U.S. Pat. No. 6,861,464 (to Scott *et al.*)

EXHIBIT E

Hewlett Packard Enterprise Co. Ex. 1020, Page 1 of 56
Hewlett Packard Enterprise Co. v. Intellectual Ventures II LLC
IPR2021-01378

U.S. Pat. No. 6,816,464 – Accused Products

- **EdgeConnect Hardware Platforms**

Aruba EdgeConnect Hardware Platforms
EdgeConnect –US (Ultra Small)
EdgeConnect – XS (Extra Small)
EdgeConnect – S (Small)
EdgeConnect – M (Medium)
EdgeConnect – L (Large)
EdgeConnect – XL (Extra-Large)

- **Subscription Licensing**

Licensing
Subscription Licensing, including but not limited to Unity EdgeConnect/Aruba EdgeConnect Base, Boost, Plus and SaaS licensing packages

U.S. Pat. No. 6,816,464 – Claim 1 pre(i)

1. A method for assessing network routes for use in establishing a communications link within a communications network, comprising the steps of:

(1) identifying a plurality of candidate routes that can be used to establish said communication link, wherein a terminating gateway associated with each of said plurality of candidate routes is identified;

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(6) scoring each of said candidate routes based on route statistics and said route ordering schedule, wherein a scoring table is configured that includes a quality score and one or more of packet loss, average delay, and average jitter.

Intelligent Internet Breakout

Often customers provision two or more WAN links from remote branch sites to increase network and application availability and performance. These links are used for breaking out traffic locally at each branch. Using the internet as an underlay transport is less expensive than private leased line connections such as MPLS since it offers much higher bandwidth at a given price point. To optimize utilization of the provisioned WAN internet links and to optimize SaaS application performance, EdgeConnect monitors the performance of all links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in realtime. EdgeConnect uses statistical learning based on jitter, latency, loss and MOS on all provisioned internet links to dynamically determine which link is performing the best before sending traffic. This optimizes internet break out traffic to deliver the highest SaaS and cloud application performance (see Figure 11). Configuring these policies is fully automated within Silver Peak Unity Orchestrator™ and doesn't require any manual configuration. The Orchestrator also enables configuration of an automated policy for finding the best path for that traffic over the SD-WAN fabric, across MPLS or another WAN service, in the rare case that both underlying internet links are underperforming or are unavailable (see Figure 12).

Source: https://www.silver-peak.com/resource-center/sd-wan-performance-matters-solution-brief

U.S. Pat. No. 6,816,464 – Claim 1 pre(ii)

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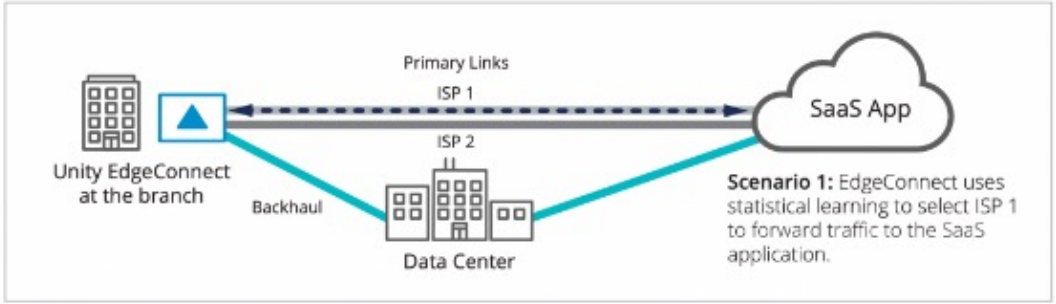

Figure 11: To optimize utilization of the provisioned WAN internet links (ISP 1 and ISP 2), EdgeConnect monitors the performance of the two links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in real-time. In this example, based on statistical learning, EdgeConnect dynamically selects ISP 1 to send traffic to the SaaS application since it is performing better than the ISP 2 service.

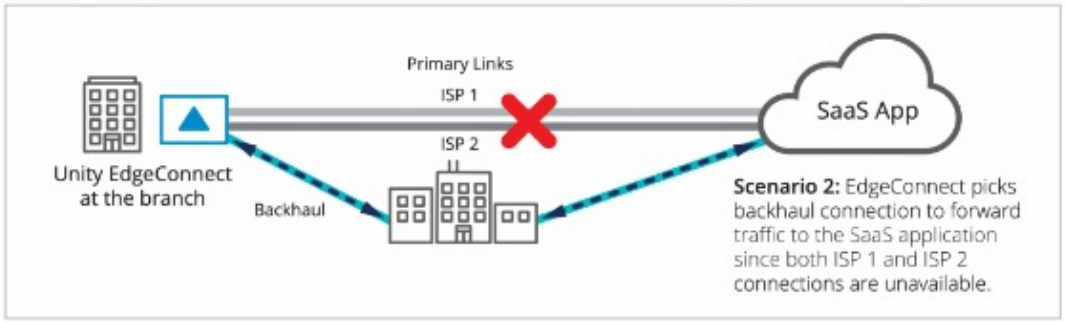

Figure 12: If both ISP 1 and ISP 2 connections become unavailable, EdgeConnect automatically moves application traffic to the transport service configured as a backup that backhauls traffic through the data center.

Source: https://www.silver-peak.com/resource-center/sd-wan-performance-matters-solution-brief

U.S. Pat. No. 6,816,464 – Claim 1 a(i)

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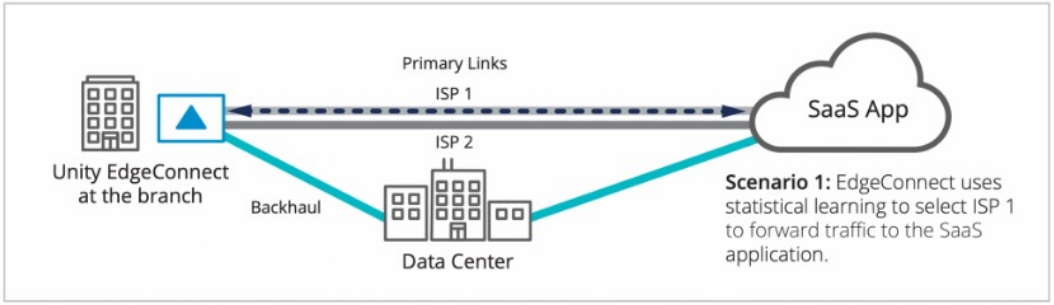

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U.S. Pat. No. 6,816,464 – Claim 1 a(ii)

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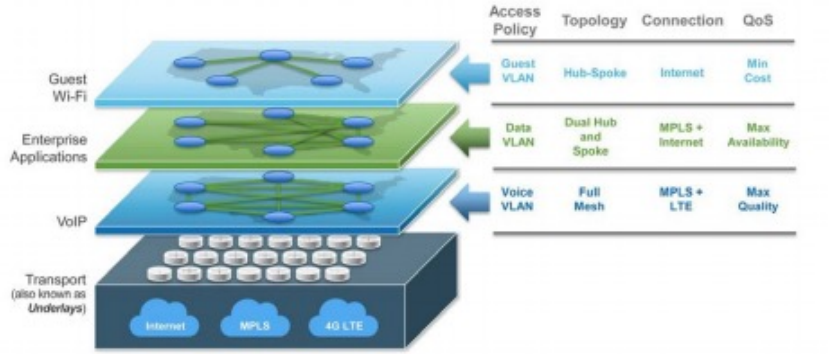
Overview of SD-WAN Prerequisites

With Orchestrator, you create virtual network overlays to apply business intent to network segments. Provisioning a device is managed by applying profiles.

