Arista WAN Routing System

Modern WAN Evolution

The distribution of users and applications across campus, cloud, SaaS, edge, and data center environments is creating new challenges for wide-area networking architectures and Internet routing:

- Traditional WAN and SD-WAN architectures are often monolithic solutions that do not extend visibility or operational consistency into the campus, data center, and cloud environment
- Many SD-WAN vendors developed highly proprietary technologies that locked clients into their systems and made troubleshooting difficult
- Application architectural evolution often mandates transport diversity and the secure usage of Internet and Cloud Transit options.
- SD-WAN brought valuable features to customers; however, traditional federated routing systems are still the majority of the WAN market.

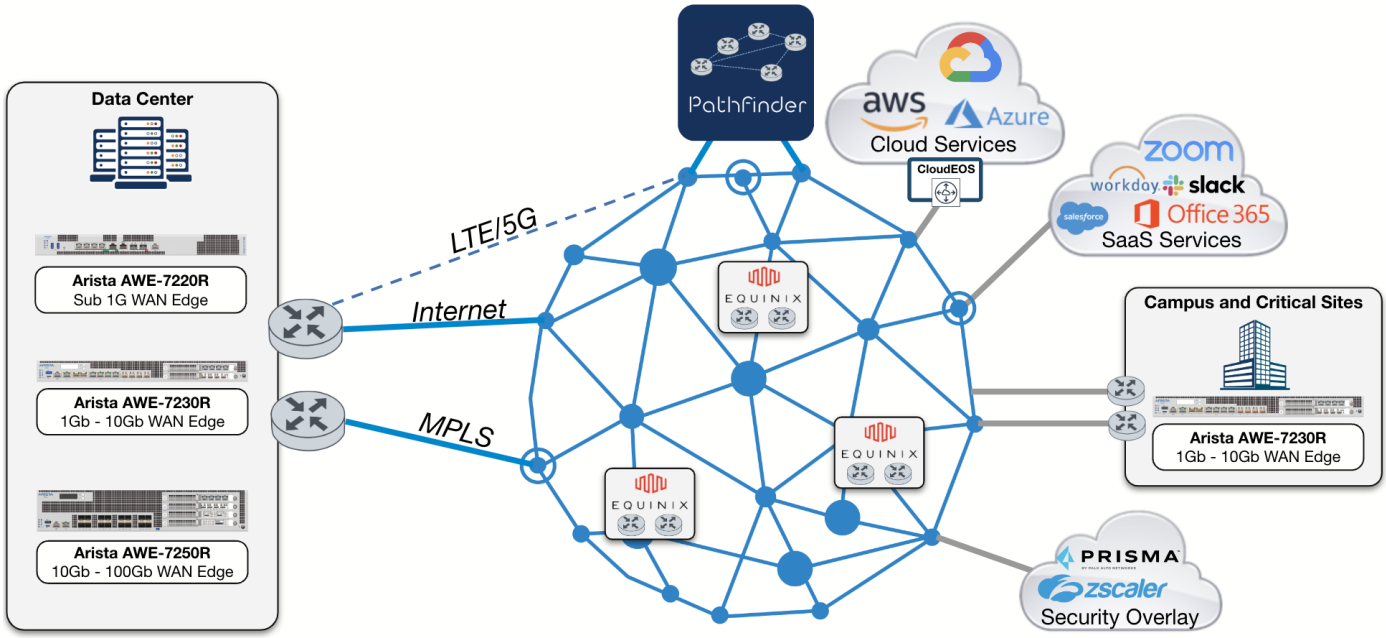


Figure 1: Arista WAN Routing System

Arista introduced the WAN Routing System (Figure 1) to address the above challenges with the following key capabilities:

- Enterprise Class Routing Systems: Physical, Virtual, and Cloud – all using identical EOS software with consistent capabilities. Physical systems are designed for dual-router and carrier-diverse deployments in critical sites, campus, and data centers as well as in carrier-neutral and cloud-adjacent transit hubs.
- Dual Modality: Systems can operate in a classic and stand-alone routing model with traditional federated routing protocols within public and private networks, or operate in a more 'SD-WAN' model with configurations procedurally rendered, tested, and automatically deployed with CloudVision Pathfinder Service.
- Multi-Transit: MPLS, Direct Internet, Cloud Transit, 5G/LTE, and SASE/ZTNA Overlay Options.
- Transit Hubs: dynamic provisioning and scaling of carrier-neutral densely peered environments with Equinix Metal, Fabric, and Network Edge services (CloudEOS on Equinix).
- Application Identification: identify and classify applications into virtual topologies which are then automatically traffic engineered.
- Adaptive Overlays: Adaptive Virtual Topology with traffic engineering, application awareness, IPsec AutoVPN cryptography, and self-healing.
- Dynamic Path Selection and Path Computation: self-healing and traffic engineering for edge, aggregation, and core.

Solution Overview

The Arista WAN Routing System solution architecture (Figure 2), enabled with the CloudVision Pathfinder Service delivers the following key capabilities

- WAN Fabric - Secure Encrypted Transport
- Adaptive Virtual Topology - Application-Aware Routing
- CloudVision Pathfinder Service
- Service Onboarding
- Enterprise-Class Routing System
- Arista Validated Design (AVD)
- CloudVision WAN Management

