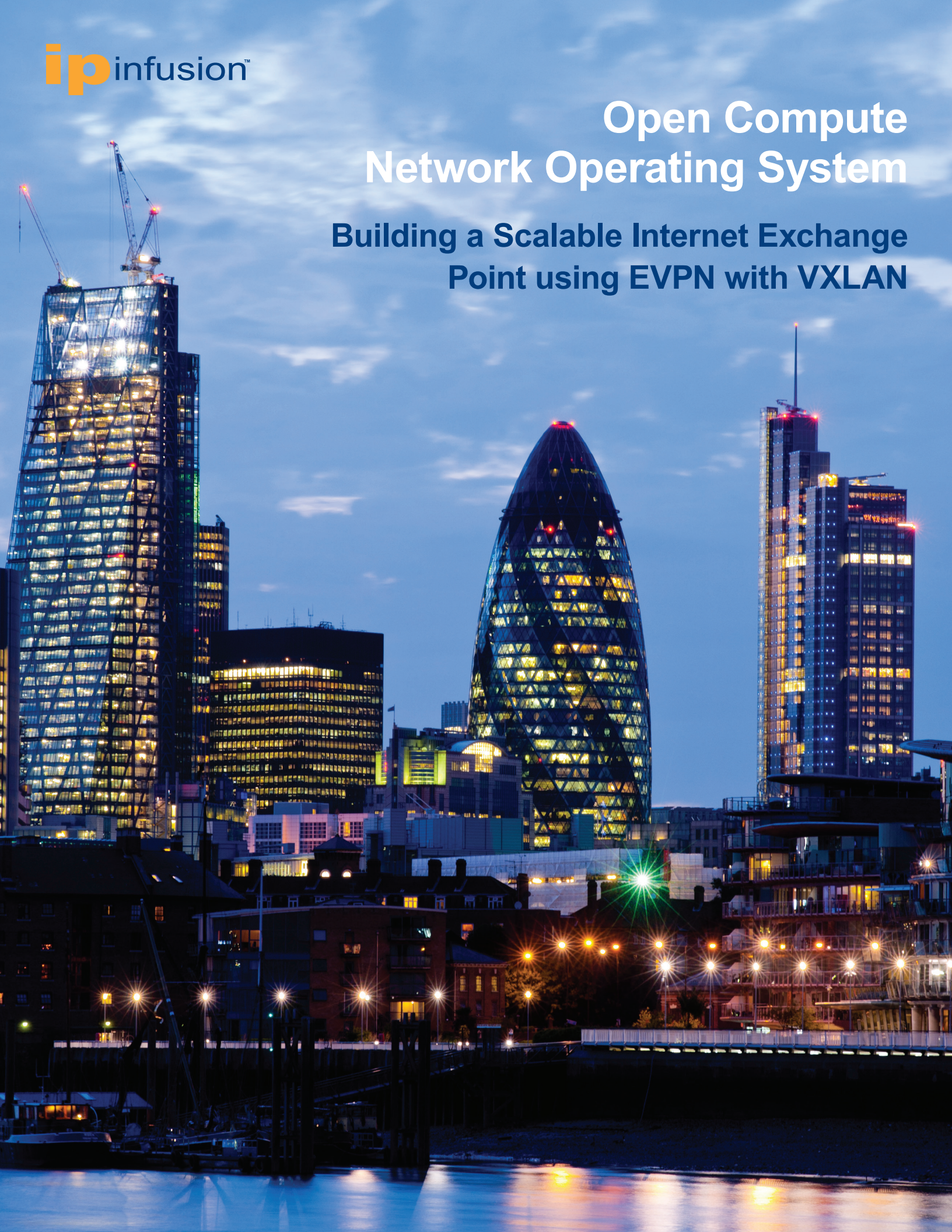
ip infusion™

Open Compute Network Operating System

Building a Scalable Internet Exchange Point using EVPN with VXLAN



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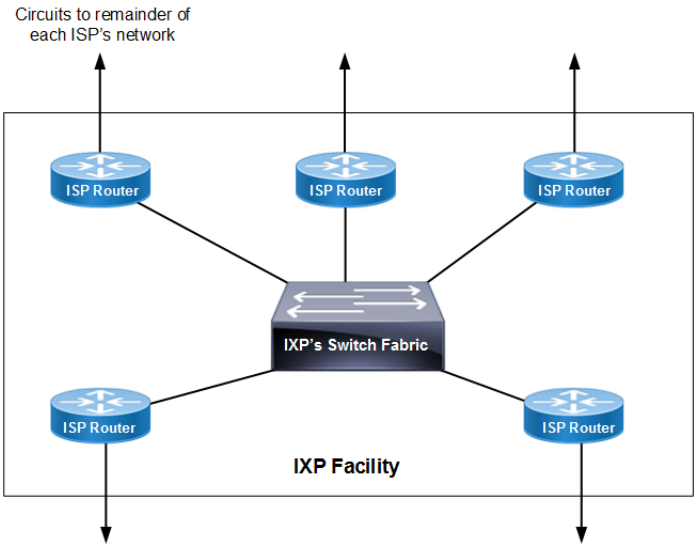
Overview of Internet Exchange Points

An Internet eXchange Point (IXP) is a physical location through which Internet infrastructure companies such as Internet Service Providers (ISPs) and Content Delivery Networks (CDNs) connect with each other. These locations exist on the “edge” of different networks, and allow network providers to share transit outside their own network. By having a presence inside of an IXP location, companies are able to shorten their path to the transit coming from other participating networks, thereby reducing latency, improving round-trip time, and potentially reducing costs.

As shown in Figure 1, an IXP is essentially a data center containing network switches that route traffic between the different member companies that share the costs of maintaining the physical infrastructure. This approach avoids relying on a transit network. To avoid these costs and other drawbacks associated with sending their traffic across a third-party network, member companies connect with each other in these special IXP nodes to cut down on costs and shorten distances.

Figure 1: IXP core



The Role of IXPs

Without an IXP, connecting one network to another relies on an intermediary network to carry the traffic from source to destination. In some situations there is no problem with doing this: this is how a large portion of international Internet traffic flows as it is cost prohibitive to maintain direct connections to each and every ISP in the world. However, relying on a backbone ISP to carry local traffic can adversely affect performance, such as when the ISP routes traffic to another network through a completely different city.

IXPs are usually implemented as Layer 2 broadcast domains to which customers connect BGP-speaking routers and exchange Layer 3 IP traffic. An IXP is similar to a LAN network with the difference being scale. IXPs can range from hundreds of megabits/second to many terabits/second of exchanged traffic. Independent of size, their primary goal is to make sure that many networks' routers are connected together cleanly and efficiently.

About the IXP solution

OcNOS supports a highly scalable 100G interconnection fabric for connecting multiple distributed locations. The solution shown in this document uses:

- Control plane learning using EVPN
- Network segmentation and virtualization using VXLAN
- Multihoming for redundancy
- ACL/QoS policies for fine-grained control of member traffic
- Support for sFlow and management automation

Architecture of a Modern IXP

Some of the architectures used by IXPs have proven to have limits.

Today the most common architecture of a modern exchange point is a shared broadcast domain. Most IXPs are almost exclusively based on a flat Layer 2 Ethernet network. Any member can talk to any other member and broadcast traffic is delivered to every member.

An alternate approach is to use point-to-point virtual circuit or tunnels which can solve some of the challenges with the existing architecture.

The following are some of the design considerations for an IXP:

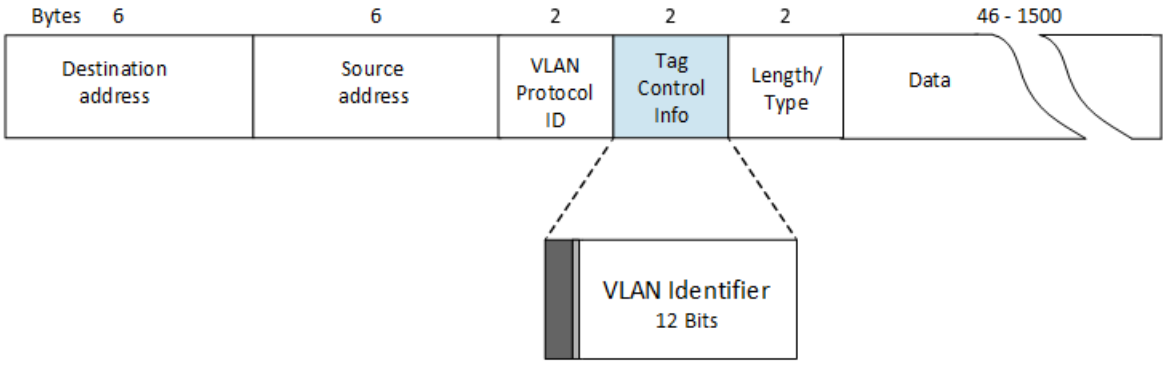
- Managing a large L2 broadcast domain and scaling VLANs
- Monitoring member traffic/usage
- Security - vulnerable to traffic injection from peers and non-peers
- Difficult to scale and debug large layer 2 networks
- Member port traffic controls

In this solution guide, we discuss some of these issues and how we solve them to help design a scalable next-generation IXP.

Problems with VLAN Scaling

Many IXPs use a flat Layer 2 VLAN architecture for the transport. As shown in Figure 2, a VLAN is identified with 12 bits, which limits the maximum number of segments in the data center to 4,096 VLANS.

Figure 2: VLAN frame format



With this design, a VLAN is logically equivalent to a tenant (member), so providing for 10 tenants means setting up 10 different VLANs.

The traditional use of VLANs presents challenges such as a single fault domain, large broadcast domain, difficult troubleshooting, and a large number of VLAN ports.

VXLAN and EVPN with MP-BGP

The IXP solution shown in this document uses a combination of VXLAN, BGP, and EVPN:

- VXLAN: provides Layer 2 virtualization
  - Uses VLAN-like encapsulation
  - 16 million logical networks possible providing multi-tenancy
- BGP: scalable and robust Layer 3 protocol that allows multiple bridged VXLAN domains
- EVPN uses MP-BGP for MAC learning
  - Multi-homing support
  - Optimized delivery: multi-point to multi-point
  - Simplified provisioning: helps in operations and administration maintenance
  - Fast convergence: improves performance
  - Flood suppression: improves scalability

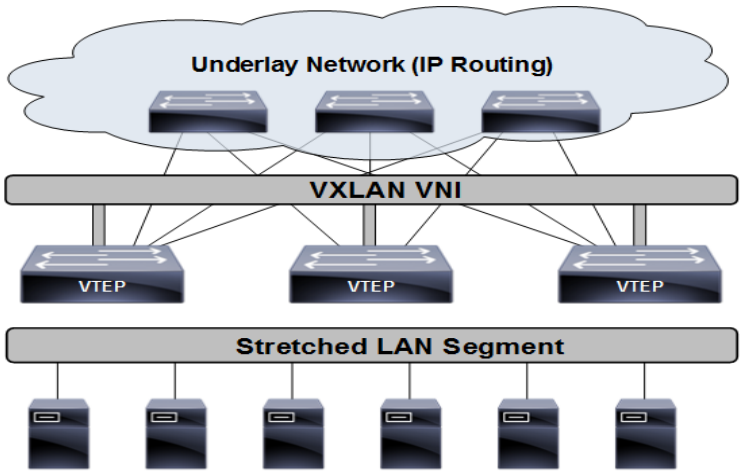
VXLAN

VXLAN (Virtual eXtensible Local Area Network), defined in RFC 7348, is an overlay technology which uses IP underlay. An overlay is basically a tunneling protocol where the customer traffic can be tunneled across the network without reconfiguring the network.

Tunneling technologies are widely used in enterprise and data center networks where a core network transparently tunnels traffic between provider edge switches, hypervisors, or Top-of-Rack (ToR) switches.

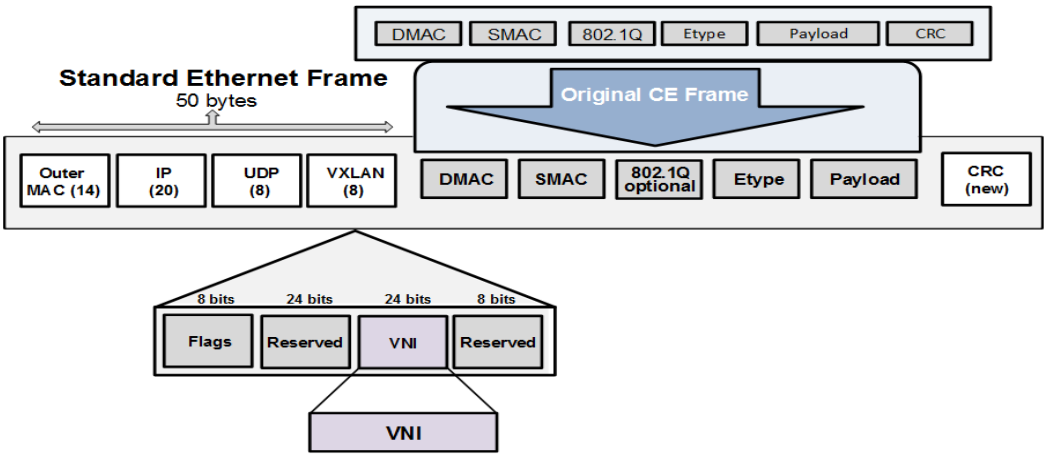
As shown in Figure 3, IP routing is a proven, stable, and scalable underlay network which takes advantage of ECMP to utilize all available paths. VXLAN is the overlay, providing Layer 2 extensibility and mobility, an expanded Layer 2 name space, a scalable network domain, and multi-tenancy.

Figure 3: VXLAN overlay



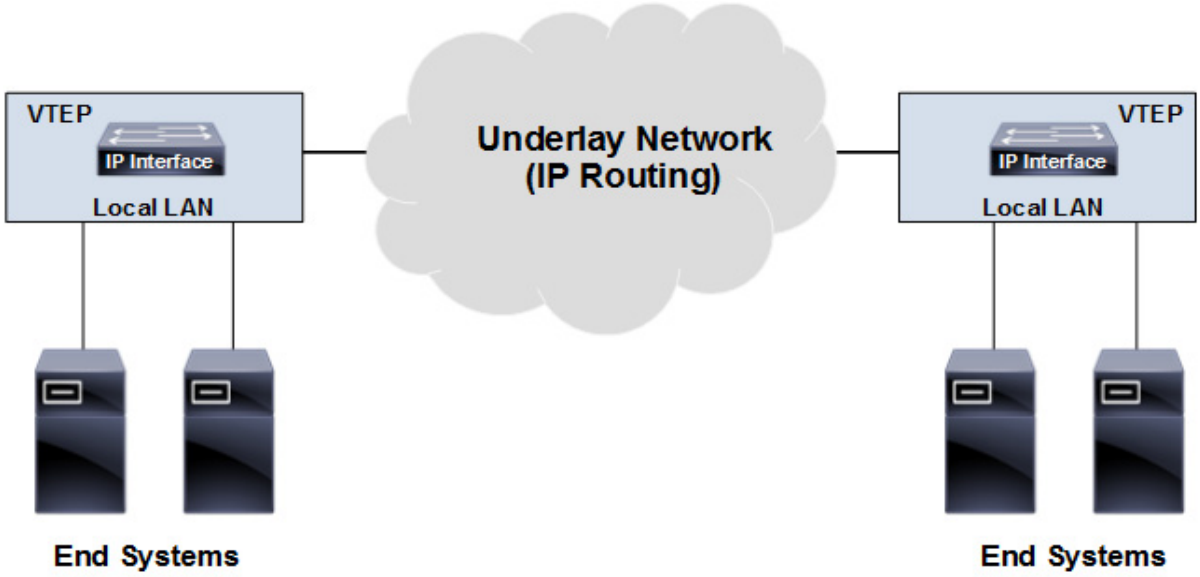
VXLAN overcomes the problems faced by classical VLANs. The advantage provided by VXLANs is increased scalability of Layer 2 domains using VXLAN Network Identifier (VNI/VNID) that offers up to 16 million addresses per segment. The VNI (sometimes called a segment identifier) acts as a multiplexing field to identify a specific tenant. The VNI/VNID is part of the VXLAN header and is shown in Figure 4.

Figure 4: VXLAN frame



As shown in Figure 5, a device that originates or terminates a VXLAN tunnel is called a VTEP (VXLAN Tunnel End Point). Each VTEP has two interfaces, one to provide bridging functionality for local hosts, and the other to provide an IP identification in the core network for VXLAN encapsulation/decapsulation.