- **Interface Labels** associate each interface with a use.
  - **LAN** labels refer to traffic type, such as **VoIP**, **data**, or **replication**.
  - **WAN** labels refer to the service or connection type, such as **MPLS**, **internet**, or **Verizon**.
- **Deployment Profiles** configure the interfaces and map the labels to them, to characterize the appliance.
- **Business Intent Overlays** use the Labels specified in Deployment Profiles to define how traffic is routed and optimized between sites. These overlays can specify preferred paths and can link bonding policies based on **application**, **VLAN**, or **subnet**, independent of the brand and physical routing attributes of the underlay.

This diagram shows the basic architecture and capabilities of **Overlays**.



- Management routes specify the **default gateways** and local IP subnets for the management interfaces.

Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 14 & 93 of 431

U.S. Pat. No. 6,816,464 – Claim 1 a(iii)

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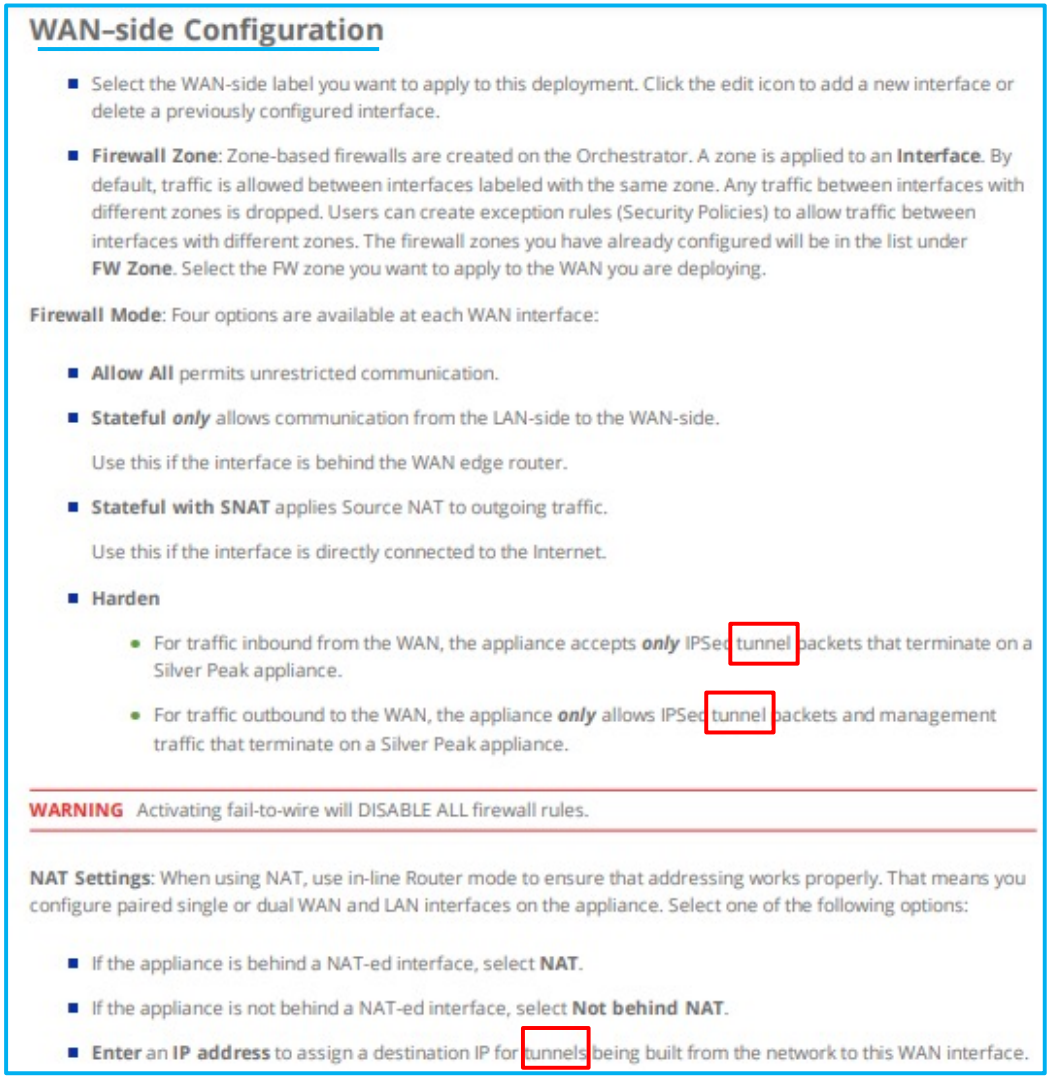

WAN-side Configuration

- Select the WAN-side label you want to apply to this deployment. Click the edit icon to add a new interface or delete a previously configured interface.
- **Firewall Zone**: Zone-based firewalls are created on the Orchestrator. A zone is applied to an **Interface**. By default, traffic is allowed between interfaces labeled with the same zone. Any traffic between interfaces with different zones is dropped. Users can create exception rules (Security Policies) to allow traffic between interfaces with different zones. The firewall zones you have already configured will be in the list under **FW Zone**. Select the FW zone you want to apply to the WAN you are deploying.

Firewall Mode: Four options are available at each WAN interface:

- **Allow All** permits unrestricted communication.
- **Stateful *only*** allows communication from the LAN-side to the WAN-side.

  Use this if the interface is behind the WAN edge router.
- **Stateful with SNAT** applies Source NAT to outgoing traffic.

  Use this if the interface is directly connected to the Internet.
- **Harden**
  - For traffic inbound from the WAN, the appliance accepts ***only*** IPSec tunnel packets that terminate on a Silver Peak appliance.
  - For traffic outbound to the WAN, the appliance ***only*** allows IPSec tunnel packets and management traffic that terminate on a Silver Peak appliance.

WARNING Activating fail-to-wire will DISABLE ALL firewall rules.

NAT Settings: When using NAT, use in-line Router mode to ensure that addressing works properly. That means you configure paired single or dual WAN and LAN interfaces on the appliance. Select one of the following options:

- If the appliance is behind a NAT-ed interface, select **NAT**.
- If the appliance is not behind a NAT-ed interface, select **Not behind NAT**.
- **Enter** an **IP address** to assign a destination IP for tunnels being built from the network to this WAN interface.

Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 22 of 431

U.S. Pat. No. 6,816,464 – Claim 1 a(iv)

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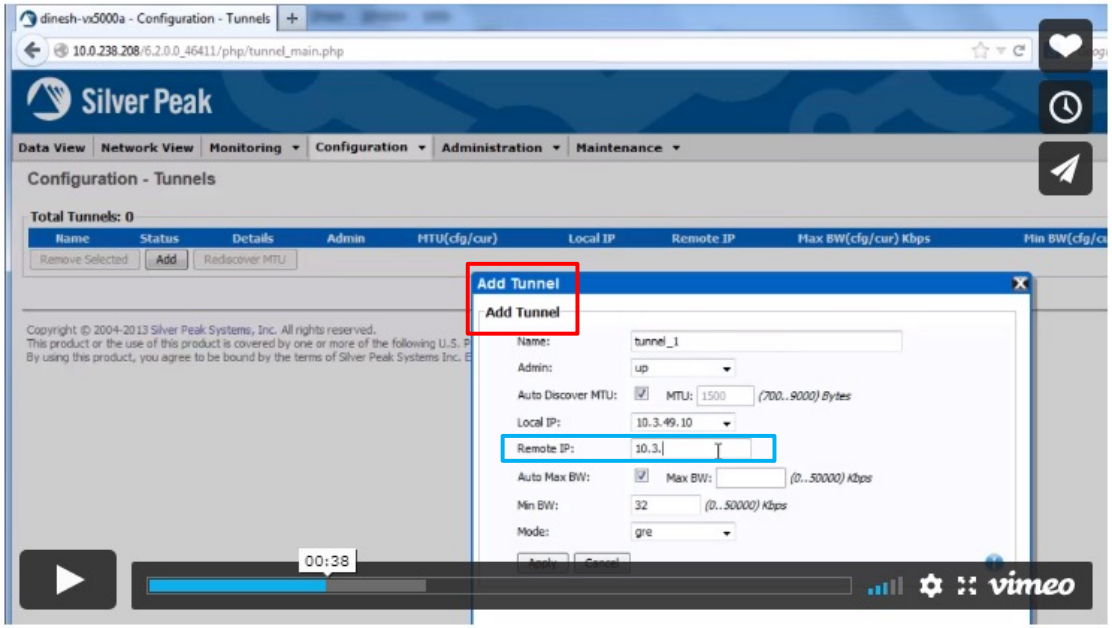

This video demonstrates the basic process of creating a Silver Peak tunnel in order to optimize traffic. The video covers tunnel configuration, creating a route policy that specifies what is being optimized, and checking your work via the Current Flows.

