv6-tunneling
user@host-R3# set mpls interface lo0.0
user@host-R3# set mpls interface ge-5/0/2.0
```

```

user@host-R3# set mpls interface xe-5/3/0.0
user@host-R3# set mpls interface ge-0/1/0.0

```

5. Configure IS-IS for IGP routing.

```

[edit protocols]
user@host-R3# set isis lsp-lifetime 65535
user@host-R3# set isis ignore-attached-bit
user@host-R3# set isis level 2 disable
user@host-R3# set isis level 1 authentication-key "secret key!"
user@host-R3# set isis level 1 authentication-type md5
user@host-R3# set isis level 1 wide-metrics-only
user@host-R3# set isis interface lo0.0 passive
user@host-R3# set isis interface ge-5/0/2.0 ldp-synchronization
user@host-R3# set isis interface ge-5/0/2.0 lsp-interval 10
user@host-R3# set isis interface ge-5/0/2.0 point-to-point
user@host-R3# set isis interface ge-5/0/2.0 link-protection
user@host-R3# set isis interface ge-5/0/2.0 level 1 metric 2000070
user@host-R3# set isis interface xe-5/3/0.0 ldp-synchronization
user@host-R3# set isis interface xe-5/3/0.0 lsp-interval 10
user@host-R3# set isis interface xe-5/3/0.0 point-to-point
user@host-R3# set isis interface xe-5/3/0.0 link-protection
user@host-R3# set isis interface xe-5/3/0.0 level 1 metric 2000070
user@host-R3# set isis interface ge-0/1/0.0 ldp-synchronization
user@host-R3# set isis interface ge-0/1/0.0 lsp-interval 10
user@host-R3# set isis interface ge-0/1/0.0 point-to-point
user@host-R3# set isis interface ge-0/1/0.0 link-protection
user@host-R3# set isis interface ge-0/1/0.0 level 1 metric 2000070

```

6. Enable LDP.

LDP must be enabled for BNG-facing and LNS-facing ports.

```

[edit protocols]
user@host-R3# set ldp interface lo0.0
user@host-R3# set ldp interface ge-5/0/2.0
user@host-R3# set ldp interface xe-5/3/0.0
user@host-R3# set ldp interface ge-0/1/0.0

```

7. Enable PIM.

PIM is used for multicast group and source information exchange. Configure PIM sparse mode with all interfaces, and configure static RP.

```

[edit protocols]
user@host-R3# set pim rp static address 102.0.0.1 version 2
user@host-R3# set pim interface ge-5/0/2.0 mode sparse
user@host-R3# set pim interface ge-5/0/2.0 version 2
user@host-R3# set pim interface xe-5/3/0.0 mode sparse
user@host-R3# set pim interface xe-5/3/0.0 version 2
user@host-R3# set pim interface ge-0/1/0.0 mode sparse
user@host-R3# set pim interface ge-0/1/0.0 version 2
user@host-R3# set pim interface all mode sparse
user@host-R3# set pim interface all version 2
user@host-R3# set pim interface fxp0.0 disable

```

Results From configuration mode, confirm your configuration by entering the following **show** commands:

1. Confirm the interface configurations.

```
user@host-R3# show interfaces
lo0 {
  unit 0 {
    family inet {
      address 103.0.0.1/32 {
        primary;
        preferred;
      }
    }
    family iso {
      address 47.0007.3000.0000.0000.0100.0001.0100.0100.1012.00;
    }
    family inet6 {
      address 1003:0::1/128 {
        primary;
        preferred;
      }
    }
  }
}
ge-5/0/2 {
  description "To R0 - BNG";
  mtu 4484;
  unit 0 {
    family inet {
      address 20.20.70.3/24;
    }
    family iso;
    family inet6;
    family mpls;
  }
}
xe-5/3/0 {
  description "To R2 - LNS";
  mtu 4484;
  unit 0 {
    family inet {
      address 20.20.80.3/24;
    }
    family iso;
    family inet6;
    family mpls;
  }
}
ge-0/1/0 {
  description "To R1 - Core";
  mtu 4484;
  unit 0 {
    family inet {
      address 20.20.90.3/24;
    }
    family iso;
    family inet6;
    family mpls;
  }
}
```

```

    }
  }

```

2. Confirm the router ID configuration.

```

user@host-R3# show routing-options
router-id 103.0.0.1;

```

3. Confirm the protocol configurations.

```

user@host-R3# show protocols
mpls {
  ipv6-tunneling;
  interface lo0.0;
  interface ge-5/0/2.0;
  interface xe-5/3/0.0;
  interface ge-0/1/0.0;
}
isis {
  lsp-lifetime 65535;
  ignore-attached-bit;
  level 2 {
    disable;
  }
  level 1 {
    authentication-key "secret key!"; ## SECRET-DATA
    authentication-type md5;
    wide-metrics-only;
  }
  interface lo0.0 {
    passive;
  }
  interface ge-5/0/2.0 {
    ldp-synchronization;
    lsp-interval 10;
    point-to-point;
    link-protection;
    level 1 {
      metric 2000070;
    }
  }
  interface xe-5/3/0.0 {
    ldp-synchronization;
    lsp-interval 10;
    point-to-point;
    link-protection;
    level 1 {
      metric 2000070;
    }
  }
  interface ge-0/1/0.0 {
    ldp-synchronization;
    lsp-interval 10;
    point-to-point;
    link-protection;
    level 1 {
      metric 2000070;
    }
  }
}

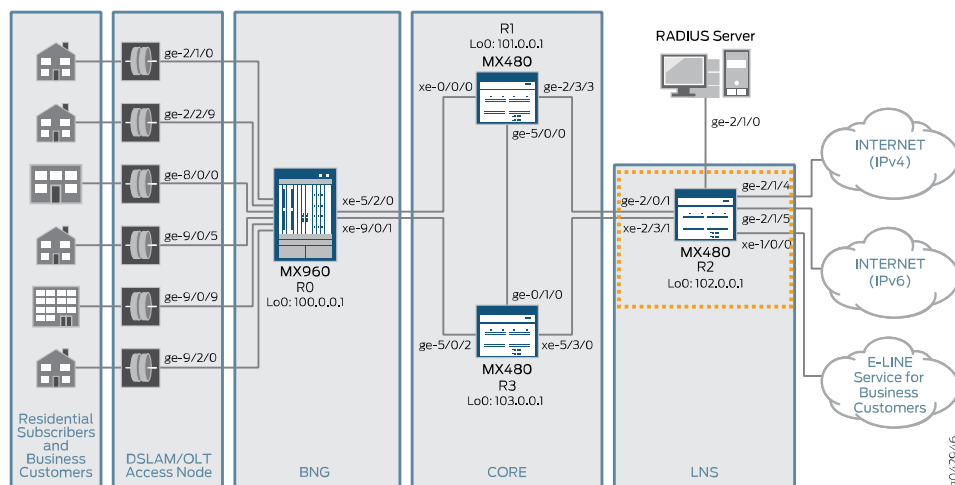
```

```
    }  
  }  
}  
ldp {  
  interface lo0.0;  
  interface ge-5/0/2.0;  
  interface xe-5/3/0.0;  
  interface ge-0/1/0.0;  
}  
pim {  
  rp {  
    static {  
      address 102.0.0.1 {  
        version 2;  
      }  
    }  
  }  
  interface ge-5/0/2.0 {  
    mode sparse;  
    version 2;  
  }  
  interface xe-5/3/0.0 {  
    mode sparse;  
    version 2;  
  }  
  interface ge-0/1/0.0 {  
    mode sparse;  
    version 2;  
  }  
  interface all {  
    mode sparse;  
    version 2;  
  }  
  interface fxp0.0 {  
    disable;  
  }  
}
```

Configuring the LNS Device, R2

CLI Quick Configuration [Figure 6 on page 111](#) highlights the LNS device (R2) in the context of the reference example topology.

Figure 6: L2TP Network Server Device in the Topology



To quickly configure the R2 device as in this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the [edit] hierarchy level.

```

set dynamic-profiles lns-profile routing-instances "$junos-routing-instance" interface
"$junos-interface-name"
set dynamic-profiles lns-profile interfaces "$junos-interface-ifd-name" unit
"$junos-interface-unit" dial-options l2tp-interface-id dedicated
set dynamic-profiles lns-profile interfaces "$junos-interface-ifd-name" unit
"$junos-interface-unit" no-keepalives
set dynamic-profiles lns-profile interfaces "$junos-interface-ifd-name" unit
"$junos-interface-unit" family inet unnumbered-address "$junos-loopback-interface"
set dynamic-profiles lns-profile interfaces "$junos-interface-ifd-name" unit
"$junos-interface-unit" family inet6 unnumbered-address "$junos-loopback-interface"
set system host-name R2
set system services dhcp-local-server dhcpv6 overrides delegated-pool v6-l2tp-pool-0
set system services dhcp-local-server dhcpv6 group v6-ppp-client-0 interface si-2/0/0.0
set chassis fpc 2 pic 0 tunnel-services bandwidth 1g
set chassis fpc 2 pic 0 inline-services bandwidth 1g
set services l2tp tunnel-group lns-tunnel-group l2tp-access-profile lns-profile
set services l2tp tunnel-group lns-tunnel-group local-gateway address 102.0.0.1
set services l2tp tunnel-group lns-tunnel-group service-device-pool
lns_service_device_pool
set services l2tp tunnel-group lns-tunnel-group dynamic-profile lns-profile
set services service-device-pools pool lns_service_device_pool interface si-2/0/0
set access-profile AccProf-LNS
set interfaces lo0 unit 0 family inet address 102.0.0.1/32 primary
set interfaces lo0 unit 0 family inet address 102.0.0.1/32 preferred
set interfaces lo0 unit 0 family iso address
47.0007.3000.0000.0000.0100.0001.0100.0100.1013.00
set interfaces lo0 unit 0 family inet6 address 1002::1/128 primary
set interfaces lo0 unit 0 family inet6 address 1002::1/128 preferred
set interfaces si-2/0/0 unit 0 family inet
set interfaces si-2/0/0 unit 0 family inet6

```

```
set interfaces ge-2/1/0 description "To Radius Server"
set interfaces ge-2/1/0 unit 0 family inet address 9.0.0.1/24
set interfaces ge-2/1/4 description "To IPv4 Network"
set interfaces ge-2/1/4 mtu 4484
set interfaces ge-2/1/4 unit 0 family inet address 20.20.60.3/24
set interfaces ge-2/1/4 unit 0 family inet address 200.0.1.1/24
set interfaces ge-2/1/4 unit 0 family iso
set interfaces ge-2/1/4 unit 0 family inet6
set interfaces ge-2/1/4 unit 0 family mpls
set interfaces xe-2/3/1 description "To R3 - Core"
set interfaces xe-2/3/1 mtu 4484
set interfaces xe-2/3/1 unit 0 family inet address 20.20.80.2/24
set interfaces xe-2/3/1 unit 0 family iso
set interfaces xe-2/3/1 unit 0 family inet6
set interfaces xe-2/3/1 unit 0 family mpls
set interfaces ge-2/1/5 description "To IPv6 Network"
set interfaces ge-2/1/5 unit 0 family inet6 address 3008:db8:ffff:3::3/64
set interfaces xe-1/0/0 flexible-vlan-tagging
set interfaces xe-1/0/0 encapsulation flexible-ethernet-services
set interfaces xe-1/0/0 unit 1 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 1 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 1 vlan-tags inner 301
set interfaces xe-1/0/0 unit 2 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 2 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 2 vlan-tags inner 302
set interfaces xe-1/0/0 unit 3 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 3 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 3 vlan-tags inner 303
set interfaces xe-1/0/0 unit 4 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 4 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 4 vlan-tags inner 304
set interfaces xe-1/0/0 unit 5 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 5 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 5 vlan-tags inner 305
set interfaces xe-1/0/0 unit 6 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 6 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 6 vlan-tags inner 306
set interfaces xe-1/0/0 unit 7 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 7 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 7 vlan-tags inner 307
set interfaces xe-1/0/0 unit 8 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 8 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 8 vlan-tags inner 308
set interfaces xe-1/0/0 unit 9 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 9 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 9 vlan-tags inner 309
set interfaces xe-1/0/0 unit 10 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 10 vlan-tags outer 3001
set interfaces xe-1/0/0 unit 10 vlan-tags inner 310
set interfaces xe-1/0/0 unit 11 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 11 vlan-tags outer 3001
set interfaces xe-1/0/0 unit 11 vlan-tags inner 311
set interfaces xe-1/0/0 unit 12 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 12 vlan-tags outer 3001
set interfaces xe-1/0/0 unit 12 vlan-tags inner 312
set interfaces xe-1/0/0 unit 13 encapsulation vlan-ccc
```



```
set interfaces xe-1/0/0 unit 13 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 13 vlan-tags inner 313
set interfaces xe-1/0/0 unit 14 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 14 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 14 vlan-tags inner 314
set interfaces xe-1/0/0 unit 15 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 15 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 15 vlan-tags inner 315
set interfaces xe-1/0/0 unit 16 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 16 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 16 vlan-tags inner 316
set interfaces xe-1/0/0 unit 17 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 17 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 17 vlan-tags inner 317
set interfaces xe-1/0/0 unit 18 encapsulation vlan-ccc
set interfaces xe-1/0/0 unit 18 vlan-tags outer 3101
set interfaces xe-1/0/0 unit 18 vlan-tags inner 318
set routing-options router-id 102.0.0.1
set protocols mpls ipv6-tunneling
set protocols mpls interface lo0.0
set protocols mpls interface xe-2/3/1.0
set protocols mpls interface ge-2/1/4.0
set protocols bgp local-as 65500
set protocols bgp group Internal type internal
set protocols bgp group Internal local-address 102.0.0.1
set protocols bgp group Internal export export-static
set protocols bgp group Internal neighbor 100.0.0.1 family inet unicast
set protocols bgp group Internal neighbor 100.0.0.1 family inet6 unicast
set protocols bgp group Internal neighbor 100.0.0.1 export export-static
set protocols bgp group External type external
set protocols bgp group External multihop ttl 5
set protocols bgp group External peer-as 20000
set protocols bgp group External as-override
set protocols bgp group External neighbor 200.1.0.2 family inet unicast
set protocols bgp group External neighbor 200.1.0.2 family inet6 unicast
set protocols isis lsp-lifetime 65535
set protocols isis ignore-attached-bit
set protocols isis level 2 disable
set protocols isis level 1 authentication-key "secret key!"
set protocols isis level 1 authentication-type md5
set protocols isis level 1 wide-metrics-only
set protocols isis interface fxp0.0 disable
set protocols isis interface lo0.0 passive
set protocols isis interface ge-2/1/0.0 passive
set protocols isis interface ge-2/1/5.0 passive
set protocols isis interface ge-2/1/4.0 ldp-synchronization
set protocols isis interface ge-2/1/4.0 lsp-interval 10
set protocols isis interface ge-2/1/4.0 point-to-point
set protocols isis interface ge-2/1/4.0 link-protection
set protocols isis interface ge-2/1/4.0 passive
set protocols isis interface ge-2/1/4.0 level 1 metric 2000070
set protocols isis interface xe-2/3/1.0 ldp-synchronization
set protocols isis interface xe-2/3/1.0 lsp-interval 10
set protocols isis interface xe-2/3/1.0 point-to-point
set protocols isis interface xe-2/3/1.0 link-protection
set protocols isis interface xe-2/3/1.0 level 1 metric 2000070
```

```
set protocols ldp interface lo0.0
set protocols ldp interface xe-2/3/1.0
set protocols ldp interface ge-2/1/4.0
set protocols pim rp local address 102.0.0.1
set protocols pim interface fxp0.0 disable
set protocols pim interface lo0.0 mode sparse
set protocols pim interface lo0.0 version 2
set protocols pim interface xe-2/3/1.0 mode sparse
set protocols pim interface xe-2/3/1.0 version 2
set protocols pim interface ge-2/1/4.0 mode sparse
set protocols pim interface ge-2/1/4.0 version 2
set protocols pim interface ge-2/1/5.0 mode sparse
set protocols pim interface ge-2/1/5.0 version 2
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.1 virtual-circuit-id 1
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.2 virtual-circuit-id 2
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.3 virtual-circuit-id 3
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.4 virtual-circuit-id 4
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.5 virtual-circuit-id 5
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.6 virtual-circuit-id 6
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.7 virtual-circuit-id 7
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.8 virtual-circuit-id 8
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.9 virtual-circuit-id 9
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.10 virtual-circuit-id 10
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.11 virtual-circuit-id 11
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.12 virtual-circuit-id 12
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.13 virtual-circuit-id 13
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.14 virtual-circuit-id 14
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.15 virtual-circuit-id 15
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.16 virtual-circuit-id 16
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.17 virtual-circuit-id 17
set protocols l2circuit neighbor 100.0.0.1 interface xe-1/0/0.18 virtual-circuit-id 18
set policy-options policy-statement export-static term 1 from protocol static
set policy-options policy-statement export-static term 1 from route-filter 200.1.0.0/24
  exact
set policy-options policy-statement export-static term 1 then accept
set policy-options policy-statement export-static term 2 from protocol static
set policy-options policy-statement export-static term 2 then accept
set access radius-server 9.0.0.9 secret "secret key!"
set access radius-server 9.0.0.9 source-address 102.0.0.1
set access group-profile lns-group-profile ppp ppp-options pap
set access group-profile lns-group-profile ppp ppp-options chap
set access group-profile lns-group-profile ppp keepalive 30
set access profile AccProf-LNS authentication-order none
set access profile lns-profile client sandbox_1 l2tp shared-secret "secret key!"
set access profile lns-profile client sandbox_1 user-group-profile lns-group-profile
set access profile lns-profile client sandbox_2 l2tp shared-secret "secret key!"
set access profile lns-profile client sandbox_2 user-group-profile lns-group-profile
set access profile lns-profile client sandbox_3 l2tp shared-secret "secret key!"
set access profile lns-profile client sandbox_3 user-group-profile lns-group-profile
set access profile lns-profile client sandbox_4 l2tp shared-secret "secret key!"
set access profile lns-profile client sandbox_4 user-group-profile lns-group-profile
set access address-assignment pool v4-l2tp-pool-0 family inet network 100.0.0.0/8
set access address-assignment pool v4-l2tp-pool-0 family inet range l2tpv4 low 100.48.0.1
set access address-assignment pool v4-l2tp-pool-0 family inet range l2tpv4 high
  100.63.255.255
set access address-assignment pool v6-l2tp-pool-0 family inet6 prefix 1000:0000::/32
```

```

set access address-assignment pool v6-l2tp-pool-0 family inet6 range v6-range low
1000:0000:0000:0001::/64
set access address-assignment pool v6-l2tp-pool-0 family inet6 range v6-range high
1000:0000:0000:ffff::/64
set access address-assignment pool v6-ndra-pool-0 family inet6 prefix
3000:0000:0000:0000:0000:0000:0000:0000/32
set access address-assignment pool v6-ndra-pool-0 family inet6 range v6-range-0
prefix-length 64

```

Step-by-Step Procedure The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure R2:

1. Configure dynamic profiles.

Dynamic profiles are required for dynamic configuration of L2TP session interface characteristics such as address family type, address type, and filters.

```

[edit dynamic-profiles]
user@host-R2# set lns-profile routing-instances "$junos-routing-instance" interface
"$junos-interface-name"
user@host-R2# set lns-profile interfaces "$junos-interface-ifd-name" unit
"$junos-interface-unit" dial-options l2tp-interface-id dedicated
user@host-R2# set s lns-profile interfaces "$junos-interface-ifd-name" unit
"$junos-interface-unit" no-keepalives
user@host-R2# set lns-profile interfaces "$junos-interface-ifd-name" unit
"$junos-interface-unit" family inet unnumbered-address
"$junos-loopback-interface"
user@host-R2# set lns-profile interfaces "$junos-interface-ifd-name" unit
"$junos-interface-unit" family inet6 unnumbered-address
"$junos-loopback-interface"

```

2. Configure system-level parameters.

- a. Establish the hostname.

```

[edit system]
user@host-R2# set host-name host-R2

```

- b. Configure DHCPv6 local server parameters.

Override DHCPv6 configuration options, and specify an interface within a DHCPv6 group on which the DHCP local server is enabled.

```

[edit system]
user@host-R2# set services dhcp-local-server dhcpv6 overrides delegated-pool
v6-l2tp-pool-0
user@host-R2# set services dhcp-local-server dhcpv6 group v6-ppp-client-0
interface si-2/0/0.0

```

3. Configure assigned bandwidth for L2TP in-line and tunnel services.

L2TP traffic is processed by the in-line service capability of the general network interface module rather than by a service dedicated module; line modules handle both L2TP and non-L2TP traffic.

```

[edit chassis]

```

```
user@host-R2# set fpc 2 pic 0 tunnel-services bandwidth 1g
user@host-R2# set fpc 2 pic 0 inline-services bandwidth 1g
```

4. Configure L2TP tunnel group parameters.

Configure an L2TP tunnel group with the L2TP gateway's local address. Configure a pool of service interfaces and assign it to an L2TP tunnel group for traffic load balancing. The service device pool is required for dynamic LNS sessions.

```
[edit services]
user@host-R2# set l2tp tunnel-group lns-tunnel-group l2tp-access-profile lns-profile
user@host-R2# set l2tp tunnel-group lns-tunnel-group local-gateway address
102.0.0.1
user@host-R2# set l2tp tunnel-group lns-tunnel-group service-device-pool
lns_service_device_pool
user@host-R2# set l2tp tunnel-group lns-tunnel-group dynamic-profile lns-profile
user@host-R2# set service-device-pools pool lns_service_device_pool interface
si-2/0/0
```

5. Specify the access profile to be used by the primary routing instance.

```
[edit]
user@host-R2# set access-profile AccProf-LNS
```

6. Configure the interfaces.

- a. Configure the loopback interface.

The loopback interface includes both inet and inet6 address families to enable a dual-stack routing environment.

```
[edit interfaces]
user@host-R2# set lo0 unit 0 family inet address 102.0.0.1/32 primary
user@host-R2# set lo0 unit 0 family inet address 102.0.0.1/32 preferred
user@host-R2# set lo0 unit 0 family iso address
47.0007.3000.0000.0000.0100.0001.0100.0100.1013.00
user@host-R2# set lo0 unit 0 family inet6 address 1002:0::1/128 primary
user@host-R2# set lo0 unit 0 family inet6 address 1002:0::1/128 preferred
```

7. Enable inet and inet6 address families to allow in-line service to support IPv4 and IPv6 dual-stack traffic.

```
[edit interfaces]
user@host-R2# set si-2/0/0 unit 0 family inet
user@host-R2# set si-2/0/0 unit 0 family inet6
```

8. Configure the RADIUS server-facing interface.

```
[edit interfaces]
user@host-R2# set ge-2/1/0 description "To Radius Server"
user@host-R2# set ge-2/1/0 unit 0 family inet address 9.0.0.1/24
```

9. Configure the network-facing interfaces.

```
[edit interfaces]
user@host-R2# set ge-2/1/4 description "To IPv4 Network"
user@host-R2# set ge-2/1/4 unit 0 family inet address 200.0.1.1/24
user@host-R2# set ge-2/1/5 description "To IPv6 Network"
user@host-R2# set ge-2/1/5 unit 0 family inet6 address 3008:db8:ffff:3::3/64
```

10. Configure the core-facing interfaces.

```
[edit interfaces]
user@host-R2# set ge-2/0/1 description "To R1 - Core"
user@host-R2# set ge-2/0/1 mtu 4484
user@host-R2# set ge-2/0/1 unit 0 family inet address 20.20.60.3/24
user@host-R2# set ge-2/0/1 unit 0 family iso
user@host-R2# set ge-2/0/1 unit 0 family inet6
user@host-R2# set ge-2/0/1 unit 0 family mpls
user@host-R2# set xe-2/3/1 description "To R3 - Core"
user@host-R2# set xe-2/3/1 mtu 4484
user@host-R2# set xe-2/3/1 unit 0 family inet address 20.20.80.2/24
user@host-R2# set xe-2/3/1 unit 0 family iso
user@host-R2# set xe-2/3/1 unit 0 family inet6
user@host-R2# set xe-2/3/1 unit 0 family mpls
```

11. Configure the interface for Ethernet private line (EPL) service to business customers.

```
[edit interfaces]
user@host-R2# set xe-1/0/0 flexible-vlan-tagging
user@host-R2# set xe-1/0/0 encapsulation flexible-ethernet-services
user@host-R2# set xe-1/0/0 unit 1 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 1 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 1 vlan-tags inner 301
user@host-R2# set xe-1/0/0 unit 2 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 2 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 2 vlan-tags inner 302
user@host-R2# set xe-1/0/0 unit 3 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 3 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 3 vlan-tags inner 303
user@host-R2# set xe-1/0/0 unit 4 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 4 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 4 vlan-tags inner 304
user@host-R2# set xe-1/0/0 unit 5 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 5 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 5 vlan-tags inner 305
user@host-R2# set xe-1/0/0 unit 6 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 6 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 6 vlan-tags inner 306
user@host-R2# set xe-1/0/0 unit 7 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 7 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 7 vlan-tags inner 307
user@host-R2# set xe-1/0/0 unit 8 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 8 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 8 vlan-tags inner 308
user@host-R2# set xe-1/0/0 unit 9 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 9 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 9 vlan-tags inner 309
user@host-R2# set xe-1/0/0 unit 10 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 10 vlan-tags outer 3001
user@host-R2# set xe-1/0/0 unit 10 vlan-tags inner 310
user@host-R2# set xe-1/0/0 unit 11 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 11 vlan-tags outer 3001
user@host-R2# set xe-1/0/0 unit 11 vlan-tags inner 311
user@host-R2# set xe-1/0/0 unit 12 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 12 vlan-tags outer 3001
user@host-R2# set xe-1/0/0 unit 12 vlan-tags inner 312
user@host-R2# set xe-1/0/0 unit 13 encapsulation vlan-ccc
```

```
user@host-R2# set xe-1/0/0 unit 13 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 13 vlan-tags inner 313
user@host-R2# set xe-1/0/0 unit 14 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 14 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 14 vlan-tags inner 314
user@host-R2# set xe-1/0/0 unit 15 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 15 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 15 vlan-tags inner 315
user@host-R2# set xe-1/0/0 unit 16 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 16 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 16 vlan-tags inner 316
user@host-R2# set xe-1/0/0 unit 17 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 17 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 17 vlan-tags inner 317
user@host-R2# set xe-1/0/0 unit 18 encapsulation vlan-ccc
user@host-R2# set xe-1/0/0 unit 18 vlan-tags outer 3101
user@host-R2# set xe-1/0/0 unit 18 vlan-tags inner 318
```

12. Configure the router ID.

```
[edit routing-options]
user@host-R2# set router-id 102.0.0.1
```

13. Configure and enable protocols.

- a. Configure MPLS.

MPLS must be enabled for all interfaces connected to BNG-facing and LNS-facing ports. Because IPv6 MPLS tunneling is enabled, IPv6 routes can be resolved over an MPLS network. This is accomplished by converting LDP and RSVP routes stored in the inet.3 routing table to IPv4-mapped IPv6 addresses, which are then copied into the inet6.3 routing table. The inet6.3 routing table can be used to resolve next hops for both inet6 and inet6-vpn routes.

```
[edit protocols]
user@host-R2# set mpls ipv6-tunneling
user@host-R2# set mpls interface lo0.0
user@host-R2# set mpls interface xe-2/3/1.0
user@host-R2# set mpls interface ge-2/1/4.0
```

- b. Configure BGP.

```
[edit protocols]
user@host-R2# set bgp local-as 65500
user@host-R2# set bgp group Internal type internal
user@host-R2# set bgp group Internal local-address 102.0.0.1
user@host-R2# set bgp group Internal export export-static
user@host-R2# set bgp group Internal neighbor 100.0.0.1 family inet unicast
user@host-R2# set bgp group Internal neighbor 100.0.0.1 family inet6 unicast
user@host-R2# set bgp group Internal neighbor 100.0.0.1 export export-static
user@host-R2# set bgp group External type external
user@host-R2# set bgp group External multihop ttl 5
user@host-R2# set bgp group External peer-as 20000
user@host-R2# set bgp group External as-override
user@host-R2# set bgp group External neighbor 200.1.0.2 family inet unicast
user@host-R2# set bgp group External neighbor 200.1.0.2 family inet6 unicast
```

- c. Configure IS-IS for routing information exchange.

```
[edit protocols]
user@host-R2# set isis lsp-lifetime 65535
user@host-R2# set isis ignore-attached-bit
user@host-R2# set isis level 2 disable
user@host-R2# set isis level 1 authentication-key "secret key!"
user@host-R2# set isis level 1 authentication-type md5
user@host-R2# set isis level 1 wide-metrics-only
user@host-R2# set isis interface fxp0.0 disable
user@host-R2# set isis interface lo0.0 passive
user@host-R2# set isis interface ge-2/1/0.0 passive
user@host-R2# set isis interface ge-2/1/5.0 passive
user@host-R2# set isis interface ge-2/1/4.0 ldp-synchronization
user@host-R2# set isis interface ge-2/1/4.0 lsp-interval 10
user@host-R2# set isis interface ge-2/1/4.0 point-to-point
user@host-R2# set isis interface ge-2/1/4.0 link-protection
user@host-R2# set isis interface ge-2/1/4.0 passive
user@host-R2# set isis interface ge-2/1/4.0 level 1 metric 2000070
user@host-R2# set isis interface xe-2/3/1.0 ldp-synchronization
user@host-R2# set isis interface xe-2/3/1.0 lsp-interval 10
user@host-R2# set isis interface xe-2/3/1.0 point-to-point
user@host-R2# set isis interface xe-2/3/1.0 link-protection
user@host-R2# set isis interface xe-2/3/1.0 level 1 metric 2000070
```

- d. Configure LDP for BNG-facing and LNS-facing ports.

```
[edit protocols]
user@host-R2# set ldp interface lo0.0
user@host-R2# set ldp interface xe-2/3/1.0
user@host-R2# set ldp interface ge-2/1/4.0
```

- e. Configure PIM.

Configure PIM sparse mode with all interfaces, and configure static RP.

```
[edit protocols]
user@host-R2# set pim rp local address 102.0.0.1
user@host-R2# set pim interface fxp0.0 disable
user@host-R2# set pim interface lo0.0 mode sparse
user@host-R2# set pim interface lo0.0 version 2
user@host-R2# set pim interface xe-2/3/1.0 mode sparse
user@host-R2# set pim interface xe-2/3/1.0 version 2
user@host-R2# set pim interface ge-2/1/4.0 mode sparse
user@host-R2# set pim interface ge-2/1/4.0 version 2
user@host-R2# set pim interface ge-2/1/5.0 mode sparse
user@host-R2# set pim interface ge-2/1/5.0 version 2
```

- f. Configure L2 Circuits.

```
[edit protocols]
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.1
virtual-circuit-id 1
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.2
virtual-circuit-id 2
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.3
virtual-circuit-id 3
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.4
virtual-circuit-id 4
```

```
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.5
virtual-circuit-id 5
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.6
virtual-circuit-id 6
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.7
virtual-circuit-id 7
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.8
virtual-circuit-id 8
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.9
virtual-circuit-id 9
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.10
virtual-circuit-id 10
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.11
virtual-circuit-id 11
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.12
virtual-circuit-id 12
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.13
virtual-circuit-id 13
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.14
virtual-circuit-id 14
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.15
virtual-circuit-id 15
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.16
virtual-circuit-id 16
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.17
virtual-circuit-id 17
user@host-R2# set l2circuit neighbor 100.0.0.1 interface xe-1/0/0.18
virtual-circuit-id 18
```

14. Configure policy options.

```
[edit policy-options]
user@host-R2# set policy-statement export-static term 1 from protocol static
user@host-R2# set policy-statement export-static term 1 from route-filter
200.1.0.0/24 exact
user@host-R2# set policy-statement export-static term 1 then accept
user@host-R2# set policy-statement export-static term 2 from protocol static
user@host-R2# set policy-statement export-static term 2 then accept
```

15. Configure RADIUS server access parameters.

```
[edit access]
user@host-R2# set radius-server 9.0.0.9 secret "secret key!"
user@host-R2# set radius-server 9.0.0.9 source-address 102.0.0.1
```

16. Configure the parameters of PPP running over the L2TP tunnel.