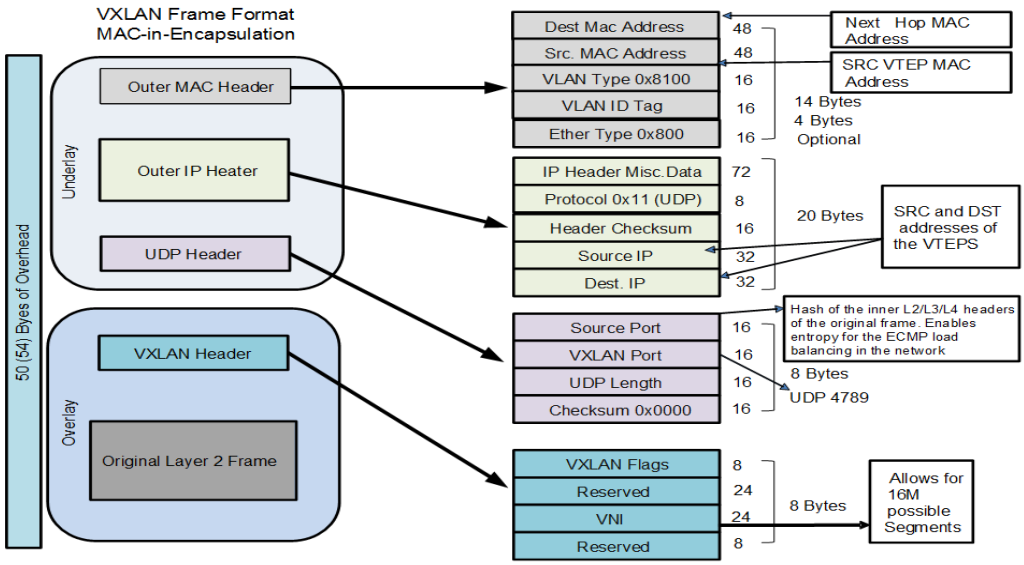
Figure 5: VXLAN tunnel end point



VTEPs form UDP tunnels between themselves. VTEPs identify a specific tenant's traffic and encapsulates it within the UDP tunnel. If the traffic is broadcast, multicast, or unknown, then the traffic is multicasted over UDP to other VTEPs.

A VXLAN header is inserted by the VTEP. Figure 6 shows details of the VXLAN frame format.

Figure 6: VXLAN frame details



The original Ethernet frame (VLAN) is removed from the Ethernet header and encapsulated with an outer Ethernet header, outer IP header, UDP header, VXLAN header, and sent across the core routers or spines. At arrival, VXLAN decapsulates the outer Ethernet header, outer IP header, and VXLAN header and forwards the original frame to the logical Layer 2 destination (including the VLAN tag if needed).

The tenant traffic can be identified through a port or through a port+VLAN identifier mapped to the tenant. When a port is mapped to the tenant, all traffic arriving at the port is treated as the tenant traffic and tunneled to remote VTEP(s) using the tenant id (VNID) in the VXLAN header.

EVPN with MP-BGP

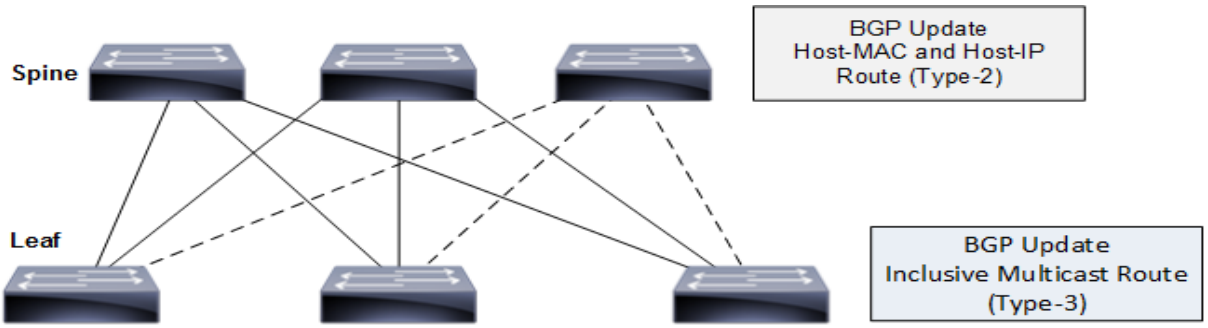
Ethernet VPN (EVPN), defined in RFC 7432, is a control plane technology that connects geographically disperse sites using Multi-Protocol Extensions to BGP (MP-BGP) to distribute MAC or IP addresses.

BGP neighbors must be configured for the EVPN address family. When configuring VXLAN VNIDs, the network administrator must specify that EVPN is used as a control plane. When a VNID is configured with EVPN, a BGP update message is sent to the EVPN neighbors with the “inclusive multicast Ethernet tag route”.

Figure 7 shows the EVPN control plane for host route distribution which features:

- EVPN uses MP-BGP with EVPN address families on leaf nodes to distribute internal host MAC/IP addresses (EVPN Type-2 Route) with an AFI of 25 (L2VPN) and a SAFI of 70 (EVPN).
- Head-end replication is performed by each VTEP for BUM (broadcast, unknown, multicast) traffic. BGP updates with the “inclusive multicast Ethernet tag route” (EVPN Type-3 Route) are used for head-end replication for non-multicast networks.

Figure 7: EVPN control plane



OcNOS supports only head end replication with EVPN. Once the tunnels are established on receiving this route, the advertisements for host MAC and IP addresses are distributed to the remote VTEPs using BGP-MP.

EVPN can use full-mesh BGP peering or BGP peering with route reflectors.

EVPN instances are configured on provider edge switches/routers/top-of-rack switches. The configuration in this document uses top-of-rack (ToR) switches to logically separate tenants.

EVPN improves current VPN technologies with control plane learning, multicast optimization, multi-homing, better convergence, and simplicity in provisioning. EVPN supports east-west, and north-south traffic forwarding and supports MAC diversity, so that Virtual Machines (VM) can relocate within or across data centers.

The EVPN-based control plane has many advantages such as:

- BGP protocol-driven automated VXLAN tunnel creation
- Control plane based learning to avoid flood and learn behavior
- Multi-homing support
- MAC mobility support
- Managed broadcast and multicast support

EVPN Learn and Advertise

Unlike traditional bridging, MAC learning between provider edge switches in EVPN occurs in the control plane and not the data plane. They are not learned through the data frames themselves, but rather in the control plane using MP-BGP. As broadcast domains increase, ARP traffic increases. This EVPN functionality reduces flooding for unknown unicast traffic and end-host learning, providing better control over end-host reachability information distribution.

To overcome the flood-and-learn scheme used with VLAN-based architectures, EVPN uses a learn-and-advertise mechanism. Combining the learn-and-advertise capability with MP-BGP solves the traditional scaling issues with MAC learning and re-advertising seen in VLAN-based solutions.

In EVPN, host MAC/IP addresses are learned at the local VTEP through control plane learning using MP-BGP. These addresses are then transmitted to the other VTEPs through MP-BGP. The remote VTEPs learn these routes at the tunnels connected to these VTEPs.

Note: OcNOS supports VTEP functionality for VXLAN tunnels. When VXLAN is deployed in the data center, multicast and data plane learning are not preferred. A VXLAN solution with an EVPN control plane is preferred in that deployment.

Local Learning. A local edge VTEP learns MAC and IP address information for connected hosts on its physical interface locally. Hosts send Gratuitous ARP (GARP) requests when they come online which allows for local learning by EVPN provider edges. When a VTEP learns the MAC address of a local end-host (local learning), it creates an entry in its forwarding table.

Each VTEP distributes this MAC and IP address information distributes this information through the MP-BGP EVPN control plane.

Note: Local hosts can also be learned statically through configuration.

Remote Learning. A remote edge VTEP device learns MAC and IP address information for connected hosts connected on a local edge through the MP-BGP control plane. When a VTEP receives a VXLAN packet, it creates an association tracking the remote MAC, the VNI for which it was learned, and the remote VTEP from which it was learned, so that it knows how to forward traffic destined to that remote MAC in the future.

Solution Details

This section shows the configuration for this solution. The major features of this solution are:

- Fabric based on OSPFv2
- Member traffic controlled at various grades using ingress/egress policing
- Storm control with rate limiting for controlled flooding
- LAG for redundancy
- BGP for EVPN
- SNMP
- Management through NetConf/Yang
- sFlow enabled on all member ports to track traffic
- BFD for faster convergence (hardware-based micro-BFD)

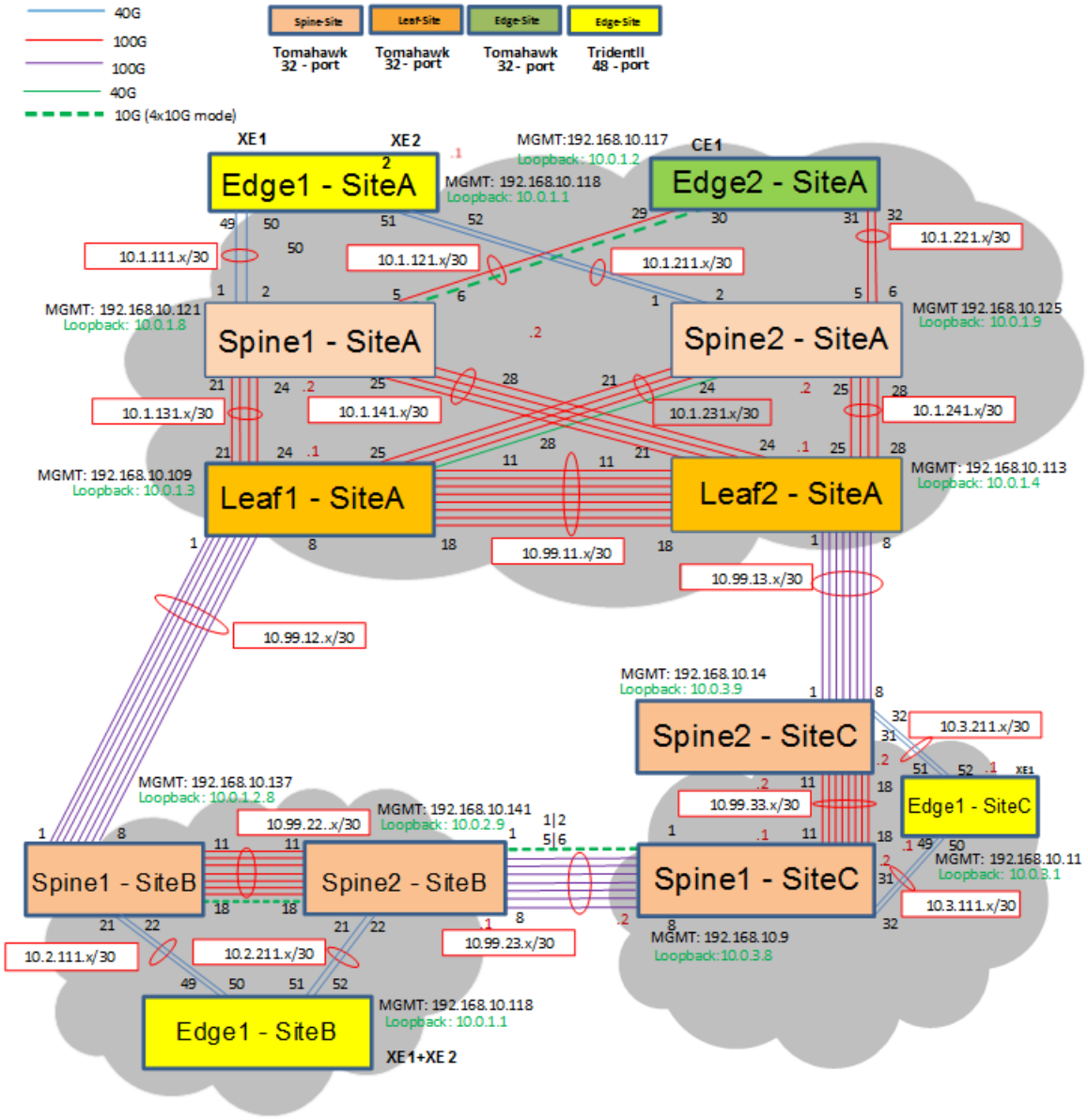
Topology

Figure 8 shows the test topology used to simulate a multi-site IXP network:

- Edge switches contain the VTEPs and connect members to the IXP. There are two types of member-facing ports: tagged (VLAN) and dedicated untagged ports.
- Spine routers distribute traffic within the sites
- Leaf switches carry the transport between sites A, B and C.

The configurations for Site A (Edge1, Spine1, and Leaf1) are shown in this section. Appendix: Other Configurations shows the configuration for the remaining devices.

Figure 8: Solution topology



Edge1-SiteA

Miscellaneous

`Edge1-SiteA(config-vrf)#mac vrf vrfp`	Create VRF for EVPN
`Edge1-SiteA(config-vrf)#rd 10.0.1.1:1`	Assign route distinguisher
`Edge1-SiteA(config-vrf)#route-target both 1:1`	Assign route target
`Edge1-SiteA(config)#load-balance rtag7 macro-flow`	Configure rtag7 load balancing to choose a hash function dynamically
`Edge1-SiteA(config)#load-balance rtag7 vxlan inner-l3 dest-ip src-ip destl4-port srcl4-port protocol-id`	Enable rtag7 load balancing for VXLAN based on inner-L3 header
`Edge1-SiteA(config)#load-balance rtag7 ipv4 dest-ipv4 src-ipv4 destl4-port srcl4-port protocol-id`	Enable rtag7 load balancing based on IPv4 header
`Edge1-SiteA(config)#load-balance rtag7 ipv6 dest-ipv6 src-ipv6 destl4-port srcl4-port next-hdr`	Enable rtag7 load balancing based on IPv6 header
`Edge1-SiteA(config)#forwarding profile l2-profile-three`	Set the forwarding profile, making the Layer 2 address table and Layer 3 address tables almost the same size
`Edge1-SiteA(config)#qos enable`	Enable QoS
`Edge1-SiteA(config)#qos statistics`	Enable QoS statistics
`Edge1-SiteA(config)#ip domain-lookup vrf management`	Enable DNS host name-to-address translation
`Edge1-SiteA(config)#bridge 1 protocol mstp`	Create an MSTP bridge
`Edge1-SiteA(config)#tfo disable`	Disable TFO
`Edge1-SiteA(config)#errdisable cause link-flap`	Shut down a port when link flaps
`Edge1-SiteA(config)#errdisable timeout interval 60`	Enable errdisable timeout and set the interval
`Edge1-SiteA(config)#errdisable link-flap-setting max-flaps 3 time 30`	Configure link-flap errdisable settings
`Edge1-SiteA(config)#feature telnet vrf management`	Enable telnet
`Edge1-SiteA(config)#feature ssh vrf management`	Enable SSH

MAC Access Control List

`Edge1-SiteA(config)#mac access-list CX-A`	Create a MAC access list
`Edge1-SiteA(config-mac-acl)#10 permit host 0000.0000.1111 any vlan 100`	Permit traffic from source host only to any destination for VLAN
`Edge1-SiteA(config-mac-acl)#105 permit host 0000.0000.1111 any vlan 10`	Permit traffic from source host only to any destination for VLAN
`Edge1-SiteA(config-mac-acl)#110 permit host 0000.0000.1112 any vlan 1010`	Permit traffic from source host only to any destination for VLAN
`Edge1-SiteA(config-mac-acl)#115 permit host 0000.0000.1113 any vlan 2020`	Permit traffic from source host only to any destination for VLAN

Quality of Service

`Edge1-SiteA(config)#class-map match-all CX-A-100-Broadcast`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 100`	Classify traffic based on VLAN
`Edge1-SiteA(config-cmap-qos)#match traffic-type default`	Classify traffic for all other types
`Edge1-SiteA(config)#class-map match-all CX-A-100-EGRESS`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 100`	Classify traffic based on VLAN
`Edge1-SiteA(config)#class-map match-all CX-A-100-Known-Unicast`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 100`	Classify traffic based on VLAN
`Edge1-SiteA(config-cmap-qos)#match traffic-type l2-uc`	Classify traffic for L2 unicast
`Edge1-SiteA(config)#class-map match-all CX-A-100-Unknown-Unicast`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 100`	Classify traffic based on VLAN
`Edge1-SiteA(config-cmap-qos)#match traffic-type l2-uc-unknown`	Classify traffic for unknown L2 unicast
`Edge1-SiteA(config)#class-map match-all CX-A-1010-Broadcast`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 1010`	Classify traffic based on VLAN
`Edge1-SiteA(config-cmap-qos)#match traffic-type default`	Classify traffic for all other types
`Edge1-SiteA(config)#class-map match-all CX-A-1010-EGRESS`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 1010`	Classify traffic based on VLAN
`Edge1-SiteA(config)#class-map match-all CX-A-1010-Known-Unicast`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 1010`	Classify traffic based on VLAN
`Edge1-SiteA(config-cmap-qos)#match traffic-type l2-uc`	Classify traffic for L2 unicast
`Edge1-SiteA(config)#class-map match-all CX-A-1010-Unknown-Unicast`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 1010`	Classify traffic based on VLAN
`Edge1-SiteA(config-cmap-qos)#match traffic-type l2-uc-unknown`	Classify traffic for unknown L2 unicast
`Edge1-SiteA(config)#class-map match-all CX-A-2020-Broadcast`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 2020`	Classify traffic based on VLAN
`Edge1-SiteA(config-cmap-qos)#match traffic-type default`	Classify traffic for all other types
`Edge1-SiteA(config)#class-map match-all CX-A-2020-EGRESS`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 2020`	Classify traffic based on VLAN
`Edge1-SiteA(config)#class-map match-all CX-A-2020-Known-Unicast`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 2020`	Classify traffic based on VLAN