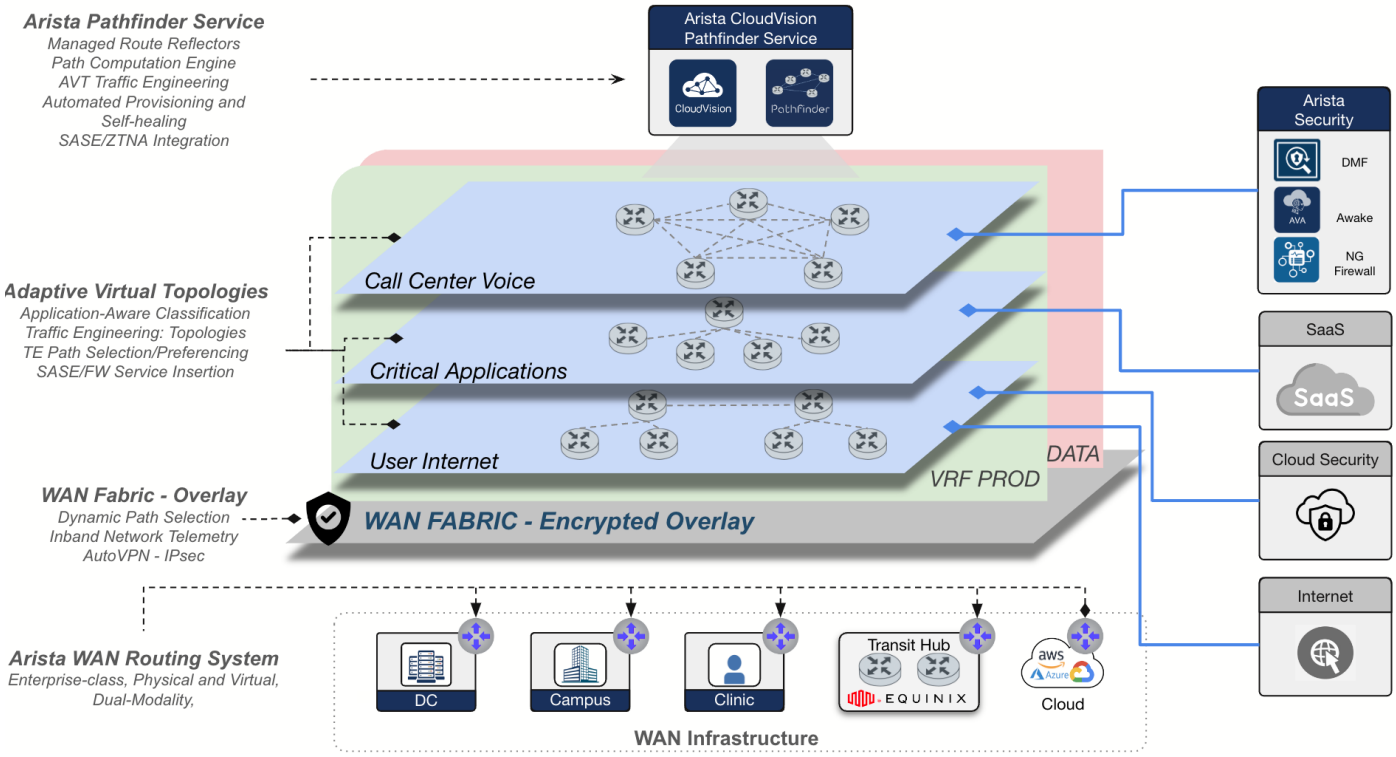


Figure 2: Arista CV Pathfinder Solution Architecture

WAN Fabric - Secure Encrypted Transport

To provide secure encrypted transport over the end-to-end network, a WAN fabric is built between the routing systems deployed at each customer location - across data center, campus, branch, and cloud. The WAN fabric is a secure overlay network, built and maintained by combining Dynamic Path Selection (DPS), Inband Network Telemetry (INT), and Automated Virtual Private Network (Auto-VPN) technologies

DPS provides secure tunneled paths using IPSec encryption over MPLS, public internet, and 5G/LTE transport networks. Inband Network Telemetry (INT), monitors the network performance (latency, jitter, packet loss, throughput, and MTU) of each path and is significantly more accurate than out-of-band monitoring or probe-based solutions. DPS steers application traffic into these different paths based on the real-time performance attributes of the network. For example, if there is performance degradation on an MPLS link, sensitive real-time traffic such as IP voice can be rerouted to a different path with better performance.

Managing a large end-to-end network can be operationally challenging. Arista Auto-VPN automatically discovers the routing systems at remote sites, whether directly connected to the WAN or Internet including behind a NAT device, and establishes DPS tunnels between all of the sites greatly simplifying network operations.

Adaptive Virtual Topology - Application-Aware Routing

Arista Adaptive Virtual Topology (AVT) is a network abstraction construct on top of the WAN Fabric that allows customers to put applications into groups, applying different network policies, including:

- Application Group Policy and Ingress Classification: DPI (Deep Packet Inspection) based to identify thousands of applications automaticall, as well as classic interface, sub-interface, and 5-tuple based classification
- Network Topology Construction: hub-spoke, full mesh and regional full mesh
- Traffic Engineering: maps the AVT and its associated performance requirements to the available paths based on real-time path performance, business policy including path cost and billing model, and traffic prioritization
- Internet Exit Policy: local internet exit, remote internet exit through a firewall and internet exit through a cloud security/SASE provider
- QoS Policy:, marking, queuing and shaping are also bound to the AVT
- Cloud Transit: the ability to utilize a cloud provider's high performance backbone can be set on a per-AVT basis

For example, call center voice traffic often requires full-mesh connectivity using the lowest latency paths available; a credit card processing application might specify a hub-spoke topology, with an MPLS link as primary and Internet link as backup, to meet compliance requirements; SaaS applications such as Office365 benefit by having traffic locally break out to the Internet and directed to the SaaS provider's closest point of presence. The AVT construct allows customers to provision network services that meet and then automatically maintain application SLAs.

CloudVision Pathfinder Service with Transit Hubs - Traffic Engineering

The Enterprise WAN is getting more complex with the adoption of public cloud, SaaS, and a distributed workforce, the point-to-point tunnel-based approach from many SD-WAN vendors is often not enough to meet today's IT requirements.

Arista introduced the CloudVision Pathfinder Service combined with Transit Hubs to provide a holistic traffic engineering approach to improving the end-to-end enterprise application experience and provide self-healing capabilities across the Internet, Cloud, critical sites, and campus and data center environments. Arista Pathfinder Service includes the Pathfinder Path Computation Engine that monitors and dynamically reprograms all of the routing systems within an enterprise and the network performance of all paths, computing the best possible path for every application. This could be a direct path between two sites or a multi-hop path that goes through a transit hub point.

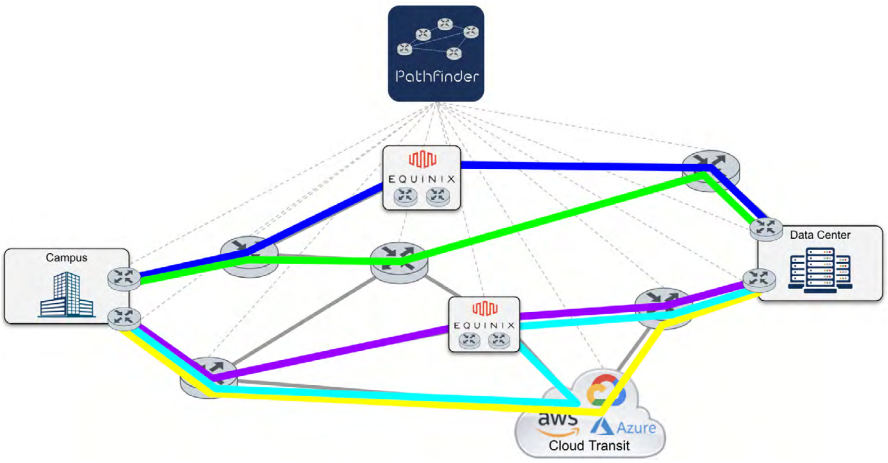


Figure 3: Pathfinder - Distributed Path Computation Engine

Transit Hubs are physical or virtual WAN routing systems deployed in carrier-neutral and cloud-adjacent facilities with dense telecommunications interconnection. Arista has partnered with Equinix to allow enterprise customers to deploy Transit Hubs using CloudEOS on Equinix Network Edge and Bare Metal Cloud Platforms and leveraging the Equinix Fabric backbone to deliver a superior experience for enterprise applications.

