

Validated Design Solution Overview:

Executive Summary

Telecommunications service providers are rapidly transforming their networks to support 5G, edge computing, cloud native network functions (CNFs), artificial intelligence (AI), and modern digital services. Traditional network architectures, built around dedicated hardware appliances, lack the agility, scalability, and automation required to support these evolving service demands.

HPE Juniper Networking Telco Cloud solution addresses these challenges by providing a shared, multi-tenant cloud infrastructure capable of hosting both cloud-native and high-performance workloads. It enables network functions and applications to be deployed as software on industry-standard servers, allowing operators to scale services dynamically, reduce operational complexity, and accelerate service delivery.

Solution Overview

The *Telco Cloud EVPN VXLAN Data Center Fabric with HPE Networking Apstra Data Center Director* offers comprehensive guidance on deploying a IPv6 only 3-stage data center fabric with EVPN-VXLAN. The fabric serves as a common transport infrastructure, enabling secure multi-tenancy through Layer 2 and Layer 3 segmentation while maintaining operational simplicity. HPE Juniper Networking Apstra Data center director automation and network management fully supports this design. [Hybrid Telco Cloud Solution Architecture](#) diagrams the recommended setup.

The architecture supports two workload connectivity models:

1. JCNr-based cloud native networking, where tenant connectivity is provided through MPLS-over-UDP overlays.
2. SR-IOV-based networking, where performance-sensitive workloads use Q-in-Q encapsulation and direct hardware acceleration.

The Telco Cloud solution combines an automated EVPN-VXLAN fabric, cloud native networking, high-performance workload connectivity, and centralized routing services to provide a scalable multi-tenant platform.

HPE Networking Apstra Data Center Director 6.2

Provides intent-based deployment, automation, assurance, and lifecycle management for the EVPN-VXLAN fabric.

EVPN-VXLAN Fabric

Serves as the common transport infrastructure, providing tenant isolation, IP reachability, and scalable Layer 2 and Layer 3 connectivity across the data center. The leaf switches only support layer 2 and do not host Anycast IRB gateways.

Border Leaf Switches

Act as the fabric edge, hosting Anycast IRB gateways and providing Layer 3 reachability within individual routing domains while connecting the fabric to the Off-Ramp Gateway.

Juniper Cloud-Native Router (JCNR)

Provides cloud-native networking for Kubernetes workloads using MPLS-over-UDP overlays, enabling scalable tenant connectivity without requiring Kubernetes nodes to function as VXLAN tunnel endpoints.

Virtual Route Reflector (vRR)

Simplifies the BGP control plane by providing centralized route reflection between JCNR instances and the Off-Ramp Gateway, eliminating the need for a full-mesh BGP topology.

Off-Ramp Gateway

Serves as the centralized routing and policy enforcement point, providing inter-subnet routing, inter-VRF route leaking, inter-tenant connectivity, JCNR-to-SR-IOV interworking, and external network access.