```
[edit access]
user@host-R2# set group-profile lns-group-profile ppp ppp-options pap
user@host-R2# set group-profile lns-group-profile ppp ppp-options chap
user@host-R2# set group-profile lns-group-profile ppp keepalive 30
```

17. Configure L2TP access concentrator (LAC) parameters.

```
[edit access]
user@host-R2# set profile AccProf-LNS authentication-order none
user@host-R2# set profile lns-profile client sandbox_1 l2tp shared-secret "secret
key!"
```



```

user@host-R2# set profile lns-profile client sandbox_1 user-group-profile
lns-group-profile
user@host-R2# set profile lns-profile client sandbox_2 l2tp shared-secret "secret
key!"
user@host-R2# set profile lns-profile client sandbox_2 user-group-profile
lns-group-profile
user@host-R2# set profile lns-profile client sandbox_3 l2tp shared-secret "secret
key!"
user@host-R2# set profile lns-profile client sandbox_3 user-group-profile
lns-group-profile
user@host-R2# set profile lns-profile client sandbox_4 l2tp shared-secret "secret
key!"
user@host-R2# set profile lns-profile client sandbox_4 user-group-profile
lns-group-profile

```

18. Configure IPv4 and IPv6 local address pools.

Subscriber end devices get addresses from the inet local address pool using PPP IPCP negotiation. Subscriber end devices get prefixes from the inet6 local address pool using DHCPv6.

```

[edit access]
user@host-R2# set address-assignment pool v4-l2tp-pool-0 family inet network
100.0.0.0/8
user@host-R2# set address-assignment pool v4-l2tp-pool-0 family inet range
l2tpv4 low 100.48.0.1
user@host-R2# set address-assignment pool v4-l2tp-pool-0 family inet range
l2tpv4 high 100.63.255.255
user@host-R2# set address-assignment pool v6-l2tp-pool-0 family inet6 prefix
1000:0000::/32
user@host-R2# set address-assignment pool v6-l2tp-pool-0 family inet6 range
v6-range low 1000:0000:0000:0001::/64
user@host-R2# set address-assignment pool v6-l2tp-pool-0 family inet6 range
v6-range high 1000:0000:0000:ffff::/64
user@host-R2# set address-assignment pool v6-ndra-pool-0 family inet6 prefix
3000:0000:0000:0000:0000:0000:0000:0000/32
user@host-R2# set address-assignment pool v6-ndra-pool-0 family inet6 range
v6-range-0 prefix-length 64

```

Results From configuration mode, confirm your configuration by entering the following **show** commands:

1. Confirm the dynamic profile configuration.

```

user@host-R2# show dynamic-profiles lns-profile
routing-instances {
  "$junos-routing-instance" {
    interface "$junos-interface-name";
  }
}
interfaces {
  "$junos-interface-ifd-name" {
    unit "$junos-interface-unit" {
      dial-options {
        l2tp-interface-id dedicated;
      }
    }
  }
}

```

```
no-keepalives;
family inet {
    unnumbered-address "$junos-loopback-interface";
}
family inet6 {
    unnumbered-address "$junos-loopback-interface";
}
}
}
```

2. Confirm the system parameter configuration.

```
user@host-R2# show system
host-name R2;
services {
    dhcp-local-server {
        dhcpv6 {
            overrides {
                delegated-pool v6-l2tp-pool-0;
            }
            group v6-ppp-client-0 {
                interface si-2/0/0.0;
            }
        }
    }
}
```

3. Confirm the L2TP services bandwidth configuration.

```
user@host-R2# show chassis
fpc 2 {
    pic 0 {
        tunnel-services {
            bandwidth 1g;
        }
        inline-services {
            bandwidth 1g;
        }
    }
}
```

4. Confirm the L2TP tunnel group configuration.

```
user@host-R2# show services
l2tp {
    tunnel-group lns-tunnel-group {
        l2tp-access-profile lns-profile;
        local-gateway {
            address 102.0.0.1;
        }
        service-device-pool lns_service_device_pool;
        dynamic-profile lns-profile;
    }
}
service-device-pools {
    pool lns_service_device_pool {
        interface si-2/0/0;
    }
}
```

```

    }
  }

```

5. Confirm the access profile configuration.

```

user@host-R2# show access-profile
AccProf-LNS;

```

6. Confirm the interface configurations.

```

user@host-R2# show interfaces
lo0 {
  unit 0 {
    family inet {
      address 102.0.0.1/32 {
        primary;
        preferred;
      }
    }
    family iso {
      address 47.0007.3000.0000.0000.0100.0001.0100.0100.1013.00;
    }
    family inet6 {
      address 1002:0::1/128 {
        primary;
        preferred;
      }
    }
  }
}
si-2/0/0 {
  unit 0 {
    family inet;
    family inet6;
  }
}
ge-2/1/0 {
  description "To Radius Server";
  unit 0 {
    family inet {
      address 9.0.0.1/24;
    }
  }
}
ge-2/0/1 {
  description "To R1 - Core";
  mtu 4484;
  unit 0 {
    family inet {
      address 20.20.60.3/24;
    }
    family iso;
    family inet6;
    family mpls;
  }
}
xe-2/3/1 {

```

```
description "To R3 - Core";
mtu 4484;
unit 0 {
    family inet {
        address 20.20.80.2/24;
    }
    family iso;
    family inet6;
    family mpls;
}
}
ge-2/1/4 {
    description "To IPv4 Network";
    unit 0 {
        family inet {
            address 200.0.1.1/24;
        }
    }
}
ge-2/1/5 {
    description "To IPv6 Network";
    unit 0 {
        family inet6 {
            address 3008:db8:ffff:3::3/64;
        }
    }
}
xe-1/0/0 {
    flexible-vlan-tagging;
    encapsulation flexible-ethernet-services;
    unit 1 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 301;
    }
    unit 2 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 302;
    }
    unit 3 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 303;
    }
    unit 4 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 304;
    }
    unit 5 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 305;
    }
    unit 6 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 306;
    }
    unit 7 {
        encapsulation vlan-ccc;
    }
```

```

        vlan-tags outer 3101 inner 307;
    }
    unit 8 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 308;
    }
    unit 9 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 309;
    }
    unit 10 {
        encapsulation vlan-ccc;
        vlan-tags outer 3001 inner 310;
    }
    unit 11 {
        encapsulation vlan-ccc;
        vlan-tags outer 3001 inner 311;
    }
    unit 12 {
        encapsulation vlan-ccc;
        vlan-tags outer 3001 inner 312;
    }
    unit 13 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 313;
    }
    unit 14 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 314;
    }
    unit 15 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 315;
    }
    unit 16 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 316;
    }
    unit 17 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 317;
    }
    unit 18 {
        encapsulation vlan-ccc;
        vlan-tags outer 3101 inner 318;
    }
}

```

7. Confirm the router ID configuration.

```

user@host-R2# show routing-options
router-id 102.0.0.1;

```

8. Confirm the protocol configurations.

```

user@host-R2# show protocols
mpls {

```

```
    ipv6-tunneling;
    interface lo0.0;
    interface xe-2/3/1.0;
    interface ge-2/1/4.0;
  }
  bgp {
    local-as 65500;
    group Internal {
      type internal;
      local-address 102.0.0.1;
      export export-static;
      neighbor 100.0.0.1 {
        family inet {
          unicast;
        }
        family inet6 {
          unicast;
        }
      }
      export export-static;
    }
  }
  group External {
    type external;
    multihop {
      ttl 5;
    }
    peer-as 20000;
    as-override;
    neighbor 200.1.0.2 {
      family inet {
        unicast;
      }
      family inet6 {
        unicast;
      }
    }
  }
}

isis {
  lsp-lifetime 65535;
  ignore-attached-bit;
  level 2 {
    disable;
  }
  level 1 {
    authentication-key "secret key!"; ## SECRET-DATA
    authentication-type md5;
    wide-metrics-only;
  }
  interface fxp0.0 {
    disable;
  }
  interface lo0.0 {
    passive;
  }
  interface ge-2/1/0.0 {
```

```
        passive;
    }
    interface ge-2/1/5.0 {
        passive;
    }
    interface ge-2/1/4.0 {
        passive;
    }
    interface xe-2/3/1.0 {
        ldp-synchronization;
        lsp-interval 10;
        point-to-point;
        link-protection;
        level 1 {
            metric 2000070;
        }
    }
    interface ge-2/1/4.0 {
        ldp-synchronization;
        lsp-interval 10;
        point-to-point;
        link-protection;
        level 1 {
            metric 2000070;
        }
    }
}
ldp {
    interface lo0.0;
    interface xe-2/3/1.0;
    interface ge-2/1/4.0;
}
pim {
    rp {
        local {
            address 102.0.0.1;
        }
    }
}
interface fxp0.0 {
    disable;
}
interface lo0.0 {
    mode sparse;
    version 2;
}
interface xe-2/3/1.0 {
    mode sparse;
    version 2;
}
interface ge-2/1/4.0 {
    mode sparse;
    version 2;
}
interface ge-2/1/5.0 {
    mode sparse;
    version 2;
}
```

```
    }  
  }  
  l2circuit {  
    neighbor 100.0.0.1 {  
      interface xe-1/0/0.1 {  
        virtual-circuit-id 1;  
      }  
      interface xe-1/0/0.2 {  
        virtual-circuit-id 2;  
      }  
      interface xe-1/0/0.3 {  
        virtual-circuit-id 3;  
      }  
      interface xe-1/0/0.4 {  
        virtual-circuit-id 4;  
      }  
      interface xe-1/0/0.5 {  
        virtual-circuit-id 5;  
      }  
      interface xe-1/0/0.6 {  
        virtual-circuit-id 6;  
      }  
      interface xe-1/0/0.7 {  
        virtual-circuit-id 7;  
      }  
      interface xe-1/0/0.8 {  
        virtual-circuit-id 8;  
      }  
      interface xe-1/0/0.9 {  
        virtual-circuit-id 9;  
      }  
      interface xe-1/0/0.10 {  
        virtual-circuit-id 10;  
      }  
      interface xe-1/0/0.11 {  
        virtual-circuit-id 11;  
      }  
      interface xe-1/0/0.12 {  
        virtual-circuit-id 12;  
      }  
      interface xe-1/0/0.13 {  
        virtual-circuit-id 13;  
      }  
      interface xe-1/0/0.14 {  
        virtual-circuit-id 14;  
      }  
      interface xe-1/0/0.15 {  
        virtual-circuit-id 15;  
      }  
      interface xe-1/0/0.16 {  
        virtual-circuit-id 16;  
      }  
      interface xe-1/0/0.17 {  
        virtual-circuit-id 17;  
      }  
      interface xe-1/0/0.18 {
```



```

        virtual-circuit-id 18;
    }
}

```

9. Confirm the policy options configuration.

```

user@host-R2# show policy-options
policy-statement export-static {
  term 1 {
    from {
      protocol static;
      route-filter 200.1.0.0/24 exact;
    }
    then accept;
  }
  term 2 {
    from protocol static;
    then accept;
  }
}

```

10. Confirm the RADIUS server access configuration.

```

user@host-R2# show access radius-server
9.0.0.9 {
  secret "secret key!"; ## SECRET-DATA
  source-address 102.0.0.1;
}

```

11. Confirm the PPP configuration.

```

user@host-R2# show access group-profile lns-group-profile
ppp {
  ppp-options {
    pap;
    chap;
  }
  keepalive 30;
}

```

12. Confirm LAC configuration.

```

user@host-R2# show access profile
AccProf-LNS {
  authentication-order none;
}
lns-profile {
  client sandbox_1 {
    l2tp {
      shared-secret "secret key!"; ## SECRET-DATA
    }
    user-group-profile lns-group-profile;
  }
  client sandbox_2 {
    l2tp {
      shared-secret "secret key!"; ## SECRET-DATA
    }
    user-group-profile lns-group-profile;
  }
}

```

```
}
client sandbox_3 {
  l2tp {
    shared-secret "secret key!"; ## SECRET-DATA
  }
  user-group-profile lns-group-profile;
}
client sandbox_4 {
  l2tp {
    shared-secret "secret key!"; ## SECRET-DATA
  }
  user-group-profile lns-group-profile;
}
}
```

13. Confirm the local address pool configuration.

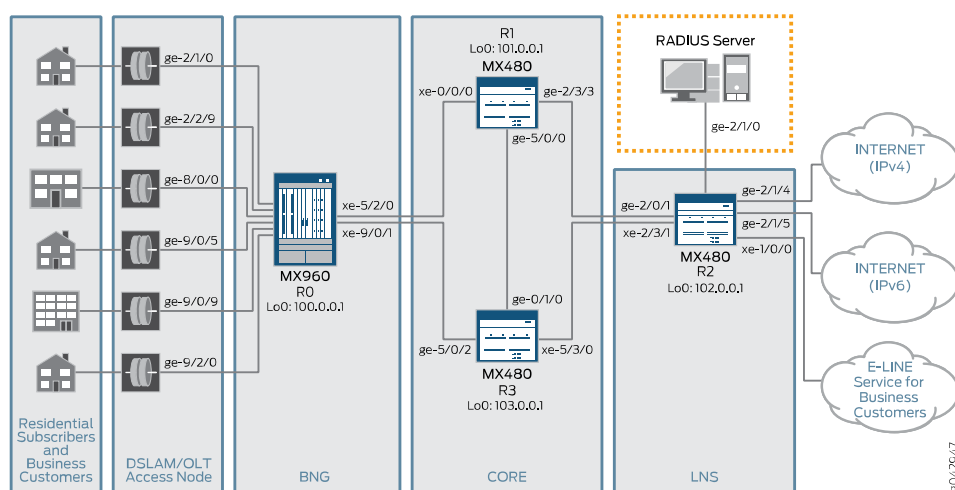
```
user@host-R2# show access address-assignment
pool v4-l2tp-pool-0 {
  family inet {
    network 100.0.0.0/8;
    range l2tpv4 {
      low 100.48.0.1;
      high 100.63.255.255;
    }
  }
}
pool v6-l2tp-pool-0 {
  family inet6 {
    prefix 1000:0000::/32;
    range v6-range {
      low 1000:0000:0000:0001::/64;
      high 1000:0000:0000:ffff::/64;
    }
  }
}
pool v6-ndra-pool-0 {
  family inet6 {
    prefix 3000:0000:0000:0000:0000:0000:0000/32;
    range v6-range-0 prefix-length 64;
  }
}
```

Configuring the Default User Profile for the RADIUS Server

Step-by-Step Procedure

Figure 7 on page 131 highlights the RADIUS server in the context of the reference example topology.

Figure 7: RADIUS Server in the Topology



In this example, the RADIUS server has two user profiles. The first, DEFAULTUSER, is for PPPoE local termination with dynamic filter provisioning using ADF, dynamic CoS profile, and service activations for high-speed Internet (HSI), video, and voice services. The second, DEFAULTUSER@ABC1.COM, is for L2TP tunnel subscribers, to provide the L2TP tunnel destination (LNS address) and other attributes.

To configure user profiles for the RADIUS server:

1. Include the following RADIUS attributes and values in the RADIUS user profile configurations:

```
DEFAULTUSER    Auth-Type := Accept, User-Password := joshua
X-Ascend-Data-Filter = "ip in drop dstip 8.1.1.0/32",
X-Ascend-Data-Filter += "ip in forward srcip 100.0.0.0/8 udp dstport
= 53",
X-Ascend-Data-Filter += "ip in forward dstip 200.0.0.101/32 srcip
100.0.0.0/8",
X-Ascend-Data-Filter += "ip in forward dstip 200.0.0.102/32 srcip
100.0.0.0/8",
X-Ascend-Data-Filter += "ip in forward",
CoS-Traffic-Control-Profile-Parameter-Type = "T02 75000000",
ERX-Service-Activate:1 += "voice(600000, 20.0.0.0/24,
2016:323:abcd::/64)",
ERX-Service-Acct-Interval:1 += "14400",
ERX-Service-Statistics:1 += time-volume,
ERX-Service-Activate:2 += "video(20000000,40000000,10.0.0.0/24)",
ERX-Service-Acct-Interval:2 += "14400",
ERX-Service-Statistics:2 += time-volume,
ERX-Service-Activate:3 += "input_qos(35000000)",
ERX-Service-Acct-Interval:3 += "14400",
ERX-Service-Statistics:3 += time-volume,
```

```
DEFAULTUSER@ABC1.COM    Auth-Type := Accept, User-Password := joshua
                          CoS-Traffic-Control-Profile-Parameter-Type = "T02 8000000",

Tunnel-Client-Endpoint:1 += 100.0.0.1,
Tunnel-Server-Endpoint:1 += 102.0.0.1,
Tunnel-Assignment-Id:1 += tunnel_1,
Tunnel-Client-Auth-Id:1 += sandbox_1,
Tunnel-Preference:1 += 1,
Tunnel-Password:1 += testing123,
Tunnel-Type:1 += L2TP,
Tunnel-Medium-Type:1 += IP,

Tunnel-Client-Endpoint:2 += 100.0.0.1,
Tunnel-Server-Endpoint:2 += 102.0.0.1,
Tunnel-Assignment-Id:2 += tunnel_2,
Tunnel-Client-Auth-Id:2 += sandbox_2,
Tunnel-Preference:2 += 1,
Tunnel-Password:2 += testing123,
Tunnel-Type:2 += L2TP,
Tunnel-Medium-Type:2 += IP,

Tunnel-Client-Endpoint:3 += 100.0.0.1,
Tunnel-Server-Endpoint:3 += 102.0.0.1,
Tunnel-Assignment-Id:3 += tunnel_3,
Tunnel-Client-Auth-Id:3 += sandbox_3,
Tunnel-Preference:3 += 1,
Tunnel-Password:3 += testing123,
Tunnel-Type:3 += L2TP,
Tunnel-Medium-Type:3 += IP,

Tunnel-Client-Endpoint:4 += 100.0.0.1,
Tunnel-Server-Endpoint:4 += 102.0.0.1,
Tunnel-Assignment-Id:4 += tunnel_4,
Tunnel-Client-Auth-Id:4 += sandbox_4,
Tunnel-Preference:4 += 1,
Tunnel-Password:4 += testing123,
Tunnel-Type:4 += L2TP,
Tunnel-Medium-Type:4 += IP,
```

Verification

The following sections show how to verify that the configuration is working properly. Within each group, verification steps are listed for the devices from left to right in the example topology.

- [Verify Route Summary Information on page 133](#)
- [Verify the Loopback and Physical Ports on page 136](#)
- [Verify IS-IS Functionality on page 142](#)
- [Verify LDP Functionality on page 148](#)
- [Verify MPLS Interfaces on page 150](#)
- [Verify CCC Interfaces and L2 Circuits on R0 on page 150](#)
- [Verify Interface Accounting Files on page 151](#)
- [Verify Inline Flow Monitoring on page 153](#)
- [Verify PPPoE over Dynamic VLAN Subscribers on R0 on page 153](#)

- [Verify DHCPv6 over PPPoE over Dynamic VLAN Subscribers on R0 on page 182](#)
- [Verify PPP LAC Subscribers on page 188](#)
- [Verify the AAA Access and RADIUS Server Configuration and Statistics on R0 on page 207](#)
- [Verify L2TP Functionality on R2 on page 210](#)

Verify Route Summary Information

Purpose Confirm that all routing protocols and routes are functional and active.

- On R0, confirm inet, ISO, MPLS, inet6, and L2 circuit destinations and routes on router ID 100.0.0.1.
- On R1, confirm inet, ISO, MPLS, and inet6 destinations and routes on router ID 101.0.0.1.
- On R3, confirm inet, ISO, MPLS, and inet6 destinations and routes on router ID 103.0.0.1.
- On R2, confirm inet, ISO, MPLS, inet6, and L2 circuit destinations and routes on router ID 102.0.0.1.

Action On each device, run the **show route summary** command from operational mode.

```
user@host-R0>show route summary
Router ID: 100.0.0.1

inet.0: 31 destinations, 33 routes (31 active, 0 holddown, 0 hidden)
  Direct:    10 routes,    10 active
  Local:     9 routes,     9 active
  BGP:       2 routes,     0 active
  Static:    2 routes,     2 active
  IS-IS:     8 routes,     8 active
  PIM:       2 routes,     2 active

inet.1: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)
  Multicast:  6 routes,    6 active

inet.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
  LDP:        3 routes,    3 active

iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
  Direct:     1 routes,    1 active

mpls.0: 47 destinations, 47 routes (47 active, 0 holddown, 0 hidden)
  MPLS:       6 routes,    6 active
  LDP:        5 routes,    5 active
  L2CKT:     36 routes,   36 active

inet6.0: 10 destinations, 11 routes (10 active, 0 holddown, 0 hidden)
  Direct:     4 routes,     3 active
  Local:      2 routes,     2 active
  IS-IS:      4 routes,     4 active
  MLD:        1 routes,     1 active

inet6.1: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
  Multicast:  1 routes,    1 active

inet6.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
  LDP:        3 routes,    3 active

l2circuit.0: 36 destinations, 36 routes (36 active, 0 holddown, 0 hidden)
  LDP:       18 routes,   18 active
  L2CKT:     18 routes,   18 active

user@host-R1>show route summary
Router ID: 101.0.0.1

inet.0: 25 destinations, 25 routes (25 active, 0 holddown, 0 hidden)
  Direct:     6 routes,     6 active
  Local:      5 routes,     5 active
  Static:     5 routes,     5 active
  IS-IS:      6 routes,     6 active
  IGMP:       1 routes,     1 active
  PIM:        2 routes,     2 active

inet.1: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
  Multicast:  3 routes,     3 active

inet.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
  LDP:        3 routes,     3 active
```

```

iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
      Direct:      1 routes,      1 active

mpls.0: 12 destinations, 12 routes (12 active, 0 holddown, 0 hidden)
      MPLS:       6 routes,      6 active
      LDP:       6 routes,      6 active

inet6.0: 13 destinations, 15 routes (13 active, 0 holddown, 0 hidden)
      Direct:     5 routes,      3 active
      Local:     3 routes,      3 active
      IS-IS:     4 routes,      4 active
      PIM:       2 routes,      2 active
      MLD:       1 routes,      1 active

inet6.1: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
      Multicast:  3 routes,      3 active

inet6.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
      LDP:       3 routes,      3 active

```

user@host-R3>show route summary

Router ID: 103.0.0.1

```

inet.0: 21 destinations, 21 routes (21 active, 0 holddown, 0 hidden)
      Direct:     5 routes,      5 active
      Local:     4 routes,      4 active
      Static:    2 routes,      2 active
      IS-IS:     7 routes,      7 active
      IGMP:      1 routes,      1 active
      PIM:       2 routes,      2 active

inet.1: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
      Multicast:  3 routes,      3 active

inet.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
      LDP:       3 routes,      3 active

iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
      Direct:     1 routes,      1 active

mpls.0: 12 destinations, 12 routes (12 active, 0 holddown, 0 hidden)
      MPLS:       6 routes,      6 active
      LDP:       6 routes,      6 active

inet6.0: 13 destinations, 15 routes (13 active, 0 holddown, 0 hidden)
      Direct:     5 routes,      3 active
      Local:     3 routes,      3 active
      IS-IS:     4 routes,      4 active
      PIM:       2 routes,      2 active
      MLD:       1 routes,      1 active

inet6.1: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
      Multicast:  3 routes,      3 active

inet6.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
      LDP:       3 routes,      3 active

```

user@host-R2>show route summary

Router ID: 102.0.0.1

```

inet.0: 21 destinations, 21 routes (21 active, 0 holddown, 0 hidden)

```

```
Direct:      5 routes,      5 active
Local:       4 routes,      4 active
Static:      2 routes,      2 active
IS-IS:       7 routes,      7 active
IGMP:        1 routes,      1 active
PIM:         2 routes,      2 active

inet.1: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
Multicast:   3 routes,      3 active

inet.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
LDP:         3 routes,      3 active

iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
Direct:      1 routes,      1 active

mpls.0: 47 destinations, 47 routes (47 active, 0 holddown, 0 hidden)
MPLS:        6 routes,      6 active
LDP:         5 routes,      5 active
L2CKT:       36 routes,     36 active

inet6.0: 15 destinations, 18 routes (15 active, 0 holddown, 0 hidden)
Direct:      7 routes,      4 active
Local:       5 routes,      5 active
IS-IS:       3 routes,      3 active
PIM:         2 routes,      2 active
MLD:         1 routes,      1 active

inet6.1: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
Multicast:   3 routes,      3 active

inet6.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
LDP:         3 routes,      3 active

l2circuit.0: 36 destinations, 36 routes (36 active, 0 holddown, 0 hidden)
LDP:         18 routes,     18 active
L2CKT:       18 routes,     18 active
```

Meaning Destinations and routes are functional.

Verify the Loopback and Physical Ports

Purpose On each device, test connections to the loopback and physical ports.

Action On each device, run the **show interfaces** command from operational mode for each port to confirm that the interfaces are up. Then run the **ping** command to verify communication with each interface. For the loopback port, it is not necessary to run the **show interfaces** command, because the port is always up and running.

```
user@host-R0> ping 100.0.0.1 rapid
PING 100.0.0.1 (100.0.0.1): 56 data bytes
!!!!
--- 100.0.0.1 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.052/0.079/0.121/0.023 ms
```

```
user@host-R0> ping 1000::1 rapid
PING6(56=40+8+8 bytes) 1000::1 --> 1000::1
!!!!
--- 1000::1 ping6 statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/std-dev = 0.068/0.098/0.115/0.017 ms
```

```
user@host-R0> show interfaces xe-5/2/0 terse
Interface      Admin Link Proto  Local          Remote
xe-5/2/0       up    up
xe-5/2/0.0     up    up    inet    20.20.50.2/24
               iso
               inet6   fe80::ae4b:c8ff:fe45:6800/64
               mpls
               multiservice
```

```
user@host-R0> ping 20.20.50.2 rapid
PING 20.20.50.2 (20.20.50.2): 56 data bytes
!!!!
--- 20.20.50.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.073/0.118/0.281/0.082 ms
```

```
user@host-R0> show interfaces ge-9/0/1 terse
Interface      Admin Link Proto  Local          Remote
ge-9/0/1       up    up
ge-9/0/1.0     up    up    inet    20.20.70.2/24
               iso
               inet6   fe80::ae4b:c8ff:fe45:6bde/64
               mpls
               multiservice
```

```
user@host-R0> ping 20.20.70.2 rapid
PING 20.20.70.2 (20.20.70.2): 56 data bytes
!!!!
--- 20.20.70.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.051/0.074/0.103/0.020 ms
```

```
user@host-R1> show interfaces lo0 terse
Interface      Admin Link Proto  Local          Remote
lo0            up    up
lo0.0          up    up    inet    101.0.0.1      --> 0/0
               iso
47.0005.80ff.f800.0000.0108.0001.0100.0925.0103
               inet6   1001::1
```

```

                                fe80::aad0:e50f:fc50:b2ff
1o0.16384                        up    up    inet    127.0.0.1      --> 0/0
1o0.16385                        up    up    inet

```

user@host-R1> ping 101.0.0.1 rapid
PING 101.0.0.1 (101.0.0.1): 56 data bytes
!!!!
--- 101.0.0.1 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.090/0.258/0.394/0.103 ms

user@host-R1> ping 1001::1 rapid
PING6(56=40+8+8 bytes) 1001::1 --> 1001::1
!!!!
--- 1001::1 ping6 statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/std-dev = 0.252/0.494/0.761/0.205 ms

user@host-R1> show interfaces xe-0/0/0 terse

Interface	Admin	Link	Proto	Local	Remote
xe-0/0/0	up	up			
xe-0/0/0.0	up	up	inet	20.20.50.3/24	
			iso		
			inet6	fe80::aad0:e5ff:fe50:b200/64	
			mpls		
			multiservice		

user@host-R1> ping 20.20.50.3 rapid
PING 20.20.50.3 (20.20.50.3): 56 data bytes
!!!!
--- 20.20.50.3 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.090/0.144/0.244/0.065 ms

user@host-R1> show interfaces ge-2/3/3 terse

Interface	Admin	Link	Proto	Local	Remote
ge-2/3/3	up	up			
ge-2/3/3.0	up	up	inet	20.20.60.2/24	
			iso		
			inet6	fe80::aad0:e5ff:fe50:b201/64	
			mpls		
			multiservice		

user@host-R1> ping 20.20.60.2 rapid
PING 20.20.60.2 (20.20.60.2): 56 data bytes
!!!!
--- 20.20.60.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.092/0.136/0.223/0.054 ms

user@host-R1> show interfaces ge-5/0/0 terse

Interface	Admin	Link	Proto	Local	Remote
ge-5/0/0	up	up			
ge-5/0/0.0	up	up	inet	20.20.90.2/24	
			iso		
			inet6	fe80::aad0:e5ff:fe50:b203/64	
			mpls		
			multiservice		

```

user@host-R1> ping 20.20.90.2 rapid
PING 20.20.90.2 (20.20.90.2): 56 data bytes
!!!!
--- 20.20.90.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.091/0.112/0.194/0.041 ms

user@host-R3> show interfaces lo0.0 terse
Interface           Admin Link Proto  Local              Remote
lo0.0                up    up    inet   103.0.0.1          --> 0/0
                    iso
47.0005.80ff.f800.0000.0108.0001.0100.0925.0078
                    inet6  1003::1
                    fe80::fac0:10f:fc19:d997

user@host-R3> ping 103.0.0.1 rapid
PING 103.0.0.1 (103.0.0.1): 56 data bytes
!!!!
--- 103.0.0.1 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.071/0.106/0.171/0.042 ms

user@host-R3> ping 1003::1 rapid
PING6(56=40+8+8 bytes) 1003::1 --> 1003::1
!!!!
--- 1003::1 ping6 statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/std-dev = 0.095/0.425/1.716/0.646 ms

user@host-R3> show interfaces ge-5/0/2 terse
Interface           Admin Link Proto  Local              Remote
ge-5/0/2            up    up
ge-5/0/2.0          up    up    inet   20.20.70.3/24
                    iso
                    inet6  fe80::fac0:1ff:fe19:d8f9/64
                    mpls
                    multiservice

user@host-R3> ping 20.20.70.3 rapid
PING 20.20.70.3 (20.20.70.3): 56 data bytes
!!!!
--- 20.20.70.3 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.073/0.114/0.173/0.048 ms

user@host-R3> show interfaces xe-5/3/0 terse
Interface           Admin Link Proto  Local              Remote
xe-5/3/0            up    up
xe-5/3/0.0          up    up    inet   20.20.80.3/24
                    iso
                    inet6  fe80::fac0:1ff:fe19:d910/64
                    mpls
                    multiservice

user@host-R3> ping 20.20.80.3 rapid
PING 20.20.80.3 (20.20.80.3): 56 data bytes
!!!!
--- 20.20.80.3 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.072/0.118/0.196/0.055 ms

```

```

user@host-R3> show interfaces ge-0/1/0 terse
Interface      Admin Link Proto  Local          Remote
ge-0/1/0       up    up
ge-0/1/0.0     up    up    inet   20.20.90.3/24
               up    up    iso
               up    up    inet6  fe80::fac0:1ff:fe19:d89b/64
               up    up    mpls
               up    up    multiservice

```

```

user@host-R3> ping 20.20.90.3 rapid
PING 20.20.90.3 (20.20.90.3): 56 data bytes
!!!!
--- 20.20.90.3 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.072/0.112/0.263/0.076 ms

```

```

user@host-R2> show interfaces lo0 terse
Interface      Admin Link Proto  Local          Remote
lo0            up    up
lo0.0          up    up    inet   102.0.0.1      --> 0/0
               up    up    iso
47.0005.80ff.f800.0000.0108.0001.0100.0925.0080
               up    up    inet6  1002::1
               up    up    inet6  fe80::2a0:a50f:fc76:14d2
lo0.16384      up    up    inet   127.0.0.1      --> 0/0
lo0.16385      up    up    inet

```

```

user@host-R2> ping 102.0.0.1 rapid
PING 102.0.0.1 (102.0.0.1): 56 data bytes
!!!!
--- 102.0.0.1 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.049/0.076/0.100/0.023 ms

```

```

user@host-R2> ping 1002::1 rapid
PING6(56=40+8+8 bytes) 1002::1 --> 1002::1
!!!!
--- 1002::1 ping6 statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/std-dev = 0.064/0.103/0.135/0.024 ms

```

```

user@host-R2> show interfaces ge-2/1/4 terse
Interface      Admin Link Proto  Local          Remote
ge-2/1/4       up    up
ge-2/1/4.0     up    up    inet   20.20.60.3/24
               up    up    iso
               up    up    inet6  fe80::ae4b:c8ff:fe45:f000/64
               up    up    mpls
               up    up    multiservice

```

```

user@host-R2> ping 20.20.60.3 rapid
PING 20.20.60.3 (20.20.60.3): 56 data bytes
!!!!
--- 20.20.60.3 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.051/0.088/0.132/0.031 ms

```

```

user@host-R2> show interfaces xe-2/3/1 terse
Interface      Admin Link Proto  Local          Remote

```

```

xe-2/3/1          up    up
xe-2/3/1.0        up    up    inet    20.20.80.2/24
                                   iso
                                   inet6    fe80::ae4b:c8ff:fe45:f294/64
                                   mpls
                                   multiservice

```

```

user@host-R2> ping 20.20.80.2 rapid
PING 20.20.80.2 (20.20.80.2): 56 data bytes
!!!!
--- 20.20.80.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.050/0.090/0.127/0.034 ms

```

```

user@host-R2> show interfaces ge-2/1/4 terse
Interface      Admin Link Proto  Local          Remote
ge-2/1/4       up    up
ge-2/1/4.0     up    up    inet    200.0.1.1/24
                                   multiservice

```

```

user@host-R2> ping 200.0.1.1 rapid
PING 200.0.1.1 (200.0.1.1): 56 data bytes
!!!!
--- 200.0.1.1 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.052/0.076/0.107/0.018 ms

```

```

user@host-R2> show interfaces ge-2/1/5 terse
Interface      Admin Link Proto  Local          Remote
ge-2/1/5       up    up
ge-2/1/5.0     up    up    inet6    3008:db8:ffff:3::3/64
                                   fe80::ae4b:c8ff:fe45:f3df/64
                                   multiservice

```

```

user@host-R2> ping 3008:db8:ffff:3::3 rapid
PING6(56=40+8+8 bytes) 3008:db8:ffff:3::3 --> 3008:db8:ffff:3::3
!!!!
--- 3008:db8:ffff:3::3 ping6 statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/std-dev = 0.063/0.097/0.133/0.028 ms

```

```

user@host-R2> show interfaces ge-2/1/0 terse
Interface      Admin Link Proto  Local          Remote
ge-2/1/0       up    up
ge-2/1/0.0     up    up    inet    9.0.0.1/24
                                   multiservice

```

```

user@host-R2> ping 9.0.0.1 rapid
PING 9.0.0.1 (9.0.0.1): 56 data bytes
!!!!
--- 9.0.0.1 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.051/0.280/1.090/0.406 ms

```

Meaning Loopback and physical port interfaces are functional and communicating.

Verify IS-IS Functionality

Purpose On each device, display IS-IS interface, adjacency, and route information to confirm that all entities are functioning properly.

Action On each device, run the **show isis interface**, **show isis adjacency**, **show route protocol isis | match /32**, **show route protocol isis | match /128**, and **show route protocol isis** commands from operational mode.