- Fast access to the public cloud providers via Equinix's 27+ global metros
- End-to-end encryption from the data center, campus, and branch to the cloud
- Improving site-to-site connectivity using Equinix Fabric with Arista Pathfinder Service
- Flexible deployment with Equinix Network Edge and Bare Metal Cloud

Service Onboarding

Seamlessly enabling enterprise network services like firewalls, IPS, IDS, observability tools and many more are a key priority for IT teams. The Arista CloudVision Pathfinder solution allows customers to connect the Arista WAN Fabric to internal and external services and define an AVT policy to route traffic to wherever the service resides. Typical enterprise network services include:

- On-premises Firewall Insertion
- Secure Internet Exit (local or remote with firewall)
- Cloud Security Access (SASE) / ZTNA
- SaaS Application Access
- Enhanced Observability (with Arista DMF)
- Network Detection and Response (with Arista NDR and Edge Threat Management)

All of these can be easily inserted using the Arista CloudVision Pathfinder solution.

Enterprise-Class Routing Systems

The Arista AWE-7200R Series of WAN Systems, powered by EOS, offer the right levels of performance, scale, and resilient systems design to meet modern enterprise WAN edge and aggregation requirements with the following highlights:

- Delivering from 1Gbps to over 50Gbps of bidirectional AES256 encrypted traffic
- Supporting 1/10/100GbE interfaces and flexible network modules
- Redundant power supplies and fan assemblies
- Arista AWE-7230R is equipped with FTW (fail-to-wire) ports to ensure WAN link availability during power outages, system reloads, and other disruptive events.

Arista AWE-7220R WAN Routing System (Figure 3), provides up to 1Gbps IPsec encrypted throughout and 5Gbps IP routing, with 4x 1G BASE-T POE++ ports, 1x 1G BASE-T port, and 2x 10G SFP+ ports.

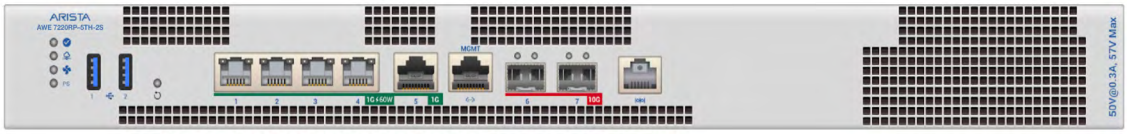


Figure 4: Arista 7220R WAN Routing System

Arista AWE-7230R WAN Routing System (Figure 3), provides up to 5Gbps IPsec encrypted throughput and 30Gbps IP routing, with 4x 1/10GbE RJ45 Ports (with 2x Fail to Wire Ports) and 4x 1/10GbE SFP+ Ports, and two expansion slots.

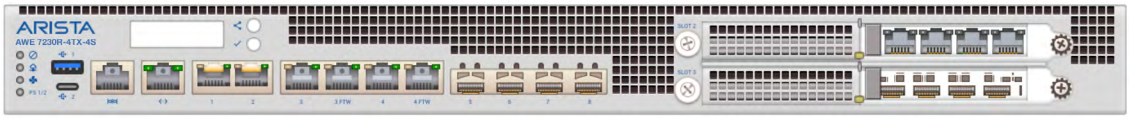


Figure 5: Arista 7230R WAN Routing System

Arista AWE-7250R WAN Routing System (Figure 4), provides up to 50Gbps IPsec encrypted throughput and 100G IP routing, with 16 x 1/10G SFP+ Ports, and four expansion slots.

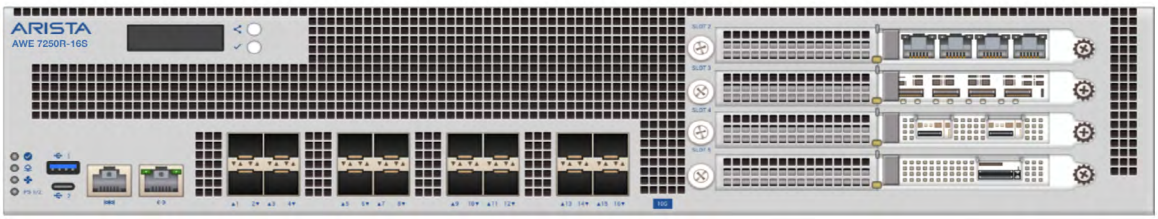


Figure 6: Arista 7250R WAN Routing System

Arista AWE-7200R Series WAN Systems are suited for deployments in critical sites requiring high availability and service resilience, across multiple different WAN service providers.

In addition, Arista CloudEOS Router (Figure 5) with the same functionality, is offered in public cloud providers like AWS, Azure, GCP, and Equinix platform, as well as private VM deployment with the support of VMware ESXi and Linux KVM.

Figure 7: Arista CloudEOS Router for Cloud and Virtual Deployment

Arista Validated Design (AVD)

Arista Validated Design (AVD) has been widely deployed and acknowledged by customers on their path to network automation or have just started looking at network automation. AVD provides a consistent network-wide model for network engineers to deploy network automation at scale, from DC to Campus, to Cloud, and now with the expanded capabilities to the Wide Area Network (WAN).

Starting from the 4.7 release in AVD, customers can now use the AVD framework to define their global WAN infrastructure with configuration rendering and staging in conjunction with CloudVision for the review process. Then only after the customer has viewed and approved the change in CloudVision will the actual configurations be pushed down to the device level.

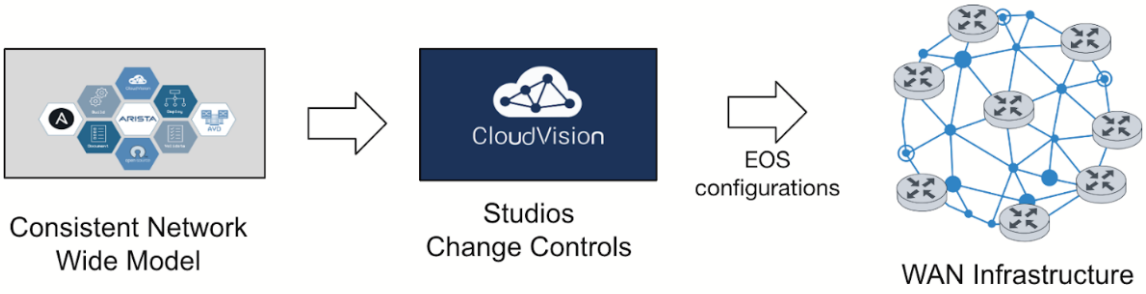


Figure 8: Arista Validated Design for WAN Deployments

CloudVision WAN Management

CloudVision has been the foundation for customers regarding network management because of its rich telemetry with time-based visibility. Now with expanded feature sets specifically built for the WAN and CV Pathfinder use-case, the wan operator can manage their global WAN