`Edge1-SiteA(config-cmap-qos)#match traffic-type l2-uc`	Classify traffic for L2 unicast
`Edge1-SiteA(config)#class-map match-all CX-A-2020-Unknown-Unicast`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 2020`	Classify traffic based on VLAN
`Edge1-SiteA(config-cmap-qos)#match traffic-type l2-uc-unknown`	Classify traffic for unknown L2 unicast
`Edge1-SiteA(config)#class-map match-all CX-A-2120-Broadcast`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 2120`	Classify traffic based on VLAN
`Edge1-SiteA(config-cmap-qos)#match traffic-type default`	Classify traffic for all other types
`Edge1-SiteA(config)#class-map match-all CX-A-2120-EGRESS`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 2120`	Classify traffic based on VLAN
`Edge1-SiteA(config)#class-map match-all CX-A-2120-Known-Unicast`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 2120`	Classify traffic based on VLAN
`Edge1-SiteA(config-cmap-qos)#match traffic-type l2-uc`	Classify traffic for L2 unicast
`Edge1-SiteA(config)#class-map match-all CX-A-2120-Unknown-Unicast`	Create class map
`Edge1-SiteA(config-cmap-qos)#match vlan 2120`	Classify traffic based on VLAN
`Edge1-SiteA(config-cmap-qos)#match traffic-type l2-uc-unknown`	Classify traffic for unknown L2 unicast
`Edge1-SiteA(config)#policy-map CX-A`	Create a policy map; for each class-map, set a different CIR (Committed Information Rate)
`Edge1-SiteA(config-pmap-qos)#class CX-A-100-Broadcast`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 2 mbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#class CX-A-100-Known-Unicast`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 11 gbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#class CX-A-100-Unknown-Unicast`	Add class map to policy map.
`Edge1-SiteA(config-pmap-c-qos)#police cir 1 kbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#class CX-A-1010-Broadcast`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 2 mbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#class CX-A-1010-Known-Unicast`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 11 gbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode

`Edge1-SiteA(config-pmap-qos)#class CX-A-1010-Unknown-Unicast`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 2 mbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#class CX-A-2020-Broadcast`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 2 mbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#class CX-A-2020-Known-Unicast`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 11 gbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#class CX-A-2020-Unknown-Unicast`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 2 mbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#class CX-A-2120-Broadcast`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 2 mbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#class CX-A-2120-Known-Unicast`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 11 gbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#class CX-A-2120-Unknown-Unicast`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 2 mbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#policy-map CX-A-EGRESS`	Create a policy map
`Edge1-SiteA(config-pmap-qos)#class CX-A-100-EGRESS`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 11 gbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#class CX-A-1010-EGRESS`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 11 gbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#class CX-A-2020-EGRESS`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 11 gbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteA(config-pmap-qos)#class CX-A-2120-EGRESS`	Add class map to policy map
`Edge1-SiteA(config-pmap-c-qos)#police cir 11 gbps`	Set policing CIR
`Edge1-SiteA(config-pmap-c-qos)#exit`	Exit policy-map-class mode

Queuing Policy

The default queuing policy configuration below applies to *all* of the switches in this topology. For brevity, it is shown only for the Edge1-SiteA switch.

`Edge1-SiteA(config)#policy-map type queuing default default-out-policy`	Create a queuing policy map to apply to every single port in the system by default: eight queues with strict priorities
`Edge1-SiteA(config-pmap-que-def)#class type queuing default q0`	Add a queuing class map to the policy map
`Edge1-SiteA(config-pmap-c-que-def)#priority level 1`	Set the priority level for the queuing class
`Edge1-SiteA(config-pmap-c-que-def)#exit`	Exit policy-map-class-queue mode
`Edge1-SiteA(config-pmap-que-def)#class type queuing default q1`	Add a queuing class map to the policy map
`Edge1-SiteA(config-pmap-c-que-def)#priority level 1`	Set the priority level for the queuing class
`Edge1-SiteA(config-pmap-c-que-def)#exit`	Exit policy-map-class-queue mode
`Edge1-SiteA(config-pmap-que-def)#class type queuing default q2`	Add a queuing class map to the policy map
`Edge1-SiteA(config-pmap-c-que-def)#priority level 1`	Set the priority level for the queuing class
`Edge1-SiteA(config-pmap-c-que-def)#exit`	Exit policy-map-class-queue mode
`Edge1-SiteA(config-pmap-que-def)#class type queuing default q3`	Add a queuing class map to the policy map
`Edge1-SiteA(config-pmap-c-que-def)#priority level 1`	Set the priority level for the queuing class
`Edge1-SiteA(config-pmap-c-que-def)#exit`	Exit policy-map-class-queue mode
`Edge1-SiteA(config-pmap-que-def)#class type queuing default q4`	Add a queuing class map to the policy map
`Edge1-SiteA(config-pmap-c-que-def)#priority level 1`	Set the priority level for the queuing class
`Edge1-SiteA(config-pmap-c-que-def)#exit`	Exit policy-map-class-queue mode
`Edge1-SiteA(config-pmap-que-def)#class type queuing default q5`	Add a queuing class map to the policy map
`Edge1-SiteA(config-pmap-c-que-def)#priority level 1`	Set the priority level for the queuing class
`Edge1-SiteA(config-pmap-c-que-def)#exit`	Exit policy-map-class-queue mode
`Edge1-SiteA(config-pmap-que-def)#class type queuing default q6`	Add a queuing class map to the policy map
`Edge1-SiteA(config-pmap-c-que-def)#priority level 1`	Set the priority level for the queuing class
`Edge1-SiteA(config-pmap-c-que-def)#exit`	Exit policy-map-class-queue mode
`Edge1-SiteA(config-pmap-que-def)#class type queuing default q7`	Add a queuing class map to the policy map
`Edge1-SiteA(config-pmap-c-que-def)#priority level 1`	Set the priority level for the queuing class
`Edge1-SiteA(config-pmap-c-que-def)#exit`	Exit policy-map-class-queue mode

Interfaces

`Edge1-SiteA(config)#ip pim register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Edge1-SiteA(config)#ip pim vrf management register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Edge1-SiteA(config)#interface lo`	Configure loopback interface
`Edge1-SiteA(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Edge1-SiteA(config-if)#ip address 10.0.1.1/32 secondary`	Assign secondary IPv4 address
`Edge1-SiteA(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Edge1-SiteA(config-if)#ip ospf cost 1`	Set OSPF cost
`Edge1-SiteA(config-if)#interface lo.management`	Configure loopback management interface
`Edge1-SiteA(config-if)#mtu 1500`	Set the MTU
`Edge1-SiteA(config-if)#ip vrf forwarding management`	Associate the interface with the management VRF
`Edge1-SiteA(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Edge1-SiteA(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Edge1-SiteA(config)#interface xe1`	Configure interface
`Edge1-SiteA(config-if)#description ***Connexion Partner CX-A***`	Assign a description to the interface
`Edge1-SiteA(config-if)#switchport`	Make the interface Layer 2
`Edge1-SiteA(config-if)#storm-control broadcast 0 kbps`	Set the rising threshold level for broadcast traffic
`Edge1-SiteA(config-if)#storm-control multicast 0 kbps`	Set the rising threshold level for multicast traffic
`Edge1-SiteA(config-if)#storm-control dlf 0 kbps`	Set the rising threshold level for destination lookup failure traffic
`Edge1-SiteA(config-if)#switchport allowed ethertype arp ipv4 ipv6 0x8809`	Permit ethertypes and deny remaining traffic
`Edge1-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Edge1-SiteA(config-if)#mac access-group CX-A in`	Apply mac-access list
`Edge1-SiteA(config-if)#service-policy type qos input CX-A`	Apply ingress service policy
`Edge1-SiteA(config-if)#service-policy type qos output CX-A-EGRESS`	Apply egress service policy
`Edge1-SiteA(config-if)#sflow sampling-rate 8192 direction ingress max-header-size 16`	Configure sFlow
`Edge1-SiteA(config)#interface xe49/1`	Configure interface
`Edge1-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Edge1-SiteA(config-if)#interface xe50/1`	Configure interface
`Edge1-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Edge1-SiteA(config-if)#interface xe51/1`	Configure interface

`Edge1-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Edge1-SiteA(config-if)#interface xe52/1`	Configure interface
`Edge1-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG

Link Aggregation Group

`Edge1-SiteA(config)#interface po3`	Configure LAG interface
`Edge1-SiteA(config-if)#description ***Connection to Spine1-SiteA***`	Assign a description to the interface
`Edge1-SiteA(config-if)#mtu 1600`	Set the MTU
`Edge1-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Edge1-SiteA(config-if)#ip address 10.1.111.1/30`	Assign IPv4 address
`Edge1-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Edge1-SiteA(config-if)#port-channel min-links 2`	Set the minimum number of links that need to be up in the LAG interface
`Edge1-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Edge1-SiteA(config-if)#ip ospf cost 10000`	Set OSPF cost
`Edge1-SiteA(config-if)#interface po4`	Configure LAG interface
`Edge1-SiteA(config-if)#description ***Connection to Spine2-SiteA***`	Assign a description to the interface
`Edge1-SiteA(config-if)#mtu 1600`	Set the MTU
`Edge1-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Edge1-SiteA(config-if)#ip address 10.1.211.1/30`	Assign IPv4 address
`Edge1-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Edge1-SiteA(config-if)#port-channel min-links 2`	Set the minimum number of links that need to be up in the LAG interface
`Edge1-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Edge1-SiteA(config-if)#ip ospf cost 10000`	Set OSPF cost

OSPF

`Edge1-SiteA(config)#router ospf`	Enter OSPF router mode
`Edge1-SiteA(config-router)#ospf router-id 10.0.1.1`	Assign a router identifier
`Edge1-SiteA(config-router)#bfd all-interfaces`	Enable BFD on all interfaces
`Edge1-SiteA(config-router)#timers spf exp 50 50`	Set the Shortest-Path First (SPF) best-path schedule minimum and maximum delay between receiving a change to SPF calculation in milliseconds
`Edge1-SiteA(config-router)#timers throttle lsa all 0 1 1`	Set the rate-limiting intervals for OSPF LSA generation

`Edge1-SiteA(config-router)#timers lsa arrival 1`	Set the minimum interval to accept the same LSA from OSPF neighbors
`Edge1-SiteA(config-router)#passive-interface lo`	Suppress sending Hello packets on the interface
`Edge1-SiteA(config-router)#network 10.0.1.1/32 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Edge1-SiteA(config-router)#network 10.1.111.0/30 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Edge1-SiteA(config-router)#network 10.1.211.0/30 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address

BGP

`Edge1-SiteA(config)#router bgp 64512`	Enter BGP router mode
`Edge1-SiteA(config-router)#bgp log-neighbor-changes`	Log BGP neighbor status change messages
`Edge1-SiteA(config-router)#neighbor 10.0.1.2 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteA(config-router)#neighbor 10.0.1.2 update-source lo`	Use loopback interface for TCP
`Edge1-SiteA(config-router)#neighbor 10.0.2.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteA(config-router)#neighbor 10.0.2.1 update-source lo`	Use loopback interface for TCP
`Edge1-SiteA(config-router)#neighbor 10.0.2.2 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteA(config-router)#neighbor 10.0.2.2 update-source lo`	Use loopback interface for TCP
`Edge1-SiteA(config-router)#neighbor 10.0.3.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteA(config-router)#neighbor 10.0.3.1 update-source lo`	Use loopback interface for TCP
`Edge1-SiteA(config-router)#neighbor 10.0.5.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteA(config-router)#neighbor 10.0.5.1 update-source lo`	Use loopback interface for TCP
`Edge1-SiteA(config-router)#neighbor 10.0.6.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteA(config-router)#neighbor 10.0.6.1 update-source lo`	Use loopback interface for TCP
`Edge1-SiteA(config-router)#address-family l2vpn evpn`	Enter EVPN address-family mode
`Edge1-SiteA(config-router-af)#neighbor 10.0.1.2 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteA(config-router-af)#neighbor 10.0.2.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteA(config-router-af)#neighbor 10.0.2.2 activate`	Enable the exchange of EVPN address-family routes with a neighbor

`Edge1-SiteA(config-router-af)#neighbor 10.0.3.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteA(config-router-af)#neighbor 10.0.5.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteA(config-router-af)#neighbor 10.0.6.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteA(config-router-af)#exit-address-family`	Exit address-family mode
`Edge1-SiteA(config-router)#bfd interval 3 minrx 3 multiplier 3`	Set the BFD transmit and receive intervals, and the hello multiplier value

VXLAN

`Edge1-SiteA(config)#nvo vxlan enable`	Enable VXLAN
`Edge1-SiteA(config)#nvo vxlan vtep-ip-global 10.0.1.1`	Set the source IP address of the VXLAN tunnels
`Edge1-SiteA(config)#nvo vxlan max-cache-disable 2`	Set the maximum number of ARP/ND cache disables on access ports configured with the port+VLAN option
`Edge1-SiteA(config)#nvo vxlan id 1 ingress-replication inner-vid-disabled`	Add a tenant and the type of VPN
`Edge1-SiteA(config-nvo)#vxlan host-reachability-protocol evpn-bgp vrfp`	Set the host reachable protocol to EVPN over BGP
`Edge1-SiteA(config-nvo)#nvo vxlan access-if port-vlan xe1 1010`	Map a VLAN on an interface to identify the tenant traffic
`Edge1-SiteA(config-nvo-acc-if)#description **CX-A 1010**`	Assign a description to the interface
`Edge1-SiteA(config-nvo-acc-if)#no shutdown`	Start the interface
`Edge1-SiteA(config-nvo-acc-if)#dynamic-learning disable`	Disable dynamic learning
`Edge1-SiteA(config-nvo-acc-if)#map vnid 1`	Map a tenant to an access port
`Edge1-SiteA(config-nvo-acc-if)#mac 0000.0000.1112 ip 172.16.0.12`	Associate a static MAC address and a static IPv4 address to the access interface
`Edge1-SiteA(config-nvo-acc-if)#mac 0000.0000.1112 ipv6 2001:dead:beef:cafe::12:1`	Associate a static MAC address and a static IPv6 address to the access interface
`Edge1-SiteA(config-nvo-acc-if)#nvo vxlan access-if port-vlan xe1 100`	Map a VLAN on an interface to identify the tenant traffic
`Edge1-SiteA(config-nvo-acc-if)#description **CX-A 100**`	Assign a description to the interface
`Edge1-SiteA(config-nvo-acc-if)#no shutdown`	Start the interface
`Edge1-SiteA(config-nvo-acc-if)#dynamic-learning disable`	Disable dynamic learning
`Edge1-SiteA(config-nvo-acc-if)#map vnid 1`	Map a tenant to an access port
`Edge1-SiteA(config-nvo-acc-if)#mac 0000.0000.1111 ip 172.16.0.11`	Associate a static MAC address and a static IPv4 address to the access interface
`Edge1-SiteA(config-nvo-acc-if)#mac 0000.0000.1111 ipv6 2001:dead:beef:cafe::11:1`	Associate a static MAC address and a static IPv6 address to the access interface
`Edge1-SiteA(config-nvo-acc-if)#nvo vxlan access-if port-vlan xe1 2020`	Map a VLAN on an interface to identify the tenant traffic

`Edge1-SiteA(config-nvo-acc-if)#description **CX-A 2020**`	Assign a description to the interface
`Edge1-SiteA(config-nvo-acc-if)#no shutdown`	Start the interface
`Edge1-SiteA(config-nvo-acc-if)#dynamic-learning disable`	Disable dynamic learning
`Edge1-SiteA(config-nvo-acc-if)#map vnid 1`	Map a tenant to an access port
`Edge1-SiteA(config-nvo-acc-if)#mac 0000.0000.1113 ip 172.16.0.13`	Associate a static MAC address and a static IPv4 address to the access interface
`Edge1-SiteA(config-nvo-acc-if)#mac 0000.0000.1113 ipv6 2001:dead:beef:cafe::13:1`	Associate a static MAC address and a static IPv6 address to the access interface

Spine1-SiteA

Load Balancing

`Spine1-SiteA(config)#load-balance rtag7`	Enable rtag7 load balancing globally
`Spine1-SiteA(config)#load-balance rtag7 macro-flow`	Configure rtag7 load balancing to choose a hash function dynamically
`Spine1-SiteA(config)#load-balance rtag7 ipv4 dest-ipv4 src-ipv4 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv4 header
`Spine1-SiteA(config)#load-balance rtag7 ipv6 dest-ipv6 src-ipv6 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv6 header
`Spine1-SiteA(config)#forwarding profile l2-profile-three`	Set the forwarding profile, making the Layer 2 address table and Layer 3 address tables almost the same size

Miscellaneous

`Spine1-SiteA(config)#qos enable`	Enable QoS
`Spine1-SiteA(config)#qos statistics`	Enable QoS statistics
`Spine1-SiteA(config)#ip domain-lookup vrf management`	Enable DNS host name-to-address translation
`Spine1-SiteA(config)#feature telnet vrf management`	Enable telnet
`Spine1-SiteA(config)#feature ssh vrf management`	Enable SSH
`Spine1-SiteA(config)#feature tacacs+ vrf management`	Enable TACACS+
`Spine1-SiteA(config)#tacacs-server login host 192.168.10.215 vrf management key 7 test123`	Set the TACACS+ server IP address
`Spine1-SiteA(config)#aaa authentication login default vrf management group tacacs+ local`	Set the AAA authentication method
`Spine1-SiteA(config)#snmp-server enable snmp vrf management`	Start the SNMP agent daemon
`Spine1-SiteA(config)#snmp-server view all .1 included vrf management`	Create an SNMP view
`Spine1-SiteA(config)#snmp-server community test group network-operator vrf management`	Create an SNMP community
`Spine1-SiteA(config)#snmp-server host 192.168.10.222 traps version 2c test udp-port 162 vrf management`	Configure an SNMP trap host