```
user@host-R0>show isis interface
```

```
IS-IS interface database:
```

Interface	L	CirID	Level	1 DR	Level 2 DR	L1/L2 Metric
ge-9/0/1.0	1	0x1	Point to Point	Disabled	Disabled	2000070/10
lo0.0	0	0x1	Passive	Passive	Passive	0/0
xe-5/2/0.0	1	0x1	Point to Point	Disabled	Disabled	2000070/10

```
user@host-R0>show isis adjacency
```

Interface	System	L	State	Hold (secs)	SNPA
ge-9/0/1.0	R3	1	Up	21	
xe-5/2/0.0	R1	1	Up	25	

```
user@host-R0>show route protocol isis | match /32
```

```
101.0.0.1/32      *[IS-IS/15] 3d 17:30:08, metric 2000070
102.0.0.1/32      *[IS-IS/15] 3d 14:07:11, metric 4000140
103.0.0.1/32      *[IS-IS/15] 3d 17:29:57, metric 2000070
```

```
user@host-R0>show route protocol isis | match /128
```

```
1001::1/128       *[IS-IS/15] 3d 17:25:02, metric 2000070
1002::1/128       *[IS-IS/15] 3d 14:07:14, metric 4000140
1003::1/128       *[IS-IS/15] 3d 17:25:02, metric 2000070
```

```
user@host-R0>show route protocol isis
```

```
inet.0: 31 destinations, 33 routes (31 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both
```

```
9.0.0.0/24        *[IS-IS/15] 3d 13:21:56, metric 2000080
> to 20.20.50.3 via xe-5/2/0.0
  to 20.20.70.3 via ge-9/0/1.0
20.20.60.0/24     *[IS-IS/15] 3d 14:08:05, metric 4000140
> to 20.20.50.3 via xe-5/2/0.0
  to 20.20.70.3 via ge-9/0/1.0
20.20.80.0/24     *[IS-IS/15] 3d 14:07:38, metric 4000140
> to 20.20.70.3 via ge-9/0/1.0
  to 20.20.50.3 via xe-5/2/0.0
20.20.90.0/24     *[IS-IS/15] 3d 17:30:02, metric 4000140
> to 20.20.70.3 via ge-9/0/1.0
  to 20.20.50.3 via xe-5/2/0.0
101.0.0.1/32      *[IS-IS/15] 3d 17:30:13, metric 2000070
> to 20.20.50.3 via xe-5/2/0.0
  to 20.20.70.3 via ge-9/0/1.0
102.0.0.1/32      *[IS-IS/15] 3d 14:07:16, metric 4000140
> to 20.20.70.3 via ge-9/0/1.0
  to 20.20.50.3 via xe-5/2/0.0
103.0.0.1/32      *[IS-IS/15] 3d 17:30:02, metric 2000070
> to 20.20.70.3 via ge-9/0/1.0
  to 20.20.50.3 via xe-5/2/0.0
200.0.1.0/24      *[IS-IS/15] 3d 14:07:16, metric 4000150
> to 20.20.70.3 via ge-9/0/1.0
  to 20.20.50.3 via xe-5/2/0.0
```

```
inet.1: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)
```

```
inet.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
```

```

iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

mpls.0: 47 destinations, 47 routes (47 active, 0 holddown, 0 hidden)

inet6.0: 10 destinations, 11 routes (10 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

1001::1/128      *[IS-IS/15] 3d 17:25:04, metric 2000070
                  > to fe80::aad0:e5ff:fe50:b200 via xe-5/2/0.0
                  to fe80::fac0:1ff:fe19:d8f9 via ge-9/0/1.0
1002::1/128      *[IS-IS/15] 3d 14:07:16, metric 4000140
                  > to fe80::fac0:1ff:fe19:d8f9 via ge-9/0/1.0
                  > to fe80::aad0:e5ff:fe50:b200 via xe-5/2/0.0
1003::1/128      *[IS-IS/15] 3d 17:25:04, metric 2000070
                  > to fe80::fac0:1ff:fe19:d8f9 via ge-9/0/1.0
                  to fe80::aad0:e5ff:fe50:b200 via xe-5/2/0.0
3008:db8:ffff:3::/64
                  *[IS-IS/15] 3d 14:07:16, metric 4000150
                  > to fe80::fac0:1ff:fe19:d8f9 via ge-9/0/1.0
                  to fe80::aad0:e5ff:fe50:b200 via xe-5/2/0.0

inet6.1: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

inet6.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)

l2circuit.0: 36 destinations, 36 routes (36 active, 0 holddown, 0 hidden)

```

```
user@host-R1>show isis interface
```

```
IS-IS interface database:
```

Interface	L	CirID	Level 1	DR	Level 2	DR	L1/L2 Metric
ge-1/1/7.0	1	0x1	Passive		Passive		10/10
lo0.0	1	0x1	Passive		Passive		0/0
xe-0/0/0.0	1	0x1	Point to Point		Disabled		2000070/10
ge-2/3/3.0	1	0x1	Point to Point		Disabled		2000070/10
ge-5/0/0.0	1	0x1	Point to Point		Disabled		2000070/10

```
user@host-R1>show isis adjacency
```

Interface	System	L	State	Hold (secs)	SNPA
xe-0/0/0.0	R0	1	Up	26	
ge-2/3/3.0	R2	1	Up	25	
ge-5/0/0.0	R3	1	Up	26	

```
user@host-R1>show route protocol isis | match /32
```

```

100.0.0.1/32      *[IS-IS/15] 3d 16:59:21, metric 2000070
102.0.0.1/32      *[IS-IS/15] 3d 13:36:24, metric 2000070
103.0.0.1/32      *[IS-IS/15] 3d 16:59:11, metric 2000070

```

```
user@host-R1>show route protocol isis | match /128
```

```

1000::1/128      *[IS-IS/15] 3d 16:54:14, metric 2000070
1002::1/128      *[IS-IS/15] 3d 13:36:26, metric 2000070
1003::1/128      *[IS-IS/15] 3d 16:54:14, metric 2000070

```

```
user@host-R1>show route protocol isis
```

```

inet.0: 25 destinations, 25 routes (25 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

```

```

20.20.70.0/24     *[IS-IS/15] 3d 16:59:14, metric 4000140
                  > to 20.20.50.2 via xe-0/0/0.0
                  > to 20.20.90.3 via ge-5/0/0.0
20.20.80.0/24     *[IS-IS/15] 3d 13:36:38, metric 4000140

```



```

> to 20.20.60.3 via ge-2/3/3.0
  to 20.20.90.3 via ge-5/0/0.0
100.0.0.1/32    *[IS-IS/15] 3d 16:59:24, metric 2000070
> to 20.20.50.2 via xe-0/0/0.0
  to 20.20.90.3 via ge-5/0/0.0
102.0.0.1/32    *[IS-IS/15] 3d 13:36:27, metric 2000070
> to 20.20.60.3 via ge-2/3/3.0
  to 20.20.90.3 via ge-5/0/0.0
103.0.0.1/32    *[IS-IS/15] 3d 16:59:14, metric 2000070
> to 20.20.90.3 via ge-5/0/0.0
  to 20.20.50.2 via xe-0/0/0.0
200.0.1.0/24    *[IS-IS/15] 3d 13:36:27, metric 2000080
> to 20.20.60.3 via ge-2/3/3.0
  to 20.20.90.3 via ge-5/0/0.0

inet.1: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)

inet.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)

iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

mpls.0: 12 destinations, 12 routes (12 active, 0 holddown, 0 hidden)

inet6.0: 13 destinations, 15 routes (13 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

1000::1/128      *[IS-IS/15] 3d 16:54:15, metric 2000070
> to fe80::ae4b:c8ff:fe45:6800 via xe-0/0/0.0
  to fe80::fac0:1ff:fe19:d89b via ge-5/0/0.0
1002::1/128      *[IS-IS/15] 3d 13:36:27, metric 2000070
> to fe80::ae4b:c8ff:fe45:f000 via ge-2/3/3.0
  to fe80::fac0:1ff:fe19:d89b via ge-5/0/0.0
1003::1/128      *[IS-IS/15] 3d 16:54:15, metric 2000070
> to fe80::fac0:1ff:fe19:d89b via ge-5/0/0.0
  to fe80::ae4b:c8ff:fe45:6800 via xe-0/0/0.0
3008:db8:ffff:3::/64
*[IS-IS/15] 3d 13:36:27, metric 2000080
> to fe80::ae4b:c8ff:fe45:f000 via ge-2/3/3.0
  to fe80::fac0:1ff:fe19:d89b via ge-5/0/0.0

inet6.1: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)

inet6.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)

user@host-R3>show isis interface
IS-IS interface database:
Interface          L CirID Level 1 DR      Level 2 DR      L1/L2 Metric
ge-5/0/2.0         1  0x1 Point to Point    Disabled        2000070/10
xe-5/3/0.0         1  0x1 Point to Point    Disabled        2000070/10
lo0.0              1  0x1 Passive           Passive         0/0
ge-0/1/0.0         1  0x1 Point to Point    Disabled        2000070/10

user@host-R3>show isis adjacency
Interface          System          L State          Hold (secs) SNPA
ge-5/0/2.0         R0              1 Up              24
xe-5/3/0.0         R2              1 Up              24
ge-0/1/0.0         R1              1 Up              19

user@host-R3>show route protocol isis | match /32
100.0.0.1/32      *[IS-IS/15] 3d 16:55:51, metric 2000070
101.0.0.1/32      *[IS-IS/15] 3d 16:55:51, metric 2000070

```

```

102.0.0.1/32      *[IS-IS/15] 3d 13:33:05, metric 2000070

user@host-R3>show route protocol isis | match /128
1000::1/128      *[IS-IS/15] 3d 16:50:55, metric 2000070
1001::1/128      *[IS-IS/15] 3d 16:50:55, metric 2000070
1002::1/128      *[IS-IS/15] 3d 13:33:07, metric 2000070

user@host-R3>show route protocol isis
inet.0: 21 destinations, 21 routes (21 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

9.0.0.0/24       *[IS-IS/15] 00:12:58, metric 2000080
> to 20.20.90.2 via ge-0/1/0.0
  to 20.20.70.2 via ge-5/0/2.0
20.20.50.0/24    *[IS-IS/15] 3d 16:55:55, metric 4000140
> to 20.20.70.2 via ge-5/0/2.0
  to 20.20.90.2 via ge-0/1/0.0
20.20.60.0/24    *[IS-IS/15] 3d 13:33:09, metric 4000140
> to 20.20.80.2 via xe-5/3/0.0
  to 20.20.90.2 via ge-0/1/0.0
100.0.0.1/32     *[IS-IS/15] 3d 16:55:55, metric 2000070
> to 20.20.70.2 via ge-5/0/2.0
  to 20.20.90.2 via ge-0/1/0.0
101.0.0.1/32     *[IS-IS/15] 3d 16:55:55, metric 2000070
> to 20.20.90.2 via ge-0/1/0.0
  to 20.20.70.2 via ge-5/0/2.0
102.0.0.1/32     *[IS-IS/15] 3d 13:33:09, metric 2000070
> to 20.20.80.2 via xe-5/3/0.0
  to 20.20.90.2 via ge-0/1/0.0
200.0.1.0/24     *[IS-IS/15] 3d 13:33:09, metric 2000080
> to 20.20.80.2 via xe-5/3/0.0
  to 20.20.90.2 via ge-0/1/0.0

inet.1: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)

inet.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)

iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

mpls.0: 12 destinations, 12 routes (12 active, 0 holddown, 0 hidden)

inet6.0: 13 destinations, 15 routes (13 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

1000::1/128      *[IS-IS/15] 3d 16:50:57, metric 2000070
> to fe80::ae4b:c8ff:fe45:6bde via ge-5/0/2.0
  to fe80::aad0:e5ff:fe50:b203 via ge-0/1/0.0
1001::1/128      *[IS-IS/15] 3d 16:50:57, metric 2000070
> to fe80::aad0:e5ff:fe50:b203 via ge-0/1/0.0
  to fe80::ae4b:c8ff:fe45:6bde via ge-5/0/2.0
1002::1/128      *[IS-IS/15] 3d 13:33:09, metric 2000070
> to fe80::ae4b:c8ff:fe45:f294 via xe-5/3/0.0
  to fe80::aad0:e5ff:fe50:b203 via ge-0/1/0.0
3008:db8:ffff:3::/64
*[IS-IS/15] 3d 13:33:09, metric 2000080
> to fe80::ae4b:c8ff:fe45:f294 via xe-5/3/0.0
  to fe80::aad0:e5ff:fe50:b203 via ge-0/1/0.0

inet6.1: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)

inet6.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)

```

```
user@host-R2>show isis interface
```

```
IS-IS interface database:
```

Interface	L	CirID	Level 1	DR	Level 2	DR	L1/L2 Metric
xe-2/3/1.0	1	0x1	Point to Point		Disabled		2000070/10
ge-2/1/4.0	0	0x1	Passive		Passive		10/10
ge-2/1/0.0	0	0x1	Passive		Passive		10/10
ge-2/1/5.0	0	0x1	Passive		Passive		10/10
lo0.0	0	0x1	Passive		Passive		0/0
ge-2/1/4.0	1	0x1	Point to Point		Disabled		2000070/10

```
user@host-R2>show isis adjacency
```

Interface	System	L	State	Hold (secs)	SNPA
xe-2/3/1.0	R3	1	Up	24	
ge-2/1/4.0	R1	1	Up	25	

```
user@host-R2>show route protocol isis | match /32
```

```
100.0.0.1/32      *[IS-IS/15] 3d 13:20:49, metric 4000140
101.0.0.1/32      *[IS-IS/15] 3d 13:20:51, metric 2000070
103.0.0.1/32      *[IS-IS/15] 3d 13:20:49, metric 2000070
```

```
user@host-R2>show route protocol isis | match /128
```

```
1000::1/128       *[IS-IS/15] 3d 13:21:49, metric 4000140
1001::1/128       *[IS-IS/15] 3d 13:21:51, metric 2000070
1003::1/128       *[IS-IS/15] 3d 13:21:49, metric 2000070
```

```
user@host-R2>show route protocol isis
```

```
inet.0: 21 destinations, 21 routes (21 active, 0 holddown, 0 hidden)
```

```
+ = Active Route, - = Last Active, * = Both
```

```
9.0.0.0/24        *[IS-IS/15] 00:00:55, metric 2000080
> to 20.20.60.2 via ge-2/1/4.0
  to 20.20.80.3 via xe-2/3/1.0
20.20.50.0/24      *[IS-IS/15] 3d 13:21:01, metric 4000140
> to 20.20.60.2 via ge-2/1/4.0
  to 20.20.80.3 via xe-2/3/1.0
20.20.70.0/24      *[IS-IS/15] 3d 13:20:59, metric 4000140
> to 20.20.80.3 via xe-2/3/1.0
  to 20.20.60.2 via ge-2/1/4.0
20.20.90.0/24      *[IS-IS/15] 3d 13:20:59, metric 4000140
  to 20.20.60.2 via ge-2/1/4.0
> to 20.20.80.3 via xe-2/3/1.0
100.0.0.1/32       *[IS-IS/15] 3d 13:20:59, metric 4000140
  to 20.20.60.2 via ge-2/1/4.0
> to 20.20.80.3 via xe-2/3/1.0
101.0.0.1/32       *[IS-IS/15] 3d 13:21:01, metric 2000070
> to 20.20.60.2 via ge-2/1/4.0
  to 20.20.80.3 via xe-2/3/1.0
103.0.0.1/32       *[IS-IS/15] 3d 13:20:59, metric 2000070
> to 20.20.80.3 via xe-2/3/1.0
  to 20.20.60.2 via ge-2/1/4.0
```

```
inet.1: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
```

```
inet.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
```

```
iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
```

```
mpls.0: 47 destinations, 47 routes (47 active, 0 holddown, 0 hidden)
```

```
inet6.0: 15 destinations, 18 routes (15 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

1000::1/128      *[IS-IS/15] 3d 13:20:59, metric 4000140
                  > to fe80::aad0:e5ff:fe50:b201 via ge-2/1/4.0
                  to fe80::fac0:1ff:fe19:d910 via xe-2/3/1.0
1001::1/128      *[IS-IS/15] 3d 13:21:01, metric 2000070
                  > to fe80::aad0:e5ff:fe50:b201 via ge-2/1/4.0
                  to fe80::fac0:1ff:fe19:d910 via xe-2/3/1.0
1003::1/128      *[IS-IS/15] 3d 13:20:59, metric 2000070
                  > to fe80::fac0:1ff:fe19:d910 via xe-2/3/1.0
                  to fe80::aad0:e5ff:fe50:b201 via ge-2/1/4.0

inet6.1: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)

inet6.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)

l2circuit.0: 36 destinations, 36 routes (36 active, 0 holddown, 0 hidden)
```

Meaning IS-IS interfaces, adjacencies, and routes are functioning properly.

Verify LDP Functionality

Purpose On each device, display LDP interface and neighbor information to confirm that the entities are functioning properly.

Action On each device, run the **show ldp interface** and **show ldp neighbor** commands from operational mode.

user@host-R0>show ldp interface

Interface	Label space ID	Nbr count	Next hello
ge-9/0/1.0	100.0.0.1:0	1	0
lo0.0	100.0.0.1:0	1	0
xe-5/2/0.0	100.0.0.1:0	1	0

user@host-R0>show ldp neighbor

Address	Interface	Label space ID	Hold time
20.20.70.3	ge-9/0/1.0	103.0.0.1:0	11
102.0.0.1	lo0.0	102.0.0.1:0	34
20.20.50.3	xe-5/2/0.0	101.0.0.1:0	10

user@host-R1>show ldp interface

Interface	Label space ID	Nbr count	Next hello
lo0.0	101.0.0.1:0	0	0
xe-0/0/0.0	101.0.0.1:0	1	0
ge-2/3/3.0	101.0.0.1:0	1	2
ge-5/0/0.0	101.0.0.1:0	1	2

user@host-R1>show ldp neighbor

Address	Interface	Label space ID	Hold time
20.20.50.2	xe-0/0/0.0	100.0.0.1:0	14
20.20.60.3	ge-2/3/3.0	102.0.0.1:0	14
20.20.90.3	ge-5/0/0.0	103.0.0.1:0	13

user@host-R3>show ldp interface

Interface	Label space ID	Nbr count	Next hello
ge-5/0/2.0	103.0.0.1:0	1	1
xe-5/3/0.0	103.0.0.1:0	1	1
lo0.0	103.0.0.1:0	0	0
ge-0/1/0.0	103.0.0.1:0	1	1

user@host-R3>show ldp neighbor

Address	Interface	Label space ID	Hold time
20.20.70.2	ge-5/0/2.0	100.0.0.1:0	13
20.20.80.2	xe-5/3/0.0	102.0.0.1:0	13
20.20.90.2	ge-0/1/0.0	101.0.0.1:0	11

user@host-R2>show ldp interface

Interface	Label space ID	Nbr count	Next hello
lo0.0	102.0.0.1:0	1	0
ge-2/1/4.0	102.0.0.1:0	1	3
xe-2/3/1.0	102.0.0.1:0	1	2

user@host-R2>show ldp neighbor

Address	Interface	Label space ID	Hold time
100.0.0.1	lo0.0	100.0.0.1:0	38
20.20.60.2	ge-2/1/4.0	101.0.0.1:0	11
20.20.80.3	xe-2/3/1.0	103.0.0.1:0	13

Meaning LDP interfaces and neighbors are operational.

Verify MPLS Interfaces

Purpose On each device, display MPLS interface information to confirm the interfaces are Up.

Action On each device, run the **show mpls interface** command from operational mode.

```
user@host-R0>show mpls interface
```

Interface	State	Administrative groups (x: extended)
ge-9/0/1.0	Up	none
xe-5/2/0.0	Up	none

```
user@host-R1>show mpls interface
```

Interface	State	Administrative groups (x: extended)
xe-0/0/0.0	Up	none
ge-2/3/3.0	Up	none
ge-5/0/0.0	Up	none

```
user@host-R3>show mpls interface
```

Interface	State	Administrative groups (x: extended)
ge-5/0/2.0	Up	none
xe-5/3/0.0	Up	none
ge-0/1/0.0	Up	none

```
user@host-R2>show mpls interface
```

Interface	State	Administrative groups (x: extended)
ge-2/1/4.0	Up	none
xe-2/3/1.0	Up	none

Meaning MPLS interfaces are operational.

Verify CCC Interfaces and L2 Circuits on R0

Purpose Display L2 circuit connection information to confirm that the interfaces and virtual circuits are functioning properly.

Action On R0, run the `show l2circuit connections summary` and `show l2circuit connections interface ge-2/1/0.1` commands from operational mode.

```
user@host-R0>show l2circuit connections summary
```

```
Layer-2 Circuit Connections Summary:
```

```
Neighbor: 102.0.0.1
```

```
Total VCs up: 18, Total VCs down: 0
```

```
user@host-R0>show l2circuit connections interface ge-2/1/0.1
```

```
Layer-2 Circuit Connections:
```

```
Legend for connection status (St)
```

```
EI -- encapsulation invalid      NP -- interface h/w not present
MM -- mtu mismatch               Dn -- down
EM -- encapsulation mismatch     VC-Dn -- Virtual circuit Down
CM -- control-word mismatch      Up -- operational
VM -- vlan id mismatch          CF -- Call admission control failure
OL -- no outgoing label         IB -- TDM incompatible bitrate
NC -- intf encaps not CCC/TCC    TM -- TDM misconfiguration
BK -- Backup Connection         ST -- Standby Connection
CB -- rcvd cell-bundle size bad SP -- Static Pseudowire
LD -- local site signaled down   RS -- remote site standby
RD -- remote site signaled down HS -- Hot-standby Connection
XX -- unknown
```

```
Legend for interface status
```

```
Up -- operational
```

```
Dn -- down
```

```
Neighbor: 102.0.0.1
```

Interface	Type	St	Time last up	# Up trans
ge-2/1/0.1(vc 1)	rmt	Up	Feb 20 20:13:36 2015	1
Remote PE: 102.0.0.1, Negotiated control-word: Yes (Null)				
Incoming label: 337280, Outgoing label: 299776				
Negotiated PW status TLV: No				
Local interface: ge-2/1/0.1, Status: Up, Encapsulation: VLAN				

Meaning CCC and L2 circuit interfaces are operational.

Verify Interface Accounting Files

Purpose Display accounting filenames on the local router, along with the content of those files, to determine whether the system is able to collect input and output statistics from the business customer service interface.

- input-packets
- output-packets
- input-multicast
- output-multicast

The accounting file size and backup file count should be updated if the system's interface accounting component is working as expected.

Verify Inline Flow Monitoring

- Purpose** Display inline flow accounting status and statistics for the specified FPC. Inline flow monitoring supports a sampling output format designated IP_FIX.
- Action** On R0, run the **show services accounting status inline-jflow fpc-slot 2** and **fshow services accounting flow inline-jflow fpc-slot 2** commands from operational mode.
- ```
user@host-R0>show services accounting status inline-jflow fpc-slot 2
Status information
 FPC Slot: 2
 IPv4 export format: Version-IPFIX, IPv6 export format: Version-IPFIX
 VPLS export format: Not set
 IPv4 Route Record Count: 36, IPv6 Route Record Count: 18
 Route Record Count: 54, AS Record Count: 1
 Route-Records Set: Yes, Config Set: Yes

user@host-R0>show services accounting flow inline-jflow fpc-slot 2
Flow information
 FPC Slot: 2
 Flow Packets: 181, Flow Bytes: 39932
 Active Flows: 0, Total Flows: 180
 Flows Exported: 178, Flow Packets Exported: 178
 Flows Inactive Timed Out: 177, Flows Active Timed Out: 3

 IPv4 Flows:
 IPv4 Flow Packets: 181, IPv4 Flow Bytes: 39932
 IPv4 Active Flows: 0, IPv4 Total Flows: 180
 IPv4 Flows Exported: 178, IPv4 Flow Packets exported: 178
 IPv4 Flows Inactive Timed Out: 177, IPv4 Flows Active Timed Out: 3

 IPv6 Flows:
 IPv6 Flow Packets: 0, IPv6 Flow Bytes: 0
 IPv6 Active Flows: 0, IPv6 Total Flows: 0
 IPv6 Flows Exported: 0, IPv6 Flow Packets Exported: 0
 IPv6 Flows Inactive Timed Out: 0, IPv6 Flows Active Timed Out: 0
```
- Meaning** If the inline flow feature is enabled and working properly, the IPv4 and IPv6 flow counts should increase as traffic is forwarded using a line module.

---

### Verify PPPoE over Dynamic VLAN Subscribers on R0

- Purpose** Display PPPoE subscriber and other PPPoE over dynamic VLAN information to confirm that the interfaces are functioning properly.

The BNG system dynamically creates subscriber interfaces such as pp0.xyz and assigns system-generated interface unit numbers and session IDs for subscriber session identification purposes. These ID values are not fixed, because they are maintained by the system. Obtaining the interface name and session ID is the first step in the verification process.

**Action** From operational mode, run the **show subscribers**, **show subscribers detail**, **show route protocol access-internal**, **show subscribers extensive**, **show network-access aaa subscribers**, **show network-access aaa subscribers session-id 748**, **show network-access aaa subscribers session-id 748 detail**, **show firewall**, **show class-of-service traffic-control-profile**, **show class-of-service scheduler-hierarchy interface pp0.1073742493**, **show interfaces queue pp0.1073742493**, **show class-of-service interface pp0.1073742493**, **show class-of-service interface pp0.1073742493 detail**, and **show class-of-service interface pp0.1073742493 comprehensive** commands.