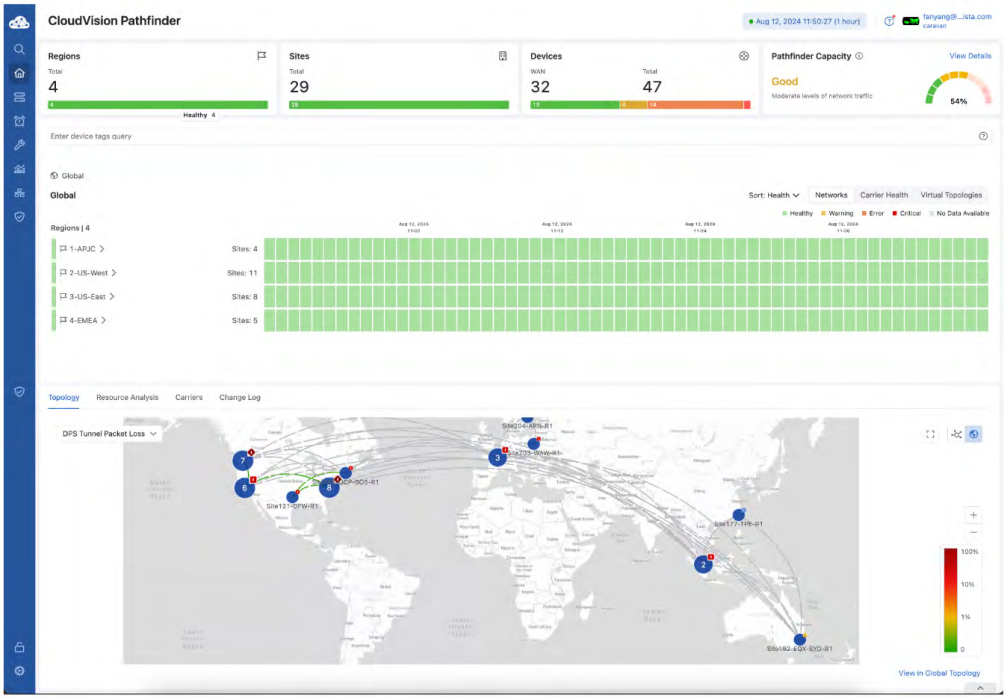


Figure 9: CV Pathfinder WAN Dashboard - with Topology Tab

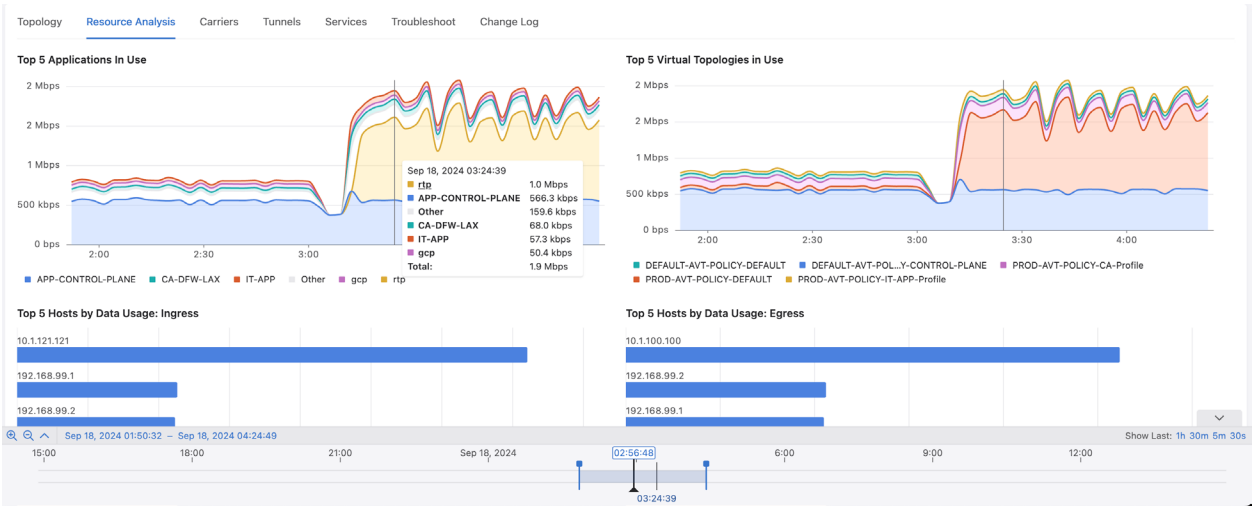


Figure 10: CV Pathfinder WAN Dashboard - Resource Tab

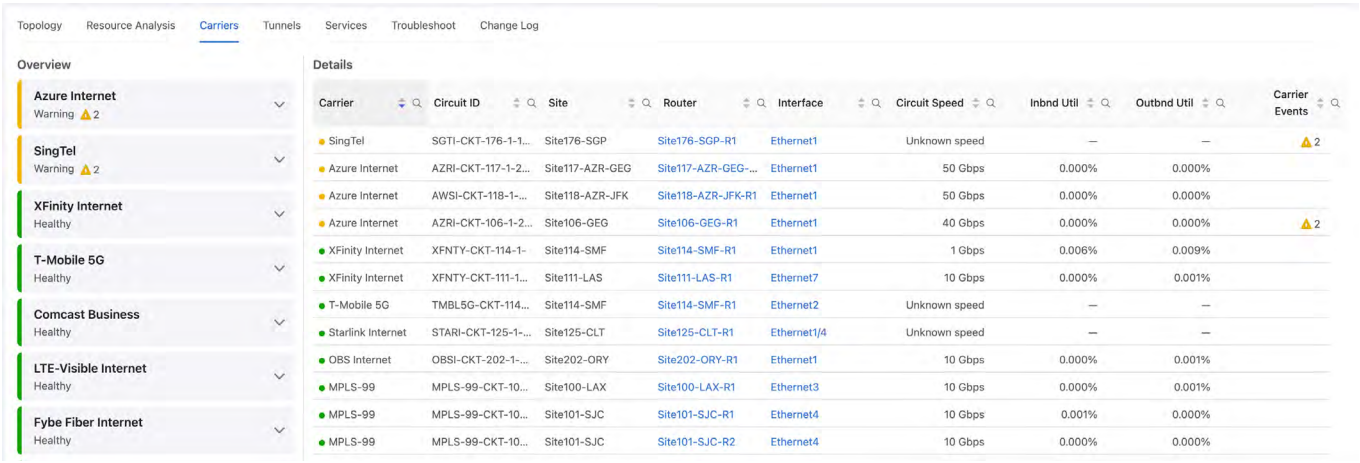


Figure 11: CV Pathfinder WAN Dashboard - Carrier Tab

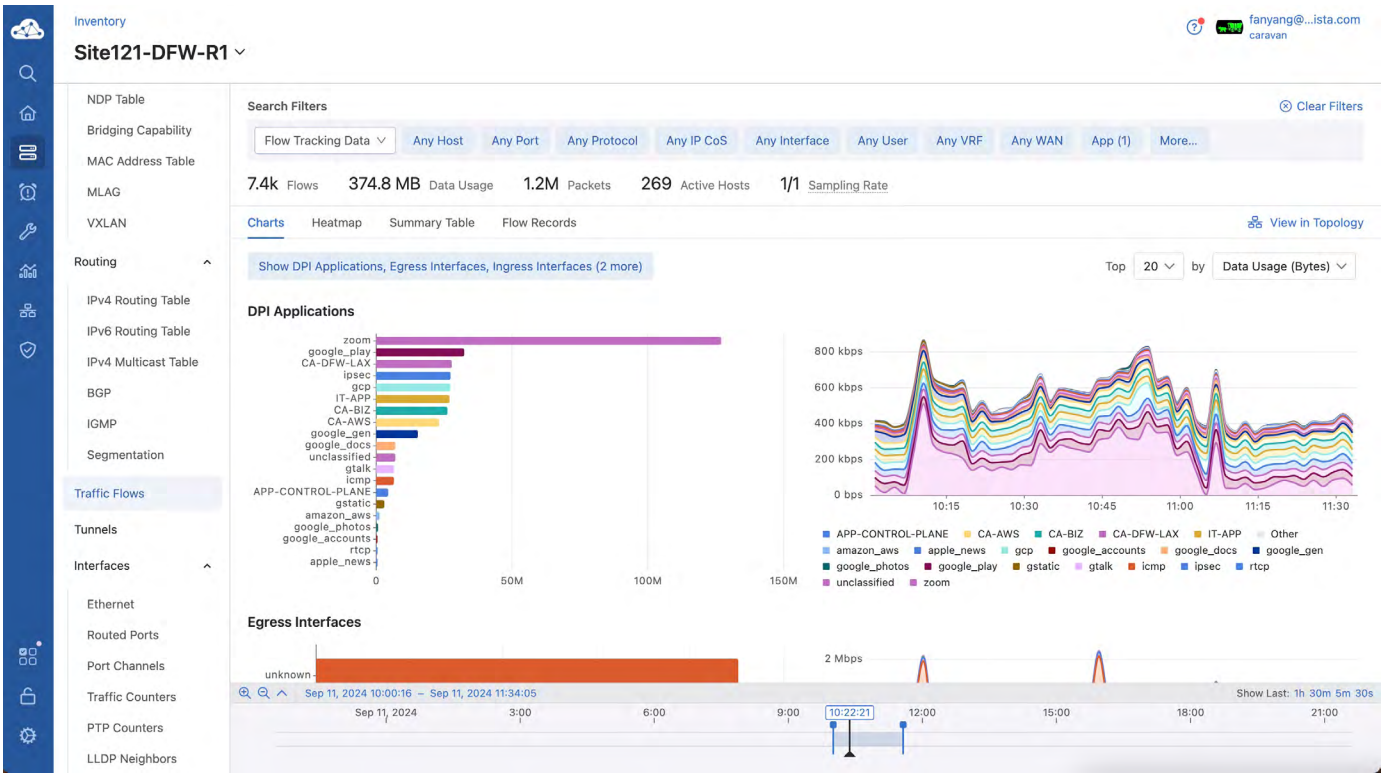


Figure 12: CV Pathfinder Traffic Flow Analysis with DPI Applications

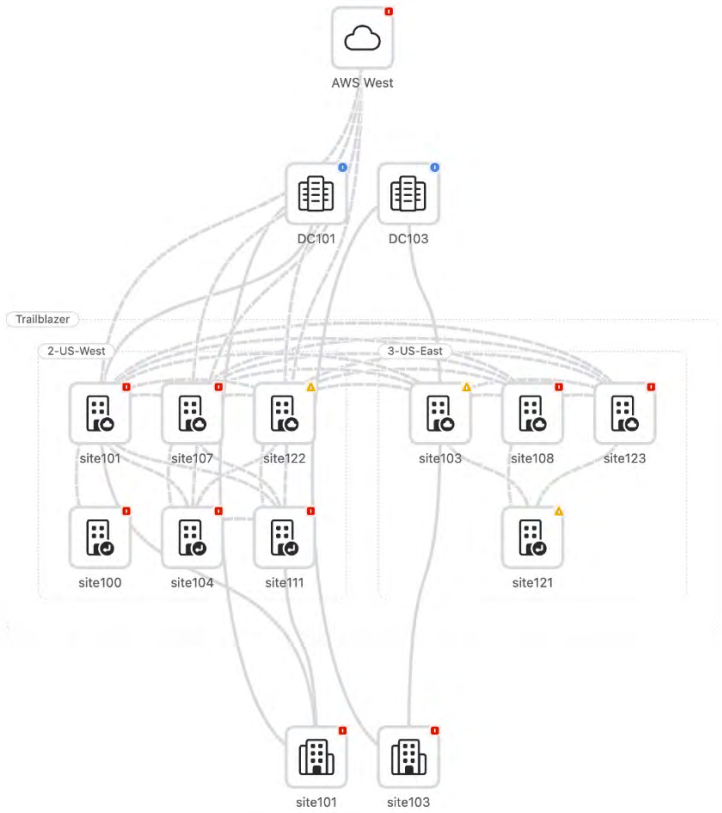


Figure 13: Logical Topology with Hierarchy

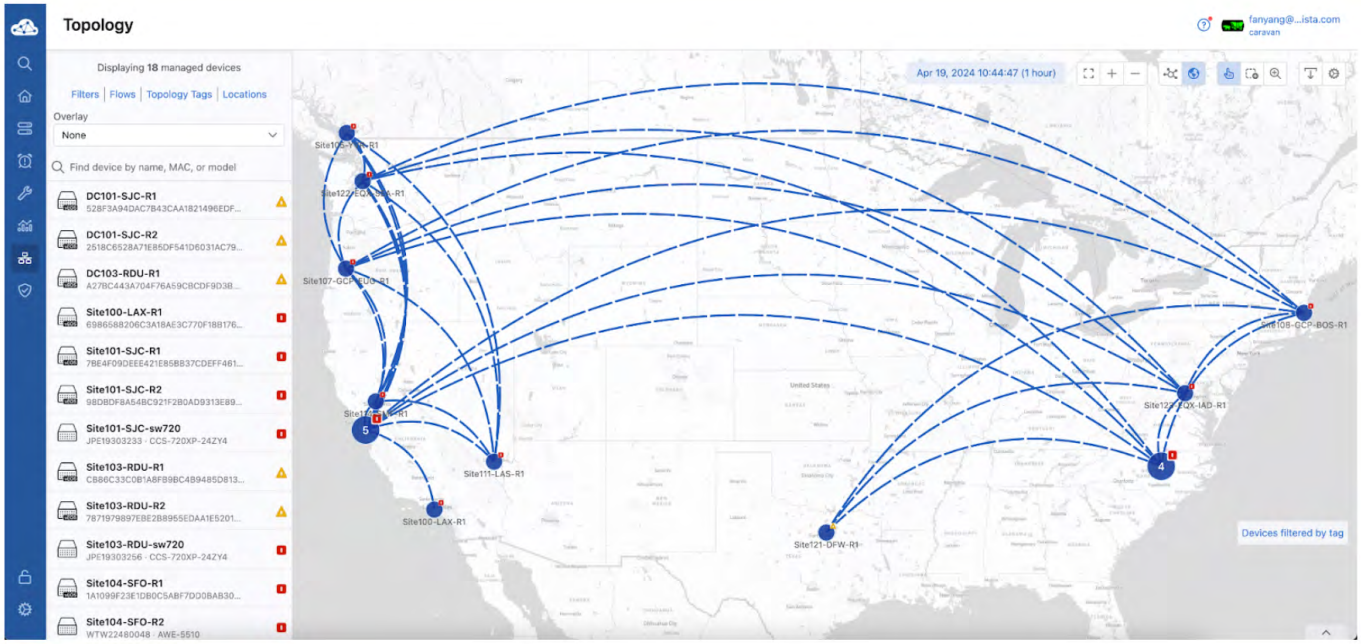


Figure 14: Geographic Topology

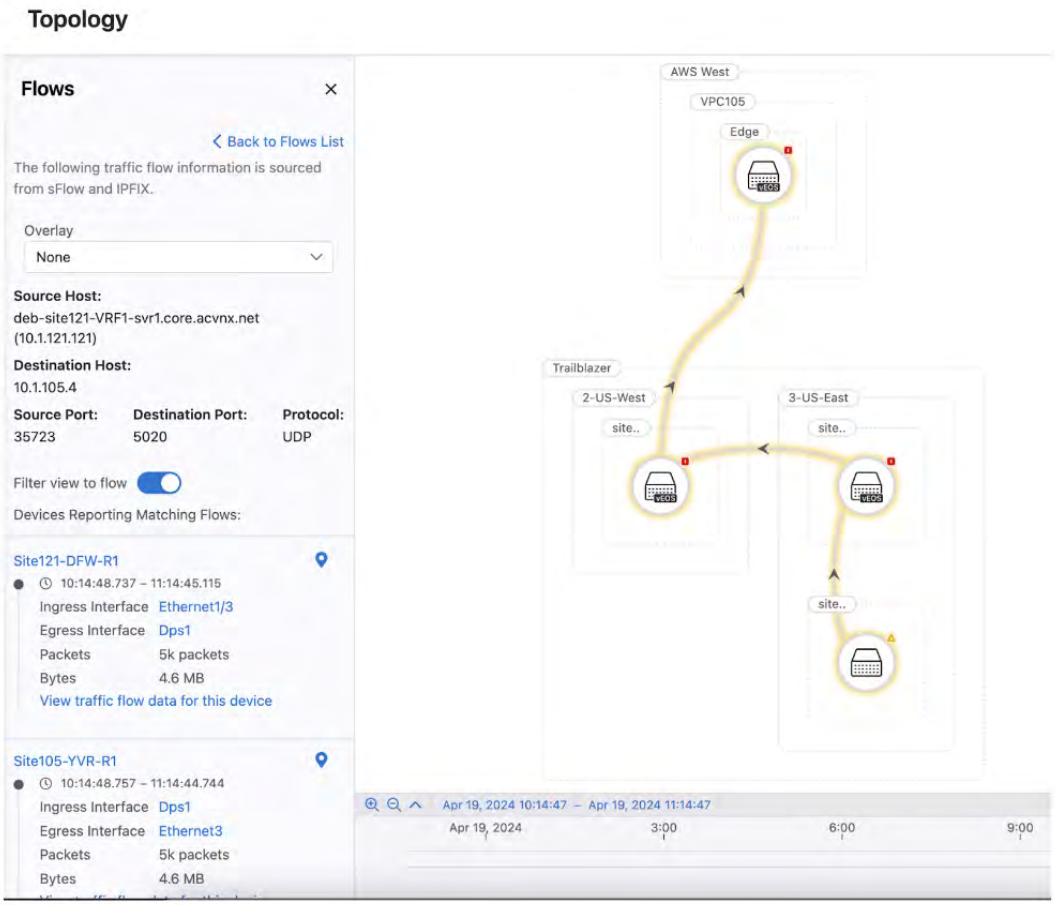