`Spine1-SiteA(config)#ntp enable vrf management`	Enable NTP.
`Spine1-SiteA(config)#ntp server 192.168.10.254 vrf management`	Configure an NTP server
`Spine1-SiteA(config)#logging server 192.168.10.254 7 vrf management`	Configure a syslog server
`Spine1-SiteA(config)#ip pim register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Spine1-SiteA(config)#ip pim vrf management register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router

Interfaces

`Spine1-SiteA(config)#interface lo`	Configure loopback interface
`Spine1-SiteA(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Spine1-SiteA(config-if)#ip address 10.0.1.8/32 secondary`	Assign secondary IP address
`Spine1-SiteA(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Spine1-SiteA(config-if)#ip ospf cost 1`	Set OSPF cost
`Spine1-SiteA(config-if)#interface ce1/1`	Configure interface
`Spine1-SiteA(config-if)#description *Contn to Edge1-SiteA port 49*`	Assign a description to the interface
`Spine1-SiteA(config-if)#speed 40g`	Set the link speed of the interface
`Spine1-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface ce2/1`	Configure interface
`Spine1-SiteA(config-if)#description *Contn to Edge1-SiteA port 50*`	Assign a description to the interface
`Spine1-SiteA(config-if)#speed 40g`	Set the link speed of the interface
`Spine1-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface ce5/1`	Configure interface
`Spine1-SiteA(config-if)#description *Contn to Edge2-SiteA port 29*`	Assign a description to the interface
`Spine1-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface ce6/1`	Configure interface
`Spine1-SiteA(config-if)#description *Contn to Edge2-SiteA port 25*`	Assign a description to the interface
`Spine1-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface ce7/1`	Configure interface
`Spine1-SiteA(config-if)#description *Contn to Edge2-SiteA port 25*`	Assign a description to the interface
`Spine1-SiteA(config-if)#interface ce21/1`	Configure interface
`Spine1-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface ce22/1`	Configure interface
`Spine1-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface ce23/1`	Configure interface

`Spine1-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface ce24/1`	Configure interface
`Spine1-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface ce25/1`	Configure interface
`Spine1-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface ce26/1`	Configure interface
`Spine1-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface ce27/1`	Configure interface
`Spine1-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface ce28/1`	Configure interface
`Spine1-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface ce31/1`	Configure interface
`Spine1-SiteA(config-if)#description *Contn to Edge2-SiteA port 29*`	Assign a description to the interface
`Spine1-SiteA(config-if)#speed 40g`	Set the link speed of the interface
`Spine1-SiteA(config-if)#channel-group 5 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface ce32/1`	Configure interface
`Spine1-SiteA(config-if)#description *Contn to Edge2-SiteA port 30*`	Assign a description to the interface
`Spine1-SiteA(config-if)#speed 40g`	Set the link speed of the interface
`Spine1-SiteA(config-if)#channel-group 5 mode active`	Add interface to LAG
`Spine1-SiteA(config-if)#interface lo.management`	Configure loopback management interface
`Spine1-SiteA(config-if)#mtu 1500`	Set the MTU
`Spine1-SiteA(config-if)#ip vrf forwarding management`	Associate the interface with the management VRF
`Spine1-SiteA(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Spine1-SiteA(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address

OSPF

`Spine1-SiteA(config-if)#router ospf`	Enter OSPF router mode
`Spine1-SiteA(config-router)#ospf router-id 10.0.1.8`	Assign a router identifier
`Spine1-SiteA(config-router)#bfd all-interfaces`	Enable BFD on all interfaces
`Spine1-SiteA(config-router)#timers spf exp 50 50`	Set the Shortest-Path First (SPF) best-path schedule minimum and maximum delay between receiving a change to SPF calculation in milliseconds
`Spine1-SiteA(config-router)#timers throttle lsa all 0 1 1`	Set the rate-limiting intervals for OSPF LSA generation
`Spine1-SiteA(config-router)#timers lsa arrival 1`	Set the minimum interval to accept the same LSA from OSPF neighbors
`Spine1-SiteA(config-router)#network 10.0.1.8/32 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address

`Spine1-SiteA(config-router)#network 10.1.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine1-SiteA(config)#bfd interval 3 minrx 3 multiplier 3`	Set the BFD transmit and receive intervals, and the hello multiplier value
`Spine1-SiteA(config)#ip route vrf management 0.0.0.0/0 192.168.10.254 eth0`	Create a VRF static route

Link Aggregation Groups

`Spine1-SiteA(config-if)#interface po1`	Configure LAG interface
`Spine1-SiteA(config-if)#description *LACP channel to P-Leaf1-SiteA*`	Assign a description to the interface
`Spine1-SiteA(config-if)#mtu 1600`	Set the MTU
`Spine1-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine1-SiteA(config-if)#ip address 10.1.131.1/30`	Assign IPv4 address
`Spine1-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine1-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine1-SiteA(config-if)#ip ospf cost 100`	Set OSPF cost
`Spine1-SiteA(config-if)#interface po2`	Configure LAG interface
`Spine1-SiteA(config-if)#description *LACP P-Leaf2-SiteA p49-50*`	Assign a description to the interface
`Spine1-SiteA(config-if)#mtu 1600`	Set the MTU
`Spine1-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine1-SiteA(config-if)#ip address 10.1.141.1/30`	Assign IPv4 address
`Spine1-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine1-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine1-SiteA(config-if)#ip ospf cost 100`	Set OSPF cost
`Spine1-SiteA(config-if)#interface po3`	Configure LAG interface
`Spine1-SiteA(config-if)#mtu 1600`	Set the MTU
`Spine1-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine1-SiteA(config-if)#ip address 10.1.111.2/30`	Assign IPv4 address
`Spine1-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine1-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine1-SiteA(config-if)#ip ospf cost 10000`	Set OSPF cost
`Spine1-SiteA(config-if)#interface po4`	Configure LAG interface
`Spine1-SiteA(config-if)#mtu 1600`	Set the MTU

`Spine1-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine1-SiteA(config-if)#ip address 10.1.121.2/30`	Assign IPv4 address
`Spine1-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine1-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine1-SiteA(config-if)#ip ospf cost 10000`	Set OSPF cost
`Spine1-SiteA(config-if)#interface po5`	Configure LAG interface
`Spine1-SiteA(config-if)#mtu 1600`	Set the MTU
`Spine1-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine1-SiteA(config-if)#ip address 10.1.151.1/30`	Assign IPv4 address
`Spine1-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine1-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine1-SiteA(config-if)#ip ospf cost 100`	Set OSPF cost

Leaf1-SiteA

Miscellaneous

`Leaf1-SiteA(config)#load-balance rtag7`	Enable rtag7 load balancing globally
`Leaf1-SiteA(config)#load-balance rtag7 macro-flow`	Configure rtag7 load balancing to choose a hash function dynamically
`Leaf1-SiteA(config)#load-balance rtag7 ipv4 dest-ipv4 src-ipv4 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv4 header
`Leaf1-SiteA(config)#load-balance rtag7 ipv6 dest-ipv6 src-ipv6 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv6 header
`Leaf1-SiteA(config)#forwarding profile l2-profile-three`	Set the forwarding profile, making the Layer 2 address table and Layer 3 address tables almost the same size
`Leaf1-SiteA(config)#hardware-profile filter ingress-ipv6 disable`	Disable ingress IPv6 filter groups
`Leaf1-SiteA(config)#hardware-profile filter egress-ipv6 disable`	Disable egress IPv6 filter groups
`Leaf1-SiteA(config)#qos enable`	Enable QoS
`Leaf1-SiteA(config)#qos statistics`	Enable QoS statistics
`Leaf1-SiteA(config)#ip domain-lookup vrf management`	Enable DNS host name-to-address translation
`Leaf1-SiteA(config)#errdisable cause link-flap`	Shut down a port when a link flap happens
`Leaf1-SiteA(config)#errdisable timeout interval 120`	Enable ErrDisable timeout and set the timeout interval
`Leaf1-SiteA(config)#errdisable link-flap-setting max-flaps 10 time 120`	Configure link-flap errdisable settings

`Leaf1-SiteA(config)#feature telnet vrf management`	Enable telnet
`Leaf1-SiteA(config)#feature ssh vrf management`	Enable SSH

Interfaces

`Leaf1-SiteA(config)#interface ce1/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce2/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce3/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce4/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce5/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce6/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce7/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce8/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf1-SiteA(config)#interface ce11/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf1-SiteA(config)#interface ce12/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf1-SiteA(config)#interface ce13/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf1-SiteA(config)#interface ce14/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf1-SiteA(config)#interface ce15/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf1-SiteA(config)#interface ce16/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf1-SiteA(config)#interface ce17/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf1-SiteA(config)#interface ce18/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce21/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce22/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce23/1`	Configure interface

`Leaf1-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce24/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce25/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce26/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce27/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Leaf1-SiteA(config-if)#interface ce28/1`	Configure interface
`Leaf1-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Leaf1-SiteA(config)#interface lo`	Configure loopback interface
`Leaf1-SiteA(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Leaf1-SiteA(config-if)#ip address 10.0.1.3/32 secondary`	Assign secondary IPv4 address
`Leaf1-SiteA(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Leaf1-SiteA(config-if)#ip ospf cost 1`	Set OSPF cost
`Leaf1-SiteA(config-if)#interface lo.management`	Configure loopback management interface
`Leaf1-SiteA(config-if)#mtu 1500`	Set the MTU
`Leaf1-SiteA(config-if)#ip vrf forwarding management`	Associate the interface with the management VRF
`Leaf1-SiteA(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Leaf1-SiteA(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address

OSPF

`Leaf1-SiteA(config-if)#router ospf`	Enter OSPF router mode
`Leaf1-SiteA(config-router)#ospf router-id 10.0.1.3`	Assign a router identifier
`Leaf1-SiteA(config-router)#bfd all-interfaces`	Enable BFD on all interfaces
`Leaf1-SiteA(config-router)#timers spf exp 50 50`	Set the Shortest-Path First (SPF) best-path schedule minimum and maximum delay between receiving a change to SPF calculation in milliseconds
`Leaf1-SiteA(config-router)#timers throttle lsa all 0 1 1`	Set the rate-limiting intervals for OSPF LSA generation
`Leaf1-SiteA(config-router)#timers lsa arrival 1`	Set the minimum interval to accept the same LSA from OSPF neighbors
`Leaf1-SiteA(config-router)#network 10.0.1.3/32 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Leaf1-SiteA(config-router)#network 10.1.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Leaf1-SiteA(config-router)#network 10.99.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address

`Leaf1-SiteA(config-router)#bfd interval 3 minrx 3 multiplier 3`	Set the BFD transmit and receive intervals, and the hello multiplier value
`Leaf1-SiteA(config)#ip pim register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Leaf1-SiteA(config)#ip pim vrf management register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router

Link Aggregation Groups

`Leaf1-SiteA(config-if)#interface po1`	Configure LAG interface
`Leaf1-SiteA(config-if)#mtu 1600`	Set the MTU
`Leaf1-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Leaf1-SiteA(config-if)#ip address 10.1.131.2/30`	Assign IPv4 address
`Leaf1-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Leaf1-SiteA(config-if)#port-channel min-links 2`	Set the minimum number of links that need to be up in the LAG interface
`Leaf1-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Leaf1-SiteA(config-if)#ip ospf cost 100`	Set OSPF cost
`Leaf1-SiteA(config-if)#interface po2`	Configure LAG interface
`Leaf1-SiteA(config-if)#mtu 1600`	Set the MTU
`Leaf1-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Leaf1-SiteA(config-if)#ip address 10.1.231.2/30`	Assign IPv4 address
`Leaf1-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Leaf1-SiteA(config-if)#port-channel min-links 2`	Set the minimum number of links that need to be up in the LAG interface
`Leaf1-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Leaf1-SiteA(config-if)#ip ospf cost 100`	Set OSPF cost
`Leaf1-SiteA(config-if)#interface po3`	Configure LAG interface
`Leaf1-SiteA(config-if)#mtu 1600`	Set the MTU
`Leaf1-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Leaf1-SiteA(config-if)#ip address 10.99.11.1/30`	Assign IPv4 address
`Leaf1-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Leaf1-SiteA(config-if)#port-channel min-links 6`	Set the minimum number of links that need to be up in the LAG interface
`Leaf1-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Leaf1-SiteA(config-if)#ip ospf cost 2`	Set OSPF cost

`Leaf1-SiteA(config-if)#interface po4`	Configure LAG interface
`Leaf1-SiteA(config-if)#mtu 1600`	Set the MTU
`Leaf1-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Leaf1-SiteA(config-if)#ip address 10.99.12.1/30`	Assign IPv4 address
`Leaf1-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Leaf1-SiteA(config-if)#port-channel min-links 6`	Set the minimum number of links that need to be up in the LAG interface
`Leaf1-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Leaf1-SiteA(config-if)#ip ospf cost 10`	Set OSPF cost

Appendix: Other Configurations

Edge Configurations

Edge2-SiteA

`Edge2-SiteA(config)#ip vrf management`	Create a VRF (Virtual Routing and Forwarding) RIB (Routing Information Base)
`Edge2-SiteA(config-vrf)#mac vrf vrfp`	Create a MAC VRF to use in EVPN routes
`Edge2-SiteA(config-vrf)#rd 10.0.1.2:1`	Assign route distinguisher
`Edge2-SiteA(config-vrf)#route-target both 1:1`	Assign route target
`Edge2-SiteA(config-vrf)#load-balance rtag7`	Enable rtag7 load balancing globally
`Edge2-SiteA(config)#load-balance rtag7 macro-flow`	Configure rtag7 load balancing to choose a hash function dynamically
`Edge2-SiteA(config)#load-balance rtag7 vxlan inner-l3 dest-ip src-ip destl4-port srcl4-port protocol-id`	Enable rtag7 load balancing for VXLAN based on inner-L3 header
`Edge2-SiteA(config)#load-balance rtag7 ipv4 dest-ipv4 src-ipv4 destl4-port srcl4-port protocol-id`	Enable rtag7 load balancing based on IPv4 header
`Edge2-SiteA(config)#load-balance rtag7 ipv6 dest-ipv6 src-ipv6 destl4-port srcl4-port next-hdr`	Enable rtag7 load balancing based on IPv6 header
`Edge2-SiteA(config)#forwarding profile l2-profile-three`	Set the forwarding profile, making the Layer 2 address table and Layer 3 address tables almost the same size
`Edge2-SiteA(config)#hardware-profile filter ingress-ipv6 disable`	Disable ingress IPv6 filter groups
`Edge2-SiteA(config)#hardware-profile filter egress-ipv6 disable`	Disable egress IPv6 filter groups
`Edge2-SiteA(config)#qos enable`	Enable QoS
`Edge2-SiteA(config)#qos statistics`	Enable QoS statistics
`Edge2-SiteA(config)#ip domain-lookup vrf management`	Enable DNS host name-to-address translation
`Edge2-SiteA(config)#errdisable cause link-flap`	Shut down a port when a link flap happens
`Edge2-SiteA(config)#errdisable timeout interval 60`	Enable ErrDisable timeout and set the timeout interval
`Edge2-SiteA(config)#errdisable link-flap-setting max-flaps 10 time 120`	Configure link-flap errdisable settings
`Edge2-SiteA(config)#feature telnet vrf management`	Enable telnet
`Edge2-SiteA(config)#feature ssh vrf management`	Enable SSH
`Edge2-SiteA(config)#feature tacacs+ vrf management`	Enable TACACS+
`Edge2-SiteA(config)#mac access-list 100G-PORT-F`	Create a MAC access list
`Edge2-SiteA(config-mac-acl)#10 permit host 0000.0000.1118 any`	Permit traffic from source host only to any destination
`Edge2-SiteA(config)#class-map match-all 100G-PORT-F-Broadcast`	Create class map