```
user@host-R0>show subscribers
Interface IP Address/VLAN ID User Name
 LS:RI
demux0.1073742492 0x8100.1 0x8100.100
 default:default
pp0.1073742493 100.16.1.41 DEFAULTUSER
 default:default
* 1016:0:0:18::/64
```

```
user@host-R0>show subscribers detail
Type: VLAN
Logical System: default
Routing Instance: default
Interface: demux0.1073742492
Interface type: Dynamic
Underlying Interface: ge-2/1/0
Dynamic Profile Name: vlan-client-profile
State: Active
Session ID: 747
Stacked VLAN Id: 0x8100.1
VLAN Id: 0x8100.100
Login Time: 2015-02-24 08:54:31 PST
```

```
Type: PPPoE
User Name: DEFAULTUSER
IP Address: 100.16.1.41
IP Netmask: 255.0.0.0
IPv6 User Prefix: 1016:0:0:18::/64
Logical System: default
Routing Instance: default
Interface: pp0.1073742493
Interface type: Dynamic
Underlying Interface: demux0.1073742492
Interface description: To access facing port1
Dynamic Profile Name: pppoe-client-profile
MAC Address: 00:22:68:14:84:d5
Session Timeout (seconds): 5184000
Idle Timeout (seconds): 54000
State: Active
Radius Accounting ID: jnpr demux0.1073742492:748
Session ID: 748
Stacked VLAN Id: 1
VLAN Id: 100
Login Time: 2015-02-24 08:54:36 PST
Service Sessions: 3
```

```
user@host-R0>show route protocol access-internal
inet.0: 33 destinations, 35 routes (33 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both
```

```
100.16.1.41/32 *[Access-internal/12] 00:03:08
 > via pp0.1073742493

inet.1: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)
inet.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
mpls.0: 47 destinations, 47 routes (47 active, 0 holddown, 0 hidden)
inet6.0: 12 destinations, 13 routes (12 active, 0 holddown, 0 hidden)
inet6.1: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
inet6.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
l2circuit.0: 36 destinations, 36 routes (36 active, 0 holddown, 0 hidden)

user@host-R0>show subscribers extensive
Type: VLAN
Logical System: default
Routing Instance: default
Interface: demux0.1073742492
Interface type: Dynamic
Underlying Interface: ge-2/1/0
Dynamic Profile Name: vlan-client-profile
State: Active
Session ID: 747
Stacked VLAN Id: 0x8100.1
VLAN Id: 0x8100.100
Login Time: 2015-02-24 08:54:31 PST
Effective shaping-rate: 1000000k

Type: PPPoE
User Name: DEFAULTUSER
IP Address: 100.16.1.41
IP Netmask: 255.0.0.0
IPv6 User Prefix: 1016:0:0:18::/64
Logical System: default
Routing Instance: default
Interface: pp0.1073742493
Interface type: Dynamic
Underlying Interface: demux0.1073742492
Interface description: To access facing port1
Dynamic Profile Name: pppoe-client-profile
MAC Address: 00:22:68:14:84:d5
Session Timeout (seconds): 5184000
Idle Timeout (seconds): 54000
State: Active
Radius Accounting ID: jnpr demux0.1073742492:748
Session ID: 748
Stacked VLAN Id: 1
VLAN Id: 100
Login Time: 2015-02-24 08:54:36 PST
Service Sessions: 3
IP Address Pool: v4-pool-0
IPv6 Address Pool: v6_NDRA_Prefix_Pool1
IPv6 Interface Address: 1016:0:0:18::1/64
IPv6 Framed Interface Id: 75a3:ba9f:348:4cd1
```

```

IPv4 Input Filter Name: DEFAULT_V4-IN-pp0.1073742493-in
IPv4 Output Filter Name: DEFAULT_V4-OUT-pp0.1073742493-out
IPv6 Input Filter Name: DEFAULT_V6-IN-pp0.1073742493-in
IPv6 Output Filter Name: DEFAULT_V6-OUT-pp0.1073742493-out
ADF IPv4 Input Filter Name: __junos_adf_748-pp0.1073742493-inet-in
Rule 0:
0100010000000000509c3500002000000000000000000000000000000000000000
 from {
 destination-address 8.1.1.0/32;
 }
 then {
 discard;
 }
Rule 1:
010101006400000000000000080011000000003500020000000000000000000000000000
 from {
 source-address 100.0.0.0/8;
 protocol 17;
 destination-port 53;
 }
 then {
 accept;
 }
Rule 2:
0101010064000000d25a0a01082000
 from {
 source-address 100.0.0.0/8;
 destination-address 200.0.0.101/32;
 }
 then {
 accept;
 }
Rule 3:
0101010064000000d25a0a02082000
 from {
 source-address 100.0.0.0/8;
 destination-address 200.0.0.102/32;
 }
 then {
 accept;
 }
Rule 4:
01010100
 then {
 accept;
 }
Effective shaping-rate: 75000k

Service Session ID: 749
Service Session Name: voice
State: Active
Family: inet, inet6
IPv4 Input Filter Name: filter_voice_input_UID1034-pp0.1073742493-in
IPv4 Output Filter Name: filter_voice_output_UID1035-pp0.1073742493-out
IPv6 Input Filter Name: filter_voice_input_v6_UID1036-pp0.1073742493-in
IPv6 Output Filter Name: filter_voice_output_v6_UID1037-pp0.1073742493-out

Service Session ID: 750
Service Session Name: video
State: Active
Family: inet

```

IPv4 Output Filter Name: video\_filter\_name\_UID1161-pp0.1073742493-out

Service Session ID: 751

Service Session Name: input\_qos

State: Active

Family: inet, inet6

IPv4 Input Filter Name: input\_filter\_name\_UID1167-pp0.1073742493-in

IPv6 Input Filter Name: input\_filter\_v6\_name\_UID1168-pp0.1073742493-in

user@host-R0>show network-access aaa subscribers

| Username    | Logical system/Routing instance | Client type |     |
|-------------|---------------------------------|-------------|-----|
| Session-ID  |                                 |             |     |
| DEFAULTUSER | default:default                 | pppoe       | 748 |

{master}

poc@R0> show network-access aaa subscribers session-id 748

| Logical system/Routing instance                         | Client type  | Session-ID | Session uptime |
|---------------------------------------------------------|--------------|------------|----------------|
| Accounting                                              |              |            |                |
| default:default                                         | pppoe        | 748        | 00:12:39       |
| on/volume+time                                          |              |            |                |
| Service name                                            | Service type | Quota      | Accounting     |
| voice(600000,20.0.0.0/24, 2016:323:abcd::/64) -na- -na- |              |            | on/volume+time |
| video(20000000,40000000,10.0.0.0/24) -na- -na-          |              |            | on/volume+time |
| input_qos(35000000) -na- -na-                           |              |            | on/volume+time |

user@host-R0>show network-access aaa subscribers session-id 748 detail

Type: pppoe

Stripped username: DEFAULTUSER

AAA Logical system/Routing instance: default:default

Target Logical system/Routing instance: default:default

Access-profile: Access-Profile-0

Session ID: 748

Accounting Session ID: jnpr demux0.1073742492:748

Multi Accounting Session ID: 0

IP Address: 100.16.1.41

IPv6 Prefix: 1016:0:0:18::/64

Authentication State: AuthStateActive

Accounting State: Acc-Interim-Sent

Provisioning Type: None

Service name: voice(600000,20.0.0.0/24, 2016:323:abcd::/64)

Service State: SvcActive

Service Family: inet, inet6

Service Activation Source: Radius

Session ID: 749

Session uptime: 00:12:51

Accounting status: on/volume+time

Service accounting session ID: jnpr demux0.1073742492:748:749-1424796876

Service accounting state: Acc-Start-Sent

Accounting interim interval: 14400

Service name: video(20000000,40000000,10.0.0.0/24)

Service State: SvcActive

Service Family: inet

Service Activation Source: Radius

Session ID: 750

Session uptime: 00:12:51

Accounting status: on/volume+time

Service accounting session ID: jnpr demux0.1073742492:748:750-1424796876

Service accounting state: Acc-Start-Sent

Accounting interim interval: 14400

Service name: input\_qos(35000000)

Service State: SvcActive

```

Service Family: inet, inet6
Service Activation Source: Radius
Session ID: 751
Session uptime: 00:12:51
Accounting status: on/volume+time
Service accounting session ID: jnpr demux0.1073742492:748:751-1424796876
Service accounting state: Acc-Start-Sent
Accounting interim interval: 14400

```

```

user@host-R0>show firewall
Filter: JFlow-Sample-IPv4

```

```
Filter: JFlow-Sample-IPv6
```

```
Counters:
```

| Name                 | Bytes   | Packets |
|----------------------|---------|---------|
| all-accept           | 2126272 | 28958   |
| from-backbone-reject | 0       | 0       |
| local-accept         | 672     | 12      |
| to-backbone-reject   | 560     | 10      |

```
Filter: __default_bpdu_filter__
```

```
Filter: DEFAULT_V4-IN-pp0.1073742493-in
```

```
Filter: DEFAULT_V4-OUT-pp0.1073742493-out
```

```
Filter: __junos_adf_748-pp0.1073742493-inet-in
```

```
Counters:
```

| Name   | Bytes | Packets |
|--------|-------|---------|
| t0-cnt | 0     | 0       |
| t1-cnt | 2852  | 46      |
| t2-cnt | 0     | 0       |
| t3-cnt | 0     | 0       |
| t4-cnt | 40720 | 144     |

```
Filter: DEFAULT_V6-IN-pp0.1073742493-in
```

```
Filter: DEFAULT_V6-OUT-pp0.1073742493-out
```

```
Filter: filter_voice_input_UID1034-pp0.1073742493-in
```

```
Counters:
```

| Name                        | Bytes | Packets |
|-----------------------------|-------|---------|
| __junos-dyn-service-counter | 0     | 0       |

```
Policers:
```

| Name                                           | Bytes | Packets |
|------------------------------------------------|-------|---------|
| voice_policer_UID1033-filter-pp0.1073742493-in | 0     | 0       |

```
Filter: filter_voice_output_UID1035-pp0.1073742493-out
```

```
Counters:
```

| Name                        | Bytes | Packets |
|-----------------------------|-------|---------|
| __junos-dyn-service-counter | 0     | 0       |

```
Policers:
```

| Name                                            | Bytes | Packets |
|-------------------------------------------------|-------|---------|
| voice_policer_UID1033-filter-pp0.1073742493-out | 0     | 0       |

```
Filter: video_filter_name_UID1161-pp0.1073742493-out
```

```
Counters:
```

| Name                        | Bytes | Packets |
|-----------------------------|-------|---------|
| __junos-dyn-service-counter | 0     | 0       |

Filter: input\_filter\_name\_UID1167-pp0.1073742493-in

Counters:

| Name                        | Bytes | Packets |
|-----------------------------|-------|---------|
| __junos-dyn-service-counter | 2852  | 46      |

Hierarchical Policers:

| Name                                                      | Bytes | Packets |
|-----------------------------------------------------------|-------|---------|
| lowdelay_class_hpolicer_UID1164-filter-pp0.1073742493-in  |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| lowloss_class_hpolicer_UID1165-filter-pp0.1073742493-in   |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| multicast_class_hpolicer_UID1163-filter-pp0.1073742493-in |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| premium_classes_hpolicer_UID1162-filter-pp0.1073742493-in |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| subscriber_hpolicer_UID1166-filter-pp0.1073742493-in      |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |

Filter: filter\_voice\_input\_v6\_UID1036-pp0.1073742493-in

Counters:

| Name                        | Bytes | Packets |
|-----------------------------|-------|---------|
| __junos-dyn-service-counter | 0     | 0       |

Policers:

| Name                                           | Bytes | Packets |
|------------------------------------------------|-------|---------|
| voice_policer_UID1033-filter-pp0.1073742493-in | 0     | 0       |

Filter: filter\_voice\_output\_v6\_UID1037-pp0.1073742493-out

Counters:

| Name                        | Bytes | Packets |
|-----------------------------|-------|---------|
| __junos-dyn-service-counter | 0     | 0       |

Policers:

| Name                                            | Bytes | Packets |
|-------------------------------------------------|-------|---------|
| voice_policer_UID1033-filter-pp0.1073742493-out | 0     | 0       |

Filter: input\_filter\_v6\_name\_UID1168-pp0.1073742493-in

Counters:

| Name                        | Bytes | Packets |
|-----------------------------|-------|---------|
| __junos-dyn-service-counter | 0     | 0       |

Hierarchical Policers:

| Name                                                      | Bytes | Packets |
|-----------------------------------------------------------|-------|---------|
| lowdelay_class_hpolicer_UID1164-filter-pp0.1073742493-in  |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| lowloss_class_hpolicer_UID1165-filter-pp0.1073742493-in   |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| multicast_class_hpolicer_UID1163-filter-pp0.1073742493-in |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| premium_classes_hpolicer_UID1162-filter-pp0.1073742493-in |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| subscriber_hpolicer_UID1166-filter-pp0.1073742493-in      |       |         |
| Aggregate                                                 | 0     | 0       |



```
Premium 0 0
```

```
user@host-R0>show class-of-service traffic-control-profile
```

```
Traffic control profile: SessionShaper.o.pp0.1073742493, Index: 1666108328
```

```
Shaping rate: 75000000
```

```
Scheduler map: schedmap_residential
```

```
user@host-R0>show class-of-service scheduler-hierarchy interface pp0.1073742493
```

| Interface/<br>Resource name | Shaping<br>rate<br>kbits | Guaranteed<br>rate<br>kbits | Guaranteed/<br>Excess<br>priority | Queue<br>weight | Excess<br>weight<br>high/low |
|-----------------------------|--------------------------|-----------------------------|-----------------------------------|-----------------|------------------------------|
| ge-2/1/0                    | 1000000                  |                             |                                   |                 |                              |
| ge-2/1/0 RTP                | 1000000                  | 0                           |                                   |                 | 1 1                          |
| BestEffort                  | 1000000                  | 0                           | Low Low                           | 950             |                              |
| Control                     | 1000000                  | 0                           | Low Low                           | 50              |                              |
| pp0.1073742493              | 75000                    | 0                           |                                   |                 | 500 500                      |
| BestEffort                  | 75000                    | 0                           | Low Low                           | 150             |                              |
| LowLoss                     | 75000                    | 0                           | Low Low                           | 666             |                              |
| LowDelay                    | 75000                    | 0                           | Medium High                       | 150             |                              |
| Control                     | 75000                    | 256                         | High Low                          | 16              |                              |
| Voice                       | 75000                    | Disabled                    | High High                         | 1               |                              |
| Multicast                   | 75000                    | 100000                      | Medium High                       | 16              |                              |

```
user@host-R0>show interfaces queue pp0.1073742493
```

```
Logical interface pp0.1073742493 (Index 363) (SNMP ifIndex 7012)
```

```
Forwarding classes: 16 supported, 6 in use
```

```
Egress queues: 8 supported, 6 in use
```

```
Burst size: 0
```

```
Queue: 0, Forwarding classes: BestEffort
```

```
Queued:
```

```
Packets : 0 0 pps
Bytes : 0 0 bps
```

```
Transmitted:
```

```
Packets : 0 0 pps
Bytes : 0 0 bps
Tail-dropped packets : 0 0 pps
RL-dropped packets : 0 0 pps
RL-dropped bytes : 0 0 bps
RED-dropped packets : 0 0 pps
Low : 0 0 pps
Medium-low : 0 0 pps
Medium-high : 0 0 pps
High : 0 0 pps
RED-dropped bytes : 0 0 bps
Low : 0 0 bps
Medium-low : 0 0 bps
Medium-high : 0 0 bps
High : 0 0 bps
```

```
Queue: 1, Forwarding classes: LowLoss
```

```
Queued:
```

```
Packets : 0 0 pps
Bytes : 0 0 bps
```

```
Transmitted:
```

```
Packets : 0 0 pps
Bytes : 0 0 bps
Tail-dropped packets : 0 0 pps
RL-dropped packets : 0 0 pps
RL-dropped bytes : 0 0 bps
RED-dropped packets : 0 0 pps
Low : 0 0 pps
Medium-low : 0 0 pps
```

```

Medium-high : 0 0 pps
High : 0 0 pps
RED-dropped bytes : 0 0 bps
Low : 0 0 bps
Medium-low : 0 0 bps
Medium-high : 0 0 bps
High : 0 0 bps
Queue: 2, Forwarding classes: LowDelay
Queued:
Packets : 0 0 pps
Bytes : 0 0 bps
Transmitted:
Packets : 0 0 pps
Bytes : 0 0 bps
Tail-dropped packets : 0 0 pps
RL-dropped packets : 0 0 pps
RL-dropped bytes : 0 0 bps
RED-dropped packets : 0 0 pps
Low : 0 0 pps
Medium-low : 0 0 pps
Medium-high : 0 0 pps
High : 0 0 pps
RED-dropped bytes : 0 0 bps
Low : 0 0 bps
Medium-low : 0 0 bps
Medium-high : 0 0 bps
High : 0 0 bps
Queue: 3, Forwarding classes: Control
Queued:
Packets : 225 0 pps
Bytes : 32314 0 bps
Transmitted:
Packets : 225 0 pps
Bytes : 32314 0 bps
Tail-dropped packets : 0 0 pps
RL-dropped packets : 0 0 pps
RL-dropped bytes : 0 0 bps
RED-dropped packets : 0 0 pps
Low : 0 0 pps
Medium-low : 0 0 pps
Medium-high : 0 0 pps
High : 0 0 pps
RED-dropped bytes : 0 0 bps
Low : 0 0 bps
Medium-low : 0 0 bps
Medium-high : 0 0 bps
High : 0 0 bps
Queue: 4, Forwarding classes: Voice
Queued:
Packets : 0 0 pps
Bytes : 0 0 bps
Transmitted:
Packets : 0 0 pps
Bytes : 0 0 bps
Tail-dropped packets : 0 0 pps
RL-dropped packets : 0 0 pps
RL-dropped bytes : 0 0 bps
RED-dropped packets : 0 0 pps
Low : 0 0 pps
Medium-low : 0 0 pps
Medium-high : 0 0 pps

```

```

 High : 0 0 pps
 RED-dropped bytes : 0 0 bps
 Low : 0 0 bps
 Medium-low : 0 0 bps
 Medium-high : 0 0 bps
 High : 0 0 bps
Queue: 7, Forwarding classes: Multicast
Queued:
 Packets : 0 0 pps
 Bytes : 0 0 bps
Transmitted:
 Packets : 0 0 pps
 Bytes : 0 0 bps
Tail-dropped packets : 0 0 pps
RL-dropped packets : 0 0 pps
RL-dropped bytes : 0 0 bps
RED-dropped packets : 0 0 pps
 Low : 0 0 pps
 Medium-low : 0 0 pps
 Medium-high : 0 0 pps
 High : 0 0 pps
RED-dropped bytes : 0 0 bps
 Low : 0 0 bps
 Medium-low : 0 0 bps
 Medium-high : 0 0 bps
 High : 0 0 bps

```

user@host-R0>show class-of-service interface pp0.1073742493

```

Logical interface: pp0.1073742493, Index: 363
Object Name Type Index
Traffic-control-profile SessionShaper.o.pp0.1073742493 Output 1666108328
Rewrite-Output residential-default dscp 11459
Rewrite-Output residential-default-v6 dscp-ipv6 18201
Rewrite-Output residential-default-vlan ieee8021p (outer) 2172
Rewrite-Output residential-default-vlan ieee8021p (both) 2172
Classifier dscp-ipv6-compatibility dscp-ipv6 9
Classifier ipprec-compatibility ip 13

```

user@host-R0>show class-of-service interface pp0.1073742493 detail

```

Logical interface pp0.1073742493
Flags: Up Point-To-Point 0x4000 Encapsulation: PPPoE
PPPoE:
 State: SessionUp, Session ID: 1,
 Session AC name: R0, Remote MAC address: 00:22:68:14:84:d5,
 Underlying interface: demux0.1073742492 (Index 357)
inet 100.0.0.1 --> 0/0
inet6 1016:0:0:18::1/64
 fe80::2a0:a50f:fc76:14de
Interface Admin Link Proto Input Filter Output Filter
pp0.1073742493 up up inet DEFAULT_V4-IN-pp0.1073742493-in
DEFAULT_V4-OUT-pp0.1073742493-out
 inet __junos_adf_748-pp0.1073742493-inet-in
filter_voice_output_UID1035-pp0.1073742493-out
 inet filter_voice_input_UID1034-pp0.1073742493-in
video_filter_name_UID1161-pp0.1073742493-out
 inet input_filter_name_UID1167-pp0.1073742493-in
 inet6 DEFAULT_V6-IN-pp0.1073742493-in
DEFAULT_V6-OUT-pp0.1073742493-out
 inet6 filter_voice_input_v6_UID1036-pp0.1073742493-in
filter_voice_output_v6_UID1037-pp0.1073742493-out
 inet6 input_filter_v6_name_UID1168-pp0.1073742493-in

```

```

Interface Admin Link Proto Input Policer Output Policer
pp0.1073742493 up up inet
 inet6

```

Logical interface: pp0.1073742493, Index: 363

| Object                  | Name                           | Type              | Index      |
|-------------------------|--------------------------------|-------------------|------------|
| Traffic-control-profile | SessionShaper.o.pp0.1073742493 | Output            | 1666108328 |
| Rewrite-Output          | residential-default            | dscp              | 11459      |
| Rewrite-Output          | residential-default-v6         | dscp-ipv6         | 18201      |
| Rewrite-Output          | residential-default-vlan       | ieee8021p (outer) | 2172       |
| Rewrite-Output          | residential-default-vlan       | ieee8021p (both)  | 2172       |
| Classifier              | dscp-ipv6-compatibility        | dscp-ipv6         | 9          |
| Classifier              | ipprec-compatibility           | ip                | 13         |

user@host-R0>show class-of-service interface pp0.1073742493 comprehensive

Logical interface pp0.1073742493 (Index 363) (SNMP ifIndex 7012) (Generation 5044)

Flags: Up Point-To-Point 0x4000 Encapsulation: PPPoE

PPPoE:

State: SessionUp, Session ID: 1,

Session AC name: R0, Remote MAC address: 00:22:68:14:84:d5,

Underlying interface: demux0.1073742492 (Index 357)

Traffic statistics:

Input bytes : 65155

Output bytes : 35771

Input packets: 309

Output packets: 291

IPv6 transit statistics:

Input bytes : 0

Output bytes : 0

Input packets: 0

Output packets: 0

Local statistics:

Input bytes : 59921

Output bytes : 35089

Input packets: 224

Output packets: 262

Transit statistics:

Input bytes : 5234 0 bps

Output bytes : 682 0 bps

Input packets: 85 0 pps

Output packets: 29 0 pps

IPv6 transit statistics:

Input bytes : 0

Output bytes : 0

Input packets: 0

Output packets: 0

Keepalive settings: Interval 30 seconds, Up-count 1, Down-count 3

LCP state: Opened

NCP state: inet: Opened, inet6: Opened, iso: Not-configured, mpls: Not-configured

CHAP state: Closed

PAP state: Success

Protocol inet, MTU: 1492, Generation: 3437, Route table: 0

Flags: Sendbcst-pkt-to-re

Input Filters: DEFAULT\_V4-IN-pp0.1073742493-in (240),

\_\_junos\_adf\_748-pp0.1073742493-inet-in (100),

filter\_voice\_input\_UID1034-pp0.1073742493-in (100),

input\_filter\_name\_UID1167-pp0.1073742493-in (250)

Output Filters: DEFAULT\_V4-OUT-pp0.1073742493-out (240),

```

filter_voice_output_UID1035-pp0.1073742493-out (100),
 video_filter_name_UID1161-pp0.1073742493-out (120)
 Addresses, Flags: Is-Primary
 Destination: Unspecified, Local: 100.0.0.1, Broadcast: Unspecified,
Generation: 1768
 Protocol inet6, MTU: 1492, Generation: 3438, Route table: 0
 Input Filters: DEFAULT_V6-IN-pp0.1073742493-in (240),
filter_voice_input_v6_UID1036-pp0.1073742493-in (100),
 input_filter_v6_name_UID1168-pp0.1073742493-in (250)
 Output Filters: DEFAULT_V6-OUT-pp0.1073742493-out (240),
filter_voice_output_v6_UID1037-pp0.1073742493-out (100)
 Addresses, Flags: Is-Preferred Is-Primary
 Destination: 1016:0:0:18::/64, Local: 1016:0:0:18::1
Generation: 1770
 Destination: Unspecified, Local: fe80::2a0:a50f:fc76:14de
Generation: 1771

```

Logical interface pp0.1073742493 (Index 363) (SNMP ifIndex 7012)

Forwarding classes: 16 supported, 6 in use

Egress queues: 8 supported, 6 in use

Burst size: 0

Queue: 0, Forwarding classes: BestEffort

Queued:

|         |   |   |       |
|---------|---|---|-------|
| Packets | : | 0 | 0 pps |
| Bytes   | : | 0 | 0 bps |

Transmitted:

|                      |   |   |       |
|----------------------|---|---|-------|
| Packets              | : | 0 | 0 pps |
| Bytes                | : | 0 | 0 bps |
| Tail-dropped packets | : | 0 | 0 pps |
| RL-dropped packets   | : | 0 | 0 pps |
| RL-dropped bytes     | : | 0 | 0 bps |
| RED-dropped packets  | : | 0 | 0 pps |
| Low                  | : | 0 | 0 pps |
| Medium-low           | : | 0 | 0 pps |
| Medium-high          | : | 0 | 0 pps |
| High                 | : | 0 | 0 pps |
| RED-dropped bytes    | : | 0 | 0 bps |
| Low                  | : | 0 | 0 bps |
| Medium-low           | : | 0 | 0 bps |
| Medium-high          | : | 0 | 0 bps |
| High                 | : | 0 | 0 bps |

Queue: 1, Forwarding classes: LowLoss

Queued:

|         |   |   |       |
|---------|---|---|-------|
| Packets | : | 0 | 0 pps |
| Bytes   | : | 0 | 0 bps |

Transmitted:

|                      |   |   |       |
|----------------------|---|---|-------|
| Packets              | : | 0 | 0 pps |
| Bytes                | : | 0 | 0 bps |
| Tail-dropped packets | : | 0 | 0 pps |
| RL-dropped packets   | : | 0 | 0 pps |
| RL-dropped bytes     | : | 0 | 0 bps |
| RED-dropped packets  | : | 0 | 0 pps |
| Low                  | : | 0 | 0 pps |
| Medium-low           | : | 0 | 0 pps |
| Medium-high          | : | 0 | 0 pps |
| High                 | : | 0 | 0 pps |
| RED-dropped bytes    | : | 0 | 0 bps |
| Low                  | : | 0 | 0 bps |
| Medium-low           | : | 0 | 0 bps |
| Medium-high          | : | 0 | 0 bps |
| High                 | : | 0 | 0 bps |

## Queue: 2, Forwarding classes: LowDelay

## Queued:

|         |   |   |       |
|---------|---|---|-------|
| Packets | : | 0 | 0 pps |
| Bytes   | : | 0 | 0 bps |

## Transmitted:

|                      |   |   |       |
|----------------------|---|---|-------|
| Packets              | : | 0 | 0 pps |
| Bytes                | : | 0 | 0 bps |
| Tail-dropped packets | : | 0 | 0 pps |
| RL-dropped packets   | : | 0 | 0 pps |
| RL-dropped bytes     | : | 0 | 0 bps |
| RED-dropped packets  | : | 0 | 0 pps |
| Low                  | : | 0 | 0 pps |
| Medium-low           | : | 0 | 0 pps |
| Medium-high          | : | 0 | 0 pps |
| High                 | : | 0 | 0 pps |
| RED-dropped bytes    | : | 0 | 0 bps |
| Low                  | : | 0 | 0 bps |
| Medium-low           | : | 0 | 0 bps |
| Medium-high          | : | 0 | 0 bps |
| High                 | : | 0 | 0 bps |

## Queue: 3, Forwarding classes: Control

## Queued:

|         |   |       |       |
|---------|---|-------|-------|
| Packets | : | 259   | 0 pps |
| Bytes   | : | 37154 | 0 bps |

## Transmitted:

|                      |   |       |       |
|----------------------|---|-------|-------|
| Packets              | : | 259   | 0 pps |
| Bytes                | : | 37154 | 0 bps |
| Tail-dropped packets | : | 0     | 0 pps |
| RL-dropped packets   | : | 0     | 0 pps |
| RL-dropped bytes     | : | 0     | 0 bps |
| RED-dropped packets  | : | 0     | 0 pps |
| Low                  | : | 0     | 0 pps |
| Medium-low           | : | 0     | 0 pps |
| Medium-high          | : | 0     | 0 pps |
| High                 | : | 0     | 0 pps |
| RED-dropped bytes    | : | 0     | 0 bps |
| Low                  | : | 0     | 0 bps |
| Medium-low           | : | 0     | 0 bps |
| Medium-high          | : | 0     | 0 bps |
| High                 | : | 0     | 0 bps |

## Queue: 4, Forwarding classes: Voice

## Queued:

|         |   |   |       |
|---------|---|---|-------|
| Packets | : | 0 | 0 pps |
| Bytes   | : | 0 | 0 bps |

## Transmitted:

|                      |   |   |       |
|----------------------|---|---|-------|
| Packets              | : | 0 | 0 pps |
| Bytes                | : | 0 | 0 bps |
| Tail-dropped packets | : | 0 | 0 pps |
| RL-dropped packets   | : | 0 | 0 pps |
| RL-dropped bytes     | : | 0 | 0 bps |
| RED-dropped packets  | : | 0 | 0 pps |
| Low                  | : | 0 | 0 pps |
| Medium-low           | : | 0 | 0 pps |
| Medium-high          | : | 0 | 0 pps |
| High                 | : | 0 | 0 pps |
| RED-dropped bytes    | : | 0 | 0 bps |
| Low                  | : | 0 | 0 bps |
| Medium-low           | : | 0 | 0 bps |
| Medium-high          | : | 0 | 0 bps |
| High                 | : | 0 | 0 bps |

## Queue: 7, Forwarding classes: Multicast

```

Queued:
 Packets : 0 0 pps
 Bytes : 0 0 bps
Transmitted:
 Packets : 0 0 pps
 Bytes : 0 0 bps
 Tail-dropped packets : 0 0 pps
 RL-dropped packets : 0 0 pps
 RL-dropped bytes : 0 0 bps
 RED-dropped packets : 0 0 pps
 Low : 0 0 pps
 Medium-low : 0 0 pps
 Medium-high : 0 0 pps
 High : 0 0 pps
 RED-dropped bytes : 0 0 bps
 Low : 0 0 bps
 Medium-low : 0 0 bps
 Medium-high : 0 0 bps
 High : 0 0 bps
Interface Admin Link Proto Input Filter Output Filter
pp0.1073742493 up up inet DEFAULT_V4-IN-pp0.1073742493-in
DEFAULT_V4-OUT-pp0.1073742493-out
 inet __junos_adf_748-pp0.1073742493-inet-in
filter_voice_output_UID1035-pp0.1073742493-out
 inet filter_voice_input_UID1034-pp0.1073742493-in
video_filter_name_UID1161-pp0.1073742493-out
 inet input_filter_name_UID1167-pp0.1073742493-in
 inet6 DEFAULT_V6-IN-pp0.1073742493-in
DEFAULT_V6-OUT-pp0.1073742493-out
 inet6 filter_voice_input_v6_UID1036-pp0.1073742493-in
 filter_voice_output_v6_UID1037-pp0.1073742493-out
 inet6 input_filter_v6_name_UID1168-pp0.1073742493-in
Interface Admin Link Proto Input Policer Output Policer
pp0.1073742493 up up
 inet
 inet6

Filter: DEFAULT_V4-IN-pp0.1073742493-in

Filter: __junos_adf_748-pp0.1073742493-inet-in
Counters:
Name Bytes Packets
t0-cnt 0 0
t1-cnt 2852 46
t2-cnt 0 0
t3-cnt 0 0
t4-cnt 60620 219

Filter: filter_voice_input_UID1034-pp0.1073742493-in
Counters:
Name Bytes Packets
__junos-dyn-service-counter 0 0
Policers:
Name Bytes Packets
voice_policer_UID1033-filter-pp0.1073742493-in 0
0

Filter: input_filter_name_UID1167-pp0.1073742493-in
Counters:
Name Bytes Packets
__junos-dyn-service-counter 2852 46

```

## Hierarchical Policers:

| Name                                                      | Bytes | Packets |
|-----------------------------------------------------------|-------|---------|
| lowdelay_class_hpolicer_UID1164-filter-pp0.1073742493-in  |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| lowloss_class_hpolicer_UID1165-filter-pp0.1073742493-in   |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| multicast_class_hpolicer_UID1163-filter-pp0.1073742493-in |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| premium_classes_hpolicer_UID1162-filter-pp0.1073742493-in |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| subscriber_hpolicer_UID1166-filter-pp0.1073742493-in      |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |

Filter: DEFAULT\_V4-OUT-pp0.1073742493-out

Filter: filter\_voice\_output\_UID1035-pp0.1073742493-out

## Counters:

| Name                        | Bytes | Packets |
|-----------------------------|-------|---------|
| __junos-dyn-service-counter | 0     | 0       |

## Policers:

| Name                                            | Bytes | Packets |
|-------------------------------------------------|-------|---------|
| voice_policer_UID1033-filter-pp0.1073742493-out |       | 0       |
| 0                                               |       |         |

Filter: video\_filter\_name\_UID1161-pp0.1073742493-out

## Counters:

| Name                        | Bytes | Packets |
|-----------------------------|-------|---------|
| __junos-dyn-service-counter | 0     | 0       |

Filter: DEFAULT\_V6-IN-pp0.1073742493-in

Filter: filter\_voice\_input\_v6\_UID1036-pp0.1073742493-in

## Counters:

| Name                        | Bytes | Packets |
|-----------------------------|-------|---------|
| __junos-dyn-service-counter | 0     | 0       |

## Policers:

| Name                                           | Bytes | Packets |
|------------------------------------------------|-------|---------|
| voice_policer_UID1033-filter-pp0.1073742493-in |       | 0       |
| 0                                              |       |         |

Filter: input\_filter\_v6\_name\_UID1168-pp0.1073742493-in

## Counters:

| Name                        | Bytes | Packets |
|-----------------------------|-------|---------|
| __junos-dyn-service-counter | 0     | 0       |

## Hierarchical Policers:

| Name                                                      | Bytes | Packets |
|-----------------------------------------------------------|-------|---------|
| lowdelay_class_hpolicer_UID1164-filter-pp0.1073742493-in  |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| lowloss_class_hpolicer_UID1165-filter-pp0.1073742493-in   |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| multicast_class_hpolicer_UID1163-filter-pp0.1073742493-in |       |         |
| Aggregate                                                 | 0     | 0       |
| Premium                                                   | 0     | 0       |
| premium_classes_hpolicer_UID1162-filter-pp0.1073742493-in |       |         |