SR-IOV Infrastructure

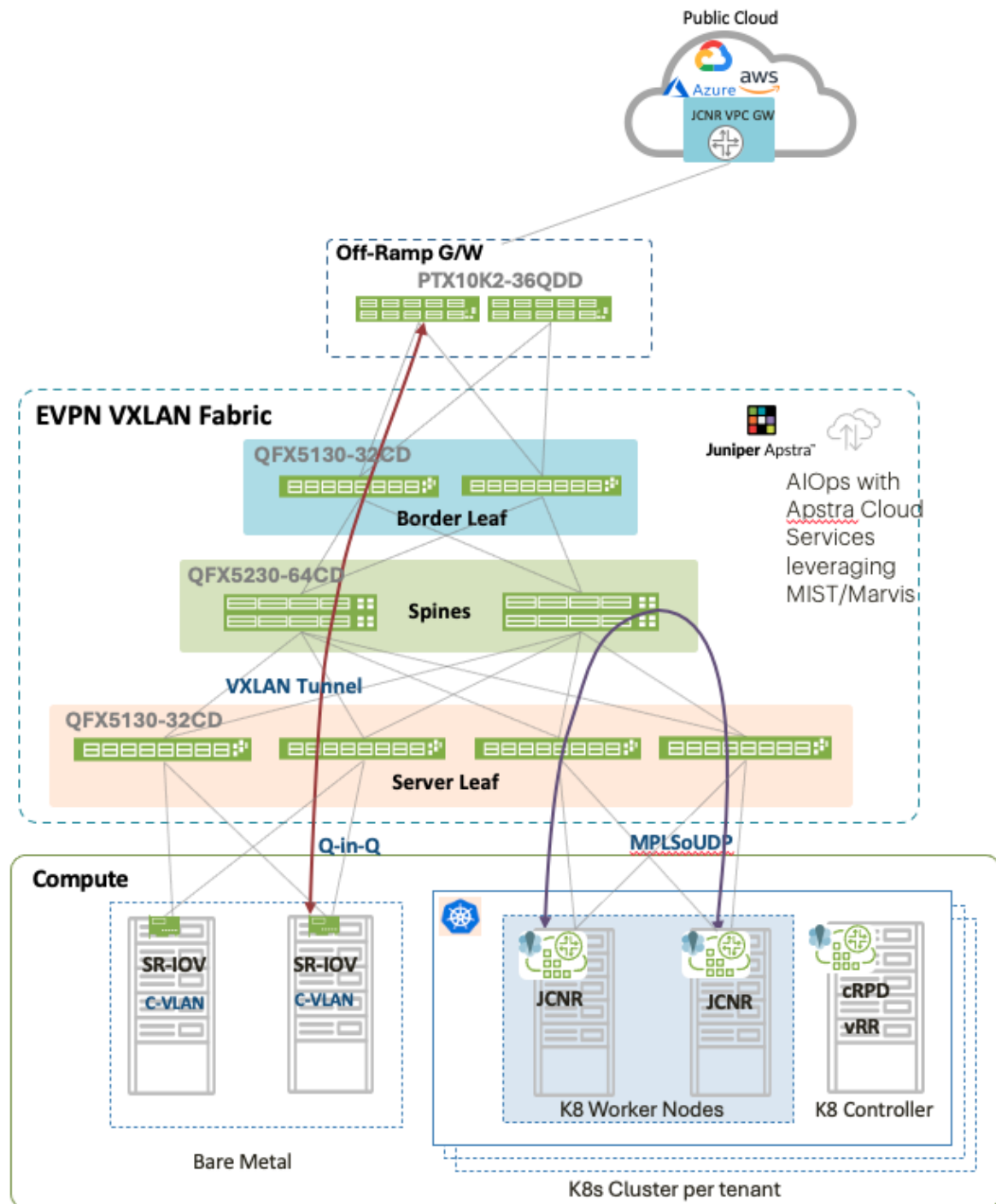
Delivers high-performance, low-latency networking for performance-sensitive workloads using Q-in-Q encapsulation supported by Apstra 6.2.

Kubernetes Cluster

Provides the compute platform for hosting cloud-native applications, JCNR services, and the vRR while supporting scalable containerized workload deployment.

Together, these components create a secure, scalable, and automated Telco Cloud platform capable of supporting cloud-native, virtualized, and bare-metal workloads within a common multi-tenant infrastructure. As with all HPE Juniper Networking validated designs, this solution follows best practices as determined by HPE Networking's subject matter experts, including support teams.

Figure 1: Hybrid Telco Cloud Solution Architecture



HPE Juniper Networking has extensively tested the design, with customers deploying it across the globe. Advanced validation testing combined with widespread adoption simplify troubleshooting and shorten the support cycle, leading to a more stable data center fabric and reduced operational costs.

This validated design consists of an Bridged Overlay (BO) based network architecture with spine, leaf, and border leaf switches in a high-availability configuration. All hardware components and software versions are tested extensively with simulated and real-world traffic.

Benefits

- Repeatability – prescriptive designs, where all validated design customers benefit from lessons from worldwide deployments.
- Reliability – integrated, best practice designs tested with real-world traffic and described with measured results.
- Velocity – streamlined deployment with step-by-step guidance, automation, and prebuilt integrations.

Table 1: Telco Cloud Service Provider Devices and Positioning

Server Leaf Switches	Border Leaf Switches	Spine	Offramp Routers	Bare Metal Servers (SR-IOV and JCNr)
QFX5130-48C	QFX5130-32CD	QFX5230-64CD	PTX10002-36QD D	HPE DL360 Gen DELL PowerEdge R750

The Telco Cloud validated design is validated using the specified HPE Juniper Networking devices and features the architectural flexibility to accommodate other device models in future iterations of this design.

About Validated Designs

Validated designs are the product of cross-functional collaboration among HPE Networking’s top experts—product teams, solution architects, support, development, and testing. The program’s goal: deliver well-characterized, multidimensional solutions that reduce complexity and support burden for networking teams. We select designs based on industry standards and real-world customer usage, targeting the most common use cases with practical, economical, fully tested solutions. Each design undergoes end-to-end validation testing to confirm best practices, with extensive lab testing quantifying performance across multiple teams. Once the required physical infrastructure is built, the design undergoes rigorous validation to prove solution viability, with results documented in test reports. Throughout validation, our engineers work directly with software developers to resolve issues quickly. Ongoing regression testing then confirms functionality, performance, reliability, and security across new software versions.

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