`Edge2-SiteA(config-cmap-qos)#match traffic-type default`	Classify traffic for all other types
`Edge2-SiteA(config-cmap-qos)#class-map match-all 100G-PORT-F-Known-Unicast`	Create class map
`Edge2-SiteA(config-cmap-qos)#match traffic-type l2-uc`	Classify traffic for L2 unicast
`Edge2-SiteA(config-cmap-qos)#class-map match-all 100G-PORT-F-Unknown-Unicast`	Create class map
`Edge2-SiteA(config-cmap-qos)#match traffic-type l2-uc-unknown`	Classify traffic for unknown L2 unicast
`Edge2-SiteA(config)#policy-map 100G-PORT-F`	Create a policy map
`Edge2-SiteA(config-pmap-qos)#class 100G-PORT-F-Broadcast`	Add class map to policy map
`Edge2-SiteA(config-pmap-c-qos)#police cir 2 mbps`	Set policing CIR
`Edge2-SiteA(config-pmap-qos)#class 100G-PORT-F-Known-Unicast`	Add class map to policy map
`Edge2-SiteA(config-pmap-qos)#class 100G-PORT-F-Unknown-Unicast`	Add class map to policy map
`Edge2-SiteA(config-pmap-c-qos)#police cir 2 mbps`	Set policing CIR
`Edge2-SiteA(config)#ip pim register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Edge2-SiteA(config)#ip pim vrf management register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Edge2-SiteA(config)#interface ce1/1`	Enter interface mode
`Edge2-SiteA(config-if)#description ***F***`	Assign a description to the interface
`Edge2-SiteA(config-if)#switchport`	Make the interface Layer 2
`Edge2-SiteA(config-if)#flowcontrol send on`	Enable flow control for sending
`Edge2-SiteA(config-if)#flowcontrol receive on`	Enable flow control for receiving
`Edge2-SiteA(config-if)#switchport allowed ethertype arp ipv4 ipv6`	Permit ethertypes and deny remaining traffic
`Edge2-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Edge2-SiteA(config-if)#mac access-group 100G-PORT-F in`	Associate a MAC access list to the interface to filter incoming packets
`Edge2-SiteA(config-if)#service-policy type qos input 100G-PORT-F`	Apply ingress service policy
`Edge2-SiteA(config-if)#sflow sampling-rate 8192 direction ingress max-header-size 16`	Configure sFlow
`Edge2-SiteA(config-if)#sflow enable`	Enable sFlow on the interface
`Edge2-SiteA(config)#interface ce29/1`	Configure interface
`Edge2-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Edge2-SiteA(config-if)#interface ce30/1`	Configure interface
`Edge2-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Edge2-SiteA(config-if)#interface ce31/1`	Configure interface
`Edge2-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG

`Edge2-SiteA(config-if)#interface ce32/1`	Configure interface
`Edge2-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Edge2-SiteA(config)#interface po1`	Configure LAG interface
`Edge2-SiteA(config-if)#description ***Connection to Spine1-SiteA***`	Assign a description to the interface
`Edge2-SiteA(config-if)#mtu 1600`	Set the MTU
`Edge2-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Edge2-SiteA(config-if)#ip address 10.1.121.1/30`	Assign IPv4 address
`Edge2-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Edge2-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Edge2-SiteA(config-if)#ip ospf cost 10000`	Set OSPF cost
`Edge2-SiteA(config-if)#interface po2`	Configure LAG interface
`Edge2-SiteA(config-if)#description ***Connection to Spine2-SiteA***`	Assign a description to the interface
`Edge2-SiteA(config-if)#mtu 1600`	Set the MTU
`Edge2-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Edge2-SiteA(config-if)#ip address 10.1.221.1/30`	Assign IPv4 address
`Edge2-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Edge2-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Edge2-SiteA(config-if)#ip ospf cost 10000`	Set OSPF cost
`Edge2-SiteA(config)#interface lo`	Configure loopback interface
`Edge2-SiteA(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Edge2-SiteA(config-if)#ip address 10.0.1.2/32 secondary`	Assign secondary IPv4 address
`Edge2-SiteA(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Edge2-SiteA(config-if)#ip ospf cost 1`	Set OSPF cost
`Edge2-SiteA(config-if)#interface lo.management`	Configure loopback management interface
`Edge2-SiteA(config-if)#mtu 1500`	Set the MTU
`Edge2-SiteA(config-if)#ip vrf forwarding management`	Associate the interface with the management VRF
`Edge2-SiteA(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Edge2-SiteA(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Edge2-SiteA(config)#router ospf`	Enter OSPF router mode
`Edge2-SiteA(config-router)#ospf router-id 10.0.1.2`	Assign a router identifier
`Edge2-SiteA(config-router)#bfd all-interfaces`	Enable BFD on all interfaces
`Edge2-SiteA(config-router)#timers spf exp 50 50`	Set the Shortest-Path First (SPF) best-path schedule minimum and maximum delay between receiving a change to SPF calculation in milliseconds

`Edge2-SiteA(config-router)#timers throttle lsa all 0 1 1`	Set the rate-limiting intervals for OSPF LSA generation
`Edge2-SiteA(config-router)#timers lsa arrival 1`	Set the minimum interval to accept the same LSA from OSPF neighbors
`Edge2-SiteA(config-router)#network 10.0.1.2/32 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Edge2-SiteA(config-router)#network 10.1.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Edge2-SiteA(config)#router bgp 64512`	Enter BGP router mode
`Edge2-SiteA(config-router)#bgp log-neighbor-changes`	Log BGP neighbor status change messages
`Edge2-SiteA(config-router)#neighbor 10.0.1.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge2-SiteA(config-router)#neighbor 10.0.1.1 update-source lo`	Use loopback interface for TCP
`Edge2-SiteA(config-router)#neighbor 10.0.2.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge2-SiteA(config-router)#neighbor 10.0.2.1 update-source lo`	Use loopback interface for TCP
`Edge2-SiteA(config-router)#neighbor 10.0.2.2 remote-as 64512`	Peer with a BGP customer edge router
`Edge2-SiteA(config-router)#neighbor 10.0.2.2 update-source lo`	Use loopback interface for TCP
`Edge2-SiteA(config-router)#neighbor 10.0.3.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge2-SiteA(config-router)#neighbor 10.0.3.1 update-source lo`	Use loopback interface for TCP
`Edge2-SiteA(config-router)#neighbor 10.0.5.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge2-SiteA(config-router)#neighbor 10.0.5.1 update-source lo`	Use loopback interface for TCP
`Edge2-SiteA(config-router)#neighbor 10.0.6.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge2-SiteA(config-router)#neighbor 10.0.6.1 update-source lo`	Use loopback interface for TCP
`Edge2-SiteA(config-router)#address-family l2vpn evpn`	Enter EVPN address-family mode
`Edge2-SiteA(config-router-af)#neighbor 10.0.1.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge2-SiteA(config-router-af)#neighbor 10.0.2.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge2-SiteA(config-router-af)#neighbor 10.0.2.2 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge2-SiteA(config-router-af)#neighbor 10.0.3.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge2-SiteA(config-router-af)#neighbor 10.0.5.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge2-SiteA(config-router-af)#neighbor 10.0.6.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor

`Edge2-SiteA(config-router-af)#exit-address-family`	Exit address-family mode
`Edge2-SiteA(config-router)#bfd interval 3 minrx 3 multiplier 3`	Set the BFD transmit and receive intervals, and the hello multiplier value
`Edge2-SiteA(config)#nvo vxlan enable`	Enable VXLAN
`Edge2-SiteA(config)#nvo vxlan vtep-ip-global 10.0.1.2`	Set the source IP address of the VXLAN tunnels
`Edge2-SiteA(config)#nvo vxlan id 1 ingress-replication inner-vid-disabled`	Add a tenant and the type of VPN
`Edge2-SiteA(config-nvo)#vxlan host-reachability-protocol evpn-bgp vrfp`	Set the host reachable protocol to EVPN over BGP
`Edge2-SiteA(config-nvo)#nvo vxlan access-if port ce1/1`	Map an interface to identify the tenant traffic
`Edge2-SiteA(config-nvo-acc-if)#description **PORT-F**`	Assign a description to the interface
`Edge2-SiteA(config-nvo-acc-if)#no shutdown`	Start the interface
`Edge2-SiteA(config-nvo-acc-if)#dynamic-learning disable`	Disable dynamic learning
`Edge2-SiteA(config-nvo-acc-if)#map vnid 1`	Map a tenant to an access port
`Edge2-SiteA(config-nvo-acc-if)#mac 0000.0000.1118 ip 172.16.0.18`	Associate a static MAC address and a static IPv4 address to the access interface
`Edge2-SiteA(config-nvo-acc-if)#mac 0000.0000.1118 ipv6 2001:dead:beef:cafe::18:1`	Associate a static MAC address and a static IPv6 address to the access interface

Edge1-SiteB

`Edge1-SiteB(config)#ip vrf management`	Create a VRF (Virtual Routing and Forwarding) RIB (Routing Information Base)
`Edge1-SiteB(config-vrf)#mac vrf vrfp`	Create a MAC VRF to use in EVPN routes
`Edge1-SiteB(config-vrf)#rd 10.0.2.1:1`	Assign route distinguisher
`Edge1-SiteB(config-vrf)#route-target both 1:1`	Assign route target
`Edge1-SiteB(config)#load-balance rtag7`	Enable rtag7 load balancing globally
`Edge1-SiteB(config)#load-balance rtag7 macro-flow`	Configure rtag7 load balancing to choose a hash function dynamically
`Edge1-SiteB(config)#load-balance rtag7 vxlan inner-l3 dest-ip src-ip destl4-port srcl4-port protocol-id`	Enable rtag7 load balancing for VXLAN based on inner-L3 header
`Edge1-SiteB(config)#load-balance rtag7 ipv4 dest-ipv4 src-ipv4 destl4-port srcl4-port protocol-id`	Enable rtag7 load balancing based on IPv4 header
`Edge1-SiteB(config)#load-balance rtag7 ipv6 dest-ipv6 src-ipv6 destl4-port srcl4-port next-hdr`	Enable rtag7 load balancing based on IPv6 header
`Edge1-SiteB(config)#forwarding profile l2-profile-three`	Set the forwarding profile, making the Layer 2 address table and Layer 3 address tables almost the same size
`Edge1-SiteB(config)#qos enable`	Enable QoS
`Edge1-SiteB(config)#qos statistics`	Enable QoS statistics
`Edge1-SiteB(config)#ip pim register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router

`Edge1-SiteB(config)#ip pim vrf management register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Edge1-SiteB(config)#mac access-list 10G-SLAG-J`	Create a MAC access list
`Edge1-SiteB(config-mac-acl)#10 permit host 0000.0000.2221 any`	Permit traffic from source host only to any destination
`Edge1-SiteB(config)#class-map match-all 10G-SLAG-J-Broadcast`	Create class map
`Edge1-SiteB(config-cmap-qos)#match traffic-type default`	Classify traffic for all other types
`Edge1-SiteB(config-cmap-qos)#class-map match-all 10G-SLAG-J-Known-Unicast`	Create class map
`Edge1-SiteB(config-cmap-qos)#match traffic-type l2-uc`	Classify traffic for L2 unicast
`Edge1-SiteB(config-cmap-qos)#class-map match-all 10G-SLAG-J-Unknown-Unicast`	Create class map
`Edge1-SiteB(config-cmap-qos)#match traffic-type l2-uc-unknown`	Classify traffic for unknown L2 unicast
`Edge1-SiteB(config)#policy-map 10G-SLAG-J`	Create a policy map
`Edge1-SiteB(config-pmap-qos)#class 10G-SLAG-J-Broadcast`	Add class map to policy map
`Edge1-SiteB(config-pmap-c-qos)#police cir 2 mbps`	Set policing CIR
`Edge1-SiteB(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteB(config-pmap-qos)#class 10G-SLAG-J-Known-Unicast`	Add class map to policy map
`Edge1-SiteB(config-pmap-c-qos)#police cir 21 gbps`	Set policing CIR
`Edge1-SiteB(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteB(config-pmap-qos)#class 10G-SLAG-J-Unknown-Unicast`	Add class map to policy map
`Edge1-SiteB(config-pmap-c-qos)#police cir 2 mbps`	Set policing CIR
`Edge1-SiteB(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteB(config)#interface lo`	Configure loopback interface
`Edge1-SiteB(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Edge1-SiteB(config-if)#ip address 10.0.2.1/32 secondary`	Assign secondary IPv4 address
`Edge1-SiteB(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Edge1-SiteB(config-if)#ip ospf cost 1`	Set OSPF cost
`Edge1-SiteB(config-if)#interface lo.management`	Configure loopback management interface
`Edge1-SiteB(config-if)#mtu 1500`	Set the MTU
`Edge1-SiteB(config-if)#ip vrf forwarding management`	Associate the interface with the management VRF
`Edge1-SiteB(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Edge1-SiteB(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Edge1-SiteB(config)#interface xe1`	Configure interface
`Edge1-SiteB(config)#switchport`	Make the interface Layer 2
`Edge1-SiteB(config-if)#static-channel-group 1`	Create a static LAG
`Edge1-SiteB(config-if)#interface xe2`	Configure interface

`Edge1-SiteB(config)#switchport`	Make the interface Layer 2
`Edge1-SiteB(config-if)#static-channel-group 1`	Create a static LAG
`Edge1-SiteB(config)#interface xe49/1`	Configure interface
`Edge1-SiteB(config-if)#channel-group 1 mode active`	Add interface to LAG
`Edge1-SiteB(config-if)#interface xe50/1`	Configure interface
`Edge1-SiteB(config-if)#channel-group 1 mode active`	Add interface to LAG
`Edge1-SiteB(config-if)#interface xe51/1`	Configure interface
`Edge1-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Edge1-SiteB(config-if)#interface xe52/1`	Configure interface
`Edge1-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Edge1-SiteB(config)#interface sa1`	Configure static LAG interface
`Edge1-SiteB(config-if)#description ***10G-SLAG-J***`	Assign a description to the interface
`Edge1-SiteB(config-if)#switchport`	Make the interface Layer 2
`Edge1-SiteB(config-if)#switchport allowed ethertype arp ipv4 ipv6`	Permit ethertypes and deny remaining traffic
`Edge1-SiteB(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Edge1-SiteB(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Edge1-SiteB(config-if)#mac access-group 10G-SLAG-J in`	Associate a MAC access list to the interface to filter incoming packets
`Edge1-SiteB(config-if)#service-policy type qos input 10G-SLAG-J`	Apply ingress service policy
`Edge1-SiteB(config-if)#sflow sampling-rate 8192 direction ingress max-header-size 16`	Configure sFlow
`Edge1-SiteB(config-if)#sflow enable`	Enable sFlow on the interface
`Edge1-SiteB(config)#interface po1`	Configure LAG interface
`Edge1-SiteB(config-if)#description ***Connection to Spine1-SiteB***`	Assign a description to the interface
`Edge1-SiteB(config-if)#mtu 1600`	Set the MTU
`Edge1-SiteB(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Edge1-SiteB(config-if)#ip address 10.2.111.1/30`	Assign IPv4 address
`Edge1-SiteB(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Edge1-SiteB(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Edge1-SiteB(config-if)#ip ospf cost 10000`	Set OSPF cost
`Edge1-SiteB(config-if)#interface po2`	Configure LAG interface
`Edge1-SiteB(config-if)#description ***Connection to Spine2-SiteB***`	Assign a description to the interface
`Edge1-SiteB(config-if)#mtu 1600`	Set the MTU
`Edge1-SiteB(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Edge1-SiteB(config-if)#ip address 10.2.211.1/30`	Assign IPv4 address

`Edge1-SiteB(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Edge1-SiteB(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Edge1-SiteB(config-if)#ip ospf cost 10000`	Set OSPF cost
`Edge1-SiteB(config)#router ospf`	Enter OSPF router mode
`Edge1-SiteB(config-router)#ospf router-id 10.0.2.1`	Assign a router identifier
`Edge1-SiteB(config-router)#bfd all-interfaces`	Enable BFD on all interfaces
`Edge1-SiteB(config-router)#timers spf exp 50 50`	Set the Shortest-Path First (SPF) best-path schedule minimum and maximum delay between receiving a change to SPF calculation in milliseconds
`Edge1-SiteB(config-router)#timers throttle lsa all 0 1 1`	Set the rate-limiting intervals for OSPF LSA generation
`Edge1-SiteB(config-router)#timers lsa arrival 1`	Set the minimum interval to accept the same LSA from OSPF neighbors
`Edge1-SiteB(config-router)#network 10.0.2.1/32 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Edge1-SiteB(config-router)#network 10.2.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Edge1-SiteB(config)#router bgp 64512`	Enter BGP router mode
`Edge1-SiteB(config-router)#bgp log-neighbor-changes`	Log BGP neighbor status change messages
`Edge1-SiteB(config-router)#neighbor 10.0.1.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteB(config-router)#neighbor 10.0.1.1 update-source lo`	Use loopback interface for TCP
`Edge1-SiteB(config-router)#neighbor 10.0.1.2 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteB(config-router)#neighbor 10.0.1.2 update-source lo`	Use loopback interface for TCP
`Edge1-SiteB(config-router)#neighbor 10.0.2.2 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteB(config-router)#neighbor 10.0.2.2 update-source lo`	Use loopback interface for TCP
`Edge1-SiteB(config-router)#neighbor 10.0.3.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteB(config-router)#neighbor 10.0.3.1 update-source lo`	Use loopback interface for TCP
`Edge1-SiteB(config-router)#neighbor 10.0.5.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteB(config-router)#neighbor 10.0.5.1 update-source lo`	Use loopback interface for TCP
`Edge1-SiteB(config-router)#neighbor 10.0.6.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteB(config-router)#neighbor 10.0.6.1 update-source lo`	Use loopback interface for TCP
`Edge1-SiteB(config-router)#address-family l2vpn evpn`	Enter EVPN address-family mode