```

Aggregate 0 0
Premium 0 0
subscriber_hpolicer_UID1166-filter-pp0.1073742493-in
Aggregate 0 0
Premium 0 0

```

Filter: DEFAULT\_V6-OUT-pp0.1073742493-out

Filter: filter\_voice\_output\_v6\_UID1037-pp0.1073742493-out

Counters:

| Name                        | Bytes | Packets |
|-----------------------------|-------|---------|
| __junos-dyn-service-counter | 0     | 0       |

Policers:

| Name                                            | Bytes | Packets |
|-------------------------------------------------|-------|---------|
| voice_policer_UID1033-filter-pp0.1073742493-out | 0     | 0       |

Logical interface: pp0.1073742493, Index: 363

| Object                  | Name                           | Type   | Index      |
|-------------------------|--------------------------------|--------|------------|
| Traffic-control-profile | SessionShaper.o.pp0.1073742493 | Output | 1666108328 |

Traffic control profile: SessionShaper.o.pp0.1073742493, Index: 1666108328

Shaping rate: 75000000

Scheduler map: schedmap\_residential

Scheduler map: schedmap\_residential, Index: 41049

Scheduler: sched\_BestEffort, Forwarding class: BestEffort, Index: 64386

Transmit rate: unspecified, Rate Limit: none, Buffer size: 30 percent, Buffer

Limit: none, Priority: low

Excess Priority: low, Excess rate: proportion 180 ,

Drop profiles:

| Loss priority | Protocol | Index | Name           |
|---------------|----------|-------|----------------|
| Low           | any      | 27391 | RED-BestEffort |
| Medium low    | any      | 27391 | RED-BestEffort |
| Medium high   | any      | 27391 | RED-BestEffort |
| High          | any      | 27391 | RED-BestEffort |

Drop profile: RED-BestEffort, Type: interpolated, Index: 27391

| Fill level | Drop probability |
|------------|------------------|
|------------|------------------|

|    |   |
|----|---|
| 0  | 0 |
| 1  | 0 |
| 2  | 0 |
| 4  | 0 |
| 5  | 0 |
| 6  | 0 |
| 8  | 0 |
| 10 | 0 |
| 12 | 0 |
| 14 | 0 |
| 15 | 0 |
| 16 | 0 |
| 18 | 0 |
| 20 | 0 |
| 22 | 0 |
| 24 | 0 |
| 25 | 0 |
| 26 | 0 |
| 28 | 0 |
| 30 | 0 |
| 32 | 0 |
| 34 | 0 |

|     |     |
|-----|-----|
| 35  | 0   |
| 36  | 0   |
| 38  | 0   |
| 40  | 0   |
| 42  | 10  |
| 44  | 20  |
| 45  | 25  |
| 46  | 30  |
| 48  | 40  |
| 49  | 45  |
| 51  | 51  |
| 52  | 52  |
| 54  | 54  |
| 55  | 55  |
| 56  | 56  |
| 58  | 58  |
| 60  | 60  |
| 62  | 62  |
| 64  | 64  |
| 65  | 65  |
| 66  | 66  |
| 68  | 68  |
| 70  | 70  |
| 72  | 72  |
| 74  | 74  |
| 75  | 75  |
| 76  | 76  |
| 78  | 78  |
| 80  | 80  |
| 82  | 82  |
| 84  | 84  |
| 85  | 85  |
| 86  | 86  |
| 88  | 88  |
| 90  | 90  |
| 92  | 92  |
| 94  | 94  |
| 95  | 95  |
| 96  | 96  |
| 98  | 98  |
| 99  | 99  |
| 100 | 100 |

Drop profile: RED-BestEffort, Type: interpolated, Index: 27391

| Fill level | Drop probability |
|------------|------------------|
| 0          | 0                |
| 1          | 0                |
| 2          | 0                |
| 4          | 0                |
| 5          | 0                |
| 6          | 0                |
| 8          | 0                |
| 10         | 0                |
| 12         | 0                |
| 14         | 0                |
| 15         | 0                |
| 16         | 0                |
| 18         | 0                |
| 20         | 0                |
| 22         | 0                |
| 24         | 0                |
| 25         | 0                |

|     |     |
|-----|-----|
| 26  | 0   |
| 28  | 0   |
| 30  | 0   |
| 32  | 0   |
| 34  | 0   |
| 35  | 0   |
| 36  | 0   |
| 38  | 0   |
| 40  | 0   |
| 42  | 10  |
| 44  | 20  |
| 45  | 25  |
| 46  | 30  |
| 48  | 40  |
| 49  | 45  |
| 51  | 51  |
| 52  | 52  |
| 54  | 54  |
| 55  | 55  |
| 56  | 56  |
| 58  | 58  |
| 60  | 60  |
| 62  | 62  |
| 64  | 64  |
| 65  | 65  |
| 66  | 66  |
| 68  | 68  |
| 70  | 70  |
| 72  | 72  |
| 74  | 74  |
| 75  | 75  |
| 76  | 76  |
| 78  | 78  |
| 80  | 80  |
| 82  | 82  |
| 84  | 84  |
| 85  | 85  |
| 86  | 86  |
| 88  | 88  |
| 90  | 90  |
| 92  | 92  |
| 94  | 94  |
| 95  | 95  |
| 96  | 96  |
| 98  | 98  |
| 99  | 99  |
| 100 | 100 |

Drop profile: RED-BestEffort, Type: interpolated, Index: 27391

| Fill level | Drop probability |
|------------|------------------|
| 0          | 0                |
| 1          | 0                |
| 2          | 0                |
| 4          | 0                |
| 5          | 0                |
| 6          | 0                |
| 8          | 0                |
| 10         | 0                |
| 12         | 0                |
| 14         | 0                |
| 15         | 0                |
| 16         | 0                |

|                                                                |                  |
|----------------------------------------------------------------|------------------|
| 18                                                             | 0                |
| 20                                                             | 0                |
| 22                                                             | 0                |
| 24                                                             | 0                |
| 25                                                             | 0                |
| 26                                                             | 0                |
| 28                                                             | 0                |
| 30                                                             | 0                |
| 32                                                             | 0                |
| 34                                                             | 0                |
| 35                                                             | 0                |
| 36                                                             | 0                |
| 38                                                             | 0                |
| 40                                                             | 0                |
| 42                                                             | 10               |
| 44                                                             | 20               |
| 45                                                             | 25               |
| 46                                                             | 30               |
| 48                                                             | 40               |
| 49                                                             | 45               |
| 51                                                             | 51               |
| 52                                                             | 52               |
| 54                                                             | 54               |
| 55                                                             | 55               |
| 56                                                             | 56               |
| 58                                                             | 58               |
| 60                                                             | 60               |
| 62                                                             | 62               |
| 64                                                             | 64               |
| 65                                                             | 65               |
| 66                                                             | 66               |
| 68                                                             | 68               |
| 70                                                             | 70               |
| 72                                                             | 72               |
| 74                                                             | 74               |
| 75                                                             | 75               |
| 76                                                             | 76               |
| 78                                                             | 78               |
| 80                                                             | 80               |
| 82                                                             | 82               |
| 84                                                             | 84               |
| 85                                                             | 85               |
| 86                                                             | 86               |
| 88                                                             | 88               |
| 90                                                             | 90               |
| 92                                                             | 92               |
| 94                                                             | 94               |
| 95                                                             | 95               |
| 96                                                             | 96               |
| 98                                                             | 98               |
| 99                                                             | 99               |
| 100                                                            | 100              |
| Drop profile: RED-BestEffort, Type: interpolated, Index: 27391 |                  |
| Fill level                                                     | Drop probability |
| 0                                                              | 0                |
| 1                                                              | 0                |
| 2                                                              | 0                |
| 4                                                              | 0                |
| 5                                                              | 0                |
| 6                                                              | 0                |
| 8                                                              | 0                |

|     |     |
|-----|-----|
| 10  | 0   |
| 12  | 0   |
| 14  | 0   |
| 15  | 0   |
| 16  | 0   |
| 18  | 0   |
| 20  | 0   |
| 22  | 0   |
| 24  | 0   |
| 25  | 0   |
| 26  | 0   |
| 28  | 0   |
| 30  | 0   |
| 32  | 0   |
| 34  | 0   |
| 35  | 0   |
| 36  | 0   |
| 38  | 0   |
| 40  | 0   |
| 42  | 10  |
| 44  | 20  |
| 45  | 25  |
| 46  | 30  |
| 48  | 40  |
| 49  | 45  |
| 51  | 51  |
| 52  | 52  |
| 54  | 54  |
| 55  | 55  |
| 56  | 56  |
| 58  | 58  |
| 60  | 60  |
| 62  | 62  |
| 64  | 64  |
| 65  | 65  |
| 66  | 66  |
| 68  | 68  |
| 70  | 70  |
| 72  | 72  |
| 74  | 74  |
| 75  | 75  |
| 76  | 76  |
| 78  | 78  |
| 80  | 80  |
| 82  | 82  |
| 84  | 84  |
| 85  | 85  |
| 86  | 86  |
| 88  | 88  |
| 90  | 90  |
| 92  | 92  |
| 94  | 94  |
| 95  | 95  |
| 96  | 96  |
| 98  | 98  |
| 99  | 99  |
| 100 | 100 |

Scheduler: sched\_LowLoss, Forwarding class: LowLoss, Index: 44420  
Transmit rate: unspecified, Rate Limit: none, Buffer size: 20 percent, Buffer  
Limit: none, Priority: low

```
Excess Priority: low, Excess rate: proportion 800 ,
Drop profiles:
 Loss priority Protocol Index Name
 Low any 27391 RED-BestEffort
 Medium low any 27391 RED-BestEffort
 Medium high any 27391 RED-BestEffort
 High any 27391 RED-BestEffort
Drop profile: RED-BestEffort, Type: interpolated, Index: 27391
Fill level Drop probability
0 0
1 0
2 0
4 0
5 0
6 0
8 0
10 0
12 0
14 0
15 0
16 0
18 0
20 0
22 0
24 0
25 0
26 0
28 0
30 0
32 0
34 0
35 0
36 0
38 0
40 0
42 10
44 20
45 25
46 30
48 40
49 45
51 51
52 52
54 54
55 55
56 56
58 58
60 60
62 62
64 64
65 65
66 66
68 68
70 70
72 72
74 74
75 75
76 76
78 78
80 80
82 82
```

|                                                                |                  |
|----------------------------------------------------------------|------------------|
| 84                                                             | 84               |
| 85                                                             | 85               |
| 86                                                             | 86               |
| 88                                                             | 88               |
| 90                                                             | 90               |
| 92                                                             | 92               |
| 94                                                             | 94               |
| 95                                                             | 95               |
| 96                                                             | 96               |
| 98                                                             | 98               |
| 99                                                             | 99               |
| 100                                                            | 100              |
| Drop profile: RED-BestEffort, Type: interpolated, Index: 27391 |                  |
| Fill level                                                     | Drop probability |
| 0                                                              | 0                |
| 1                                                              | 0                |
| 2                                                              | 0                |
| 4                                                              | 0                |
| 5                                                              | 0                |
| 6                                                              | 0                |
| 8                                                              | 0                |
| 10                                                             | 0                |
| 12                                                             | 0                |
| 14                                                             | 0                |
| 15                                                             | 0                |
| 16                                                             | 0                |
| 18                                                             | 0                |
| 20                                                             | 0                |
| 22                                                             | 0                |
| 24                                                             | 0                |
| 25                                                             | 0                |
| 26                                                             | 0                |
| 28                                                             | 0                |
| 30                                                             | 0                |
| 32                                                             | 0                |
| 34                                                             | 0                |
| 35                                                             | 0                |
| 36                                                             | 0                |
| 38                                                             | 0                |
| 40                                                             | 0                |
| 42                                                             | 10               |
| 44                                                             | 20               |
| 45                                                             | 25               |
| 46                                                             | 30               |
| 48                                                             | 40               |
| 49                                                             | 45               |
| 51                                                             | 51               |
| 52                                                             | 52               |
| 54                                                             | 54               |
| 55                                                             | 55               |
| 56                                                             | 56               |
| 58                                                             | 58               |
| 60                                                             | 60               |
| 62                                                             | 62               |
| 64                                                             | 64               |
| 65                                                             | 65               |
| 66                                                             | 66               |
| 68                                                             | 68               |
| 70                                                             | 70               |
| 72                                                             | 72               |
| 74                                                             | 74               |

|                                                                |                  |
|----------------------------------------------------------------|------------------|
| 75                                                             | 75               |
| 76                                                             | 76               |
| 78                                                             | 78               |
| 80                                                             | 80               |
| 82                                                             | 82               |
| 84                                                             | 84               |
| 85                                                             | 85               |
| 86                                                             | 86               |
| 88                                                             | 88               |
| 90                                                             | 90               |
| 92                                                             | 92               |
| 94                                                             | 94               |
| 95                                                             | 95               |
| 96                                                             | 96               |
| 98                                                             | 98               |
| 99                                                             | 99               |
| 100                                                            | 100              |
| Drop profile: RED-BestEffort, Type: interpolated, Index: 27391 |                  |
| Fill level                                                     | Drop probability |
| 0                                                              | 0                |
| 1                                                              | 0                |
| 2                                                              | 0                |
| 4                                                              | 0                |
| 5                                                              | 0                |
| 6                                                              | 0                |
| 8                                                              | 0                |
| 10                                                             | 0                |
| 12                                                             | 0                |
| 14                                                             | 0                |
| 15                                                             | 0                |
| 16                                                             | 0                |
| 18                                                             | 0                |
| 20                                                             | 0                |
| 22                                                             | 0                |
| 24                                                             | 0                |
| 25                                                             | 0                |
| 26                                                             | 0                |
| 28                                                             | 0                |
| 30                                                             | 0                |
| 32                                                             | 0                |
| 34                                                             | 0                |
| 35                                                             | 0                |
| 36                                                             | 0                |
| 38                                                             | 0                |
| 40                                                             | 0                |
| 42                                                             | 10               |
| 44                                                             | 20               |
| 45                                                             | 25               |
| 46                                                             | 30               |
| 48                                                             | 40               |
| 49                                                             | 45               |
| 51                                                             | 51               |
| 52                                                             | 52               |
| 54                                                             | 54               |
| 55                                                             | 55               |
| 56                                                             | 56               |
| 58                                                             | 58               |
| 60                                                             | 60               |
| 62                                                             | 62               |
| 64                                                             | 64               |
| 65                                                             | 65               |



|                                                                |                  |
|----------------------------------------------------------------|------------------|
| 66                                                             | 66               |
| 68                                                             | 68               |
| 70                                                             | 70               |
| 72                                                             | 72               |
| 74                                                             | 74               |
| 75                                                             | 75               |
| 76                                                             | 76               |
| 78                                                             | 78               |
| 80                                                             | 80               |
| 82                                                             | 82               |
| 84                                                             | 84               |
| 85                                                             | 85               |
| 86                                                             | 86               |
| 88                                                             | 88               |
| 90                                                             | 90               |
| 92                                                             | 92               |
| 94                                                             | 94               |
| 95                                                             | 95               |
| 96                                                             | 96               |
| 98                                                             | 98               |
| 99                                                             | 99               |
| 100                                                            | 100              |
| Drop profile: RED-BestEffort, Type: interpolated, Index: 27391 |                  |
| Fill level                                                     | Drop probability |
| 0                                                              | 0                |
| 1                                                              | 0                |
| 2                                                              | 0                |
| 4                                                              | 0                |
| 5                                                              | 0                |
| 6                                                              | 0                |
| 8                                                              | 0                |
| 10                                                             | 0                |
| 12                                                             | 0                |
| 14                                                             | 0                |
| 15                                                             | 0                |
| 16                                                             | 0                |
| 18                                                             | 0                |
| 20                                                             | 0                |
| 22                                                             | 0                |
| 24                                                             | 0                |
| 25                                                             | 0                |
| 26                                                             | 0                |
| 28                                                             | 0                |
| 30                                                             | 0                |
| 32                                                             | 0                |
| 34                                                             | 0                |
| 35                                                             | 0                |
| 36                                                             | 0                |
| 38                                                             | 0                |
| 40                                                             | 0                |
| 42                                                             | 10               |
| 44                                                             | 20               |
| 45                                                             | 25               |
| 46                                                             | 30               |
| 48                                                             | 40               |
| 49                                                             | 45               |
| 51                                                             | 51               |
| 52                                                             | 52               |
| 54                                                             | 54               |
| 55                                                             | 55               |
| 56                                                             | 56               |

|     |     |
|-----|-----|
| 58  | 58  |
| 60  | 60  |
| 62  | 62  |
| 64  | 64  |
| 65  | 65  |
| 66  | 66  |
| 68  | 68  |
| 70  | 70  |
| 72  | 72  |
| 74  | 74  |
| 75  | 75  |
| 76  | 76  |
| 78  | 78  |
| 80  | 80  |
| 82  | 82  |
| 84  | 84  |
| 85  | 85  |
| 86  | 86  |
| 88  | 88  |
| 90  | 90  |
| 92  | 92  |
| 94  | 94  |
| 95  | 95  |
| 96  | 96  |
| 98  | 98  |
| 99  | 99  |
| 100 | 100 |

Scheduler: sched\_LowDelay, Forwarding class: LowDelay, Index: 52777

Transmit rate: 1 percent, Rate Limit: none, Buffer size: 10 percent, Buffer Limit: none, Priority: medium-low

Excess Priority: high, Excess rate: proportion 180 ,

Drop profiles:

| Loss priority | Protocol | Index | Name                 |
|---------------|----------|-------|----------------------|
| Low           | any      | 1     | default-drop-profile |
| Medium low    | any      | 1     | default-drop-profile |
| Medium high   | any      | 1     | default-drop-profile |
| High          | any      | 1     | default-drop-profile |

Drop profile: default-drop-profile, Type: discrete, Index: 1

Fill level      Drop probability  
100                      100

Drop profile: default-drop-profile, Type: discrete, Index: 1

Fill level      Drop probability  
100                      100

Drop profile: default-drop-profile, Type: discrete, Index: 1

Fill level      Drop probability  
100                      100

Drop profile: default-drop-profile, Type: discrete, Index: 1

Fill level      Drop probability  
100                      100

Scheduler: sched\_Control, Forwarding class: Control, Index: 7060

Transmit rate: 256000 bps, Rate Limit: none, Buffer size: remainder, Buffer Limit: none, Priority: high

Excess Priority: low, Excess rate: proportion 20 ,

Drop profiles:

| Loss priority | Protocol | Index | Name                 |
|---------------|----------|-------|----------------------|
| Low           | any      | 1     | default-drop-profile |
| Medium low    | any      | 1     | default-drop-profile |
| Medium high   | any      | 1     | default-drop-profile |
| High          | any      | 1     | default-drop-profile |

```

Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100

Scheduler: sched_Voice, Forwarding class: Voice, Index: 39330
 Transmit rate: 1 percent, Rate Limit: none, Buffer size: 5 percent, Buffer
Limit: none, Priority: strict-high
 Excess Priority: unspecified
 Drop profiles:
 Loss priority Protocol Index Name
 Low any 1 default-drop-profile
 Medium low any 1 default-drop-profile
 Medium high any 1 default-drop-profile
 High any 1 default-drop-profile
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100

Scheduler: sched_Multicast, Forwarding class: Multicast, Index: 58652
 Transmit rate: 100000000 bps, Rate Limit: none, Buffer size: 10 percent,
Buffer Limit: none, Priority: medium-high
 Excess Priority: high, Excess rate: proportion 20 ,
 Drop profiles:
 Loss priority Protocol Index Name
 Low any 1 default-drop-profile
 Medium low any 1 default-drop-profile
 Medium high any 1 default-drop-profile
 High any 1 default-drop-profile
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100

Object Name Type Index
Rewrite-Output residential-default dscp 11459

```

Rewrite rule: residential-default, Code point type: dscp, Index: 11459

| Forwarding class | Loss priority | Code point |
|------------------|---------------|------------|
| BestEffort       | low           | 000000     |
| BestEffort       | high          | 001000     |
| LowLoss          | low           | 111010     |
| LowLoss          | high          | 111010     |
| LowDelay         | low           | 010001     |
| LowDelay         | high          | 100001     |
| Control          | low           | 110000     |
| Control          | high          | 110000     |
| Voice            | low           | 101110     |
| Voice            | high          | 101110     |
| Multicast        | low           | 100000     |
| Multicast        | high          | 100001     |

| Object         | Name                   | Type      | Index |
|----------------|------------------------|-----------|-------|
| Rewrite-Output | residential-default-v6 | dscp-ipv6 | 18201 |

Rewrite rule: residential-default-v6, Code point type: dscp-ipv6, Index: 18201

| Forwarding class | Loss priority | Code point |
|------------------|---------------|------------|
| BestEffort       | low           | 000000     |
| BestEffort       | high          | 001000     |
| LowLoss          | low           | 111010     |
| LowLoss          | high          | 111010     |
| LowDelay         | low           | 010001     |
| LowDelay         | high          | 100001     |
| Control          | low           | 110000     |
| Control          | high          | 110000     |
| Voice            | low           | 101110     |
| Voice            | high          | 101110     |
| Multicast        | low           | 100000     |
| Multicast        | high          | 100001     |

| Object         | Name                     | Type              | Index |
|----------------|--------------------------|-------------------|-------|
| Rewrite-Output | residential-default-vlan | ieee8021p (outer) | 2172  |

Rewrite rule: residential-default-vlan, Code point type: ieee-802.1, Index: 2172

| Forwarding class | Loss priority | Code point |
|------------------|---------------|------------|
| BestEffort       | low           | 000        |
| BestEffort       | high          | 001        |
| LowLoss          | low           | 111        |
| LowLoss          | high          | 111        |
| LowDelay         | low           | 010        |
| LowDelay         | high          | 100        |
| Control          | low           | 110        |
| Control          | high          | 110        |
| Voice            | low           | 101        |
| Voice            | high          | 101        |
| Multicast        | low           | 100        |
| Multicast        | high          | 100        |

| Object         | Name                     | Type             | Index |
|----------------|--------------------------|------------------|-------|
| Rewrite-Output | residential-default-vlan | ieee8021p (both) | 2172  |

Rewrite rule: residential-default-vlan, Code point type: ieee-802.1, Index: 2172

| Forwarding class | Loss priority | Code point |
|------------------|---------------|------------|
| BestEffort       | low           | 000        |
| BestEffort       | high          | 001        |
| LowLoss          | low           | 111        |
| LowLoss          | high          | 111        |
| LowDelay         | low           | 010        |
| LowDelay         | high          | 100        |

|            |                         |           |       |
|------------|-------------------------|-----------|-------|
| Control    | low                     | 110       |       |
| Control    | high                    | 110       |       |
| Voice      | low                     | 101       |       |
| Voice      | high                    | 101       |       |
| Multicast  | low                     | 100       |       |
| Multicast  | high                    | 100       |       |
| Object     | Name                    | Type      | Index |
| Classifier | dscp-ipv6-compatibility | dscp-ipv6 | 9     |

Classifier: dscp-ipv6-compatibility, Code point type: dscp-ipv6, Index: 9

| Code point | Forwarding class | Loss priority |
|------------|------------------|---------------|
| 000000     | best-effort      | low           |
| 000001     | best-effort      | low           |
| 000010     | best-effort      | low           |
| 000011     | best-effort      | low           |
| 000100     | best-effort      | low           |
| 000101     | best-effort      | low           |
| 000110     | best-effort      | low           |
| 000111     | best-effort      | low           |
| 001000     | best-effort      | low           |
| 001001     | best-effort      | low           |
| 001010     | best-effort      | low           |
| 001011     | best-effort      | low           |
| 001100     | best-effort      | low           |
| 001101     | best-effort      | low           |
| 001110     | best-effort      | low           |
| 001111     | best-effort      | low           |
| 010000     | best-effort      | low           |
| 010001     | best-effort      | low           |
| 010010     | best-effort      | low           |
| 010011     | best-effort      | low           |
| 010100     | best-effort      | low           |
| 010101     | best-effort      | low           |
| 010110     | best-effort      | low           |
| 010111     | best-effort      | low           |
| 011000     | best-effort      | low           |
| 011001     | best-effort      | low           |
| 011010     | best-effort      | low           |
| 011011     | best-effort      | low           |
| 011100     | best-effort      | low           |
| 011101     | best-effort      | low           |
| 011110     | best-effort      | low           |
| 011111     | best-effort      | low           |
| 100000     | best-effort      | low           |
| 100001     | best-effort      | low           |
| 100010     | best-effort      | low           |
| 100011     | best-effort      | low           |
| 100100     | best-effort      | low           |
| 100101     | best-effort      | low           |
| 100110     | best-effort      | low           |
| 100111     | best-effort      | low           |
| 101000     | best-effort      | low           |
| 101001     | best-effort      | low           |
| 101010     | best-effort      | low           |
| 101011     | best-effort      | low           |
| 101100     | best-effort      | low           |
| 101101     | best-effort      | low           |
| 101110     | best-effort      | low           |
| 101111     | best-effort      | low           |
| 110000     | network-control  | low           |
| 110001     | best-effort      | low           |

|                                                                               |                      |               |                  |        |
|-------------------------------------------------------------------------------|----------------------|---------------|------------------|--------|
| 110010                                                                        | best-effort          | low           |                  |        |
| 110011                                                                        | best-effort          | low           |                  |        |
| 110100                                                                        | best-effort          | low           |                  |        |
| 110101                                                                        | best-effort          | low           |                  |        |
| 110110                                                                        | best-effort          | low           |                  |        |
| 110111                                                                        | best-effort          | low           |                  |        |
| 111000                                                                        | network-control      | low           |                  |        |
| 111001                                                                        | best-effort          | low           |                  |        |
| 111010                                                                        | best-effort          | low           |                  |        |
| 111011                                                                        | best-effort          | low           |                  |        |
| 111100                                                                        | best-effort          | low           |                  |        |
| 111101                                                                        | best-effort          | low           |                  |        |
| 111110                                                                        | best-effort          | low           |                  |        |
| 111111                                                                        | best-effort          | low           |                  |        |
| Object                                                                        | Name                 | Type          | Index            |        |
| Classifier                                                                    | ipprec-compatibility | ip            | 13               |        |
| Classifier: ipprec-compatibility, Code point type: inet-precedence, Index: 13 |                      |               |                  |        |
| Code point                                                                    | Forwarding class     | Loss priority |                  |        |
| 000                                                                           | best-effort          | low           |                  |        |
| 001                                                                           | best-effort          | high          |                  |        |
| 010                                                                           | best-effort          | low           |                  |        |
| 011                                                                           | best-effort          | high          |                  |        |
| 100                                                                           | best-effort          | low           |                  |        |
| 101                                                                           | best-effort          | high          |                  |        |
| 110                                                                           | network-control      | low           |                  |        |
| 111                                                                           | network-control      | high          |                  |        |
| Forwarding class                                                              | ID                   | Queue         | Restricted queue | Fabric |
| priority Policing priority SPU priority                                       |                      |               |                  |        |
| BestEffort                                                                    | 0                    | 0             | 0                | low    |
| LowLoss                                                                       | 1                    | 1             | 1                | low    |
| LowDelay                                                                      | 2                    | 2             | 2                | high   |
| Control                                                                       | 3                    | 3             | 3                | high   |
| Voice                                                                         | 4                    | 4             | 0                | high   |
| Multicast                                                                     | 5                    | 7             | 3                | low    |

**Meaning** These commands display the logical and physical interface associations for the classifier, rewrite rules, and scheduler map objects. If all services related to the CoS configuration have been activated successfully, the output should reflect the CoS queue and scheduler mapping status.

### Verify DHCPv6 over PPPoE over Dynamic VLAN Subscribers on R0

**Purpose** Display PPPoE subscriber, DHCPv6 server binding, inet6 route table, and AAA subscriber information to confirm that the interfaces are functioning properly.

The BNG system dynamically creates subscriber interfaces such as pp0.xyz and assigns system-generated interface unit numbers and DHCPv6 subscriber session IDs for subscriber session identification purposes. These ID values are not fixed, because they are maintained by the system. Obtaining the interface name and session ID is the first step in the verification process.

**Action** From operational mode, run the **show dhcpv6 server binding**, **show dhcpv6 server binding detail**, **show subscribers**, **show subscribers detail**, **show subscribers extensive**, **show network-access aaa subscribers**, **show network-access aaa subscribers session-id 752**, and **show network-access aaa subscribers session-id 752 detail** commands.