Figure 15: Traffic Flow Highlight with Flow Direction

Use Cases

The dual modality of the Arista WAN Routing System provides flexibility to deploy the solution for different use cases:

Traditional WAN Services

In enterprise WAN networks today, traditional WAN services are still being delivered on routed WAN networks, based on traditional federated routing protocols and usually manually configured via the CLI. Arista WAN Routing Systems can be deployed as a standalone system to meet these well-known and established requirements, but with a more modern automated approach (Figure 6).

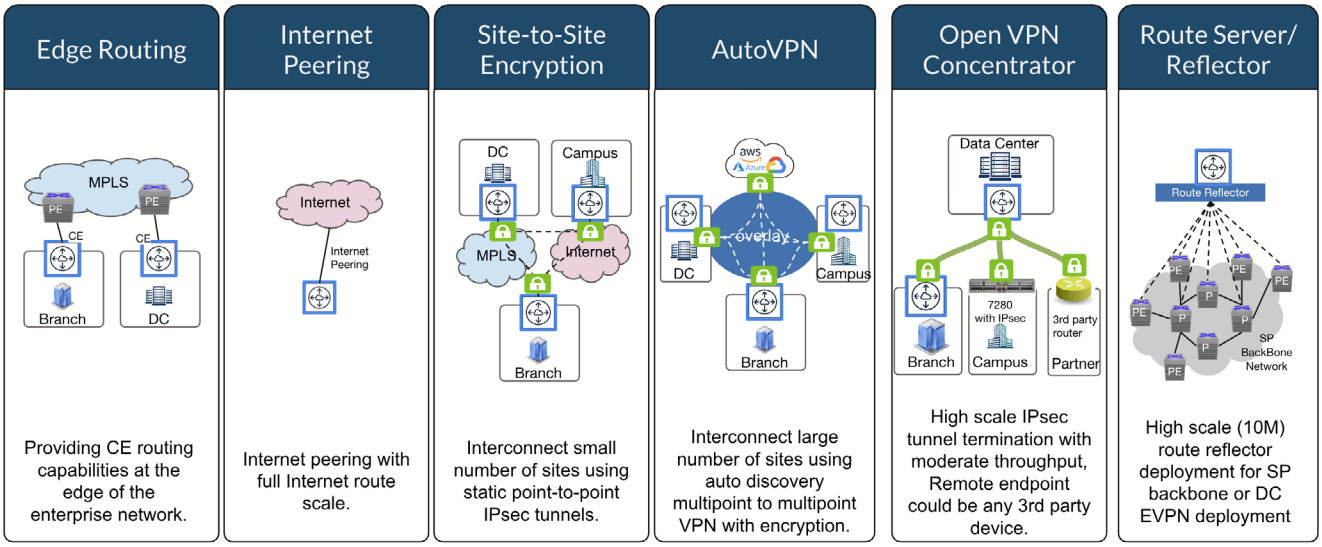


Figure 16: Traditional WAN Services - Use Cases

Modern WAN Services

The evolution of applications from residing solely within enterprise data centers to a modern hybrid environment with distributed systems across campus, branch, edge, cloud, SaaS, and data centers has been the primary driver of new WAN architectures. The Arista WAN Routing System enabled by CloudVision Pathfinder Service, allows enterprise customers to modernize their WAN infrastructure and deliver a reliable and secure WAN service at the SLA that each application and user needs.