`Edge1-SiteB(config-router-af)#neighbor 10.0.1.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteB(config-router-af)#neighbor 10.0.1.2 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteB(config-router-af)#neighbor 10.0.2.2 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteB(config-router-af)#neighbor 10.0.3.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteB(config-router-af)#neighbor 10.0.5.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteB(config-router-af)#neighbor 10.0.6.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteB(config-router-af)#exit-address-family`	Exit address-family mode
`Edge1-SiteB(config-router)#bfd interval 3 minrx 3 multiplier 3`	Set the BFD transmit and receive intervals, and the hello multiplier value
`Edge1-SiteB(config-if)#nvo vxlan enable`	Enable VXLAN
`Edge1-SiteB(config)#nvo vxlan vtep-ip-global 10.0.2.1`	Set the source IP address of the VXLAN tunnels
`Edge1-SiteB(config)#nvo vxlan id 1 ingress-replication inner-vid-disabled`	Add a tenant and the type of VPN
`Edge1-SiteB(config-nvo)#vxlan host-reachability-protocol evpn-bgp vrfp`	Set the host reachable protocol to EVPN over BGP
`Edge1-SiteB(config-nvo)#nvo vxlan access-if port sa1`	Map an interface to identify the tenant traffic
`Edge1-SiteB(config-nvo-acc-if)#no shutdown`	Start the interface
`Edge1-SiteB(config-nvo-acc-if)#dynamic-learning disable`	Disable dynamic learning
`Edge1-SiteB(config-nvo-acc-if)#map vnid 1`	Map a tenant to an access port
`Edge1-SiteB(config-nvo-acc-if)#mac 0000.0000.2221 ip 172.16.0.21`	Associate a static MAC address and a static IPv4 address to the access interface
`Edge1-SiteB(config-nvo-acc-if)#mac 0000.0000.2221 ipv6 2001:dead:beef:cafe::21:1`	Associate a static MAC address and a static IPv6 address to the access interface

Edge1-SiteC

`Edge1-SiteC(config)#ip vrf management`	Create a VRF (Virtual Routing and Forwarding) RIB (Routing Information Base)
`Edge1-SiteC(config-vrf)#mac vrf vrfp`	Create a MAC VRF to use in EVPN routes
`Edge1-SiteC(config-vrf)#rd 10.0.3.1:1`	Assign route distinguisher
`Edge1-SiteC(config-vrf)#route-target both 1:1`	Assign route target
`Edge1-SiteC(config-vrf)#load-balance rtag7`	Enable rtag7 load balancing globally
`Edge1-SiteC(config)#load-balance rtag7 macro-flow`	Configure rtag7 load balancing to choose a hash function dynamically
`Edge1-SiteC(config)#load-balance rtag7 vxlan inner-l3 dest-ip src-ip destl4-port srcl4-port protocol-id`	Enable rtag7 load balancing for VXLAN based on inner-L3 header
`Edge1-SiteC(config)#load-balance rtag7 ipv4 dest-ipv4 src-ipv4 destl4-port srcl4-port protocol-id`	Enable rtag7 load balancing based on IPv4 header

`Edge1-SiteC(config)#load-balance rtag7 ipv6 dest-ipv6 src-ipv6 destl4-port srcl4-port next-hdr`	Enable rtag7 load balancing based on IPv6 header
`Edge1-SiteC(config)#forwarding profile l2-profile-three`	Set the forwarding profile, making the Layer 2 address table and Layer 3 address tables almost the same size
`Edge1-SiteC(config)#qos enable`	Enable QoS
`Edge1-SiteC(config)#qos statistics`	Enable QoS statistics
`Edge1-SiteC(config)#mac access-list E1C`	Create a MAC access list
`Edge1-SiteC(config-mac-acl)#10 permit host 0000.0000.4441 any`	Permit traffic from source host only to any destination
`Edge1-SiteC(config)#class-map match-all 1G-LACP-H-Broadcast`	Create class map
`Edge1-SiteC(config-cmap-qos)#match traffic-type default`	Classify traffic for all other types
`Edge1-SiteC(config-cmap-qos)#class-map match-all 1G-LACP-H-Known-Unicast`	Create class map
`Edge1-SiteC(config-cmap-qos)#match traffic-type l2-uc`	Classify traffic for L2 unicast
`Edge1-SiteC(config-cmap-qos)#class-map match-all 1G-LACP-H-Unknown-Unicast`	Create class map
`Edge1-SiteC(config-cmap-qos)#match traffic-type l2-uc-unknown`	Classify traffic for unknown L2 unicast
`Edge1-SiteC(config)#policy-map 1G-LACP-H`	Create a policy map
`Edge1-SiteC(config-pmap-qos)#class 1G-LACP-H-Broadcast`	Add class map to policy map
`Edge1-SiteC(config-pmap-c-qos)#police cir 1 kbps`	Set policing CIR
`Edge1-SiteC(config-pmap-qos)#class 1G-LACP-H-Known-Unicast`	Add class map to policy map
`Edge1-SiteC(config-pmap-c-qos)#police cir 2200 mbps`	Set policing CIR
`Edge1-SiteC(config-pmap-qos)#class 1G-LACP-H-Unknown-Unicast`	Add class map to policy map
`Edge1-SiteC(config-pmap-c-qos)#police cir 1 kbps`	Set policing CIR
`Edge1-SiteC(config-pmap-c-qos)#exit`	Exit policy-map-class mode
`Edge1-SiteC(config-pmap-qos)#ip pim register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Edge1-SiteC(config)#ip pim vrf management register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Edge1-SiteC(config)#interface lo`	Configure loopback interface
`Edge1-SiteC(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Edge1-SiteC(config-if)#ip address 10.0.3.1/32 secondary`	Assign secondary IPv4 address
`Edge1-SiteC(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Edge1-SiteC(config-if)#ip ospf cost 1`	Set OSPF cost
`Edge1-SiteC(config-if)#interface lo.management`	Configure loopback management interface
`Edge1-SiteC(config-if)#mtu 1500`	Set the MTU

`Edge1-SiteC(config-if)#ip vrf forwarding management`	Associate the interface with the management VRF
`Edge1-SiteC(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Edge1-SiteC(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Edge1-SiteC(config)#interface xe1`	Configure interface
`Edge1-SiteC(config-if)#speed 1g`	Set the link speed of the interface
`Edge1-SiteC(config-if)#switchport`	Make the interface Layer 2
`Edge1-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Edge1-SiteC(config-if)#interface xe2`	Configure interface
`Edge1-SiteC(config-if)#speed 1g`	Set the link speed of the interface
`Edge1-SiteC(config-if)#switchport`	Make the interface Layer 2
`Edge1-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Edge1-SiteC(config)#interface xe49/1`	Configure interface
`Edge1-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Edge1-SiteC(config-if)#interface xe50/1`	Configure interface
`Edge1-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Edge1-SiteC(config-if)#interface xe51/1`	Configure interface
`Edge1-SiteC(config-if)#channel-group 3 mode active`	Add interface to LAG
`Edge1-SiteC(config-if)#interface xe52/1`	Configure interface
`Edge1-SiteC(config-if)#channel-group 3 mode active`	Add interface to LAG
`Edge1-SiteC(config)#interface po1`	Configure LAG interface
`Edge1-SiteC(config-if)#description ***1G-LACP-H***`	Assign a description to the interface
`Edge1-SiteC(config-if)#switchport`	Make the interface Layer 2
`Edge1-SiteC(config-if)#switchport allowed ethertype arp ipv4 ipv6`	Permit ethertypes and deny remaining traffic
`Edge1-SiteC(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Edge1-SiteC(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Edge1-SiteC(config-if)#mac access-group E1C in`	Associate a MAC access list to the interface to filter incoming packets
`Edge1-SiteC(config-if)#service-policy type qos input 1G-LACP-H`	Apply ingress service policy
`Edge1-SiteC(config-if)#sflow sampling-rate 8192 direction ingress max-header-size 16`	Configure sFlow
`Edge1-SiteC(config-if)#sflow enable`	Enable sFlow on the interface
`Edge1-SiteC(config-if)#interface po2`	Configure LAG interface
`Edge1-SiteC(config-if)#description ***Connection to Spine1-SiteC***`	Assign a description to the interface
`Edge1-SiteC(config-if)#mtu 1600`	Set the MTU
`Edge1-SiteC(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Edge1-SiteC(config-if)#ip address 10.3.111.1/30`	Assign IPv4 address
`Edge1-SiteC(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type

`Edge1-SiteC(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Edge1-SiteC(config-if)#ip ospf cost 10000`	Set OSPF cost
`Edge1-SiteC(config-if)#interface po3`	Configure LAG interface
`Edge1-SiteC(config-if)#description ***Connection to Spine2-SiteC***`	Assign a description to the interface
`Edge1-SiteC(config-if)#mtu 1600`	Set the MTU
`Edge1-SiteC(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Edge1-SiteC(config-if)#ip address 10.3.211.1/30`	Assign IPv4 address
`Edge1-SiteC(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Edge1-SiteC(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Edge1-SiteC(config-if)#ip ospf cost 10000`	Set OSPF cost
`Edge1-SiteC(config)#router ospf`	Enter OSPF router mode
`Edge1-SiteC(config-router)#ospf router-id 10.0.3.1`	Assign a router identifier
`Edge1-SiteC(config-router)#bfd all-interfaces`	Enable BFD on all interfaces
`Edge1-SiteC(config-router)#timers spf exp 50 50`	Set the Shortest-Path First (SPF) best-path schedule minimum and maximum delay between receiving a change to SPF calculation in milliseconds
`Edge1-SiteC(config-router)#timers throttle lsa all 0 1 1`	Set the rate-limiting intervals for OSPF LSA generation
`Edge1-SiteC(config-router)#timers lsa arrival 1`	Set the minimum interval to accept the same LSA from OSPF neighbors
`Edge1-SiteC(config-router)#network 10.0.3.1/32 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Edge1-SiteC(config-router)#network 10.3.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Edge1-SiteC(config-router)#exit`	Exit OSPF router mode
`Edge1-SiteC(config)#router bgp 64512`	Enter BGP router mode
`Edge1-SiteC(config-router)#bgp log-neighbor-changes`	Log BGP neighbor status change messages
`Edge1-SiteC(config-router)#neighbor 10.0.1.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteC(config-router)#neighbor 10.0.1.1 update-source lo`	Use loopback interface for TCP
`Edge1-SiteC(config-router)#neighbor 10.0.1.2 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteC(config-router)#neighbor 10.0.1.2 update-source lo`	Use loopback interface for TCP
`Edge1-SiteC(config-router)#neighbor 10.0.2.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteC(config-router)#neighbor 10.0.2.1 update-source lo`	Use loopback interface for TCP

`Edge1-SiteC(config-router)#neighbor 10.0.2.2 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteC(config-router)#neighbor 10.0.2.2 update-source lo`	Use loopback interface for TCP
`Edge1-SiteC(config-router)#neighbor 10.0.5.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteC(config-router)#neighbor 10.0.5.1 update-source lo`	Use loopback interface for TCP
`Edge1-SiteC(config-router)#neighbor 10.0.6.1 remote-as 64512`	Peer with a BGP customer edge router
`Edge1-SiteC(config-router)#neighbor 10.0.6.1 update-source lo`	Use loopback interface for TCP
`Edge1-SiteC(config-router)#address-family l2vpn evpn`	Enter EVPN address-family mode
`Edge1-SiteC(config-router-af)#neighbor 10.0.1.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteC(config-router-af)#neighbor 10.0.1.2 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteC(config-router-af)#neighbor 10.0.2.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteC(config-router-af)#neighbor 10.0.2.2 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteC(config-router-af)#neighbor 10.0.5.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteC(config-router-af)#neighbor 10.0.6.1 activate`	Enable the exchange of EVPN address-family routes with a neighbor
`Edge1-SiteC(config-router-af)#exit-address-family`	Exit address-family mode
`Edge1-SiteC(config-router)#bfd interval 3 minrx 3 multiplier 3`	Set the BFD transmit and receive intervals, and the hello multiplier value
`Edge1-SiteC(config)#nvo vxlan enable`	Enable VXLAN
`Edge1-SiteC(config)#nvo vxlan vtep-ip-global 10.0.3.1`	Set the source IP address of the VXLAN tunnels
`Edge1-SiteC(config)#nvo vxlan id 1 ingress-replication inner-vid-disabled`	Add a tenant and the type of VPN
`Edge1-SiteC(config-nvo)#vxlan host-reachability-protocol evpn-bgp vrfp`	Set the host reachable protocol to EVPN over BGP
`Edge1-SiteC(config-nvo)#nvo vxlan access-if port po1`	Map an interface to identify the tenant traffic
`Edge1-SiteC(config-nvo-acc-if)#no shutdown`	Start the interface
`Edge1-SiteC(config-nvo-acc-if)#dynamic-learning disable`	Disable dynamic learning
`Edge1-SiteC(config-nvo-acc-if)#map vnid 1`	Map a tenant to an access port
`Edge1-SiteC(config-nvo-acc-if)#mac 0000.0000.4441 ip 172.16.0.41`	Associate a static MAC address and a static IPv4 address to the access interface
`Edge1-SiteC(config-nvo-acc-if)#mac 0000.0000.4441 ipv6 2001:dead:beef:cafe::41:1`	Associate a static MAC address and a static IPv6 address to the access interface

Leaf/Spine Configurations

Spine2-SiteA

`Spine2-SiteA(config)#ip vrf management`	Create a VRF (Virtual Routing and Forwarding) RIB (Routing Information Base)
`Spine2-SiteA(config)#load-balance rtag7`	Enable rtag7 load balancing globally
`Spine2-SiteA(config)#load-balance rtag7 macro-flow`	Configure rtag7 load balancing to choose a hash function dynamically
`Spine2-SiteA(config)#load-balance rtag7 ipv4 dest-ipv4 src-ipv4 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv4 header
`Spine2-SiteA(config)#load-balance rtag7 ipv6 dest-ipv6 src-ipv6 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv6 header
`Spine2-SiteA(config)#forwarding profile l2-profile-three`	Set the forwarding profile, making the Layer 2 address table and Layer 3 address tables almost the same size
`Spine2-SiteA(config)#hardware-profile filter ingress-ipv6 disable`	Disable ingress IPv6 filter groups
`Spine2-SiteA(config)#hardware-profile filter egress-ipv6 disable`	Disable egress IPv6 filter groups
`Spine2-SiteA(config)#ip domain-lookup vrf management`	Enable DNS host name-to-address translation
`Spine2-SiteA(config)#errdisable cause link-flap`	Shut down a port when a link flap happens
`Spine2-SiteA(config)#errdisable timeout interval 60`	Enable errdisable timeout and set the timeout interval
`Spine2-SiteA(config)#errdisable link-flap-setting max-flaps 10 time 120`	Configure link-flap errdisable settings
`Spine2-SiteA(config)#feature telnet vrf management`	Enable telnet
`Spine2-SiteA(config)#feature ssh vrf management`	Enable SSH
`Spine2-SiteA(config)#ip pim register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Spine2-SiteA(config)#ip pim vrf management register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Spine2-SiteA(config)#interface ce1/1`	Configure interface
`Spine2-SiteA(config-if)#speed 40g`	Set the link speed of the interface
`Spine2-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Spine2-SiteA(config-if)#interface ce2/1`	Configure interface
`Spine2-SiteA(config-if)#speed 40g`	Set the link speed of the interface
`Spine2-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Spine2-SiteA(config-if)#interface ce5/1`	Configure interface
`Spine2-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine2-SiteA(config-if)#interface ce6/1`	Configure interface
`Spine2-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG

`Spine2-SiteA(config-if)#interface ce21/1`	Configure interface
`Spine2-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteA(config-if)#interface ce22/1`	Configure interface
`Spine2-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteA(config-if)#interface ce23/1`	Configure interface
`Spine2-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteA(config-if)#interface ce24/1`	Configure interface
`Spine2-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteA(config-if)#interface ce25/1`	Configure interface
`Spine2-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine2-SiteA(config-if)#interface ce26/1`	Configure interface
`Spine2-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine2-SiteA(config-if)#interface ce27/1`	Configure interface
`Spine2-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine2-SiteA(config-if)#interface ce28/1`	Configure interface
`Spine2-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine2-SiteA(config)#interface lo`	Configure loopback interface
`Spine2-SiteA(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Spine2-SiteA(config-if)#ip address 10.0.1.9/32 secondary`	Assign secondary IPv4 address
`Spine2-SiteA(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Spine2-SiteA(config-if)#ip ospf cost 1`	Set OSPF cost
`Spine2-SiteA(config-if)#interface lo.management`	Configure loopback management interface
`Spine2-SiteA(config-if)#mtu 1500`	Set the MTU
`Spine2-SiteA(config-if)#ip vrf forwarding management`	Associate the interface with the management VRF
`Spine2-SiteA(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Spine2-SiteA(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Spine2-SiteA(config-if)#router ospf`	Enter OSPF router mode
`Spine2-SiteA(config-router)#ospf router-id 10.0.1.9`	Assign a router identifier
`Spine2-SiteA(config-router)#bfd all-interfaces`	Enable BFD on all interfaces
`Spine2-SiteA(config-router)#timers spf exp 50 50`	Set the Shortest-Path First (SPF) best-path schedule minimum and maximum delay between receiving a change to SPF calculation in milliseconds
`Spine2-SiteA(config-router)#timers throttle lsa all 0 1 1`	Set the rate-limiting intervals for OSPF LSA generation
`Spine2-SiteA(config-router)#timers lsa arrival 1`	Set the minimum interval to accept the same LSA from OSPF neighbors
`Spine2-SiteA(config-router)#network 10.0.1.9/32 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine2-SiteA(config-router)#network 10.1.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address