```
user@host-R0>show dhcpv6 server binding
```

```
Prefix Session Id Expires State Interface Client DUID
2016:0:0:100::/56 752 1782 BOUND pp0.1073742493
LL_TIME0x1-0x1c0fbbe9-00:22:68:14:84:d5
```

```
user@host-R0>show dhcpv6 server binding detail
```

```
Session Id: 752
 Client IPv6 Prefix: 2016:0:0:100::/56
 Client DUID: LL_TIME0x1-0x1c0fbbe9-00:22:68:14:84:d5

 State: BOUND(DHCPV6_LOCAL_SERVER_STATE_BOUND)

 Lease Expires: 2015-02-24 09:34:28 PST
 Lease Expires in: 1781 seconds
 Preferred Lease Expires: 2015-02-24 09:28:28 PST
 Preferred Lease Expires in: 1421 seconds
 Lease Start: 2015-02-24 09:04:27 PST
 Last Packet Received: 2015-02-24 09:04:28 PST
 Incoming Client Interface: pp0.1073742493
 Server Ip Address: 0.0.0.0
 Client Pool Name: v6_NDRA_Prefix_Pool1
 Client Prefix Pool Name: v6_DHCPv6-PD_Pool1
 Client Id Length: 14
 Client Id: /0x00010001/0x1c0fbbe9/0x00226814/0x84d5
```

```
user@host-R0>show subscribers
```

```
Interface IP Address/VLAN ID User Name
 LS:RI
demux0.1073742492 0x8100.1 0x8100.100
 default:default
pp0.1073742493 100.16.1.41 DEFAULTUSER
 default:default
* 2016:0:0:100::/56
* 1016:0:0:18::/64
pp0.1073742493 2016:0:0:100::/56
 default:default
```

```
user@host-R0>show subscribers detail
```

```
Type: VLAN
Logical System: default
Routing Instance: default
Interface: demux0.1073742492
Interface type: Dynamic
Underlying Interface: ge-2/1/0
Dynamic Profile Name: vlan-client-profile
State: Active
Session ID: 747
Stacked VLAN Id: 0x8100.1
VLAN Id: 0x8100.100
Login Time: 2015-02-24 08:54:31 PST
```

```
Type: PPPoE
User Name: DEFAULTUSER
```

IP Address: 100.16.1.41  
IP Netmask: 255.0.0.0  
IPv6 Prefix: 2016:0:0:100::/56  
IPv6 User Prefix: 1016:0:0:18::/64  
Logical System: default  
Routing Instance: default  
Interface: pp0.1073742493  
Interface type: Dynamic  
Underlying Interface: demux0.1073742492  
Interface description: To access facing port1  
Dynamic Profile Name: pppoe-client-profile  
MAC Address: 00:22:68:14:84:d5  
Session Timeout (seconds): 5184000  
Idle Timeout (seconds): 54000  
State: Active  
Radius Accounting ID: jnpr demux0.1073742492:748  
Session ID: 748  
Stacked VLAN Id: 1  
VLAN Id: 100  
Login Time: 2015-02-24 08:54:36 PST  
Service Sessions: 3

Type: DHCP  
---(backing up)---  
Type: VLAN  
Logical System: default  
Routing Instance: default  
Interface: demux0.1073742492  
Interface type: Dynamic  
Underlying Interface: ge-2/1/0  
Dynamic Profile Name: vlan-client-profile  
State: Active  
Session ID: 747  
Stacked VLAN Id: 0x8100.1  
VLAN Id: 0x8100.100  
Login Time: 2015-02-24 08:54:31 PST

Type: PPPoE  
User Name: DEFAULTUSER  
IP Address: 100.16.1.41  
IP Netmask: 255.0.0.0  
IPv6 Prefix: 2016:0:0:100::/56  
IPv6 User Prefix: 1016:0:0:18::/64  
Logical System: default  
Routing Instance: default  
Interface: pp0.1073742493  
Interface type: Dynamic  
Underlying Interface: demux0.1073742492  
Interface description: To access facing port1  
Dynamic Profile Name: pppoe-client-profile  
MAC Address: 00:22:68:14:84:d5  
Session Timeout (seconds): 5184000  
Idle Timeout (seconds): 54000  
State: Active  
Radius Accounting ID: jnpr demux0.1073742492:748  
Session ID: 748  
Stacked VLAN Id: 1  
VLAN Id: 100  
Login Time: 2015-02-24 08:54:36 PST  
Service Sessions: 3



```

Type: DHCP
IPv6 Prefix: 2016:0:0:100::/56
Logical System: default
Routing Instance: default
Interface: pp0.1073742493
Interface type: Static
Underlying Interface: demux0.1073742492
Interface description: To access facing port1
MAC Address: 00:22:68:14:84:d5
State: Active
Radius Accounting ID: jnpr pp0.1073742493:752
Session ID: 752
Underlying Session ID: 748
Login Time: 2015-02-24 09:04:27 PST
DHCP Options: len 48
00 01 00 0e 00 01 00 01 1c 0f bb e9 00 22 68 14 84 d5 00 08
00 02 00 00 00 06 00 04 00 17 00 18 00 19 00 0c 00 00 00 01
00 00 00 00 00 00 00 00

```

```

user@host-R0>show subscribers extensive

```

```

Type: VLAN
Logical System: default
Routing Instance: default
Interface: demux0.1073742492
Interface type: Dynamic
Underlying Interface: ge-2/1/0
Dynamic Profile Name: vlan-client-profile
State: Active
Session ID: 747
Stacked VLAN Id: 0x8100.1
VLAN Id: 0x8100.100
Login Time: 2015-02-24 08:54:31 PST
Effective shaping-rate: 1000000k

```

```

Type: PPPoE
User Name: DEFAULTUSER
IP Address: 100.16.1.41
IP Netmask: 255.0.0.0
IPv6 Prefix: 2016:0:0:100::/56
IPv6 User Prefix: 1016:0:0:18::/64
Logical System: default
Routing Instance: default
Interface: pp0.1073742493
Interface type: Dynamic
Underlying Interface: demux0.1073742492
Interface description: To access facing port1
Dynamic Profile Name: pppoe-client-profile
MAC Address: 00:22:68:14:84:d5
Session Timeout (seconds): 5184000
Idle Timeout (seconds): 54000
State: Active
Radius Accounting ID: jnpr demux0.1073742492:748
Session ID: 748
Stacked VLAN Id: 1
VLAN Id: 100
Login Time: 2015-02-24 08:54:36 PST
Service Sessions: 3
IP Address Pool: v4-pool-0
IPv6 Address Pool: v6_NDRA_Prefix_Pool1
IPv6 Interface Address: 1016:0:0:18::1/64
IPv6 Framed Interface Id: 75a3:ba9f:348:4cd1

```

```

IPv4 Input Filter Name: DEFAULT_V4-IN-pp0.1073742493-in
IPv4 Output Filter Name: DEFAULT_V4-OUT-pp0.1073742493-out
IPv6 Input Filter Name: DEFAULT_V6-IN-pp0.1073742493-in
IPv6 Output Filter Name: DEFAULT_V6-OUT-pp0.1073742493-out
ADF IPv4 Input Filter Name: __junos_adf_748-pp0.1073742493-inet-in
 Rule 0:
0100010000000000509c3500002000000000000000000000000000000000000000
 from {
 destination-address 8.1.1.0/32;
 }
 then {
 discard;
 }
 Rule 1:
010101006400000000000000080011000000003500020000000000000000000000000000
 from {
 source-address 100.0.0.0/8;
 protocol 17;
 destination-port 53;
 }
 then {
 accept;
 }
 Rule 2:
0101010064000000d25a0a01082000
 from {
 source-address 100.0.0.0/8;
 destination-address 200.0.0.101/32;
 }
 then {
 accept;
 }
 Rule 3:
0101010064000000d25a0a02082000
 from {
 source-address 100.0.0.0/8;
 destination-address 200.0.0.102/32;
 }
 then {
 accept;
 }
 Rule 4:
01010100
 then {
 accept;
 }
Effective shaping-rate: 75000k

Service Session ID: 749
Service Session Name: voice
State: Active
Family: inet, inet6
IPv4 Input Filter Name: filter_voice_input_UID1034-pp0.1073742493-in
IPv4 Output Filter Name: filter_voice_output_UID1035-pp0.1073742493-out
IPv6 Input Filter Name: filter_voice_input_v6_UID1036-pp0.1073742493-in
IPv6 Output Filter Name: filter_voice_output_v6_UID1037-pp0.1073742493-out

Service Session ID: 750
Service Session Name: video
State: Active
Family: inet

```

```

IPv4 Output Filter Name: video_filter_name_UID1161-pp0.1073742493-out

Service Session ID: 751
Service Session Name: input_qos
State: Active
Family: inet, inet6
IPv4 Input Filter Name: input_filter_name_UID1167-pp0.1073742493-in
IPv6 Input Filter Name: input_filter_v6_name_UID1168-pp0.1073742493-in

```

```

Type: DHCP
IPv6 Prefix: 2016:0:0:100::/56
Logical System: default
Routing Instance: default
Interface: pp0.1073742493
Interface type: Static
Underlying Interface: demux0.1073742492
Interface description: To access facing port1
MAC Address: 00:22:68:14:84:d5
State: Active
Radius Accounting ID: jnpr pp0.1073742493:752
Session ID: 752
Underlying Session ID: 748
Login Time: 2015-02-24 09:04:27 PST
DHCP Options: len 48
00 01 00 0e 00 01 00 01 1c 0f bb e9 00 22 68 14 84 d5 00 08
00 02 00 00 00 06 00 04 00 17 00 18 00 19 00 0c 00 00 00 01
00 00 00 00 00 00 00 00
IPv6 Address Pool: v6_NDRA_Prefix_Pool1
IPv6 Delegated Address Pool: v6_DHCPv6-PD_Pool1
Effective shaping-rate: 1000000k

```

```

user@host-R0>show route table inet6.0 protocol access
inet6.0: 13 destinations, 14 routes (13 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

```

```

2016:0:0:100::/56 *[Access/13] 00:01:31
 > via pp0.1073742493

```

```

user@host-R0>show network-access aaa subscribers
Username Logical system/Routing instance Client type
Session-ID
DEFAULTUSER default:default pppoe 748
 default:default dhcp 752

```

```

user@host-R0>show network-access aaa subscribers session-id 752
Logical system/Routing instance Client type Session-ID Session uptime
Accounting
default:default dhcp 752 00:06:09
suppressed

```

```

user@host-R0>show network-access aaa subscribers session-id 752 detail
Type: dhcp
AAA Logical system/Routing instance: default:default
Target Logical system/Routing instance: default:default
Access-profile: Access-Profile-0
Session ID: 752
Accounting Session ID: jnpr pp0.1073742493:752
Multi Accounting Session ID: 0
IPv6 Prefix: 2016:0:0:100::/56
Authentication State: AuthStateActive

```

Accounting State: Acc-Init  
Provisioning Type: None

**Meaning** DHCPv6 over PPPoE over dynamic VLAN interfaces are operational.

---

#### Verify PPP LAC Subscribers

**Purpose** Display subscriber, network access AAA, CoS, and L2TP services information to confirm that the interfaces are functioning properly.

**Action** From operational mode, run the `show subscribers`, `show subscriber detail`, `show subscribers extensive`, `show network-access aaa subscribers`, `show network-access aaa subscribers session-id 754`, `show network-access aaa subscribers session-id 754 detail`, `show class-of-service traffic-control-profile`, `show class-of-service interface pp0.1073742495`, `show class-of-service scheduler-hierarchy interface pp0.1073742495`, `show class-of-service interface pp0.1073742495`, `show class-of-service interface pp0.1073742495 detail`, `show class-of-service interface pp0.1073742495 comprehensive`, `show services l2tp summary`, `show services l2tp destination`, `show services l2tp tunnel`, `show services l2tp session`, `show services l2tp destination detail`, `show services l2tp tunnel detail`, and `show services l2tp session detail` commands.

```
user@host-R0>show subscribers
Interface IP Address/VLAN ID User Name
 LS:RI
demux0.1073742494 0x8100.1 0x8100.100
 default:default
pp0.1073742495 Tunneled DEFAULTUSER@ABC1.COM
 default:default
```

```
user@host-R0>show subscribers detail
Type: VLAN
Logical System: default
Routing Instance: default
Interface: demux0.1073742494
Interface type: Dynamic
Underlying Interface: ge-2/1/0
Dynamic Profile Name: vlan-client-profile
State: Active
Session ID: 753
Stacked VLAN Id: 0x8100.1
VLAN Id: 0x8100.100
Login Time: 2015-02-24 09:12:46 PST
```

```
Type: PPPoE
User Name: DEFAULTUSER@ABC1.COM
Logical System: default
Routing Instance: default
Interface: pp0.1073742495
Interface type: Dynamic
Underlying Interface: demux0.1073742494
Interface description: To access facing port1
Dynamic Profile Name: pppoe-client-profile
MAC Address: 00:22:68:14:84:d5
Session Timeout (seconds): 5184000
Idle Timeout (seconds): 54000
State: Active
PPP State: Tunneled
Local IP Address: 100.0.0.1
Remote IP Address: 102.0.0.1
Radius Accounting ID: jnpr demux0.1073742494:754
Session ID: 754
Stacked VLAN Id: 1
VLAN Id: 100
Login Time: 2015-02-24 09:12:51 PST
```

```
user@host-R0>show subscribers extensive
Type: VLAN
```

```

Logical System: default
Routing Instance: default
Interface: demux0.1073742494
Interface type: Dynamic
Underlying Interface: ge-2/1/0
Dynamic Profile Name: vlan-client-profile
State: Active
Session ID: 753
Stacked VLAN Id: 0x8100.1
VLAN Id: 0x8100.100
Login Time: 2015-02-24 09:12:46 PST
Effective shaping-rate: 1000000k

```

```

Type: PPPoE
User Name: DEFAULTUSER@ABC1.COM
Logical System: default
Routing Instance: default
Interface: pp0.1073742495
Interface type: Dynamic
Underlying Interface: demux0.1073742494
Interface description: To access facing port1
Dynamic Profile Name: pppoe-client-profile
MAC Address: 00:22:68:14:84:d5
Session Timeout (seconds): 5184000
Idle Timeout (seconds): 54000
State: Active
PPP State: Tunneled
Local IP Address: 100.0.0.1
Remote IP Address: 102.0.0.1
Radius Accounting ID: jnpr demux0.1073742494:754
Session ID: 754
Stacked VLAN Id: 1
VLAN Id: 100
Login Time: 2015-02-24 09:12:51 PST
IPv4 Input Filter Name: DEFAULT_V4-IN-pp0.1073742495-in
IPv4 Output Filter Name: DEFAULT_V4-OUT-pp0.1073742495-out
Effective shaping-rate: 8000k

```

```
user@host-R0>show network-access aaa subscribers
```

| Username             | Logical system/Routing instance | Client type |
|----------------------|---------------------------------|-------------|
| Session-ID           |                                 |             |
| DEFAULTUSER@ABC1.COM | default:default                 | pppoe 754   |

```
user@host-R0>show network-access aaa subscribers session-id 754 detail
```

```

Type: pppoe
Stripped username: DEFAULTUSER@ABC1.COM
AAA Logical system/Routing instance: default:default
Target Logical system/Routing instance: default:default
Access-profile: Access-Profile-0
Session ID: 754
Accounting Session ID: jnpr demux0.1073742494:754
Multi Accounting Session ID: 0
Authentication State: AuthStateActive
Accounting State: Acc-Interim-Sent
Provisioning Type: None

```

```
user@host-R0>show class-of-service traffic-control-profile
```

```

Traffic control profile: SessionShaper.o.pp0.1073742495, Index: 1666108334
Shaping rate: 8000000
Scheduler map: schedmap_residential

```

user@host-R0>show class-of-service interface pp0.1073742495

```
Logical interface: pp0.1073742495, Index: 363
Object Name Type Index
Traffic-control-profile SessionShaper.o.pp0.1073742495 Output 1666108334
Rewrite-Output residential-default dscp 11459
Rewrite-Output residential-default-vlan ieee8021p (outer) 2172
Rewrite-Output residential-default-vlan ieee8021p (both) 2172
Classifier ipprec-compatibility ip 13
```

user@host-R0>show class-of-service scheduler-hierarchy interface pp0.1073742495

| Interface/<br>Resource name | Shaping<br>rate<br>kbits | Guaranteed<br>rate<br>kbits | Guaranteed/<br>Excess<br>priority | Queue<br>weight | Excess<br>weight<br>high/low |
|-----------------------------|--------------------------|-----------------------------|-----------------------------------|-----------------|------------------------------|
| ge-2/1/0                    | 1000000                  |                             |                                   |                 |                              |
| ge-2/1/0 RTP                | 1000000                  | 0                           |                                   |                 | 1 1                          |
| BestEffort                  | 1000000                  | 0                           | Low Low                           | 950             |                              |
| Control                     | 1000000                  | 0                           | Low Low                           | 50              |                              |
| pp0.1073742495              | 8000                     | 0                           |                                   |                 | 500 500                      |
| BestEffort                  | 8000                     | 0                           | Low Low                           | 150             |                              |
| LowLoss                     | 8000                     | 0                           | Low Low                           | 666             |                              |
| LowDelay                    | 8000                     | 0                           | Medium High                       | 150             |                              |
| Control                     | 8000                     | 256                         | High Low                          | 16              |                              |
| Voice                       | 8000                     | Disabled                    | High High                         | 1               |                              |
| Multicast                   | 8000                     | 100000                      | Medium High                       | 16              |                              |

user@host-R0>show class-of-service interface pp0.1073742495

```
Logical interface: pp0.1073742495, Index: 363
Object Name Type Index
Traffic-control-profile SessionShaper.o.pp0.1073742495 Output 1666108334
Rewrite-Output residential-default dscp 11459
Rewrite-Output residential-default-vlan ieee8021p (outer) 2172
Rewrite-Output residential-default-vlan ieee8021p (both) 2172
Classifier ipprec-compatibility ip 13
```

user@host-R0>show class-of-service interface pp0.1073742495 detail

```
Logical interface pp0.1073742495
Flags: Up Point-To-Point 0x4000 Encapsulation: PPPoE
PPPoE:
State: SessionUp, Session ID: 1,
Session AC name: R0, Remote MAC address: 00:22:68:14:84:d5,
Underlying interface: demux0.1073742494 (Index 357)
inet
Interface Admin Link Proto Input Filter Output Filter
pp0.1073742495 up up inet DEFAULT_V4-IN-pp0.1073742495-in
DEFAULT_V4-OUT-pp0.1073742495-out
Interface Admin Link Proto Input Policer Output Policer
pp0.1073742495 up up
inet
```

```
Logical interface: pp0.1073742495, Index: 363
Object Name Type Index
Traffic-control-profile SessionShaper.o.pp0.1073742495 Output 1666108334
Rewrite-Output residential-default dscp 11459
Rewrite-Output residential-default-vlan ieee8021p (outer) 2172
Rewrite-Output residential-default-vlan ieee8021p (both) 2172
Classifier ipprec-compatibility ip 13
```

user@host-R0>show class-of-service interface pp0.1073742495 comprehensive

```
Logical interface pp0.1073742495 (Index 363) (SNMP ifIndex 7012) (Generation
```

```

5046)
Flags: Up Point-To-Point 0x4000 Encapsulation: PPPoE
PPPoE:
 State: SessionUp, Session ID: 1,
 Session AC name: R0, Remote MAC address: 00:22:68:14:84:d5,
 Underlying interface: demux0.1073742494 (Index 357)
Traffic statistics:
 Input bytes : 26150
 Output bytes : 5549
 Input packets: 153
 Output packets: 105
Local statistics:
 Input bytes : 70
 Output bytes : 84
 Input packets: 3
 Output packets: 2
Transit statistics:
 Input bytes : 26080 2984 bps
 Output bytes : 5465 464 bps
 Input packets: 150 1 pps
 Output packets: 103 1 pps
Keepalive settings: Interval 30 seconds, Up-count 1, Down-count 3
LCP state: Opened
NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
mpls: Not-configured
CHAP state: Closed
PAP state: Success
 Protocol inet, MTU: 1492, Generation: 3440, Route table: 0
 Flags: Sendbcst-pkt-to-re
 Input Filters: DEFAULT_V4-IN-pp0.1073742495-in (240)
 Output Filters: DEFAULT_V4-OUT-pp0.1073742495-out (240)

Logical interface pp0.1073742495 (Index 363) (SNMP ifIndex 7012)
Forwarding classes: 16 supported, 6 in use
Egress queues: 8 supported, 6 in use
Burst size: 0
Queue: 0, Forwarding classes: BestEffort
Queued:
 Packets : 85 0 pps
 Bytes : 12410 640 bps
Transmitted:
 Packets : 85 0 pps
 Bytes : 12410 640 bps
Tail-dropped packets : 0 0 pps
RL-dropped packets : 0 0 pps
RL-dropped bytes : 0 0 bps
RED-dropped packets : 0 0 pps
 Low : 0 0 pps
 Medium-low : 0 0 pps
 Medium-high : 0 0 pps
 High : 0 0 pps
RED-dropped bytes : 0 0 bps
 Low : 0 0 bps
 Medium-low : 0 0 bps
 Medium-high : 0 0 bps
 High : 0 0 bps
Queue: 1, Forwarding classes: LowLoss
Queued:
 Packets : 0 0 pps
 Bytes : 0 0 bps
Transmitted:

```



```

Packets : 0 0 pps
Bytes : 0 0 bps
Tail-dropped packets : 0 0 pps
RL-dropped packets : 0 0 pps
RL-dropped bytes : 0 0 bps
RED-dropped packets : 0 0 pps
 Low : 0 0 pps
 Medium-low : 0 0 pps
 Medium-high : 0 0 pps
 High : 0 0 pps
RED-dropped bytes : 0 0 bps
 Low : 0 0 bps
 Medium-low : 0 0 bps
 Medium-high : 0 0 bps
 High : 0 0 bps
Queue: 2, Forwarding classes: LowDelay
Queued:
 Packets : 0 0 pps
 Bytes : 0 0 bps
Transmitted:
 Packets : 0 0 pps
 Bytes : 0 0 bps
 Tail-dropped packets : 0 0 pps
 RL-dropped packets : 0 0 pps
 RL-dropped bytes : 0 0 bps
 RED-dropped packets : 0 0 pps
 Low : 0 0 pps
 Medium-low : 0 0 pps
 Medium-high : 0 0 pps
 High : 0 0 pps
 RED-dropped bytes : 0 0 bps
 Low : 0 0 bps
 Medium-low : 0 0 bps
 Medium-high : 0 0 bps
 High : 0 0 bps
Queue: 3, Forwarding classes: Control
Queued:
 Packets : 16 0 pps
 Bytes : 2088 0 bps
Transmitted:
 Packets : 16 0 pps
 Bytes : 2088 0 bps
 Tail-dropped packets : 0 0 pps
 RL-dropped packets : 0 0 pps
 RL-dropped bytes : 0 0 bps
 RED-dropped packets : 0 0 pps
 Low : 0 0 pps
 Medium-low : 0 0 pps
 Medium-high : 0 0 pps
 High : 0 0 pps
 RED-dropped bytes : 0 0 bps
 Low : 0 0 bps
 Medium-low : 0 0 bps
 Medium-high : 0 0 bps
 High : 0 0 bps
Queue: 4, Forwarding classes: Voice
Queued:
 Packets : 0 0 pps
 Bytes : 0 0 bps
Transmitted:
 Packets : 0 0 pps

```

```

Bytes : 0 0 bps
Tail-dropped packets : 0 0 pps
RL-dropped packets : 0 0 pps
RL-dropped bytes : 0 0 bps
RED-dropped packets : 0 0 pps
 Low : 0 0 pps
 Medium-low : 0 0 pps
 Medium-high : 0 0 pps
 High : 0 0 pps
RED-dropped bytes : 0 0 bps
 Low : 0 0 bps
 Medium-low : 0 0 bps
 Medium-high : 0 0 bps
 High : 0 0 bps
Queue: 7, Forwarding classes: Multicast
Queued:
 Packets : 0 0 pps
 Bytes : 0 0 bps
Transmitted:
 Packets : 0 0 pps
 Bytes : 0 0 bps
 Tail-dropped packets : 0 0 pps
 RL-dropped packets : 0 0 pps
 RL-dropped bytes : 0 0 bps
 RED-dropped packets : 0 0 pps
 Low : 0 0 pps
 Medium-low : 0 0 pps
 Medium-high : 0 0 pps
 High : 0 0 pps
 RED-dropped bytes : 0 0 bps
 Low : 0 0 bps
 Medium-low : 0 0 bps
 Medium-high : 0 0 bps
 High : 0 0 bps
Interface Admin Link Proto Input Filter Output Filter
pp0.1073742495 up up inet DEFAULT_V4-IN-pp0.1073742495-in
DEFAULT_V4-OUT-pp0.1073742495-out
Interface Admin Link Proto Input Policer Output Policer
pp0.1073742495 up up inet

Filter: DEFAULT_V4-IN-pp0.1073742495-in

Filter: DEFAULT_V4-OUT-pp0.1073742495-out

Logical interface: pp0.1073742495, Index: 363
Object Name Type Index
Traffic-control-profile SessionShaper.o.pp0.1073742495 Output 1666108334

Traffic control profile: SessionShaper.o.pp0.1073742495, Index: 1666108334
Shaping rate: 8000000
Scheduler map: schedmap_residential

Scheduler map: schedmap_residential, Index: 41049

Scheduler: sched_BestEffort, Forwarding class: BestEffort, Index: 64386
Transmit rate: unspecified, Rate Limit: none, Buffer size: 30 percent, Buffer
Limit: none, Priority: low
Excess Priority: low, Excess rate: proportion 180 ,
Drop profiles:
 Loss priority Protocol Index Name

```

|             |     |       |                |
|-------------|-----|-------|----------------|
| Low         | any | 27391 | RED-BestEffort |
| Medium low  | any | 27391 | RED-BestEffort |
| Medium high | any | 27391 | RED-BestEffort |
| High        | any | 27391 | RED-BestEffort |

Drop profile: RED-BestEffort, Type: interpolated, Index: 27391

| Fill level | Drop probability |
|------------|------------------|
| 0          | 0                |
| 1          | 0                |
| 2          | 0                |
| 4          | 0                |
| 5          | 0                |
| 6          | 0                |
| 8          | 0                |
| 10         | 0                |
| 12         | 0                |
| 14         | 0                |
| 15         | 0                |
| 16         | 0                |
| 18         | 0                |
| 20         | 0                |
| 22         | 0                |
| 24         | 0                |
| 25         | 0                |
| 26         | 0                |
| 28         | 0                |
| 30         | 0                |
| 32         | 0                |
| 34         | 0                |
| 35         | 0                |
| 36         | 0                |
| 38         | 0                |
| 40         | 0                |
| 42         | 10               |
| 44         | 20               |
| 45         | 25               |
| 46         | 30               |
| 48         | 40               |
| 49         | 45               |
| 51         | 51               |
| 52         | 52               |
| 54         | 54               |
| 55         | 55               |
| 56         | 56               |
| 58         | 58               |
| 60         | 60               |
| 62         | 62               |
| 64         | 64               |
| 65         | 65               |
| 66         | 66               |
| 68         | 68               |
| 70         | 70               |
| 72         | 72               |
| 74         | 74               |
| 75         | 75               |
| 76         | 76               |
| 78         | 78               |
| 80         | 80               |
| 82         | 82               |
| 84         | 84               |
| 85         | 85               |
| 86         | 86               |

|                                                                |                  |
|----------------------------------------------------------------|------------------|
| 88                                                             | 88               |
| 90                                                             | 90               |
| 92                                                             | 92               |
| 94                                                             | 94               |
| 95                                                             | 95               |
| 96                                                             | 96               |
| 98                                                             | 98               |
| 99                                                             | 99               |
| 100                                                            | 100              |
| Drop profile: RED-BestEffort, Type: interpolated, Index: 27391 |                  |
| Fill level                                                     | Drop probability |
| 0                                                              | 0                |
| 1                                                              | 0                |
| 2                                                              | 0                |
| 4                                                              | 0                |
| 5                                                              | 0                |
| 6                                                              | 0                |
| 8                                                              | 0                |
| 10                                                             | 0                |
| 12                                                             | 0                |
| 14                                                             | 0                |
| 15                                                             | 0                |
| 16                                                             | 0                |
| 18                                                             | 0                |
| 20                                                             | 0                |
| 22                                                             | 0                |
| 24                                                             | 0                |
| 25                                                             | 0                |
| 26                                                             | 0                |
| 28                                                             | 0                |
| 30                                                             | 0                |
| 32                                                             | 0                |
| 34                                                             | 0                |
| 35                                                             | 0                |
| 36                                                             | 0                |
| 38                                                             | 0                |
| 40                                                             | 0                |
| 42                                                             | 10               |
| 44                                                             | 20               |
| 45                                                             | 25               |
| 46                                                             | 30               |
| 48                                                             | 40               |
| 49                                                             | 45               |
| 51                                                             | 51               |
| 52                                                             | 52               |
| 54                                                             | 54               |
| 55                                                             | 55               |
| 56                                                             | 56               |
| 58                                                             | 58               |
| 60                                                             | 60               |
| 62                                                             | 62               |
| 64                                                             | 64               |
| 65                                                             | 65               |
| 66                                                             | 66               |
| 68                                                             | 68               |
| 70                                                             | 70               |
| 72                                                             | 72               |
| 74                                                             | 74               |
| 75                                                             | 75               |
| 76                                                             | 76               |
| 78                                                             | 78               |

|     |     |
|-----|-----|
| 80  | 80  |
| 82  | 82  |
| 84  | 84  |
| 85  | 85  |
| 86  | 86  |
| 88  | 88  |
| 90  | 90  |
| 92  | 92  |
| 94  | 94  |
| 95  | 95  |
| 96  | 96  |
| 98  | 98  |
| 99  | 99  |
| 100 | 100 |

Drop profile: RED-BestEffort, Type: interpolated, Index: 27391

| Fill level | Drop probability |
|------------|------------------|
| 0          | 0                |
| 1          | 0                |
| 2          | 0                |
| 4          | 0                |
| 5          | 0                |
| 6          | 0                |
| 8          | 0                |
| 10         | 0                |
| 12         | 0                |
| 14         | 0                |
| 15         | 0                |
| 16         | 0                |
| 18         | 0                |
| 20         | 0                |
| 22         | 0                |
| 24         | 0                |
| 25         | 0                |
| 26         | 0                |
| 28         | 0                |
| 30         | 0                |
| 32         | 0                |
| 34         | 0                |
| 35         | 0                |
| 36         | 0                |
| 38         | 0                |
| 40         | 0                |
| 42         | 10               |
| 44         | 20               |
| 45         | 25               |
| 46         | 30               |
| 48         | 40               |
| 49         | 45               |
| 51         | 51               |
| 52         | 52               |
| 54         | 54               |
| 55         | 55               |
| 56         | 56               |
| 58         | 58               |
| 60         | 60               |
| 62         | 62               |
| 64         | 64               |
| 65         | 65               |
| 66         | 66               |
| 68         | 68               |
| 70         | 70               |

|                                                                |                  |
|----------------------------------------------------------------|------------------|
| 72                                                             | 72               |
| 74                                                             | 74               |
| 75                                                             | 75               |
| 76                                                             | 76               |
| 78                                                             | 78               |
| 80                                                             | 80               |
| 82                                                             | 82               |
| 84                                                             | 84               |
| 85                                                             | 85               |
| 86                                                             | 86               |
| 88                                                             | 88               |
| 90                                                             | 90               |
| 92                                                             | 92               |
| 94                                                             | 94               |
| 95                                                             | 95               |
| 96                                                             | 96               |
| 98                                                             | 98               |
| 99                                                             | 99               |
| 100                                                            | 100              |
| Drop profile: RED-BestEffort, Type: interpolated, Index: 27391 |                  |
| Fill level                                                     | Drop probability |
| 0                                                              | 0                |
| 1                                                              | 0                |
| 2                                                              | 0                |
| 4                                                              | 0                |
| 5                                                              | 0                |
| 6                                                              | 0                |
| 8                                                              | 0                |
| 10                                                             | 0                |
| 12                                                             | 0                |
| 14                                                             | 0                |
| 15                                                             | 0                |
| 16                                                             | 0                |
| 18                                                             | 0                |
| 20                                                             | 0                |
| 22                                                             | 0                |
| 24                                                             | 0                |
| 25                                                             | 0                |
| 26                                                             | 0                |
| 28                                                             | 0                |
| 30                                                             | 0                |
| 32                                                             | 0                |
| 34                                                             | 0                |
| 35                                                             | 0                |
| 36                                                             | 0                |
| 38                                                             | 0                |
| 40                                                             | 0                |
| 42                                                             | 10               |
| 44                                                             | 20               |
| 45                                                             | 25               |
| 46                                                             | 30               |
| 48                                                             | 40               |
| 49                                                             | 45               |
| 51                                                             | 51               |
| 52                                                             | 52               |
| 54                                                             | 54               |
| 55                                                             | 55               |
| 56                                                             | 56               |
| 58                                                             | 58               |
| 60                                                             | 60               |
| 62                                                             | 62               |

|     |     |
|-----|-----|
| 64  | 64  |
| 65  | 65  |
| 66  | 66  |
| 68  | 68  |
| 70  | 70  |
| 72  | 72  |
| 74  | 74  |
| 75  | 75  |
| 76  | 76  |
| 78  | 78  |
| 80  | 80  |
| 82  | 82  |
| 84  | 84  |
| 85  | 85  |
| 86  | 86  |
| 88  | 88  |
| 90  | 90  |
| 92  | 92  |
| 94  | 94  |
| 95  | 95  |
| 96  | 96  |
| 98  | 98  |
| 99  | 99  |
| 100 | 100 |

Scheduler: sched\_LowLoss, Forwarding class: LowLoss, Index: 44420

Transmit rate: unspecified, Rate Limit: none, Buffer size: 20 percent, Buffer

Limit: none, Priority: low

Excess Priority: low, Excess rate: proportion 800 ,

Drop profiles:

| Loss priority | Protocol | Index | Name           |
|---------------|----------|-------|----------------|
| Low           | any      | 27391 | RED-BestEffort |
| Medium low    | any      | 27391 | RED-BestEffort |
| Medium high   | any      | 27391 | RED-BestEffort |
| High          | any      | 27391 | RED-BestEffort |

Drop profile: RED-BestEffort, Type: interpolated, Index: 27391

| Fill level | Drop probability |
|------------|------------------|
| 0          | 0                |
| 1          | 0                |
| 2          | 0                |
| 4          | 0                |
| 5          | 0                |
| 6          | 0                |
| 8          | 0                |
| 10         | 0                |
| 12         | 0                |
| 14         | 0                |
| 15         | 0                |
| 16         | 0                |
| 18         | 0                |
| 20         | 0                |
| 22         | 0                |
| 24         | 0                |
| 25         | 0                |
| 26         | 0                |
| 28         | 0                |
| 30         | 0                |
| 32         | 0                |
| 34         | 0                |
| 35         | 0                |
| 36         | 0                |

|                                                                |                  |
|----------------------------------------------------------------|------------------|
| 38                                                             | 0                |
| 40                                                             | 0                |
| 42                                                             | 10               |
| 44                                                             | 20               |
| 45                                                             | 25               |
| 46                                                             | 30               |
| 48                                                             | 40               |
| 49                                                             | 45               |
| 51                                                             | 51               |
| 52                                                             | 52               |
| 54                                                             | 54               |
| 55                                                             | 55               |
| 56                                                             | 56               |
| 58                                                             | 58               |
| 60                                                             | 60               |
| 62                                                             | 62               |
| 64                                                             | 64               |
| 65                                                             | 65               |
| 66                                                             | 66               |
| 68                                                             | 68               |
| 70                                                             | 70               |
| 72                                                             | 72               |
| 74                                                             | 74               |
| 75                                                             | 75               |
| 76                                                             | 76               |
| 78                                                             | 78               |
| 80                                                             | 80               |
| 82                                                             | 82               |
| 84                                                             | 84               |
| 85                                                             | 85               |
| 86                                                             | 86               |
| 88                                                             | 88               |
| 90                                                             | 90               |
| 92                                                             | 92               |
| 94                                                             | 94               |
| 95                                                             | 95               |
| 96                                                             | 96               |
| 98                                                             | 98               |
| 99                                                             | 99               |
| 100                                                            | 100              |
| Drop profile: RED-BestEffort, Type: interpolated, Index: 27391 |                  |
| Fill level                                                     | Drop probability |
| 0                                                              | 0                |
| 1                                                              | 0                |
| 2                                                              | 0                |
| 4                                                              | 0                |
| 5                                                              | 0                |
| 6                                                              | 0                |
| 8                                                              | 0                |
| 10                                                             | 0                |
| 12                                                             | 0                |
| 14                                                             | 0                |
| 15                                                             | 0                |
| 16                                                             | 0                |
| 18                                                             | 0                |
| 20                                                             | 0                |
| 22                                                             | 0                |
| 24                                                             | 0                |
| 25                                                             | 0                |
| 26                                                             | 0                |
| 28                                                             | 0                |



|                                                                |                  |
|----------------------------------------------------------------|------------------|
| 30                                                             | 0                |
| 32                                                             | 0                |
| 34                                                             | 0                |
| 35                                                             | 0                |
| 36                                                             | 0                |
| 38                                                             | 0                |
| 40                                                             | 0                |
| 42                                                             | 10               |
| 44                                                             | 20               |
| 45                                                             | 25               |
| 46                                                             | 30               |
| 48                                                             | 40               |
| 49                                                             | 45               |
| 51                                                             | 51               |
| 52                                                             | 52               |
| 54                                                             | 54               |
| 55                                                             | 55               |
| 56                                                             | 56               |
| 58                                                             | 58               |
| 60                                                             | 60               |
| 62                                                             | 62               |
| 64                                                             | 64               |
| 65                                                             | 65               |
| 66                                                             | 66               |
| 68                                                             | 68               |
| 70                                                             | 70               |
| 72                                                             | 72               |
| 74                                                             | 74               |
| 75                                                             | 75               |
| 76                                                             | 76               |
| 78                                                             | 78               |
| 80                                                             | 80               |
| 82                                                             | 82               |
| 84                                                             | 84               |
| 85                                                             | 85               |
| 86                                                             | 86               |
| 88                                                             | 88               |
| 90                                                             | 90               |
| 92                                                             | 92               |
| 94                                                             | 94               |
| 95                                                             | 95               |
| 96                                                             | 96               |
| 98                                                             | 98               |
| 99                                                             | 99               |
| 100                                                            | 100              |
| Drop profile: RED-BestEffort, Type: interpolated, Index: 27391 |                  |
| Fill level                                                     | Drop probability |
| 0                                                              | 0                |
| 1                                                              | 0                |
| 2                                                              | 0                |
| 4                                                              | 0                |
| 5                                                              | 0                |
| 6                                                              | 0                |
| 8                                                              | 0                |
| 10                                                             | 0                |
| 12                                                             | 0                |
| 14                                                             | 0                |
| 15                                                             | 0                |
| 16                                                             | 0                |
| 18                                                             | 0                |
| 20                                                             | 0                |

|     |     |
|-----|-----|
| 22  | 0   |
| 24  | 0   |
| 25  | 0   |
| 26  | 0   |
| 28  | 0   |
| 30  | 0   |
| 32  | 0   |
| 34  | 0   |
| 35  | 0   |
| 36  | 0   |
| 38  | 0   |
| 40  | 0   |
| 42  | 10  |
| 44  | 20  |
| 45  | 25  |
| 46  | 30  |
| 48  | 40  |
| 49  | 45  |
| 51  | 51  |
| 52  | 52  |
| 54  | 54  |
| 55  | 55  |
| 56  | 56  |
| 58  | 58  |
| 60  | 60  |
| 62  | 62  |
| 64  | 64  |
| 65  | 65  |
| 66  | 66  |
| 68  | 68  |
| 70  | 70  |
| 72  | 72  |
| 74  | 74  |
| 75  | 75  |
| 76  | 76  |
| 78  | 78  |
| 80  | 80  |
| 82  | 82  |
| 84  | 84  |
| 85  | 85  |
| 86  | 86  |
| 88  | 88  |
| 90  | 90  |
| 92  | 92  |
| 94  | 94  |
| 95  | 95  |
| 96  | 96  |
| 98  | 98  |
| 99  | 99  |
| 100 | 100 |

Drop profile: RED-BestEffort, Type: interpolated, Index: 27391

| Fill level | Drop probability |
|------------|------------------|
| 0          | 0                |
| 1          | 0                |
| 2          | 0                |
| 4          | 0                |
| 5          | 0                |
| 6          | 0                |
| 8          | 0                |
| 10         | 0                |
| 12         | 0                |

|     |     |
|-----|-----|
| 14  | 0   |
| 15  | 0   |
| 16  | 0   |
| 18  | 0   |
| 20  | 0   |
| 22  | 0   |
| 24  | 0   |
| 25  | 0   |
| 26  | 0   |
| 28  | 0   |
| 30  | 0   |
| 32  | 0   |
| 34  | 0   |
| 35  | 0   |
| 36  | 0   |
| 38  | 0   |
| 40  | 0   |
| 42  | 10  |
| 44  | 20  |
| 45  | 25  |
| 46  | 30  |
| 48  | 40  |
| 49  | 45  |
| 51  | 51  |
| 52  | 52  |
| 54  | 54  |
| 55  | 55  |
| 56  | 56  |
| 58  | 58  |
| 60  | 60  |
| 62  | 62  |
| 64  | 64  |
| 65  | 65  |
| 66  | 66  |
| 68  | 68  |
| 70  | 70  |
| 72  | 72  |
| 74  | 74  |
| 75  | 75  |
| 76  | 76  |
| 78  | 78  |
| 80  | 80  |
| 82  | 82  |
| 84  | 84  |
| 85  | 85  |
| 86  | 86  |
| 88  | 88  |
| 90  | 90  |
| 92  | 92  |
| 94  | 94  |
| 95  | 95  |
| 96  | 96  |
| 98  | 98  |
| 99  | 99  |
| 100 | 100 |

Scheduler: sched\_LowDelay, Forwarding class: LowDelay, Index: 52777  
Transmit rate: 1 percent, Rate Limit: none, Buffer size: 10 percent, Buffer  
Limit: none, Priority: medium-low  
Excess Priority: high, Excess rate: proportion 180 ,  
Drop profiles:

```

 Loss priority Protocol Index Name
 Low any 1 default-drop-profile
 Medium low any 1 default-drop-profile
 Medium high any 1 default-drop-profile
 High any 1 default-drop-profile
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100

Scheduler: sched_Control, Forwarding class: Control, Index: 7060
 Transmit rate: 256000 bps, Rate Limit: none, Buffer size: remainder, Buffer
 Limit: none, Priority: high
 Excess Priority: low, Excess rate: proportion 20 ,
 Drop profiles:
 Loss priority Protocol Index Name
 Low any 1 default-drop-profile
 Medium low any 1 default-drop-profile
 Medium high any 1 default-drop-profile
 High any 1 default-drop-profile
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100

Scheduler: sched_Voice, Forwarding class: Voice, Index: 39330
 Transmit rate: 1 percent, Rate Limit: none, Buffer size: 5 percent, Buffer
 Limit: none, Priority: strict-high
 Excess Priority: unspecified
 Drop profiles:
 Loss priority Protocol Index Name
 Low any 1 default-drop-profile
 Medium low any 1 default-drop-profile
 Medium high any 1 default-drop-profile
 High any 1 default-drop-profile
Drop profile: default-drop-profile>, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100

```

```

Fill level Drop probability
 100 100

Scheduler: sched_Multicast, Forwarding class: Multicast, Index: 58652
Transmit rate: 100000000 bps, Rate Limit: none, Buffer size: 10 percent,
Buffer Limit: none, Priority: medium-high
Excess Priority: high, Excess rate: proportion 20 ,
Drop profiles:
 Loss priority Protocol Index Name
 Low any 1 default-drop-profile
 Medium low any 1 default-drop-profile
 Medium high any 1 default-drop-profile
 High any 1 default-drop-profile
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100
Drop profile: default-drop-profile, Type: discrete, Index: 1
 Fill level Drop probability
 100 100

Object Name Type Index
Rewrite-Output residential-default dscp 11459

Rewrite rule: residential-default, Code point type: dscp, Index: 11459
Forwarding class Loss priority Code point
BestEffort low 000000
BestEffort high 001000
LowLoss low 111010
LowLoss high 111010
LowDelay low 010001
LowDelay high 100001
Control low 110000
Control high 110000
Voice low 101110
Voice high 101110
Multicast low 100000
Multicast high 100001

Object Name Type Index
Rewrite-Output residential-default-vlan ieee8021p (outer) 2172

Rewrite rule: residential-default-vlan, Code point type: ieee-802.1, Index: 2172

Forwarding class Loss priority Code point
BestEffort low 000
BestEffort high 001
LowLoss low 111
LowLoss high 111
LowDelay low 010
LowDelay high 100
Control low 110
Control high 110
Voice low 101
Voice high 101
Multicast low 100
Multicast high 100

Object Name Type Index

```

Rewrite-Output residential-default-vlan ieee8021p (both) 2172

Rewrite rule: residential-default-vlan, Code point type: ieee-802.1, Index: 2172

| Forwarding class | Loss priority | Code point |
|------------------|---------------|------------|
| BestEffort       | low           | 000        |
| BestEffort       | high          | 001        |
| LowLoss          | low           | 111        |
| LowLoss          | high          | 111        |
| LowDelay         | low           | 010        |
| LowDelay         | high          | 100        |
| Control          | low           | 110        |
| Control          | high          | 110        |
| Voice            | low           | 101        |
| Voice            | high          | 101        |
| Multicast        | low           | 100        |
| Multicast        | high          | 100        |

| Object     | Name                 | Type | Index |
|------------|----------------------|------|-------|
| Classifier | ipprec-compatibility | ip   | 13    |

Classifier: ipprec-compatibility, Code point type: inet-precedence, Index: 13

| Code point | Forwarding class | Loss priority |
|------------|------------------|---------------|
| 000        | best-effort      | low           |
| 001        | best-effort      | high          |
| 010        | best-effort      | low           |
| 011        | best-effort      | high          |
| 100        | best-effort      | low           |
| 101        | best-effort      | high          |
| 110        | network-control  | low           |
| 111        | network-control  | high          |

| Forwarding class | ID | Queue | Restricted queue | Fabric |
|------------------|----|-------|------------------|--------|
| BestEffort       | 0  | 0     | 0                | low    |
| LowLoss          | 1  | 1     | 1                | low    |
| LowDelay         | 2  | 2     | 2                | high   |
| Control          | 3  | 3     | 3                | high   |
| Voice            | 4  | 4     | 0                | high   |
| Multicast        | 5  | 7     | 3                | low    |

| priority   | Policing priority | SPU priority |
|------------|-------------------|--------------|
| BestEffort | normal            | low          |
| LowLoss    | normal            | low          |
| LowDelay   | normal            | low          |
| Control    | premium           | low          |
| Voice      | premium           | low          |
| Multicast  | normal            | low          |

user@host-R0>show services l2tp summary

```

Failover within a preference level is Enabled
Weighted load balancing is Enabled
Tunnel authentication challenge is Enabled
Calling number avp is Disabled
Failover Protocol is Enabled
Tx Connect speed method is ancp
Rx speed avp when equal is Disabled
Tunnel assignment id format is client-server-id
Tunnel Tx Address Change is Accept
Max Retransmissions for Established Tunnel is 2
Max Retransmissions for Not Established Tunnel is 2
Tunnel Idle Timeout is 600 seconds
Destruct Timeout is 600 seconds
Destination Lockout Timeout is 300 seconds
Destinations: 1, Tunnels: 1, Sessions: 1, Switched sessions: 0

```

```
user@host-R0>show services l2tp destination
```

| Local Name | Remote IP | Tunnels | Sessions | State   |
|------------|-----------|---------|----------|---------|
| 2          | 102.0.0.1 | 1       | 1        | Enabled |

```
user@host-R0>show services l2tp tunnel
```

| Local ID | Remote ID | Remote IP      | Sessions | State       |
|----------|-----------|----------------|----------|-------------|
| 10267    | 44445     | 102.0.0.1:1701 | 1        | Established |

```
user@host-R0>show services l2tp session
```

```
Tunnel local ID: 10267
```

| Local ID | Remote ID | State       | Interface unit | Interface Name |
|----------|-----------|-------------|----------------|----------------|
| 29846    | 11881     | Established | 1073742495     | pp0            |

```
user@host-R0>show services l2tp destination detail
```

```
Local name: 2
Remote IP: 102.0.0.1
Tunnels: 1, Sessions: 1
State: Enabled
Local IP: 100.0.0.1
Transport: ipUdp, Logical System: default, Router Instance: default
Lockout State: not locked
```

```
user@host-R0>show services l2tp tunnel detail
```

```
Tunnel local ID: 10267, Tunnel remote ID: 44445
Remote IP: 102.0.0.1:1701
Sessions: 1, State: Established
Tunnel Name: 2/sandbox_4tunnel_4
Local IP: 100.0.0.1:1701
Local name: sandbox_4, Remote name: R2
Effective Peer Resync Mechanism: failover protocol
Nas Port Method: none
Tunnel Logical System: default, Tunnel Routing Instance: default
```

```
user@host-R0>show services l2tp session detail
```

```
Tunnel local ID: 10267
```

```
Session local ID: 29846, Session remote ID: 11881, Interface unit: 1073742495
State: Established, Interface: pp0, Mode: Dedicated
Local IP: 100.0.0.1:1701, Remote IP: 102.0.0.1:1701
Local name: sandbox_4, Remote name: R2
```

**Meaning** The **show services l2tp** commands display a list of the active L2TP tunnels for the LAC. If an L2TP tunnel is established successfully, the system should display an L2TP session list and details.

### Verify the AAA Access and RADIUS Server Configuration and Statistics on R0

**Purpose** Display RADIUS server, domain map, and AAA information to confirm that that AAA and RADIUS are functioning properly.

**Action** From operational mode, run the **show network-access aaa accounting**, **show network-access aaa radius-servers detail**, **show network-access domain-map statistics**, **show network-access aaa statistics authentication**, **show network-access aaa statistics authentication detail**, **show network-access aaa statistics accounting**, **show network-access aaa statistics accounting detail**, **show network-access requests statistics**, and **show network-access requests pending** commands.

```
user@host-R0>show network-access aaa accounting
 Profile Logical System Routing Instance
Acct-On-Response
 Access-Profile-0 default default ACK
```

```
user@host-R0>show network-access aaa radius-servers detail
Profile: Access-Profile-0
 Server address: 9.0.0.9
 Authentication port: 1812
 Accounting port: 1813
 Status: UP
```

```
RADIUS Servers
9.0.0.9
 Round Trip Time: 2
 Authentication requests: 367
 Authentication rollover requests: 0
 Authentication retransmissions: 14
 Accepts: 363
 Rejects: 0
 Challenges: 0
 Authentication malformed responses: 0
 Authentication bad authenticators: 0
 Authentication requests pending: 0
 Authentication request timeouts: 18
 Authentication unknown responses: 0
 Authentication packets dropped: 0
 Accounting start requests: 95
 Accounting interim requests: 1161
 Accounting stop requests: 381
 Accounting rollover requests: 0
 Accounting retransmissions: 1990
 Accounting start responses: 95
 Accounting interim responses: 841
 Accounting stop responses: 376
 Accounting malformed responses: 0
 Accounting bad authenticators: 0
 Accounting requests pending: 0
 Accounting request timeouts: 2436
 Accounting unknown responses: 0
 Accounting packets dropped: 0
```

```
user@host-R0>show network-access domain-map statistics
General domain mapping statistics
 Matched domains: 8
 Unmatched domains: 44
 Missing domain names: 44
 Stripped usernames: 0
Domain statistics for domain-name: default
 Default used: 0
```



```
user@host-R0>show network-access aaa statistics authentication
```

```
Authentication module statistics
```

```
Requests received: 367
Accepts: 363
Rejects: 0
Challenges: 0
Timed out requests: 4
```

```
user@host-R0>show network-access aaa statistics authentication detail
```

```
Authentication module statistics
```

```
Requests received: 367
Accepts: 363
Rejects: 0
 RADIUS authentication failures: 0
 Queue request deleted: 0
 Malformed reply: 0
 No server configured: 0
 Access Profile configuration not found: 0
 Unable to create client record: 0
 Unable to create client request: 0
 Unable to build authentication request: 0
 No available server: 0
 Unable to create handle: 0
 Unable to queue request: 0
 Invalid credentials: 0
 Malformed request: 0
 License unavailable: 0
 Redirect requested: 0
 Internal failure: 0
 Local authentication failures: 0
 LDAP lookup failures: 0
Challenges: 0
Timed out requests: 4
```

```
user@host-R0>show network-access aaa statistics accounting
```

```
Accounting module statistics
```

```
Requests received: 1779
Accounting response failures: 0
Accounting response success: 1314
Timed out requests: 446
```

```
user@host-R0>show network-access aaa statistics accounting detail
```

```
Accounting module statistics
```

```
Requests received: 1779
 Account on requests: 142
 Accounting start requests: 95
 Accounting interim requests: 1161
 Accounting stop requests: 381
Accounting response failures: 0
Accounting response success: 1314
 Account on responses: 2
 Accounting start responses: 95
 Accounting interim responses: 841
 Accounting stop responses: 376
Timed out requests: 446
Accounting rollover requests: 0
Accounting unknown responses: 0
Accounting pending account requests: 0
Accounting malformed responses: 0
Accounting retransmissions: 1990
Accounting bad authenticators: 0
```

Accounting packets dropped: 0

user@host-R0>show network-access requests statistics

General authentication statistics

Total requests received: 1504

Total responses sent: 1845

Radius authentication statistics

Total requests received: 367

Success responses: 363

Failure responses: 0

Local authentication statistics

Total requests received: 0

Success responses: 0

Failure responses: 0

LDAP authentication statistics

Total requests received: 0

Success responses: 0

Failure responses: 0

Securid authentication statistics

Total requests received: 0

Success responses: 0

Failure responses: 0

Gx-plus general counters:

| Counter                              | Value |
|--------------------------------------|-------|
| engine created                       | 1     |
| initial config: inactive             | 1     |
| recovery: cold-boot                  | 1     |
| diameter-app initial config: success | 1     |

Gx-plus sync-event counters:

| Sync-Event | Counter   | Value |
|------------|-----------|-------|
| cold-boot  | activated | 1     |

Gx-plus general counters:

| Counter                              | Value |
|--------------------------------------|-------|
| engine created                       | 1     |
| initial config: inactive             | 1     |
| recovery: cold-boot                  | 1     |
| diameter-app initial config: success | 1     |

Gx-plus sync-event counters:

| Sync-Event | Counter   | Value |
|------------|-----------|-------|
| cold-boot  | activated | 1     |

user@host-R0>show network-access requests pending

Information about pending authentication entries

Total pending authentication requests: 0

**Meaning** AAA and RADIUS server functions are correct.

---

### Verify L2TP Functionality on R2

**Purpose** Display subscriber, network access AAA, and L2TP services information to confirm that the interfaces are functioning properly.

**Action** From operational mode, run the **show subscribers**, **show subscriber summary**, **show subscribers detail**, **show network-access aaa subscribers**, **show network-access aaa subscribers session-id 4**, **show network-access aaa subscribers session-id 4 detail**, **show route protocol access internal**, **show services l2tp summary**, **show services l2tp destination**, **show services l2tp tunnel**, **show services l2tp session**, **show services l2tp destination extensive**, **show services l2tp tunnel extensive**, and **show services l2tp session extensive** commands.

```
user@host-R2>show subscribers
Interface IP Address/VLAN ID User Name
 LS:RI
si-2/0/0.1073741827 100.48.0.4 DEFAULTUSER@ABC1.COM
 default:default
```

```
user@host-R2>show subscribers summary
Subscribers by State
 Active: 1
 Total: 1
```

```
Subscribers by Client Type
 L2TP: 1
 Total: 1
```

```
user@host-R2>show subscribers detail
Type: L2TP
User Name: DEFAULTUSER@ABC1.COM
IP Address: 100.48.0.4
IP Netmask: 255.0.0.0
Logical System: default
Routing Instance: default
Interface: si-2/0/0.1073741827
Interface type: Dynamic
Underlying Interface: si-2/0/0.1073741827
Dynamic Profile Name: lns-profile
State: Active
Radius Accounting ID: 4
Session ID: 4
Login Time: 2015-02-24 08:07:25 PST
```

```
user@host-R2>show network-access aaa subscribers
Username Logical system/Routing instance Client type
Session-ID
DEFAULTUSER@ABC1.COM default:default 12tp 4
```

```
user@host-R2>show network-access aaa subscribers session-id 4
Logical system/Routing instance Client type Session-ID Session uptime
Accounting
default:default 12tp 4 00:02:09
off
```

```
user@host-R2>show network-access aaa subscribers session-id 4 detail
Type: 12tp
Stripped username: DEFAULTUSER@ABC1.COM
AAA Logical system/Routing instance: default:default
Target Logical system/Routing instance: default:default
Access-profile: AccProf-LNS
Session ID: 4
Accounting Session ID: 4
```

```

Multi Accounting Session ID: 0
IP Address: 100.48.0.4
Authentication State: AuthStateActive
Accounting State: Acc-Init
Provisioning Type: None

user@host-R2>show route protocol access-internal
inet.0: 22 destinations, 22 routes (22 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

100.48.0.4/32 *[Access-internal/12] 00:02:24
 > via si-2/0/0.1073741827

inet.1: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
inet.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
mpls.0: 47 destinations, 47 routes (47 active, 0 holddown, 0 hidden)
inet6.0: 15 destinations, 19 routes (15 active, 0 holddown, 0 hidden)
inet6.1: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
inet6.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
l2circuit.0: 36 destinations, 36 routes (36 active, 0 holddown, 0 hidden)

user@host-R2>show services l2tp summary
Failover within a preference level is Disabled
Weighted load balancing is Disabled
Tunnel authentication challenge is Enabled
Calling number avp is Enabled
Failover Protocol is Enabled
Tx Connect speed method is static
Rx speed avp when equal is Disabled
Tunnel assignment id format is assignment-id
Tunnel Tx Address Change is Accept
Max Retransmissions for Established Tunnel is 7
Max Retransmissions for Not Established Tunnel is 5
Tunnel Idle Timeout is 60 seconds
Destruct Timeout is 300 seconds
Destination Lockout Timeout is 300 seconds
Destinations: 1, Tunnels: 1, Sessions: 1, Switched sessions: 0

user@host-R2>show services l2tp destination

```

| Local Name | Remote IP | Tunnels | Sessions | State   |
|------------|-----------|---------|----------|---------|
| 2          | 100.0.0.1 | 1       | 1        | Enabled |

```

user@host-R2>show services l2tp tunnel

```

| Local ID | Remote ID | Remote IP      | Sessions | State       |
|----------|-----------|----------------|----------|-------------|
| 37420    | 7826      | 100.0.0.1:1701 | 1        | Established |

```

user@host-R2>show services l2tp session
Tunnel local ID: 37420

```

| Local ID | Remote ID | State       | Interface unit | Interface Name |
|----------|-----------|-------------|----------------|----------------|
| 40634    | 44927     | Established | 1073741827     | si-2/0/0       |

```
user@host-R2>show services l2tp destination extensive
```

```
Waiting for statistics...
```

```
Local name: 2
Remote IP: 100.0.0.1
Tunnels: 1, Sessions: 1
State: Enabled
Local IP: 102.0.0.1
Transport: ipUdp, Logical System: default, Router Instance: default
Lockout State: not locked
```

| Connections | Totals | Active | Failed |
|-------------|--------|--------|--------|
| Tunnels     | 1      | 1      | 0      |
| Sessions    | 1      | 1      | 0      |

|            | Packets | Bytes |
|------------|---------|-------|
| Control Tx | 6       | 253   |
| Control Rx | 6       | 462   |
| Data Tx    | 107     | 6.0k  |
| Data Rx    | 46      | 2852  |
| Errors Tx  | 0       |       |
| Errors Rx  | 0       |       |

```
user@host-R2>show services l2tp tunnel extensive
```

```
Waiting for statistics...
```

```
Tunnel local ID: 37420, Tunnel remote ID: 7826
Remote IP: 100.0.0.1:1701
Sessions: 1, State: Established
Tunnel Name: 2/9
Local IP: 102.0.0.1:1701
Local name: R2, Remote name: sandbox_3
Effective Peer Resync Mechanism: failover protocol
Nas Port Method: none
Tunnel Logical System: default, Tunnel Routing Instance: default
Max sessions: 128100, Window size: 4, Hello interval: 60
Create time: Tue Feb 24 08:07:25 2015, Up time: 00:03:38
Idle time: 00:00:00, ToS Reflect: Disabled
Tunnel Group Name: lns-tunnel-group
Statistics since: Tue Feb 24 08:07:25 2015
```

|            | Packets | Bytes |
|------------|---------|-------|
| Control Tx | 6       | 253   |
| Control Rx | 6       | 462   |
| Data Tx    | 109     | 6.1k  |
| Data Rx    | 46      | 2852  |
| Errors Tx  | 0       |       |
| Errors Rx  | 0       |       |

```
user@host-R2>show services l2tp session extensive
```

```
Tunnel local ID: 37420
```

```
Session local ID: 40634, Session remote ID: 44927
Interface unit: 1073741827
State: Established
Interface: si-2/0/0
Mode: Dedicated
Local IP: 102.0.0.1:1701, Remote IP: 100.0.0.1:1701
Local name: R2, Remote name: sandbox_3
Bearer type: 1, Framing type: 1
LCP renegotiation: Off, Authentication: None
Call serial number: 3
Tx speed: 1000000000, Rx speed: 0
Create time: Tue Feb 24 08:07:25 2015, Up time: 00:03:44
Idle time: N/A, ToS Reflect: Disabled
Statistics since: Tue Feb 24 08:07:25 2015
```

|         | Packets | Bytes |
|---------|---------|-------|
| Data Tx | 111     | 6.2k  |
| Data Rx | 46      | 2852  |

**Meaning** L2TP LAC PPP over dynamic VLAN interfaces are operational.

## Troubleshooting

This troubleshooting section focuses on subscriber management functions on the BNG platform. To troubleshoot these functions, see the following sections.



**NOTE:** For information on using the trace option, see [Junos OS Tracing and Logging Operations](#).

- [MPLS L2 Circuit Pseudowire on page 214](#)
- [Subscriber Sessions on page 222](#)

### MPLS L2 Circuit Pseudowire

**Problem** MPLS L2 circuit pseudowires are not being established.

**Solution** 1. On the BNG device, investigate each network layer's operational status and error count. Start by ensuring that the operational status is Up for both L1 and L2, and that the error count is not increasing.

```
user@host-BNG>show interfaces ge-2/1/0 extensive
Physical interface: ge-2/1/0, Enabled, Physical link is Up
 Interface index: 2359, SNMP ifIndex: 579, Generation: 2362
 Description: To R1 - APE1
 Link-level type: Ethernet, MTU: 1514, MRU: 1522, Speed: 1000mbps, BPDU Error:
None, MAC-REWRITE Error: None, Loopback: Disabled,
 Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
 Remote fault: Online
 Pad to minimum frame size: Disabled
 Device flags : Present Running
 Interface flags: SNMP-Traps Internal: 0x4000
 Link flags : None
 CoS queues : 8 supported, 8 maximum usable queues
 Schedulers : 0
 Hold-times : Up 0 ms, Down 0 ms
 Current address: ac:4b:c8:45:6a:94, Hardware address: ac:4b:c8:45:6a:94
 Last flapped : 2015-03-24 16:34:13 PDT (22:13:47 ago)
 Statistics last cleared: Never
Traffic statistics:
 Input bytes : 37913131 234088 bps
 Output bytes : 27109253 150976 bps
 Input packets : 750139 595 pps
 Output packets: 736385 588 pps
IPv6 transit statistics:
 Input bytes : 0
 Output bytes : 0
 Input packets : 0
 Output packets: 0
Label-switched interface (LSI) traffic statistics:
 Input bytes : 0 0 bps
```

```

Input packets: 0 0 pps
Dropped traffic statistics due to STP State:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Input errors:
 Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0, L3
incompletes: 0, L2 channel errors: 0,
 L2 mismatch timeouts: 0, FIFO errors: 0, Resource errors: 0
Output errors:
 Carrier transitions: 1, Errors: 0, Drops: 0, Collisions: 0, Aged packets:
0, FIFO errors: 0, HS link CRC errors: 0,
 MTU errors: 0, Resource errors: 0
Egress queues: 8 supported, 8 in use
Queue counters: Queued packets Transmitted packets Dropped packets
0 2082 2082
0
1 0 0
0
2 0 0
0
3 735288 735288
0
4 0 0
0
5 0 0
0
6 0 0
0
7 0 0
0
Queue number: Mapped forwarding classes
0 FC0
1 FC1
2 FC2
3 FC3
4 FC4
5 FC5
6 FC6
7 FC7
Active alarms : None
Active defects : None
MAC statistics:
Total octets Receive Transmit
Total packets 51466725 49001759
Unicast packets 750906 737115
Broadcast packets 731162 699812
Multicast packets 35 38
CRC/Align errors 19709 37265
FIFO errors 0 0
MAC control frames 0 0
MAC pause frames 0 0
Oversized frames 0
Jabber frames 0
Fragment frames 0
VLAN tagged frames 0
Code violations 0
Total errors 0 0
Filter statistics:

```

```

Input packet count 750316
Input packet rejects 0
Input DA rejects 0
Input SA rejects 0
Output packet count 736542
Output packet pad count 0
Output packet error count 0
CAM destination filters: 0, CAM source filters: 0
Autonegotiation information:
Negotiation status: Complete
Link partner:
Link mode: Full-duplex, Flow control: Symmetric/Asymmetric, Remote
fault: OK
Local resolution:
Flow control: Symmetric, Remote fault: Link OK
Packet Forwarding Engine configuration:
Destination slot: 0 (0x00)
CoS information:
Direction : Output
CoS transmit queue Bandwidth Buffer Priority
Limit % bps % usec
0 FC0 95 950000000 95 0 low
none
3 FC3 5 500000000 5 0 low
none
Interface transmit statistics: Disabled
Logical interface ge-2/1/0.0 (Index 4447) (SNMP ifIndex 14264) (Generation
4256)
Flags: Up SNMP-Traps 0x4004000 Encapsulation: ENET2
Traffic statistics:
Input bytes : 41421857
Output bytes : 27287563
Input packets: 786945
Output packets: 736385
Local statistics:
Input bytes : 8105510
Output bytes : 5342123
Input packets: 102278
Output packets: 50590
Transit statistics:
Input bytes : 33316347 230800 bps
Output bytes : 21945440 150624 bps
Input packets: 684667 591 pps
Output packets: 685795 588 pps
Protocol inet, MTU: 1500, Generation: 2247, Route table: 0
Flags: Sendbcst-pkt-to-re
Addresses, Flags: Is-Preferred Is-Primary
Destination: 21.21.11/24, Local: 21.21.11.1, Broadcast: 21.21.11.255,
Generation: 155
Protocol mpls, MTU: 1488, Maximum labels: 3, Generation: 2248, Route table:
0
Protocol multiservice, MTU: Unlimited, Generation: 2249, Route table: 0
Policer: Input: __default_arp_policer__

```

2. If the interface is a pseudo-service (PS) interface, check the status of the anchor interface as well.

```
user@host-BNG>show configuration interfaces ge-2/1/0| display inheritance no-comments
```



```

ge-2/1/0 {
 description "To access facing port1";
 accounting-profile ifprofile;
 hierarchical-scheduler;
 flexible-vlan-tagging;
 auto-configure {
 stacked-vlan-ranges {
 dynamic-profile vlan-client-profile {
 accept pppoe;
 ranges {
 1-4094,1-4094;
 }
 }
 }
 remove-when-no-subscribers;
 }
 mtu 1522;
 hold-time up 0 down 1000;
 link-mode full-duplex;
 encapsulation flexible-ethernet-services;
 no-gratuitous-arp-reply;
 no-gratuitous-arp-request;
 unit 15000 {
 description "HSI for Business customer";
 vlan-id 4000;
 accounting-profile ifprofile;
 family inet {
 rpf-check;
 address 11.1.1.1/24;
 }
 }
 unit 1 {
 encapsulation vlan-ccc;
 vlan-tags outer 3101 inner 301;
 accounting-profile ifprofile;
 }
 unit 2 {
 encapsulation vlan-ccc;
 vlan-tags outer 3101 inner 302;
 accounting-profile ifprofile;
 }
 unit 3 {
 encapsulation vlan-ccc;
 vlan-tags outer 3101 inner 303;
 accounting-profile ifprofile;
 }
}

user@host-BNG>show interfaces ge-2/1/0 media
Physical interface: ge-2/1/0, Enabled, Physical link is Up
Interface index: 160, SNMP ifIndex: 12720
Type: Software-Pseudo, Link-level type: 90, MTU: 1522, Clocking: 1, Speed:
1000mbps
Device flags : Present Running
Interface flags: Point-To-Point Internal: 0x4000
Current address: ac:4b:c8:45:68:00, Hardware address: ac:4b:c8:45:68:00
Last flapped : Never
Input rate : 0 bps (0 pps)
Output rate : 0 bps (0 pps)

user@host-BNG>show interfaces ge-2/1/0

```

```

Logical interface ge-2/1/0 (Index 332) (SNMP ifIndex 18023)
Flags: Up Point-To-Point 0x4000 Encapsulation: Ethernet-CCC
Input packets : 272
Output packets: 459
Protocol ccc, MTU: 1514
Flags: Is-Primary

```

```

user@host-BNG>show interfaces ge-2/1/0 extensive

```

```

Logical interface ge-2/1/0 (Index 332) (SNMP ifIndex 18023) (Generation 141)
Flags: Up Point-To-Point 0x4000 Encapsulation: Ethernet-CCC
Traffic statistics:
 Input bytes : 17251
 Output bytes : 37799
 Input packets: 272
 Output packets: 459
Local statistics:
 Input bytes : 0
 Output bytes : 0
 Input packets: 0
 Output packets: 0
Transit statistics:
 Input bytes : 17251 0 bps
 Output bytes : 37799 0 bps
 Input packets: 272 0 pps
 Output packets: 459 0 pps
Protocol ccc, MTU: 1514, Generation: 169, Route table: 0
Flags: Is-Primary

```

- Next, check the IP connectivity of the remote PE router (R2)'s loopback interface.