Source: https://www.silver-peak.com/resource-center/how-create-tunnel

U.S. Pat. No. 6,816,464 – Claim 1 a(v)

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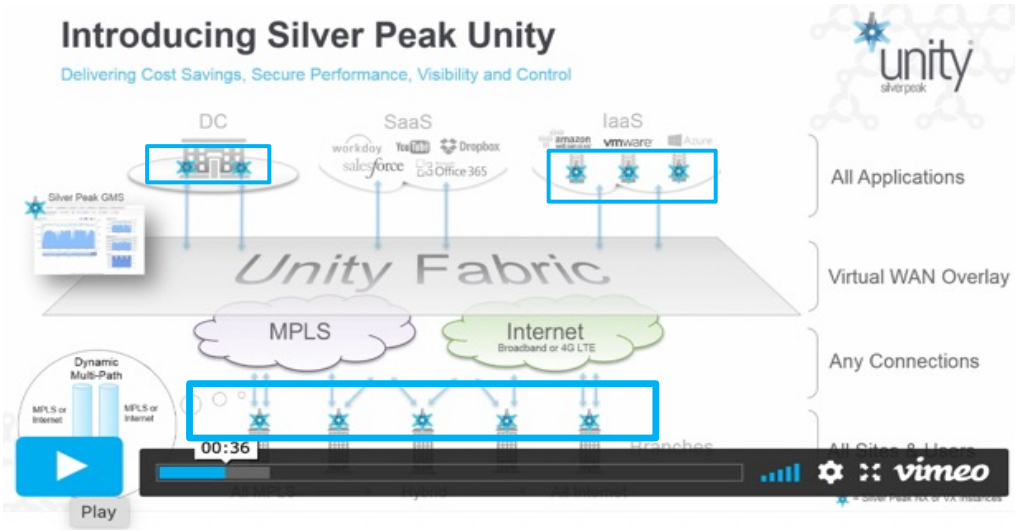

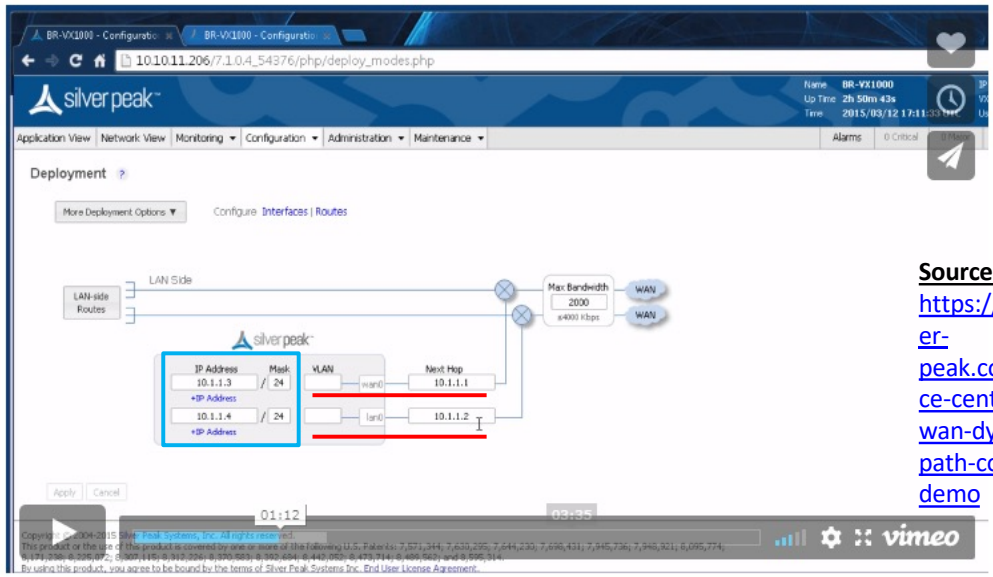

Source: https://www.silver-peak.com/resource-center/sd-wan-dynamic-path-control-demo

U.S. Pat. No. 6,816,464 – Claim 1 a(vi)

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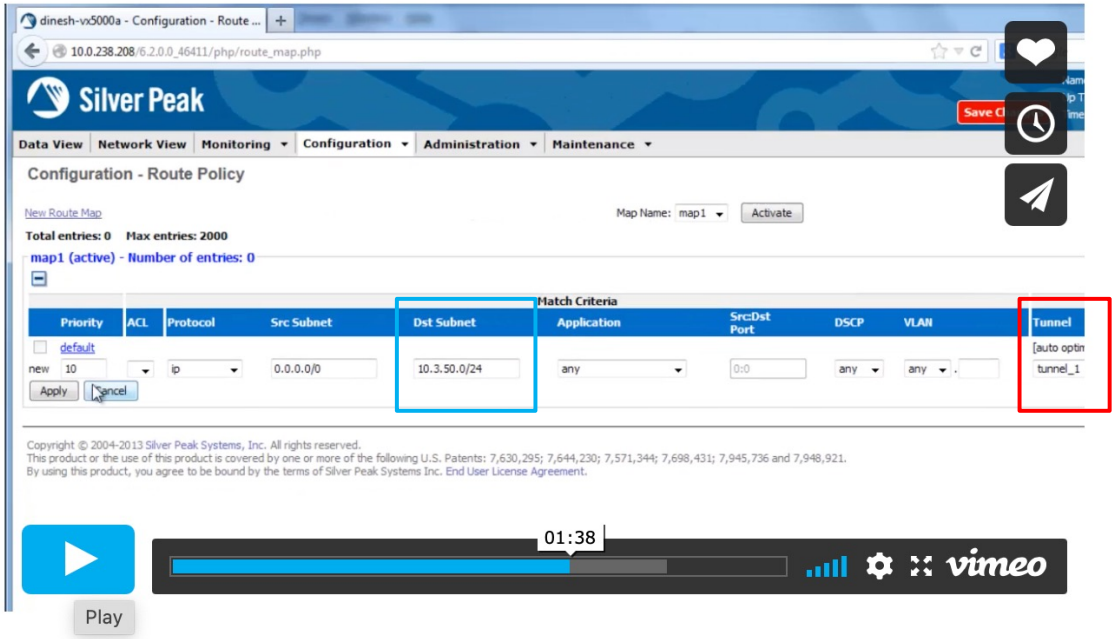

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U.S. Pat. No. 6,816,464 – Claim 1 a(vii)