`Spine2-SiteA(config-router)#bfd interval 3 minrx 3 multiplier 3`	Set the BFD transmit and receive intervals, and the hello multiplier value
`Spine2-SiteA(config)#interface po1`	Configure LAG interface
`Spine2-SiteA(config-if)#mtu 1600`	Set the MTU
`Spine2-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine2-SiteA(config-if)#ip address 10.1.241.1/30`	Assign IPv4 address
`Spine2-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine2-SiteA(config-if)#port-channel min-links 2`	Set the minimum number of links that need to be up in the LAG interface
`Spine2-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine2-SiteA(config-if)#ip ospf cost 100`	Set OSPF cost
`Spine2-SiteA(config-if)#interface po2`	Configure LAG interface
`Spine2-SiteA(config-if)#mtu 1600`	Set the MTU
`Spine2-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine2-SiteA(config-if)#ip address 10.1.231.1/30`	Assign IPv4 address
`Spine2-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine2-SiteA(config-if)#port-channel min-links 2`	Set the minimum number of links that need to be up in the LAG interface
`Spine2-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine2-SiteA(config-if)#ip ospf cost 40000`	Set OSPF cost
`Spine2-SiteA(config-if)#interface po3`	Configure LAG interface
`Spine2-SiteA(config-if)#mtu 1600`	Set the MTU
`Spine2-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine2-SiteA(config-if)#ip address 10.1.211.2/30`	Assign IPv4 address
`Spine2-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine2-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine2-SiteA(config-if)#ip ospf cost 10000`	Set OSPF cost
`Spine2-SiteA(config-if)#interface po4`	Configure LAG interface
`Spine2-SiteA(config-if)#mtu 1600`	Set the MTU
`Spine2-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine2-SiteA(config-if)#ip address 10.1.221.2/30`	Assign IPv4 address
`Spine2-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine2-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine2-SiteA(config-if)#ip ospf cost 10000`	Set OSPF cost

Leaf2-SiteA

`Leaf2-SiteA(config)#load-balance rtag7`	Enable rtag7 load balancing globally
`Leaf2-SiteA(config)#load-balance rtag7 macro-flow`	Configure rtag7 load balancing to choose a hash function dynamically
`Leaf2-SiteA(config)#load-balance rtag7 ipv4 dest-ipv4 src-ipv4 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv4 header
`Leaf2-SiteA(config)#load-balance rtag7 ipv6 dest-ipv6 src-ipv6 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv6 header
`Leaf2-SiteA(config)#forwarding profile l2-profile-three`	Set the forwarding profile, making the Layer 2 address table and Layer 3 address tables almost the same size
`Leaf2-SiteA(config)#hardware-profile filter ingress-ipv6 disable`	Disable ingress IPv6 filter groups
`Leaf2-SiteA(config)#hardware-profile filter egress-ipv6 disable`	Disable egress IPv6 filter groups
`Leaf2-SiteA(config)#qos enable`	Enable QoS
`Leaf2-SiteA(config)#qos statistics`	Enable QoS statistics
`Leaf2-SiteA(config)#ip domain-lookup vrf management`	Enable DNS host name-to-address translation
`Leaf2-SiteA(config)#errdisable cause link-flap`	Shut down a port when a link flap happens
`Leaf2-SiteA(config)#errdisable timeout interval 120`	Enable ErrDisable timeout and set the timeout interval
`Leaf2-SiteA(config)#errdisable link-flap-setting max-flaps 10 time 120`	Configure link-flap errdisable settings
`Leaf2-SiteA(config)#feature telnet vrf management`	Enable telnet
`Leaf2-SiteA(config)#feature ssh vrf management`	Enable SSH
`Leaf2-SiteA(config)#interface ce1/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce2/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce3/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce4/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 4 mode active.`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce5/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce6/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce7/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce8/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 4 mode active`	Add interface to LAG
`Leaf2-SiteA(config)#interface ce11/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG

`Leaf2-SiteA(config)#interface ce12/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf2-SiteA(config)#interface ce13/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf2-SiteA(config)#interface ce14/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf2-SiteA(config)#interface ce15/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf2-SiteA(config)#interface ce16/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf2-SiteA(config)#interface ce17/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf2-SiteA(config)#interface ce18/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 3 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce21/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce22/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce23/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce24/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 2 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce25/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce26/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce27/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Leaf2-SiteA(config-if)#interface ce28/1`	Configure interface
`Leaf2-SiteA(config-if)#channel-group 1 mode active`	Add interface to LAG
`Leaf2-SiteA(config)#interface lo`	Configure loopback interface
`Leaf2-SiteA(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Leaf2-SiteA(config-if)#ip address 10.0.1.4/32 secondary`	Assign secondary IPv4 address
`Leaf2-SiteA(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Leaf2-SiteA(config-if)#ip ospf cost 1`	Set OSPF cost
`Leaf2-SiteA(config-if)#interface lo.management`	Configure loopback management interface
`Leaf2-SiteA(config-if)#mtu 1500`	Set the MTU
`Leaf2-SiteA(config-if)#ip vrf forwarding management`	Associate the interface with the management VRF
`Leaf2-SiteA(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Leaf2-SiteA(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address

`Leaf2-SiteA(config-if)#router ospf`	Enter OSPF router mode
`Leaf2-SiteA(config-router)#ospf router-id 10.0.1.4`	Assign a router identifier
`Leaf2-SiteA(config-router)#bfd all-interfaces`	Enable BFD on all interfaces
`Leaf2-SiteA(config-router)#timers spf exp 50 50`	Set the Shortest-Path First (SPF) best-path schedule minimum and maximum delay between receiving a change to SPF calculation in milliseconds
`Leaf2-SiteA(config-router)#timers throttle lsa all 0 1 1`	Set the rate-limiting intervals for OSPF LSA generation
`Leaf2-SiteA(config-router)#timers lsa arrival 1`	Set the minimum interval to accept the same LSA from OSPF neighbors
`Leaf2-SiteA(config-router)#network 10.0.1.4/32 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Leaf2-SiteA(config-router)#network 10.1.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Leaf2-SiteA(config-router)#network 10.99.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Leaf2-SiteA(config-router)#bfd interval 3 minrx 3 multiplier 3`	Set the BFD transmit and receive intervals, and the hello multiplier value
`Leaf2-SiteA(config)#ip pim register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Leaf2-SiteA(config)#ip pim vrf management register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Leaf2-SiteA(config)#interface po1`	Configure LAG interface
`Leaf2-SiteA(config-if)#mtu 1600`	Set the MTU
`Leaf2-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Leaf2-SiteA(config-if)#ip address 10.1.241.2/30`	Assign IPv4 address
`Leaf2-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Leaf2-SiteA(config-if)#port-channel min-links 2`	Set the minimum number of links that need to be up in the LAG interface
`Leaf2-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Leaf2-SiteA(config-if)#ip ospf cost 100`	Set OSPF cost
`Leaf2-SiteA(config-if)#interface po2`	Configure LAG interface
`Leaf2-SiteA(config-if)#mtu 1600`	Set the MTU
`Leaf2-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Leaf2-SiteA(config-if)#ip address 10.1.141.2/30`	Assign IPv4 address
`Leaf2-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type

`Leaf2-SiteA(config-if)#port-channel min-links 2`	Set the minimum number of links that need to be up in the LAG interface
`Leaf2-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Leaf2-SiteA(config-if)#ip ospf cost 100`	Set OSPF cost
`Leaf2-SiteA(config-if)#interface po3`	Configure LAG interface
`Leaf2-SiteA(config-if)#mtu 1600`	Set the MTU
`Leaf2-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Leaf2-SiteA(config-if)#ip address 10.99.11.2/30`	Assign IPv4 address
`Leaf2-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Leaf2-SiteA(config-if)#port-channel min-links 6`	Set the minimum number of links that need to be up in the LAG interface
`Leaf2-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Leaf2-SiteA(config-if)#ip ospf cost 2`	Set OSPF cost
`Leaf2-SiteA(config-if)#interface po4`	Configure LAG interface
`Leaf2-SiteA(config-if)#mtu 1600`	Set the MTU
`Leaf2-SiteA(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Leaf2-SiteA(config-if)#ip address 10.99.13.1/30`	Assign IPv4 address
`Leaf2-SiteA(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Leaf2-SiteA(config-if)#port-channel min-links 6`	Set the minimum number of links that need to be up in the LAG interface
`Leaf2-SiteA(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Leaf2-SiteA(config-if)#ip ospf cost 10`	Set OSPF cost

Spine2-SiteC

`Spine2-SiteC(config)#ip vrf management`	Create a VRF (Virtual Routing and Forwarding) RIB (Routing Information Base)
`Spine2-SiteC(config-vrf)#load-balance rtag7`	Enable rtag7 load balancing globally
`Spine2-SiteC(config)#load-balance rtag7 macro-flow`	Configure rtag7 load balancing to choose a hash function dynamically
`Spine2-SiteC(config)#load-balance rtag7 ipv4 dest-ipv4 src-ipv4 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv4 header
`Spine2-SiteC(config)#load-balance rtag7 ipv6 dest-ipv6 src-ipv6 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv6 header
`Spine2-SiteC(config)#forwarding profile l2-profile-three`	Set the forwarding profile, making the Layer 2 address table and Layer 3 address tables almost the same size
`Spine2-SiteC(config)#hardware-profile filter ingress-ipv6 disable`	Disable ingress IPv6 filter groups

`Spine2-SiteC(config)#hardware-profile filter egress-ipv6 disable`	Disable egress IPv6 filter groups
`Spine2-SiteC(config)#qos enable`	Enable QoS
`Spine2-SiteC(config)#qos statistics`	Enable QoS statistics
`Spine2-SiteC(config)#ip domain-lookup vrf management`	Enable DNS host name-to-address translation
`Spine2-SiteC(config)#errdisable cause link-flap`	Shut down a port when a link flap happens
`Spine2-SiteC(config)#errdisable timeout interval 60`	Enable ErrDisable timeout and set the timeout interval
`Spine2-SiteC(config)#errdisable link-flap-setting max-flaps 10 time 120`	Configure link-flap errdisable settings
`Spine2-SiteC(config)#feature telnet vrf management`	Enable telnet
`Spine2-SiteC(config)#feature ssh vrf management`	Enable SSH
`Spine2-SiteC(config)#feature tacacs+ vrf management`	Enable TACACS+
`Spine2-SiteC(config-pmap-que-def)#ip pim register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Spine2-SiteC(config)#ip pim vrf management register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Spine2-SiteC(config)#interface ce1/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine2-SiteC(config-if)#interface ce2/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine2-SiteC(config-if)#interface ce3/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine2-SiteC(config-if)#interface ce4/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 1 mode active.`	Add interface to LAG
`Spine2-SiteC(config-if)#interface ce5/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine2-SiteC(config-if)#interface ce6/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine2-SiteC(config-if)#interface ce7/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine2-SiteC(config-if)#interface ce8/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine2-SiteC(config)#interface ce11/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteC(config)#interface ce12/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 2 mode active Leaf1`	Add interface to LAG
`Spine2-SiteC(config)#interface ce13/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteC(config)#interface ce14/1`	Configure interface

`Spine2-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteC(config)#interface ce15/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteC(config)#interface ce16/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteC(config)#interface ce17/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteC(config)#interface ce18/1`	Configure interface
`Spine2-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteC(config)#interface ce31/1`	Configure interface
`Spine2-SiteC(config-if)#speed 40g`	Set the link speed of the interface
`Spine2-SiteC(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine2-SiteC(config)#interface ce32/1`	Configure interface
`Spine2-SiteC(config-if)#speed 40g`	Set the link speed of the interface
`Spine2-SiteC(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine2-SiteC(config)#interface lo`	Configure loopback interface
`Spine2-SiteC(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Spine2-SiteC(config-if)#ip address 10.0.3.9/32 secondary`	Assign secondary IPv4 address
`Spine2-SiteC(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Spine2-SiteC(config-if)#ip ospf cost 1`	Set OSPF cost
`Spine2-SiteC(config-if)#interface lo.management`	Configure loopback management interface
`Spine2-SiteC(config-if)#mtu 1500`	Set the MTU
`Spine2-SiteC(config-if)#ip vrf forwarding management`	Associate the interface with the management VRF
`Spine2-SiteC(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Spine2-SiteC(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Spine2-SiteC(config-if)#router ospf`	Enter OSPF router mode
`Spine2-SiteC(config-router)#ospf router-id 10.0.3.9`	Assign a router identifier
`Spine2-SiteC(config-router)#bfd all-interfaces`	Enable BFD on all interfaces
`Spine2-SiteC(config-router)#timers spf exp 50 50`	Set the Shortest-Path First (SPF) best-path schedule minimum and maximum delay between receiving a change to SPF calculation in milliseconds
`Spine2-SiteC(config-router)#timers throttle lsa all 0 1 1`	Set the rate-limiting intervals for OSPF LSA generation
`Spine2-SiteC(config-router)#timers lsa arrival 1`	Set the minimum interval to accept the same LSA from OSPF neighbors
`Spine2-SiteC(config-router)#network 10.0.3.9/32 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine2-SiteC(config-router)#network 10.3.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address

`Spine2-SiteC(config-router)#network 10.99.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine2-SiteC(config-router)#bfd interval 3 minrx 3 multiplier 3`	Set the BFD transmit and receive intervals, and the hello multiplier value
`Spine2-SiteC(config)#interface po1`	Configure LAG interface
`Spine2-SiteC(config-if)#mtu 1600`	Set the MTU
`Spine2-SiteC(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine2-SiteC(config-if)#ip address 10.99.13.2/30`	Assign IPv4 address
`Spine2-SiteC(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine2-SiteC(config-if)#port-channel min-links 6`	Set the minimum number of links that need to be up in the LAG interface
`Spine2-SiteC(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine2-SiteC(config-if)#ip ospf cost 10`	Set OSPF cost
`Spine2-SiteC(config-if)#interface po2`	Configure LAG interface
`Spine2-SiteC(config-if)#mtu 1600`	Set the MTU
`Spine2-SiteC(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine2-SiteC(config-if)#ip address 10.99.33.2/30`	Assign IPv4 address
`Spine2-SiteC(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine2-SiteC(config-if)#port-channel min-links 6`	Set the minimum number of links that need to be up in the LAG interface
`Spine2-SiteC(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine2-SiteC(config-if)#ip ospf cost 2`	Set OSPF cost
`Spine2-SiteC(config-if)#interface po3`	Configure LAG interface
`Spine2-SiteC(config-if)#mtu 1600`	Set the MTU
`Spine2-SiteC(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine2-SiteC(config-if)#ip address 10.3.231.2/30`	Assign IPv4 address
`Spine2-SiteC(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine2-SiteC(config-if)#port-channel min-links 6`	Set the minimum number of links that need to be up in the LAG interface
`Spine2-SiteC(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine2-SiteC(config-if)#ip ospf cost 100`	Set OSPF cost
`Spine2-SiteC(config-if)#interface po4`	Configure LAG interface
`Spine2-SiteC(config-if)#description ***Connection to Edge1-SiteC**`	Assign a description to the interface
`Spine2-SiteC(config-if)#mtu 1600`	Set the MTU
`Spine2-SiteC(config-if)#ip address 10.3.211.2/30`	Assign IPv4 address

`Spine2-SiteC(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine2-SiteC(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine2-SiteC(config-if)#ip ospf cost 10000`	Set OSPF cost

Spine1-SiteC

`Spine1-SiteC(config)#ip vrf management`	Create a VRF (Virtual Routing and Forwarding) RIB (Routing Information Base)
`Spine1-SiteC(config-vrf)#load-balance rtag7`	Enable rtag7 load balancing globally
`Spine1-SiteC(config)#load-balance rtag7 macro-flow`	Configure rtag7 load balancing to choose a hash function dynamically
`Spine1-SiteC(config)#load-balance rtag7 ipv4 dest-ipv4 src-ipv4 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv4 header
`Spine1-SiteC(config)#load-balance rtag7 ipv6 dest-ipv6 src-ipv6 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv6 header
`Spine1-SiteC(config)#forwarding profile l2-profile-three`	Set the forwarding profile, making the Layer 2 address table and Layer 3 address tables almost the same size
`Spine1-SiteC(config)#hardware-profile filter ingress-ipv6 disable`	Disable ingress IPv6 filter groups
`Spine1-SiteC(config)#hardware-profile filter egress-ipv6 disable`	Disable egress IPv6 filter groups
`Spine1-SiteC(config)#qos enable`	Enable QoS
`Spine1-SiteC(config)#qos statistics`	Enable QoS statistics
`Spine1-SiteC(config-pmap-que-def)#ip pim register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Spine1-SiteC(config)#ip pim vrf management register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Spine1-SiteC(config)#interface ce1/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine1-SiteC(config-if)#interface ce2/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine1-SiteC(config-if)#interface ce3/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine1-SiteC(config-if)#interface ce4/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine1-SiteC(config-if)#interface ce5/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine1-SiteC(config-if)#interface ce6/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine1-SiteC(config-if)#interface ce7/1`	Configure interface