Delivering Network Services on a Shared infrastructure

Providing network services to internal and external customers over a complex WAN environment is always a challenge for IT organizations. The Arista CloudVision Pathfinder solution (Figure 7) allows customers to create different tenants for multiple business groups and separate out network resources across a shared WAN infrastructure. Within a tenant, Adaptive Virtual Topologies (AVTs) are used to further define the network policies for different users and applications.

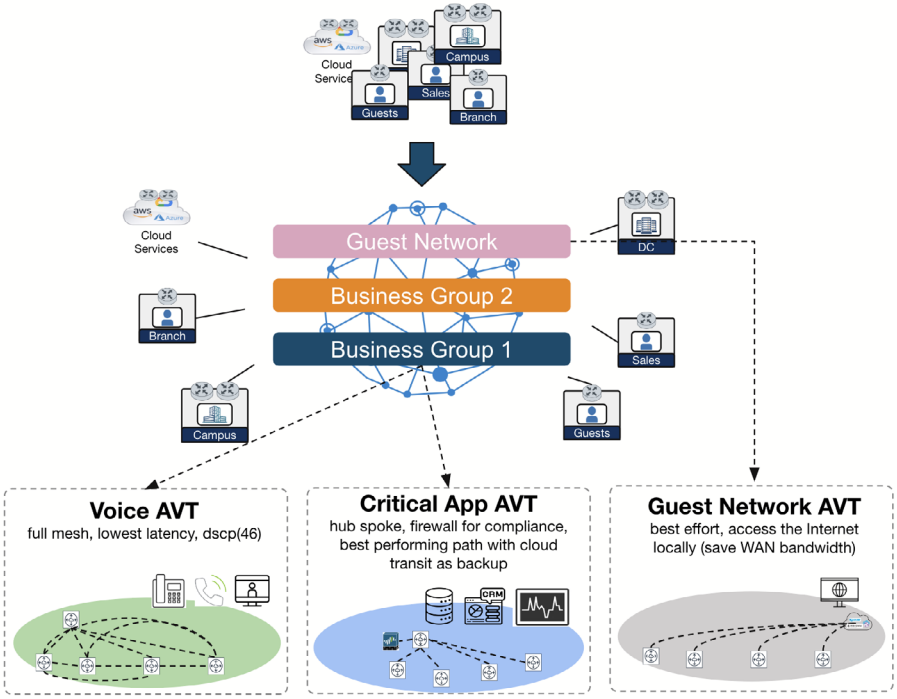
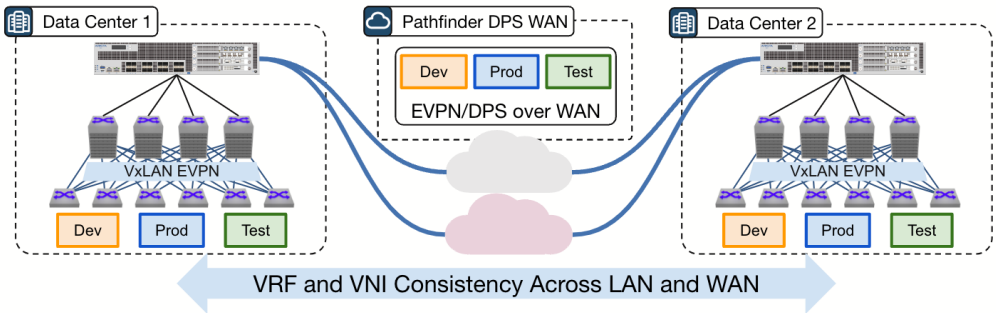


Figure 17: Delivering Network Services on a Shared Infrastructure

Multi-Domain Segmentation Across the WAN

Most enterprises have widely adopted VxLAN EVPN in their data centers, or even campus design. Where and how to extend the L3 VRF across the WAN is normally the challenge. Typically, on the router where often the LAN and WAN hand-off happens, there will be a lot of layer 3 sub-interfaces with VRF-lite configuration and running routing protocols on top with VRF peering resulting in tremendous complexity and operational overhead when a new service and VRF needs to be turned on or removed. Now on the Arista WAN Routing System, a customer can easily map a DC VRF into an L3 VRF on the WAN side of the router with just an underlay BGP peering with VxLAN, and the router will carry that VRF across the wide area network using DPS tunnel, then the remote router can map it back to the VRF used in that site where it's a dc or campus site and hand it over back to the LAN switch using VxLAN, accomplishing end to end segmentation using a consistent EVPN domain.



Use-case

- Interconnect two VxLAN EVPN domains across the WAN environment
- Stretch EVPN control plane and maintain consistent segmentation
- Dramatically reduce the configuration and operational complexity of using VRF-lite

How it works?

- On the Arista WAN Routing System, on LAN facing interface connected to the spine, map DC VRF VNI into a different L3 VNI on the WAN side of router
- Two EVPN domains could have the same or a different VRF to VNI mapping, all getting unified using the same RT.

Figure 18: Stretching L3 EVPN across the WAN

Optimizing User and Application Experience with Transit Hubs

With an ever-changing WAN environment, link failure or performance and quality degradation can happen at any time. The CloudVision Pathfinder Service (Figure 8) continuously monitors all available WAN links in real-time and finds the lowest latency and optimal link that will deliver the best operator and client experience for their critical applications. If there is a network outage or performance degradation, traffic will be rerouted for a better experience.

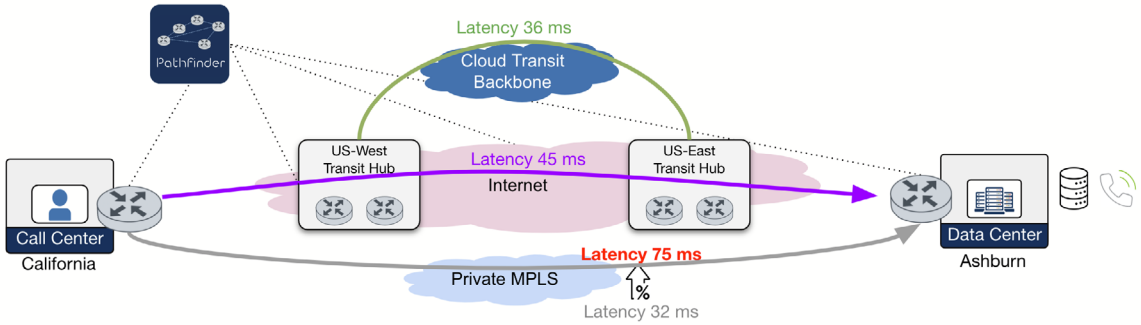


Figure 19: Optimizing User and Application Experience with Transit Hubs

Hybrid Cloud and Multi-Cloud

Consistent and secure connectivity for hybrid-cloud and multi-cloud requirements are a top priority. With Arista CloudEOS deployed at the edge of the public clouds (Figure 9), integrating with cloud-native services like AWS Transit Gateway, enterprise customers seamlessly connect their existing on-premises environments into the public clouds. This provides IPSec encryption for all data in transit, and network segmentation and enables direct edge-to-cloud access to avoid backhauling traffic through their data center or core network.