```

user@host-BNG>ping 102.0.0.1 rapid count 1000

```

```

PING 102.0.0.1 (102.0.0.1): 56 data bytes
!!
!!
!!
!!
!!
!!
--- 102.0.0.1 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.460/0.748/16.578/0.820 ms

```

- Determine whether the IGP is stable, without any route flapping. The IS-IS neighbor state should be Full, and the age of the IS-IS database and route table should increase consistently without resetting to zero. The IP connectivity to the neighbor router's loopback interface should be intact.

```

user@host-BNG>show isis adjacency

```

| Interface  | System | L State | Hold (secs) | SNPA |
|------------|--------|---------|-------------|------|
| ge-9/0/1.0 | R3     | 1 Up    | 21          |      |
| xe-5/2/0.0 | R1     | 1 Up    | 25          |      |

```

user@host-BNG>show route protocol isis | match /32

```

```

101.0.0.1/32 *[IS-IS/15] 3d 17:30:08, metric 2000070
102.0.0.1/32 *[IS-IS/15] 3d 14:07:11, metric 4000140
103.0.0.1/32 *[IS-IS/15] 3d 17:29:57, metric 2000070

```

```

user@host-BNG>show route protocol isis | match /128

```

```

1001::1/128 *[IS-IS/15] 3d 17:25:02, metric 2000070
1002::1/128 *[IS-IS/15] 3d 14:07:14, metric 4000140
1003::1/128 *[IS-IS/15] 3d 17:25:02, metric 2000070

```

```

user@host-BNG>show route protocol isis

```

```

inet.0: 31 destinations, 33 routes (31 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

9.0.0.0/24 *[IS-IS/15] 3d 13:21:56, metric 2000080
> to 20.20.50.3 via xe-5/2/0.0
 to 20.20.70.3 via ge-9/0/1.0
20.20.60.0/24 *[IS-IS/15] 3d 14:08:05, metric 4000140
> to 20.20.50.3 via xe-5/2/0.0
 to 20.20.70.3 via ge-9/0/1.0
20.20.80.0/24 *[IS-IS/15] 3d 14:07:38, metric 4000140
> to 20.20.70.3 via ge-9/0/1.0
 to 20.20.50.3 via xe-5/2/0.0
20.20.90.0/24 *[IS-IS/15] 3d 17:30:02, metric 4000140
> to 20.20.70.3 via ge-9/0/1.0
 to 20.20.50.3 via xe-5/2/0.0
101.0.0.1/32 *[IS-IS/15] 3d 17:30:13, metric 2000070
> to 20.20.50.3 via xe-5/2/0.0
 to 20.20.70.3 via ge-9/0/1.0
102.0.0.1/32 *[IS-IS/15] 3d 14:07:16, metric 4000140
> to 20.20.70.3 via ge-9/0/1.0
 to 20.20.50.3 via xe-5/2/0.0
103.0.0.1/32 *[IS-IS/15] 3d 17:30:02, metric 2000070
> to 20.20.70.3 via ge-9/0/1.0
 to 20.20.50.3 via xe-5/2/0.0
200.0.1.0/24 *[IS-IS/15] 3d 14:07:16, metric 4000150
> to 20.20.70.3 via ge-9/0/1.0
 to 20.20.50.3 via xe-5/2/0.0

inet.1: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)

inet.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)

iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

mpls.0: 47 destinations, 47 routes (47 active, 0 holddown, 0 hidden)

inet6.0: 10 destinations, 11 routes (10 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

1001::1/128 *[IS-IS/15] 3d 17:25:04, metric 2000070
> to fe80::aad0:e5ff:fe50:b200 via xe-5/2/0.0
 to fe80::fac0:1ff:fe19:d8f9 via ge-9/0/1.0
1002::1/128 *[IS-IS/15] 3d 14:07:16, metric 4000140
> to fe80::aad0:e5ff:fe50:b200 via xe-5/2/0.0
 to fe80::fac0:1ff:fe19:d8f9 via ge-9/0/1.0
1003::1/128 *[IS-IS/15] 3d 17:25:04, metric 2000070
> to fe80::fac0:1ff:fe19:d8f9 via ge-9/0/1.0
 to fe80::aad0:e5ff:fe50:b200 via xe-5/2/0.0
3008:db8:ffff:3::/64
*[IS-IS/15] 3d 14:07:16, metric 4000150
> to fe80::fac0:1ff:fe19:d8f9 via ge-9/0/1.0
 to fe80::aad0:e5ff:fe50:b200 via xe-5/2/0.0

inet6.1: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

inet6.3: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)

l2circuit.0: 36 destinations, 36 routes (36 active, 0 holddown, 0 hidden)

user@host-BNG>ping 102.0.0.1 rapid count 1000
PING 102.0.0.1 (102.0.0.1): 56 data bytes
!!

```

```

!!
!!
!!
!!
--- 102.0.0.1 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.480/0.830/11.262/0.771 ms

```

5. Examine the MPLS pseudowire data path.

```

user@host-BNG>ping mpls l2circuit virtual-circuit 1 count 10 destination 127.0.0.1 neighbor
101.0.0.1

```

```

!!!!!!
--- lsping statistics ---
10 packets transmitted, 10 packets received, 0% packet loss

```

```

user@host-PE1>ping mpls l2circuit interface ge-2/1/0.1

```

```

!!!!
--- lsping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss

```

```

user@host-PE1>ping mpls l2circuit interface ge-2/1/0.1

```

```

!!!!
--- lsping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss

```

```

user@host-PE1>ping mpls l2circuit interface ge-2/1/0.1 detail

```

```

Request for seq 1, to interface 329, label 360336, packet size 88
Reply for seq 1, return code: Egress-ok, time: -4752393.948 ms
 Local transmit time: 2015-03-25 17:21:25 PDT 394.073 ms
 Remote receive time: 2015-03-25 16:02:13 PDT 0.125 ms
Request for seq 2, to interface 329, label 360336, packet size 88
Reply for seq 2, return code: Egress-ok, time: -4752393.851 ms
 Local transmit time: 2015-03-25 17:21:26 PDT 393.976 ms
 Remote receive time: 2015-03-25 16:02:14 PDT 0.125 ms
Request for seq 3, to interface 329, label 360336, packet size 88
Reply for seq 3, return code: Egress-ok, time: -4752393.839 ms
 Local transmit time: 2015-03-25 17:21:27 PDT 393.964 ms
 Remote receive time: 2015-03-25 16:02:15 PDT 0.125 ms
Request for seq 4, to interface 329, label 360336, packet size 88
Reply for seq 4, return code: Egress-ok, time: -4752393.831 ms
 Local transmit time: 2015-03-25 17:21:28 PDT 393.956 ms
 Remote receive time: 2015-03-25 16:02:16 PDT 0.125 ms
Request for seq 5, to interface 329, label 360336, packet size 88
Reply for seq 5, return code: Egress-ok, time: -4752393.823 ms
 Local transmit time: 2015-03-25 17:21:29 PDT 393.948 ms
 Remote receive time: 2015-03-25 16:02:17 PDT 0.125 ms

```

```

--- lsping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss

```

6. Finally, verify that the MPLS L2 circuit status is Up. If it is not, consult the connection status code legend provided in the **show** command output for the reason.

```

user@host-BNG>show l2circuit connections interface ge-2/1/0 extensive
Layer-2 Circuit Connections:

```

Legend for connection status (St)

|                              |                                      |
|------------------------------|--------------------------------------|
| EI -- encapsulation invalid  | NP -- interface h/w not present      |
| MM -- mtu mismatch           | Dn -- down                           |
| EM -- encapsulation mismatch | VC-Dn -- Virtual circuit Down        |
| CM -- control-word mismatch  | Up -- operational                    |
| VM -- vlan id mismatch       | CF -- Call admission control failure |

OL -- no outgoing label                      IB -- TDM incompatible bitrate  
 NC -- intf encaps not CCC/TCC              TM -- TDM misconfiguration  
 BK -- Backup Connection                    ST -- Standby Connection  
 CB -- rcvd cell-bundle size bad          SP -- Static Pseudowire  
 LD -- local site signaled down          RS -- remote site standby  
 RD -- remote site signaled down          HS -- Hot-standby Connection  
 XX -- unknown

## Legend for interface status

Up -- operational

Dn -- down

Neighbor: 102.0.0.1

| Interface      | Type | St | Time last up         | # Up trans |
|----------------|------|----|----------------------|------------|
| ge-2/1/0(vc 1) | rmt  | Up | Mar 25 14:26:50 2015 | 1          |

1

Remote PE: 102.0.0.1, Negotiated control-word: Yes (Null)

Incoming label: 360336, Outgoing label: 338624

Negotiated PW status TLV: No

Local interface: ps0.0, Status: Up, Encapsulation: ETHERNET

## Connection History:

|                      |                     |        |
|----------------------|---------------------|--------|
| Mar 25 14:26:50 2015 | status update timer |        |
| Mar 25 14:26:50 2015 | PE route changed    |        |
| Mar 25 14:26:50 2015 | Out lbl Update      | 338624 |
| Mar 25 14:26:50 2015 | In lbl Update       | 360336 |
| Mar 25 14:26:50 2015 | loc intf up         | ps0.0  |

user@host-PE1&gt;show l2circuit connections interface ge-2/1/0.1 extensive

Layer-2 Circuit Connections:

## Legend for connection status (St)

EI -- encapsulation invalid                      NP -- interface h/w not present

MM -- mtu mismatch                              Dn -- down

EM -- encapsulation mismatch                  VC-Dn -- Virtual circuit Down

CM -- control-word mismatch                  Up -- operational

VM -- vlan id mismatch                        CF -- Call admission control failure

OL -- no outgoing label                        IB -- TDM incompatible bitrate

NC -- intf encaps not CCC/TCC                TM -- TDM misconfiguration

BK -- Backup Connection                        ST -- Standby Connection

CB -- rcvd cell-bundle size bad              SP -- Static Pseudowire

LD -- local site signaled down                RS -- remote site standby

RD -- remote site signaled down               HS -- Hot-standby Connection

XX -- unknown

## Legend for interface status

Up -- operational

Dn -- down

Neighbor: 102.0.0.1

| Interface        | Type | St | Time last up         | # Up trans |
|------------------|------|----|----------------------|------------|
| ge-2/1/0.1(vc 1) | rmt  | Up | Mar 25 15:46:05 2015 | 1          |

Remote PE: 102.0.0.1, Negotiated control-word: Yes (Null)

Incoming label: 338624, Outgoing label: 360336

Negotiated PW status TLV: No

Local interface: ge-2/1/0.1, Status: Up, Encapsulation: ETHERNET

Flow Label Transmit: No, Flow Label Receive: No

## Connection History:

|                      |                     |            |
|----------------------|---------------------|------------|
| Mar 25 15:46:05 2015 | status update timer |            |
| Mar 25 15:46:01 2015 | PE route changed    |            |
| Mar 25 15:46:01 2015 | Out lbl Update      | 360336     |
| Mar 25 15:46:01 2015 | In lbl Update       | 338624     |
| Mar 25 15:46:01 2015 | loc intf up         | ge-1/1/9.1 |

Neighbor: 103.0.0.1

ge-2/1/0.1(vc 1)                      rmt    BK

## Subscriber Sessions

**Problem** Subscriber sessions are not being established.

**Solution** 1. First, check the AAA status. Start by using the **test aaa** command to ascertain the authentication and address assignment operational status.

```
user@host-BNG>test aaa ppp user SST_USER_VLAN_DEFAULT password joshua
Authentication Grant
*****User Attributes*****
 User Name - SST_USER_VLAN_DEFAULT
 Client IP Address - 100.16.0.2
 Client IP Netmask - 255.0.0.0
 Virtual Router Name - default
 Reply Message - NULL
 Primary DNS IP Address - 0.0.0.0
 Secondary DNS IP Address - 0.0.0.0
 Primary WINS IP Address - 0.0.0.0
 Secondary WINS IP Address - 0.0.0.0
 Primary DNS IPv6 Address - ::
 Secondary DNS IPv6 Address - ::
 Framed Pool - v4-pool-0
 Class Attribute - not set
 Service Type - 0
 Client Ipv6 Address - ::
 Client Ipv6 Mask - null
 Framed Ipv6 Prefix - ::/0
 Framed Ipv6 Pool - not-set
 NDRA Ipv6 Prefix - not-set
 Login Ipv6 Host - ::
 Framed Interface Id - 0:0:0:0
 Delegated Ipv6 Prefix - ::/0
 Delegated Ipv6 Pool - not-set
 User Password - joshua
 CHAP Password - NULL
 Mac Address - AB:CD:00:00:00:01
 Filter Id - not set
 Framed MTU - (null)
 Framed Route - not set
 Ingress Policy Name - not set
 Egress Policy Name - not set
 IGMP - disabled
 Redirect VR Name - default
 Service Bundle - Null
 Framed Ip Route Tag - not set
 Ignore DF Bit - disabled
 IGMP Access Group Name - not set
 IGMP Access Source Group Name - not set
 MLD Access Group Name - not set
 MLD Access Source Group Name - not set
 IGMP Version - not set
 MLD Version - not set
 IGMP Immediate Leave - disabled
 MLD Immediate Leave - disabled
 IPv6 Ingress Policy Name - not set
 IPv6 Egress Policy Name - not set
 Acct Session ID - 10
 Acct Interim Interval - 600
 Acct Type - 2
```

```

Ingress Statistics disabled
Egress Statistics disabled
Chargeable user identity - 0
NAS Port Id - not set
NAS Port - 4095
NAS Port Type - 15
Framed Protocol - 0
****Pausing 10 seconds before disconnecting the test user*****
Logging out subscriber
 Terminate Id - not set
Test complete. Exiting

user@host-BNG>test aaa ppp user SST_USER_PPPOE_LT_DEFAULT password joshua
Authentication Grant
*****User Attributes*****
 User Name - SST_USER_PPPOE_LT_DEFAULT
 Client IP Address - 100.16.0.9
 Client IP Netmask - 255.0.0.0
 Virtual Router Name - default
 Reply Message - NULL
 Primary DNS IP Address - 0.0.0.0
 Secondary DNS IP Address - 0.0.0.0
 Primary WINS IP Address - 0.0.0.0
 Secondary WINS IP Address - 0.0.0.0
 Primary DNS IPv6 Address - ::
 Secondary DNS IPv6 Address - ::
 Framed Pool - v4-pool-0
 Class Attribute - not set
 Service Type - 0
 Client Ipv6 Address - ::
 Client Ipv6 Mask - null
 Framed Ipv6 Prefix - ::/0
 Framed Ipv6 Pool - not-set
 NDRA Ipv6 Prefix - not-set
 Login Ipv6 Host - ::
 Framed Interface Id: - 0:0:0:0
 Delegated Ipv6 Prefix - ::/0
 Delegated Ipv6 Pool - not-set
 User Password - joshua
 CHAP Password - NULL
 Mac Address - AB:CD:00:00:00:01
 Service tag - 1
 Service Name -

PPPOE-SERVICE-PROFILE(INPUT-V4-FILTER-01, OUTPUT-V4-FILTER-01,
INPUT-V6-FILTER-01, OUTPUT-V6-FILTER-01)
 Filter Id - not set
 Framed MTU - (null)
 Framed Route - not set
 Ingress Policy Name - not set
 Egress Policy Name - not set
 IGMP - disabled
 Redirect VR Name - default
 Service Bundle - Null
 Framed Ip Route Tag - not set
 Ignore DF Bit - disabled
 IGMP Access Group Name - not set
 IGMP Access Source Group Name - not set
 MLD Access Group Name - not set
 MLD Access Source Group Name - not set
 IGMP Version - not set
 MLD Version - not set
 IGMP Immediate Leave - disabled

```

```

MLD Immediate Leave - disabled
IPv6 Ingress Policy Name - not set
IPv6 Egress Policy Name - not set
Acct Session ID- 28
Acct Interim Interval - 600
Acct Type - 2
Ingress Statistics disabled
Egress Statistics disabled
Chargeable user identity - 0
NAS Port Id - not set
NAS Port - 4095
NAS Port Type - 15
Framed Protocol - 0
****Pausing 10 seconds before disconnecting the test user*****
Logging out subscriber
Terminate Id - not set
Test complete. Exiting

```

```

user@host-BNG>test aaa ppp user SST_USER_PPPOE_L2TP_DEFAULT@ABC1.COM password
joshua

```

```

Authentication Grant with Tunnel Attributes
*****Tunnel Attributes*****
****Tunnel Definiton - 1
Tunnel Medium - 1
Tunnel Type - 3
Tunnel Max Sessions - 0
Tunnel Server Endpoint - 105.0.0.1
Tunnel Client Endpoint - 100.0.0.1
Tunnel Server AuthId -
Tunnel Client AuthId -
Tunnel Password - juniper
Tunnel Assignment Id - Tunnel-ID-1
Tunnel Logical System -
Tunnel Routing Instance -
****Pausing 10 seconds before disconnecting the test user*****
Logging out subscriber
Terminate Id - not set
Test complete. Exiting

```

## 2. Check the RADIUS server's operational status and statistics.

```

user@host-BNG>show network-access aaa radius-servers detail
Profile: Access-Profile-0
Server address: 9.0.0.9
Authentication port: 1812
Accounting port: 1813
Status: UP

```

```

RADIUS Servers
9.0.0.9
Round Trip Time: 1
Authentication requests: 9
Authentication rollover requests: 0
Authentication retransmissions: 25
Accepts: 4
Rejects: 0
Challenges: 0
Authentication malformed responses: 0
Authentication bad authenticators: 0
Authentication requests pending: 0
Authentication request timeouts: 30
Authentication unknown responses: 0

```



```

Authentication packets dropped: 0
Accounting start requests: 4
Accounting interim requests: 1
Accounting stop requests: 8
Accounting rollover requests: 0
Accounting retransmissions: 30
Accounting start responses: 4
Accounting interim responses: 1
Accounting stop responses: 3
Accounting malformed responses: 0
Accounting bad authenticators: 0
Accounting requests pending: 0
Accounting request timeouts: 36
Accounting unknown responses: 0
Accounting packets dropped: 0

```

3. Monitor incoming and outgoing subscriber protocol control traffic using the pseudo-service (PS) interface. Start by checking the subscriber access protocol negotiation status.

```
user@host-BNG>monitor traffic interface ps0 no-resolve
```

```
verbose output suppressed, use (detail) or (extensive) for full protocol decode
Address resolution is OFF.
```

```
Listening on ps0, capture size 96 bytes
```

```

15:10:51.505345 In PPPoE PADI [Service-Name] [Host-Uniq UTF8]
15:10:56.507188 In PPPoE PADI [Service-Name] [Host-Uniq UTF8]
15:10:56.507566 Out PPPoE PAD0 [AC-Name "R0"] [Host-Uniq UTF8] [Service-Name]
[AC-Cookie UTF8]
15:10:56.508055 In PPPoE PADR [Service-Name] [Host-Uniq UTF8] [AC-Cookie UTF8]
15:10:56.592436 In PPPoE [ses 1]LCP, Conf-Request (0x01), id 1, length 16
15:10:56.592437 In PPPoE [ses 1]LCP, Conf-Request (0x01), id 1, length 16
15:10:56.592511 Out PPPoE [ses 1]LCP, Conf-Request (0x01), id 141, length 21
15:10:56.592511 Out PPPoE [ses 1]LCP, Conf-Request (0x01), id 141, length 21
15:10:56.592560 Out PPPoE [ses 1]LCP, Conf-Ack (0x02), id 1, length 16
15:10:56.592560 Out PPPoE [ses 1]LCP, Conf-Ack (0x02), id 1, length 16
15:10:56.593707 In PPPoE [ses 1]LCP, Conf-Ack (0x02), id 141, length 21
15:10:56.593708 In PPPoE [ses 1]LCP, Conf-Ack (0x02), id 141, length 21
15:10:56.593899 Out PPPoE [ses 1]CHAP, Challenge (0x01), id 32, Value
13bf1f6f74448948130f8648c8c14a49b46125, Name JUNOS
15:10:56.593899 Out PPPoE [ses 1]CHAP, Challenge (0x01), id 32, Value
13bf1f6f74448948130f8648c8c14a49b46125, Name JUNOS
15:10:56.594771 In PPPoE [ses 1]CHAP, Response (0x02), id 32, Value
117cf30ec090ee60ba642403955fa37d, Name SST_USER_PPP0E_LT[|chap]
15:10:56.594772 In PPPoE [ses 1]CHAP, Response (0x02), id 32, Value
117cf30ec090ee60ba642403955fa37d, Name SST_USER_PPP0E_LT[|chap]
15:10:56.800192 Out PPPoE [ses 1]CHAP, Success (0x03), id 32, Msg
15:10:56.800193 Out PPPoE [ses 1]CHAP, Success (0x03), id 32, Msg
15:10:56.800866 In PPPoE [ses 1]IPCP, Conf-Request (0x01), id 1, length 24
15:10:56.800867 In PPPoE [ses 1]IPCP, Conf-Request (0x01), id 1, length 24
15:10:56.800870 In PPPoE [ses 1]IP6CP, Conf-Request (0x01), id 1, length 16
15:10:56.800871 In PPPoE [ses 1]IP6CP, Conf-Request (0x01), id 1, length 16
15:10:56.801043 Out PPPoE [ses 1]IPCP, Conf-Nack (0x03), id 1, length 24
15:10:56.801044 Out PPPoE [ses 1]IPCP, Conf-Nack (0x03), id 1, length 24
15:10:56.801234 Out PPPoE [ses 1]IP6CP, Conf-Ack (0x02), id 1, length 16
15:10:56.801235 Out PPPoE [ses 1]IP6CP, Conf-Ack (0x02), id 1, length 16
15:10:56.801533 In PPPoE [ses 1]IPCP, Conf-Request (0x01), id 2, length 24
15:10:56.801534 In PPPoE [ses 1]IPCP, Conf-Request (0x01), id 2, length 24
15:10:56.801580 Out PPPoE [ses 1]IPCP, Conf-Ack (0x02), id 2, length 24
15:10:56.801581 Out PPPoE [ses 1]IPCP, Conf-Ack (0x02), id 2, length 24
15:10:56.872600 Out PPPoE [ses 1]IPCP, Conf-Request (0x01), id 126, length

```

```

12
15:10:56.872601 Out PPPoE [ses 1]IPCP, Conf-Request (0x01), id 126, length
12
15:10:56.872683 Out PPPoE [ses 1]IP6CP, Conf-Request (0x01), id 146, length
16
15:10:56.872683 Out PPPoE [ses 1]IP6CP, Conf-Request (0x01), id 146, length
16
15:10:56.873141 In PPPoE [ses 1]IPCP, Conf-Ack (0x02), id 126, length 12
15:10:56.873141 In PPPoE [ses 1]IPCP, Conf-Ack (0x02), id 126, length 12
15:10:56.878193 In PPPoE [ses 1]IP6CP, Conf-Ack (0x02), id 146, length 16
15:10:56.878194 In PPPoE [ses 1]IP6CP, Conf-Ack (0x02), id 146, length 16
15:11:03.085120 Out PPPoE [ses 1][|ip6]
15:11:03.085121 Out PPPoE [ses 1][|ip6]
15:11:03.469052 Out PPPoE [ses 1][|ip6]
15:11:03.469053 Out PPPoE [ses 1][|ip6]

```

```

51 packets received by filter
0 packets dropped by kernel

```

4. To monitor L2 header information, use the **monitor traffic** command with the **layer2** option.

```

user@host-BNG>monitor traffic interface ps0 layer2-headers no-resolve
verbose output suppressed, use (detail) or (extensive) for full protocol decode
Address resolution is OFF.
Listening on ps0, capture size 96 bytes

```

```

15:11:51.631290 In 00:22:68:14:84:d5 > ff:ff:ff:ff:ff:ff, ethertype 802.1Q
(0x8100), length 40: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE D, PPPoE PADI [Service-Name] [Host-Uniq UTF8]
15:11:56.634347 In 00:22:68:14:84:d5 > ff:ff:ff:ff:ff:ff, ethertype 802.1Q
(0x8100), length 40: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE D, PPPoE PADI [Service-Name] [Host-Uniq UTF8]
15:11:56.634596 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 66: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE D, PPPoE PADO [AC-Name "R0"] [Host-Uniq UTF8] [Service-Name] [AC-Cookie
UTF8]
15:11:56.635054 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 60: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE D, PPPoE PADR [Service-Name] [Host-Uniq UTF8] [AC-Cookie UTF8]
15:11:56.663820 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 44: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]LCP (0xc021), length 16: LCP, Conf-Request (0x01), id
1, length 16
15:11:56.663821 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 44: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]LCP (0xc021), length 16: LCP, Conf-Request (0x01), id
1, length 16
15:11:56.663924 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 49: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]LCP (0xc021), length 21: LCP, Conf-Request (0x01), id
8, length 21
15:11:56.663925 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 49: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]LCP (0xc021), length 21: LCP, Conf-Request (0x01), id
8, length 21
15:11:56.663973 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 44: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]LCP (0xc021), length 16: LCP, Conf-Ack (0x02), id 1,
length 16
15:11:56.663974 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q

```

```

(0x8100), length 44: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]LCP (0xc021), length 16: LCP, Conf-Ack (0x02), id 1,
length 16
15:11:56.664432 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 49: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]LCP (0xc021), length 21: LCP, Conf-Ack (0x02), id 8,
length 21
15:11:56.664433 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 49: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]LCP (0xc021), length 21: LCP, Conf-Ack (0x02), id 8,
length 21
15:11:56.664614 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 66: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]CHAP (0xc223), length 38: CHAP, Challenge (0x01), id
103, Value 29df1053315de91c31adc72e60f6aa1fa892ba1fc737082abd9d, Name JUNOS
15:11:56.664615 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 66: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]CHAP (0xc223), length 38: CHAP, Challenge (0x01), id
103, Value 29df1053315de91c31adc72e60f6aa1fa892ba1fc737082abd9d, Name JUNOS
15:11:56.666088 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 68: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]CHAP (0xc223), length 48: CHAP, Response (0x02), id
103, Value a28ce2e6abc62d6fb129888792f0914c, Name SST_USER_PPPoE_LT[|chap]
15:11:56.666089 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 68: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]CHAP (0xc223), length 48: CHAP, Response (0x02), id
103, Value a28ce2e6abc62d6fb129888792f0914c, Name SST_USER_PPPoE_LT[|chap]
15:11:56.870223 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 34: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]CHAP (0xc223), length 6: CHAP, Success (0x03), id 103,
Msg
15:11:56.870224 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 34: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]CHAP (0xc223), length 6: CHAP, Success (0x03), id 103,
Msg
15:11:56.870893 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 52: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IPCP (0x8021), length 24: IPCP, Conf-Request (0x01),
id 1, length 24
15:11:56.870893 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 52: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IPCP (0x8021), length 24: IPCP, Conf-Request (0x01),
id 1, length 24
15:11:56.870897 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 44: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IP6CP (0x8057), length 16: IP6CP, Conf-Request (0x01),
id 1, length 16
15:11:56.870897 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 44: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IP6CP (0x8057), length 16: IP6CP, Conf-Request (0x01),
id 1, length 16
15:11:56.871071 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 52: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]IPCP (0x8021), length 24: IPCP, Conf-Nack (0x03), id
1, length 24
15:11:56.871071 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 52: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]IPCP (0x8021), length 24: IPCP, Conf-Nack (0x03), id
1, length 24
15:11:56.871247 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 44: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype

```

```
PPPoE S, PPPoE [ses 1]IP6CP (0x8057), length 16: IP6CP, Conf-Ack (0x02), id
1, length 16
15:11:56.871247 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 44: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]IP6CP (0x8057), length 16: IP6CP, Conf-Ack (0x02), id
1, length 16
15:11:56.871616 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 52: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IPCP (0x8021), length 24: IPCP, Conf-Request (0x01),
id 2, length 24
15:11:56.871617 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 52: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IPCP (0x8021), length 24: IPCP, Conf-Request (0x01),
id 2, length 24
15:11:56.871662 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 52: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]IPCP (0x8021), length 24: IPCP, Conf-Ack (0x02), id 2,
length 24
15:11:56.871663 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 52: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]IPCP (0x8021), length 24: IPCP, Conf-Ack (0x02), id 2,
length 24
15:11:56.959681 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 40: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]IPCP (0x8021), length 12: IPCP, Conf-Request (0x01),
id 244, length 12
15:11:56.959681 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 40: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]IPCP (0x8021), length 12: IPCP, Conf-Request (0x01),
id 244, length 12
15:11:56.959763 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 44: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]IP6CP (0x8057), length 16: IP6CP, Conf-Request (0x01),
id 242, length 16
15:11:56.959764 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 44: vlan 1, p 6, ethertype 802.1Q, vlan 100, p 6, ethertype
PPPoE S, PPPoE [ses 1]IP6CP (0x8057), length 16: IP6CP, Conf-Request (0x01),
id 242, length 16
15:11:56.960192 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 40: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IPCP (0x8021), length 12: IPCP, Conf-Ack (0x02), id
244, length 12
15:11:56.960193 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 40: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IPCP (0x8021), length 12: IPCP, Conf-Ack (0x02), id
244, length 12
15:11:56.963905 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 44: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IP6CP (0x8057), length 16: IP6CP, Conf-Ack (0x02), id
242, length 16
15:11:56.963906 In 00:22:68:14:84:d5 > ac:4b:c8:45:68:00, ethertype 802.1Q
(0x8100), length 44: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IP6CP (0x8057), length 16: IP6CP, Conf-Ack (0x02), id
242, length 16
15:11:58.634264 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 68: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IP6 (0x0057), length 74: [!ip6]
15:11:58.634265 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 68: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IP6 (0x0057), length 74: [!ip6]
15:12:00.323994 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
```

```
(0x8100), length 68: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IP6 (0x0057), length 74: [|ip6]
15:12:00.323995 Out ac:4b:c8:45:68:00 > 00:22:68:14:84:d5, ethertype 802.1Q
(0x8100), length 68: vlan 1, p 0, ethertype 802.1Q, vlan 100, p 0, ethertype
PPPoE S, PPPoE [ses 1]IP6 (0x0057), length 74: [|ip6]
^C
54 packets received by filter
0 packets dropped by kernel
```

- Related Documentation**
- [Solution Brief: Broadband Edge](#)
  - [Reference Architecture: Broadband Edge Network Design](#)

---

## Conclusion

When a single MX Series Universal Edge platform converges residential and business subscriber management, as well as multicast video edge and Ethernet aggregation routing functions, the result is improved economic efficiency and a better user experience. This converged edge network design facilitates significant operational savings by offering a new network and service architecture that is streamlined and agile.

- Related Documentation**
- [Network Configuration Example: Configuring the Broadband Edge as a Service Node Within Seamless MPLS Network Designs](#)