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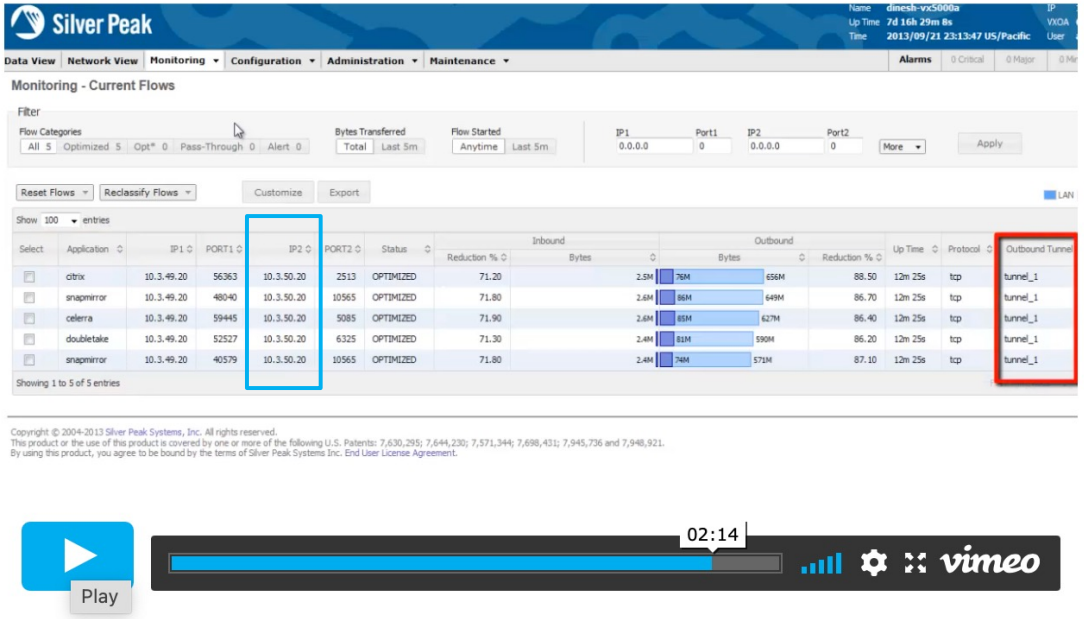

Source: https://www.silver-peak.com/resource-center/how-create-tunnel

U.S. Pat. No. 6,816,464 – Claim 1 a(viii)

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Unity Orchestrator uses the TGNM WAN API to target the branches in the network, and associate them to a Transit Gateway, configuring both ends of the tunnel endpoints for each branch as shown below in Figure 2. The EdgeConnect appliance in the branch then establishes standards-based IPSec tunnels that terminate at the head-end gateway in AWS. Orchestrator continuously monitors the status of the connections and redirects traffic to alternate tunnels or gateways as needed.

Benefits of the Integrated Silver Peak and AWS TGNM Solution

This integrated solution automates connectivity to AWS and reduces enterprise branch cloud onboarding time from days/hours to a few minutes per site. In the absence of this automation, network administrators would need to revert to a manual process repeating multiple time-consuming steps to connect each branch office to the AWS network, resulting in increased operational complexity and support costs.

Source:
https://www.silver-peak.com/resource-center/solution-briefs/silver-peak-sd-wan-and-aws-transit-gateway-network-manager

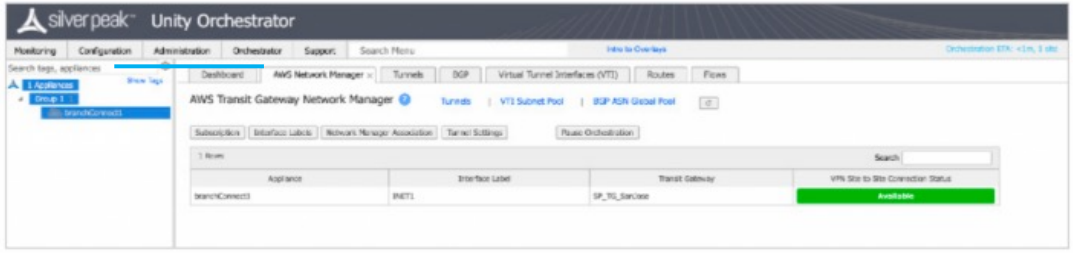

Figure 2: The Unity Orchestrator dashboard provides a single view with easy configuration and provisioning for enterprise connectivity to AWS TGNM.

U.S. Pat. No. 6,816,464 – Claim 1 b(i)

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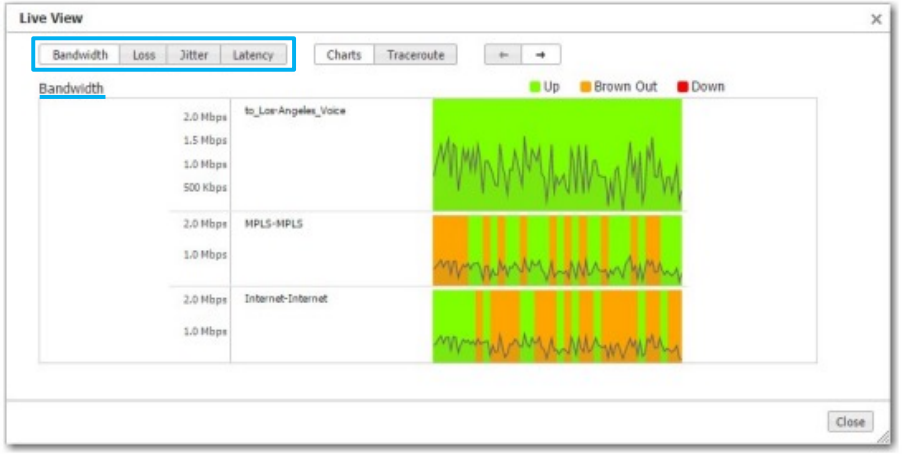
Live View

Live View shows the live bandwidth, loss, latency, and jitter on all the tunnels. For an overlay, it also shows live tunnel states — **Up**, **Browned Out**, or **Down**.



In real-time, LiveView shows how Silver Peak creates synergy to maintain coverage. The real-time chart shows the SD-WAN overlay at the top and the underlay networks at the bottom. The overlay is green and delivering consistent application performance while both underlays are in persistent brown-out state.

Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 277 of 431

U.S. Pat. No. 6,816,464 – Claim 1 b(ii)

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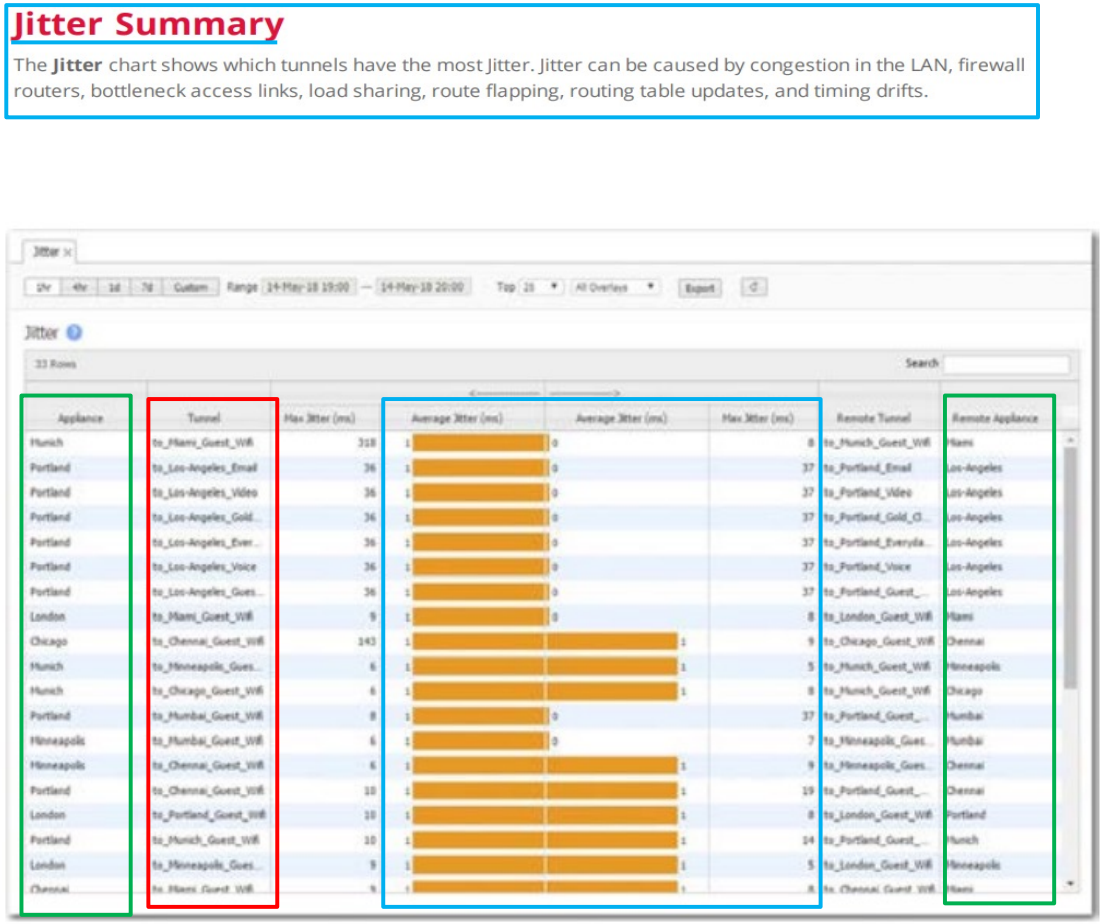

Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 299 of 431

U.S. Pat. No. 6,816,464 – Claim 1 b(iii)

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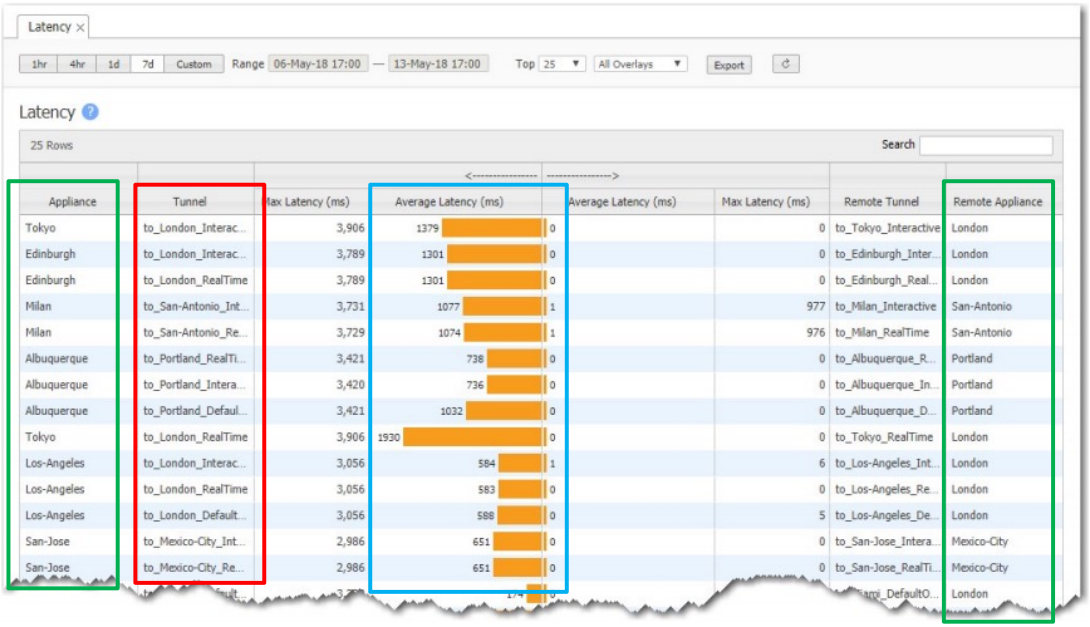
Latency

The **Latency** chart shows which tunnels have the most transmission delay, generally as a result of congestion.



Tunnel latency - measured in milliseconds, the maximum latency of a one-second sample within a 60-second span

Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 149 & 301 of 431

U.S. Pat. No. 6,816,464 – Claim 1 b(iv)

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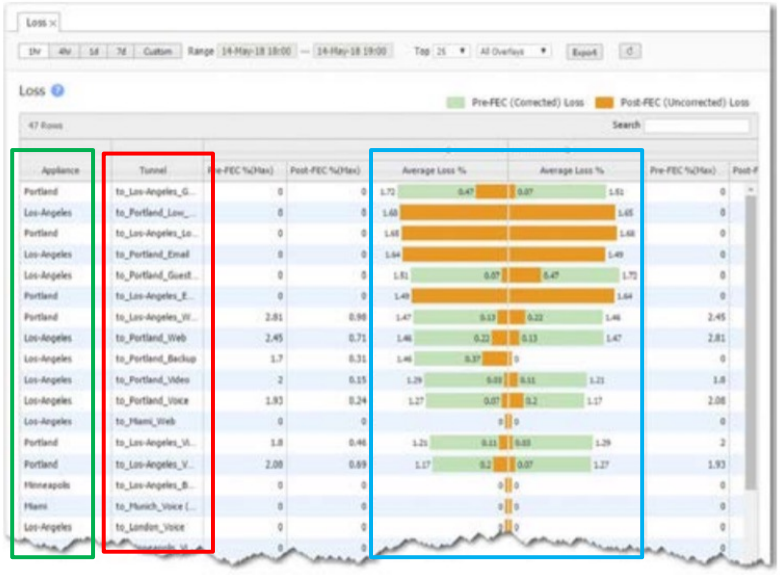
Loss

The **Loss** chart shows which tunnels have the most dropped packets.



Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 297 of 431

U.S. Pat. No. 6,816,464 – Claim 1 b,c,d (i)

1. A method for assessing network routes for use in establishing a communications link within a communications network, comprising the steps of:

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(2) transmitting quality measurement packets for each of said candidate routes, wherein said quality measurement packets can be used to determine at least one route quality metric;

(3) receiving returned quality measurement packets for each of said candidate routes, wherein said returned quality measurement packets can be used to determine route statistics;

(4) determining route statistics, wherein said route statistics are based on routing information contained within said quality measurement packets;

(5) configuring a route ordering schedule based on user set levels of route characteristics; and

(6) scoring each of said candidate routes based on route statistics and said route ordering schedule, wherein a scoring table is configured that includes a quality score and one or more of packet loss, average delay, and average jitter.

Intelligent Internet Breakout

Often customers provision two or more WAN links from remote branch sites to increase network and application availability and performance. These links are used for breaking out traffic locally at each branch. Using the internet as an underlay transport is less expensive than private leased line connections such as MPLS since it offers much higher bandwidth at a given price point. To optimize utilization of the provisioned WAN internet links and to optimize SaaS application performance, EdgeConnect monitors the performance of all links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in realtime. EdgeConnect uses statistical learning based on jitter, latency, loss and MOS on all provisioned internet links to dynamically determine which link is performing the best before sending traffic. This optimizes internet break out traffic to deliver the highest SaaS and cloud application performance (see Figure 11). Configuring these policies is fully automated within Silver Peak Unity Orchestrator™ and doesn't require any manual configuration. The Orchestrator also enables configuration of an automated policy for finding the best path for that traffic over the SD-WAN fabric, across MPLS or another WAN service, in the rare case that both underlying internet links are underperforming or are unavailable (see Figure 12).

Source https://www.silver-peak.com/resource-center/sd-wan-performance-matters-solution-brief

Live View	A live view of the status of your selected tunnel. You can view by bandwidth, loss, jitter, latency, MOS, chart, traceroute, inbound or outbound, and lock the scale.

- Thresholds for **Latency**, **Loss**, or **Jitter** are checked once every second.
  - Receiving 3 successive measurements in a row that exceed the threshold puts the tunnel into a brownout situation and flows will attempt to fail over to another tunnel within the next 100mS.
  - Receiving 3 successive measurements in a row that drop below the threshold will drop the tunnel out of brownout.

Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 106 & 187 of 431

U.S. Pat. No. 6,816,464 – Claim 1 b,c,d (ii)

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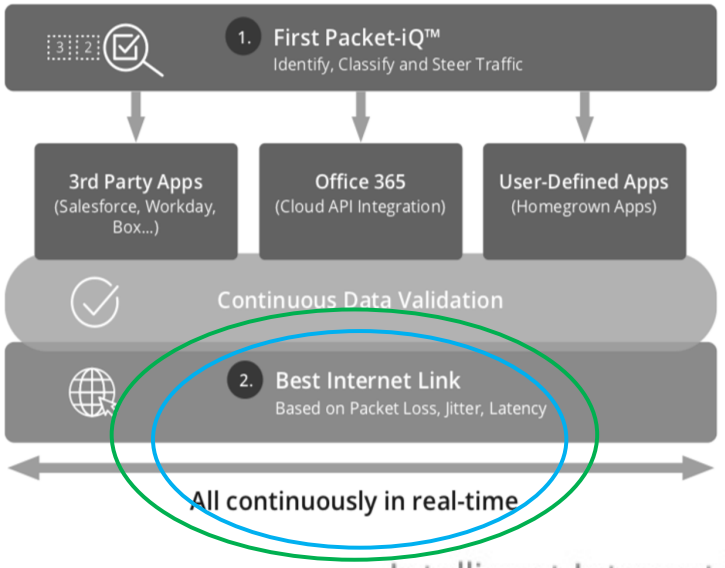

Intelligent Internet Breakout

Often customers provision two or more WAN links from the remote branch site to increase network and application availability and performance. These links are used for breaking out traffic locally at each branch. Using the internet as an underlay transport is less expensive than provisioning private leased line connections like MPLS. To optimize utilization of the provisioned WAN internet links, EdgeConnect monitors the performance of all WAN links by continuously measuring packet loss, jitter, latency and mean opinion score (MOS) in real-time. EdgeConnect uses statistical learning to determine the optimal forwarding link, ensuring maximum application performance.

Source https://www.silver-peak.com/sites/default/files/infoctr/silver-peak-datasheet-unity_edgeconnect-sd-wan-solution-service-provider.pdf

U.S. Pat. No. 6,816,464 – Claim 1 b,c,d (iii)

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Tunnel Settings Tab

Use this page to manage the properties for those tunnels created by Orchestrator. This tab provides tunnel settings for General, IKE, and IPsec for MPLS, Internet, and LTE WAN Interface labels.

Tunnel Settings for Overlays and Tunnel Groups

General	
Mode	Indicates whether the tunnel protocol is **ipsec**, **ipsec_udp**, **udp**, or **gre**. If you select IPSec, you can specify the IKE version in the **IKE** tab.
Auto Max BW Enabled	Allows the appliances to auto-negotiate the maximum tunnel bandwidth.
Auto Discover MTU Enabled	Allows the appliances to auto-negotiate the maximum tunnel bandwidth.
IPsec Encryption Algorithm	For encrypting tunnel data. Choose from **auto**, **AES-256**, or **AES-128**.
Latency	The amount of latency measure in MS.
Loss	The amount of data lost measured in percent.
Jitter	The amount of jitter measured in MS.

Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 378 & 379 of 431

Requirements for Supporting Voice

VoIP is a real-time application, based on UDP, that is highly sensitive to WAN traffic quality—jitter, latency, and packet loss. As a result, companies considering VoIP and consolidation projects will require an acceleration platform that is specifically structured to support UDP, including advanced QoS capabilities to minimize jitter, latency, and packet loss.

networks can range from 5 to 40 msec. Most VoIP gateway products can compensate for jitter up to 160 msec with dynamic buffering. When network jitter exceeds these buffer tolerances, packets are typically dropped, resulting in poor voice quality for end users. As a general rule of thumb, jitter should remain below 200 msec to avoid noticeable degradation in VoIP quality. Silver Peak makes jitter a non-issue in enterprise VoIP scenarios.

Source https://www.silver-peak.com/sites/default/files/infoctr/silver-peak_ss_voip.pdf Page 1 & 3 of 3

U.S. Pat. No. 6,816,464 – Claim 1 b,c,d (iv)

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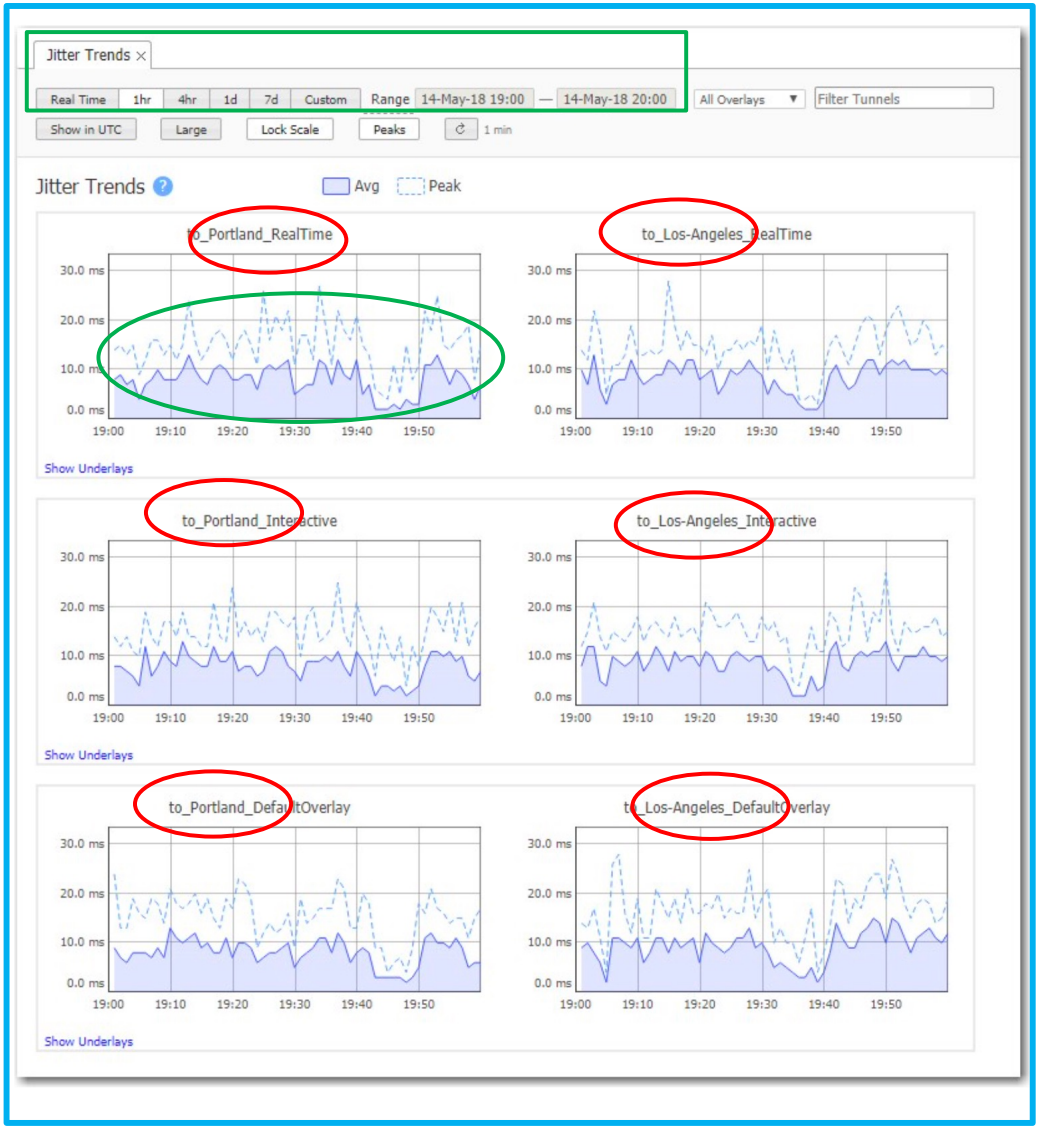
Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 300 of 431