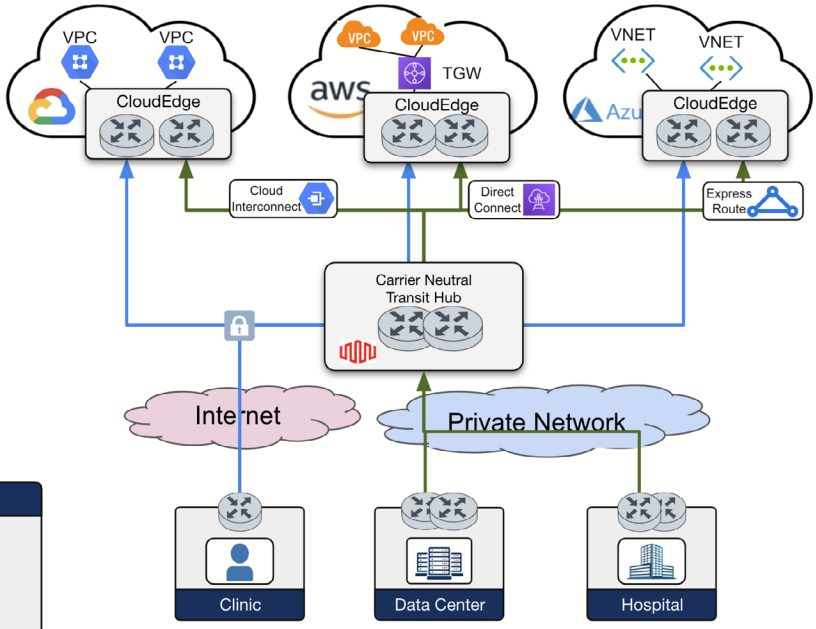


Figure 20: Multi-Cloud Connectivity

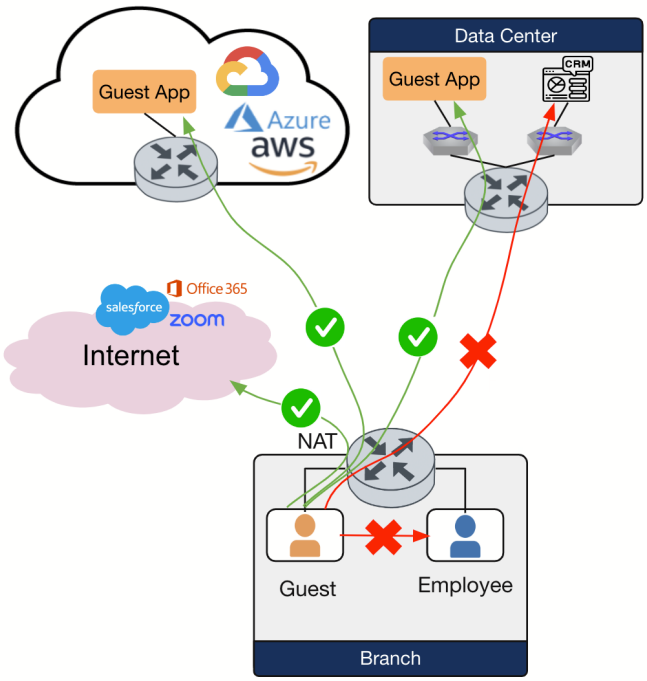


Figure 21: Providing Guest Network Access

Guest Network Access

Providing network access for guests, contractors, and partners to the existing WAN infrastructure is a key requirement for modern WAN architecture. The Arista CloudVision Pathfinder solution protects corporate resources and assets from being accessed by external users (Figure 10).

Internet Access

Within an enterprise WAN environment, employees, guests, vendors, and enterprise applications need access to the Internet securely. The Arista CloudVision Pathfinder solution is designed to provide a flexible Internet access path for different groups and applications based on their requirements and the security policies of the organization.

In the following diagram (Figure 11), different Internet access policies are applied within an organization for

- Applications: Internet traffic needs to be inspected by an on-premises firewall because of compliance reasons
- Employees: the employee to Internet traffic needs to go through a cloud security provider or via a pair of firewalls
- Guests: the guest can access the Internet directly from the branch

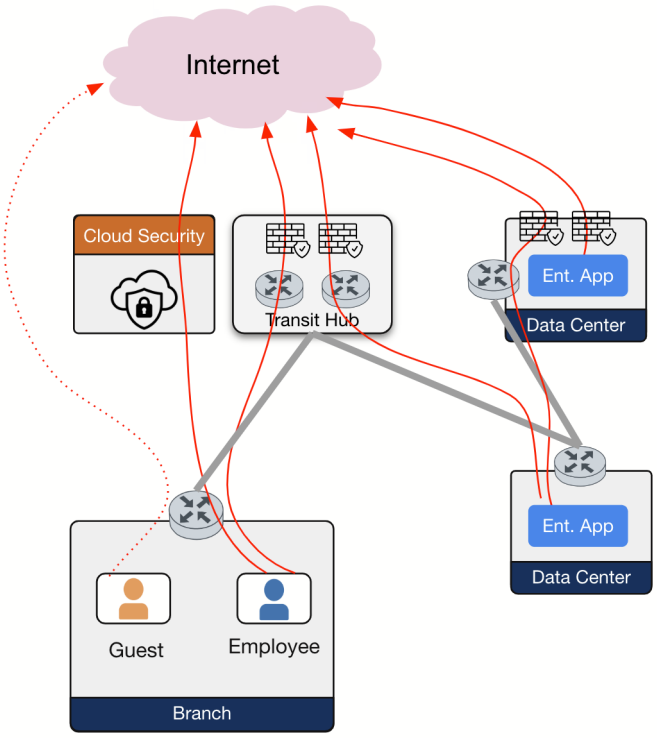


Figure 22: Providing Flexible Internet Access Options

Summary

With the Arista WAN Routing System, enterprise customers can interconnect data centers, campuses, branches, remote sites, cloud resources, and transit hubs over any transport with automated deployment, provisioning, cryptographic management, application traffic engineering provided by the CloudVision Pathfinder Service to deliver the user and application experience in a modern WAN architecture.

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October 21, 2024 05-0051-03