`Spine1-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine1-SiteC(config-if)#interface ce8/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 1 mode active`	Add interface to LAG
`Spine1-SiteC(config)#interface ce11/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteC(config)#interface ce12/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteC(config)#interface ce13/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteA(config)#interface ce14/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteC(config)#interface ce15/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteC(config)#interface ce16/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteC(config)#interface ce17/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteC(config)#interface ce18/1`	Configure interface
`Spine1-SiteC(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteC(config)#interface ce31/1`	Configure interface
`Spine1-SiteC(config-if)#speed 40g`	Set the link speed of the interface
`Spine1-SiteC(config-if)#channel-group 3 mode active`	Add interface to LAG
`Spine1-SiteC(config)#interface ce32/1`	Configure interface
`Spine1-SiteC(config-if)#speed 40g`	Set the link speed of the interface
`Spine1-SiteC(config-if)#channel-group 3 mode active`	Add interface to LAG
`Spine1-SiteC(config)#interface lo`	Configure loopback interface
`Spine1-SiteC(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Spine1-SiteC(config-if)#ip address 10.0.3.8/32 secondary`	Assign secondary IPv4 address
`Spine1-SiteC(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Spine1-SiteC(config-if)#ip ospf cost 1`	Set OSPF cost
`Spine1-SiteC(config-if)#interface lo.management`	Configure loopback interface
`Spine1-SiteC(config-if)#mtu 1500`	Set the MTU
`Spine1-SiteC(config-if)#ip vrf forwarding management`	Associate the interface with the management VRF
`Spine1-SiteC(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Spine1-SiteC(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Spine1-Site1(config-if)#router ospf`	Enter OSPF router mode
`Spine1-SiteC(config-router)#ospf router-id 10.0.3.8`	Assign a router identifier
`Spine1-SiteC(config-router)#bfd all-interfaces`	Enable BFD on all interfaces

`Spine1-SiteC(config-router)#timers spf exp 50 50`	Set the Shortest-Path First (SPF) best-path schedule minimum and maximum delay between receiving a change to SPF calculation in milliseconds
`Spine1-SiteC(config-router)#timers throttle lsa all 0 1 1`	Set the rate-limiting intervals for OSPF LSA generation
`Spine1-SiteC(config-router)#timers lsa arrival 1`	Set the minimum interval to accept the same LSA from OSPF neighbors
`Spine1-SiteC(config-router)#network 10.0.3.8/32 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine1-SiteC(config-router)#network 10.3.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine1-SiteC(config-router)#network 10.99.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine1-SiteC(config-router)#bfd interval 3 minrx 3 multiplier 3`	Set the BFD transmit and receive intervals, and the hello multiplier value
`Spine1-SiteC(config)#interface po1`	Configure LAG interface
`Spine1-SiteC(config-if)#mtu 1600`	Set the MTU
`Spine1-SiteC(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine1-SiteC(config-if)#ip address 10.99.23.2/30`	Assign IPv4 address
`Spine1-SiteC(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine1-SiteC(config-if)#port-channel min-links 6`	Set the minimum number of links that need to be up in the LAG interface
`Spine1-SiteC(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine1-SiteC(config-if)#ip ospf cost 12`	Set OSPF cost
`Spine1-SiteC(config-if)#interface po2`	Configure LAG interface
`Spine1-SiteC(config-if)#mtu 1600`	Set the MTU
`Spine1-SiteC(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine1-SiteC(config-if)#ip address 10.99.33.1/30`	Assign IPv4 address
`Spine1-SiteC(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine1-SiteC(config-if)#port-channel min-links 6`	Set the minimum number of links that need to be up in the LAG interface
`Spine1-SiteC(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine1-SiteC(config-if)#ip ospf cost 2`	Set OSPF cost
`Spine1-SiteC(config-if)#interface po3`	Configure LAG interface
`Spine1-SiteC(config-if)#description *Con to Edge1-SiteC*`	Assign a description to the interface
`Spine1-SiteC(config-if)#mtu 1600`	Set the MTU

`Spine1-SiteC(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine1-SiteC(config-if)#ip address 10.3.111.2/30`	Assign IPv4 address
`Spine1-SiteC(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine1-SiteC(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine1-SiteC(config-if)#ip ospf cost 10000`	Set OSPF cost

Spine2-SiteB

`Spine2-SiteB(config)#ip vrf management`	Create a VRF (Virtual Routing and Forwarding) RIB (Routing Information Base)
`Spine2-SiteB(config-vrf)#load-balance rtag7`	Enable rtag7 load balancing globally
`Spine2-SiteB(config)#load-balance rtag7 macro-flow`	Configure rtag7 load balancing to choose a hash function dynamically
`Spine2-SiteB(config)#load-balance rtag7 ipv4 dest-ipv4 src-ipv4 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv4 header
`Spine2-SiteB(config)#load-balance rtag7 ipv6 dest-ipv6 src-ipv6 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv6 header
`Spine2-SiteB(config)#forwarding profile l2-profile-three`	Set the forwarding profile, making the Layer 2 address table and Layer 3 address tables almost the same size
`Spine2-SiteB(config)#qos enable`	Enable QoS
`Spine2-SiteB(config)#qos statistics`	Enable QoS statistics
`Spine2-SiteB(config-pmap-que-def)#ip pim register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Spine2-SiteB(config)#ip pim vrf management register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Spine2-SiteB(config)#interface ce1/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine2-SiteB(config-if)#interface ce2/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine2-SiteB(config-if)#interface ce3/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine2-SiteB(config-if)#interface ce4/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine2-SiteB(config-if)#interface ce5/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine2-SiteB(config-if)#interface ce6/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine2-SiteB(config-if)#interface ce7/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG

`Spine2-SiteB(config-if)#interface ce8/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine2-SiteB(config)#interface ce11/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteB(config)#interface ce12/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteB(config)#interface ce13/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteA(config)#interface ce14/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteB(config)#interface ce15/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteB(config)#interface ce16/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteB(config)#interface ce17/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteB(config)#interface ce18/1`	Configure interface
`Spine2-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine2-SiteB(config)#interface ce21/1`	Configure interface
`Spine2-SiteB(config-if)#speed 40g`	Set the link speed of the interface
`Spine2-SiteB(config-if)#channel-group 3 mode active`	Add interface to LAG
`Spine2-SiteB(config)#interface ce22/1`	Configure interface
`Spine2-SiteB(config-if)#speed 40g`	Set the link speed of the interface
`Spine2-SiteB(config-if)#channel-group 3 mode active`	Add interface to LAG
`Spine2-SiteB(config)#interface lo`	Configure loopback interface
`Spine2-SiteB(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Spine2-SiteB(config-if)#ip address 10.0.2.9/32 secondary`	Assign secondary IPv4 address
`Spine2-SiteB(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Spine2-SiteB(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine2-SiteB(config-if)#ip ospf cost 1`	Set OSPF cost
`Spine2-SiteB(config-if)#interface lo.management`	Configure loopback management interface
`Spine2-SiteB(config-if)#mtu 1500`	Set the MTU
`Spine2-SiteB(config-if)#ip vrf forwarding management`	Associate the interface with the management VRF
`Spine2-SiteB(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Spine2-SiteB(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Spine2-SiteB(config-if)#router ospf`	Enter OSPF router mode
`Spine2-SiteB(config-router)#ospf router-id 10.0.2.9`	Assign a router identifier
`Spine2-SiteB(config-router)#bfd all-interfaces`	Enable BFD on all interfaces

`Spine2-SiteB(config-router)#timers spf exp 50 50`	Set the Shortest-Path First (SPF) best-path schedule minimum and maximum delay between receiving a change to SPF calculation in milliseconds
`Spine2-SiteB(config-router)#timers throttle lsa all 0 1 1`	Set the rate-limiting intervals for OSPF LSA generation
`Spine2-SiteB(config-router)#timers lsa arrival 1`	Set the minimum interval to accept the same LSA from OSPF neighbors
`Spine2-SiteB(config-router)#network 10.0.2.9/32 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine2-SiteB(config-router)#network 10.2.211.0/30 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine2-SiteB(config-router)#network 10.2.212.0/30 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine2-SiteB(config-router)#network 10.2.221.0/30 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine2-SiteB(config-router)#network 10.2.222.0/30 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine2-SiteB(config-router)#network 10.99.22.0/30 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine2-SiteB(config-router)#network 10.99.23.0/30 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine2-SiteB(config-router)#bfd interval 3 minrx 3 multiplier 3`	Set the BFD transmit and receive intervals, and the hello multiplier value
`Spine2-SiteB(config)#interface po1`	Configure LAG interface
`Spine2-SiteB(config-if)#mtu 1600`	Set the MTU
`Spine2-SiteB(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine2-SiteB(config-if)#ip address 10.99.23.1/30`	Assign IPv4 address
`Spine2-SiteB(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine2-SiteB(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine2-SiteB(config-if)#ip ospf cost 10`	Set OSPF cost
`Spine2-SiteB(config-if)#interface po2`	Configure LAG interface
`Spine2-SiteB(config-if)#mtu 1600`	Set the MTU
`Spine2-SiteB(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine2-SiteB(config-if)#ip address 10.99.22.2/30`	Assign IPv4 address
`Spine2-SiteB(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type

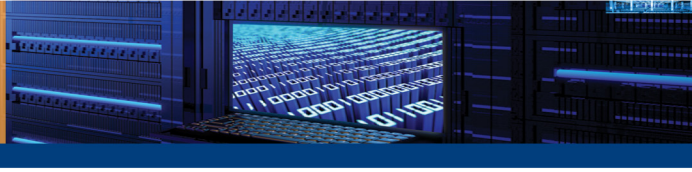
`Spine2-SiteB(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine2-SiteB(config-if)#ip ospf cost 2`	Set OSPF cost
`Spine2-SiteB(config-if)#interface po3`	Configure LAG interface
`Spine2-SiteB(config-if)#description *Conon to Edge1-SiteB*`	Assign a description to the interface
`Spine2-SiteB(config-if)#mtu 1600`	Set the MTU
`Spine2-SiteB(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine2-SiteB(config-if)#ip address 10.2.211.2/30`	Assign IPv4 address
`Spine2-SiteB(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine2-SiteB(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine2-SiteB(config-if)#ip ospf cost 10000`	Set OSPF cost

Spine1-SiteB

`Spine1-SiteB(config)#ip vrf management`	Create a VRF (Virtual Routing and Forwarding) RIB (Routing Information Base)
`Spine1-SiteB(config-vrf)#load-balance rtag7`	Enable rtag7 load balancing globally
`Spine1-SiteB(config)#load-balance rtag7 macro-flow`	Configure rtag7 load balancing to choose a hash function dynamically
`Spine1-SiteB(config)#load-balance rtag7 ipv4 dest-ipv4 src-ipv4 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv4 header
`Spine1-SiteB(config)#load-balance rtag7 ipv6 dest-ipv6 src-ipv6 destl4-port srcl4-port`	Enable rtag7 load balancing based on IPv6 header
`Spine1-SiteB(config)#forwarding profile l2-profile-three`	Set the forwarding profile, making the Layer 2 address table and Layer 3 address tables almost the same size
`Spine1-SiteB(config)#hardware-profile filter ingress-ipv6 disable`	Disable ingress IPv6 filter groups
`Spine1-SiteB(config)#hardware-profile filter egress-ipv6 disable`	Disable egress IPv6 filter groups
`Spine1-SiteB(config)#qos enable`	Enable QoS
`Spine1-SiteB(config)#qos statistics`	Enable QoS statistics
`Spine1-SiteB(config)#ip pim register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Spine1-SiteB(config)#ip pim vrf management register-rp-reachability`	Enable the Rendezvous Point (RP) reachability check for PIM registers at the designated router
`Spine1-SiteB(config)#interface ce1/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine1-SiteB(config-if)#interface ce2/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine1-SiteB(config-if)#interface ce3/1`	Configure interface

`Spine1-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine1-SiteB(config-if)#interface ce4/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 4 mode active.`	Add interface to LAG
`Spine1-SiteB(config-if)#interface ce5/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine1-SiteB(config-if)#interface ce6/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine1-SiteB(config-if)#interface ce7/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine1-SiteB(config-if)#interface ce8/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 4 mode active`	Add interface to LAG
`Spine1-SiteB(config)#interface ce11/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteB(config)#interface ce12/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteB(config)#interface ce13/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteB(config)#interface ce14/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteB(config)#interface ce15/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteB(config)#interface ce16/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteB(config)#interface ce17/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteB(config)#interface ce18/1`	Configure interface
`Spine1-SiteB(config-if)#channel-group 2 mode active`	Add interface to LAG
`Spine1-SiteB(config)#interface ce21/1`	Configure interface
`Spine1-SiteB(config-if)#speed 40g`	Set the link speed of the interface
`Spine1-SiteB(config-if)#channel-group 3 mode active`	Add interface to LAG
`Spine1-SiteB(config)#interface ce22/1`	Configure interface
`Spine1-SiteB(config-if)#speed 40g`	Set the link speed of the interface

`Spine1-SiteB(config-if)#channel-group 3 mode active`	Add interface to LAG
`Spine1-SiteB(config)#interface lo`	Configure loopback interface
`Spine1-SiteB(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Spine1-SiteB(config-if)#ip address 10.0.2.8/32 secondary`	Assign secondary IPv4 address
`Spine1-SiteB(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Spine1-SiteB(config-if)#ip ospf cost 1`	Set OSPF cost
`Spine1-SiteB(config-if)#interface lo.management`	Configure loopback management interface
`Spine1-SiteB(config-if)#mtu 1500`	Set the MTU
`Spine1-SiteB(config-if)#ip vrf forwarding management`	Associate the interface with the management VRF
`Spine1-SiteB(config-if)#ip address 127.0.0.1/8`	Assign IPv4 loopback address
`Spine1-SiteB(config-if)#ipv6 address ::1/128`	Assign IPv6 loopback address
`Spine1-SiteB(config-if)#router ospf`	Enter OSPF router mode
`Spine1-SiteB(config-router)#ospf router-id 10.0.2.8`	Assign a router identifier
`Spine1-SiteB(config-router)#bfd all-interfaces`	Enable BFD on all interfaces
`Spine1-SiteB(config-router)#timers spf exp 50 50`	Set the Shortest-Path First (SPF) best-path schedule minimum and maximum delay between receiving a change to SPF calculation in milliseconds
`Spine1-SiteB(config-router)#timers throttle lsa all 0 1 1`	Set the rate-limiting intervals for OSPF LSA generation
`Spine1-SiteB(config-router)#timers lsa arrival 1`	Set the minimum interval to accept the same LSA from OSPF neighbors
`Spine1-SiteB(config-router)#network 10.0.2.8/32 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine1-SiteB(config-router)#network 10.2.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine1-SiteB(config-router)#network 10.99.0.0/16 area 0.0.0.0`	Enable OSPF routing for the area ID on interfaces with IP addresses that match the network address
`Spine1-SiteB(config-router)#bfd interval 3 minrx 3 multiplier 3`	Set the BFD transmit and receive intervals, and the hello multiplier value
`Spine1-SiteB(config)#interface po1`	Configure LAG interface
`Spine1-SiteB(config-if)#mtu 1600`	Set the MTU
`Spine1-SiteB(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine1-SiteB(config-if)#ip address 10.99.12.2/30`	Assign IPv4 address
`Spine1-SiteB(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine1-SiteB(config-if)#port-channel min-links 6`	Set the minimum number of links that need to be up in the LAG interface
`Spine1-SiteB(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine1-SiteB(config-if)#ip ospf cost 10`	Set OSPF cost



`Spine1-SiteB(config-if)#interface po2`	Configure LAG interface
`Spine1-SiteB(config-if)#mtu 1600`	Set the MTU
`Spine1-SiteB(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine1-SiteB(config-if)#ip address 10.99.22.1/30`	Assign IPv4 address
`Spine1-SiteB(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine1-SiteB(config-if)#port-channel min-links 6`	Set the minimum number of links that need to be up in the LAG interface
`Spine1-SiteB(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine1-SiteB(config-if)#ip ospf cost 12`	Set OSPF cost
`Spine1-SiteB(config-if)#interface po3`	Configure LAG interface
`Spine1-SiteB(config-if)#description *oon to Edge1-SiteB*`	Assign a description to the interface
`Spine1-SiteB(config-if)#mtu 1600`	Set the MTU
`Spine1-SiteB(config-if)#load-interval 30`	Set the length of time for which data is used to compute load statistics
`Spine1-SiteB(config-if)#ip address 10.2.111.2/30`	Assign IPv4 address
`Spine1-SiteB(config-if)#port-channel load-balance rtag7`	Load balance hashing based on packet type
`Spine1-SiteB(config-if)#ip ospf network point-to-point`	Set the OSPF network type to point-to-point
`Spine1-SiteB(config-if)#ip ospf cost 10000`	Set OSPF cost

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