U.S. Pat. No. 6,816,464 – Claim 1 b,c,d (v)

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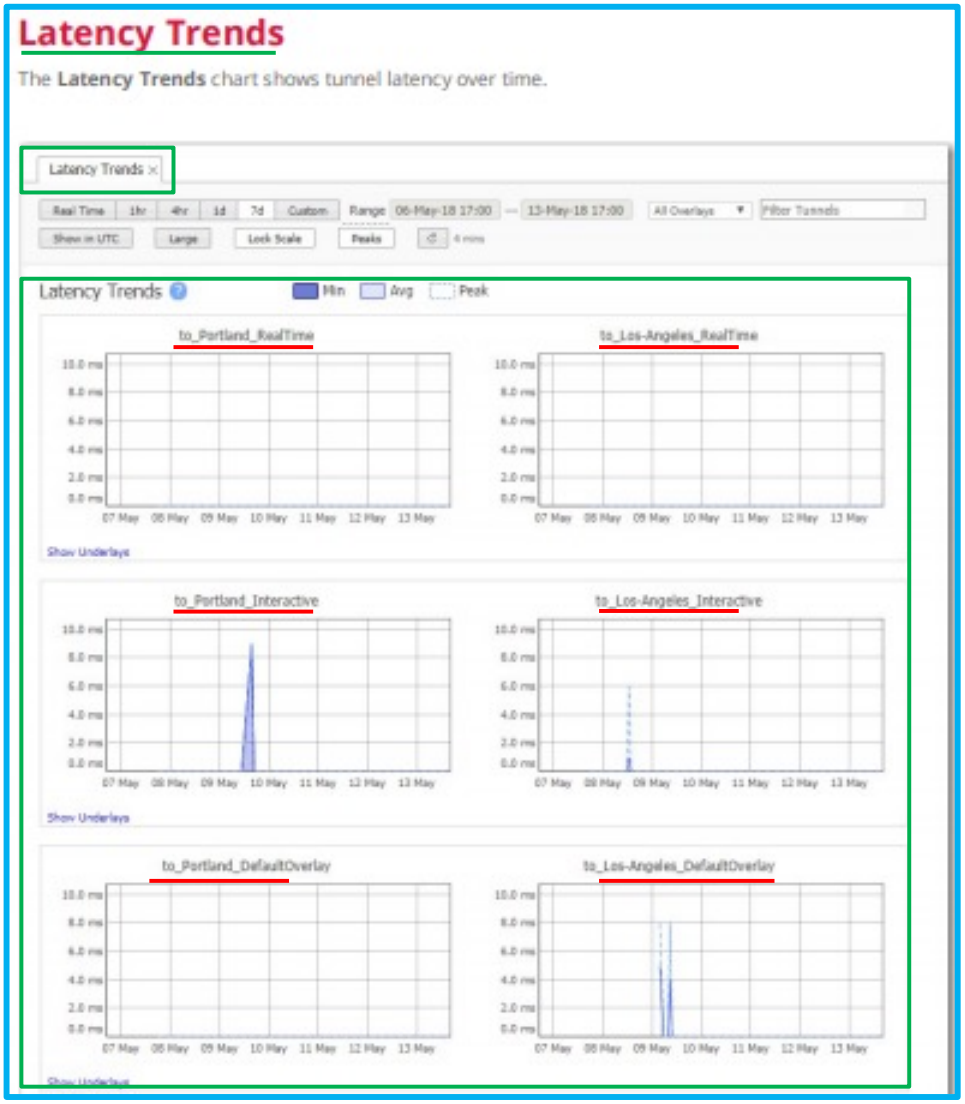
Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 302 of 431



U.S. Pat. No. 6,816,464 – Claim 1 b,c,d (vi)

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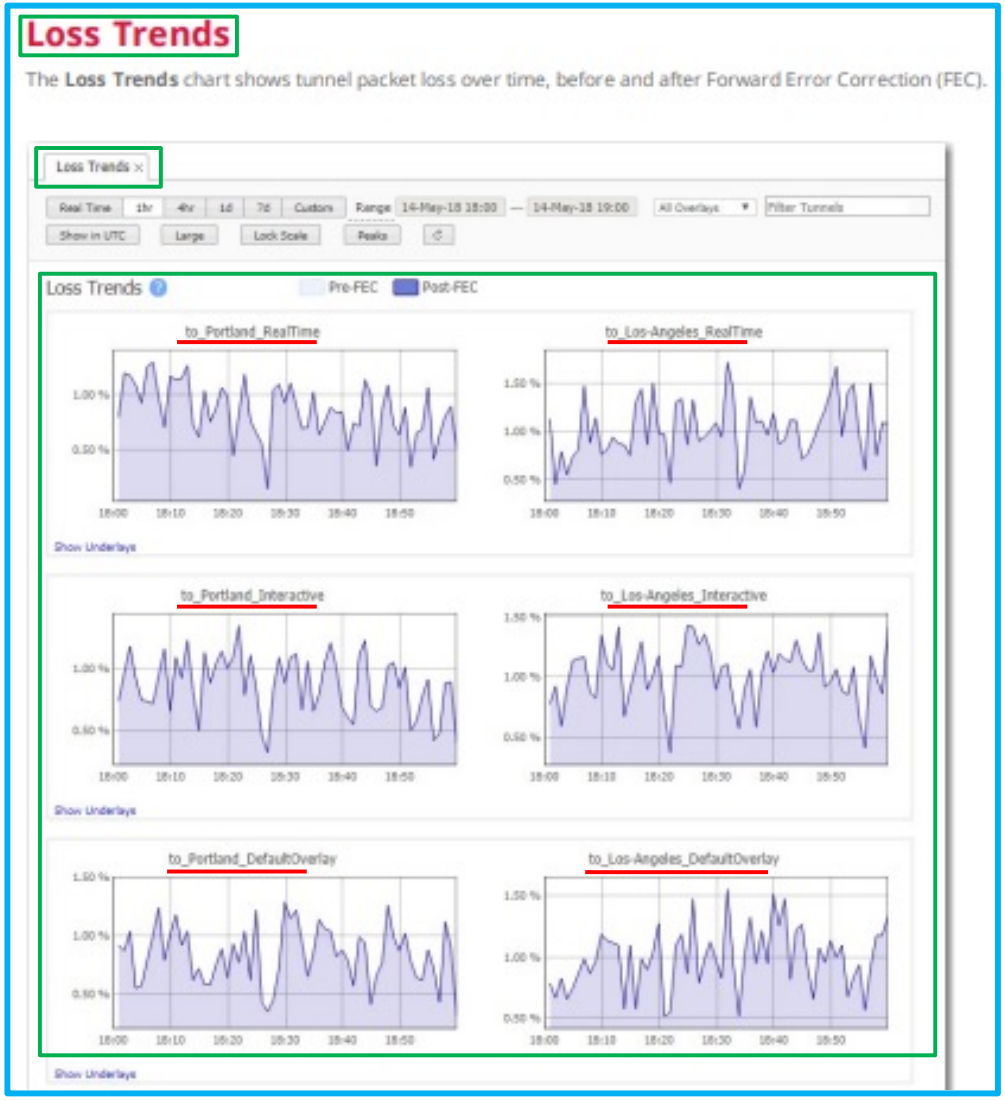
Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 298 of 431



U.S. Pat. No. 6,816,464 – Claim 1 e(i)

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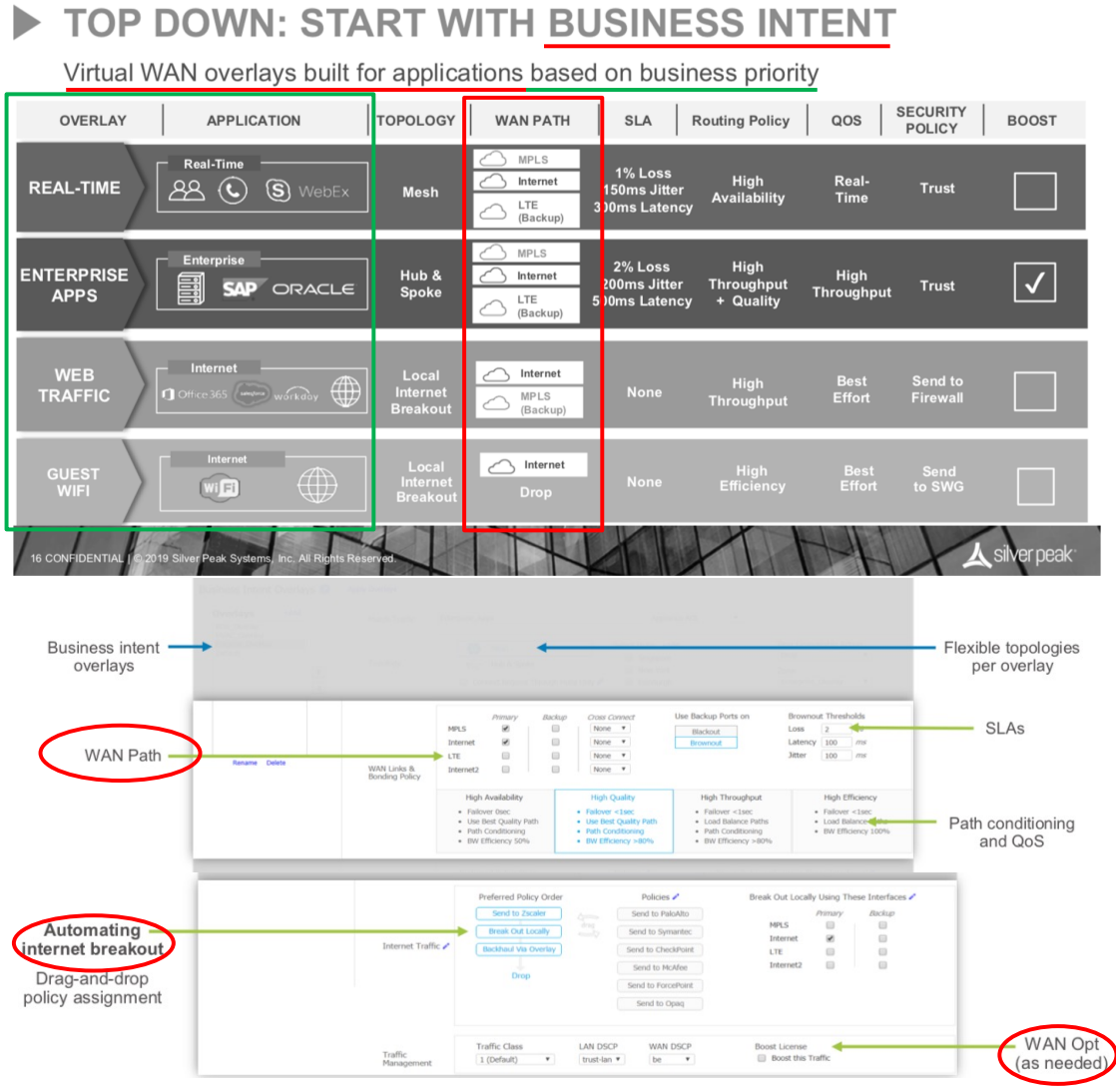

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U.S. Pat. No. 6,816,464 – Claim 1 e(ii)

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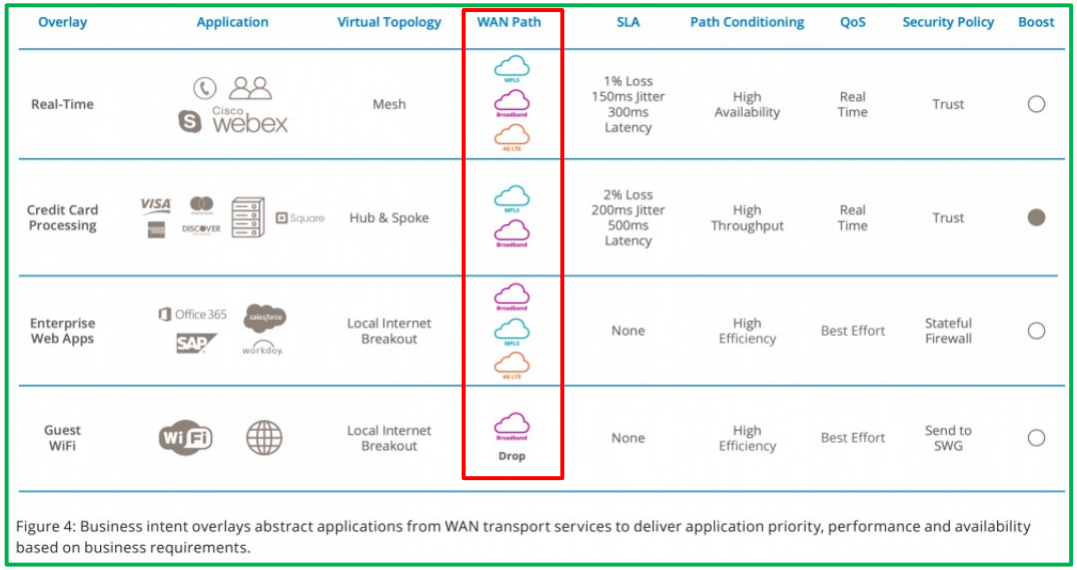

Overlay	Application	Virtual Topology	WAN Path	SLA	Path Conditioning	QoS	Security Policy	Boost
Real-Time	Cisco webex	Mesh	MPLS, Broadband, 4G LTE	1% Loss 150ms Jitter 300ms Latency	High Availability	Real Time	Trust	○
Credit Card Processing	VISA, DISCOVER, Square	Hub & Spoke	MPLS, Broadband	2% Loss 200ms Jitter 500ms Latency	High Throughput	Real Time	Trust	●
Enterprise Web Apps	Office 365, SAP, salesforce, workday.	Local Internet Breakout	Broadband, MPLS, 4G LTE	None	High Efficiency	Best Effort	Stateful Firewall	○
Guest WiFi	Wi Fi	Local Internet Breakout	Broadband Drop	None	High Efficiency	Best Effort	Send to SWG	○

Figure 4: Business intent overlays abstract applications from WAN transport services to deliver application priority, performance and availability based on business requirements.

Moreover, different applications have diverse QoS and end-user experience requirements. For example, voice and video traffic require zero packet loss and extremely low delay while file transfers need large amounts of bandwidth but can tolerate higher levels of delay. Silver Peak enables network managers to define business intent overlays — virtual WAN overlays — that reflect application QoS requirements relevant to the business. Unity EdgeConnect™ maps applications to the appropriate business intent overlay, enabling the SD-WAN to optimize traffic handling decisions automatically. EdgeConnect continuously monitors WAN link performance, factoring real-time data about delay, jitter, and packet loss to adapt and make traffic steering decisions.

Source https://www.silver-peak.com/resource-center/sd-wan-performance-matters-solution-brief

U.S. Pat. No. 6,816,464 – Claim 1 e(iii)

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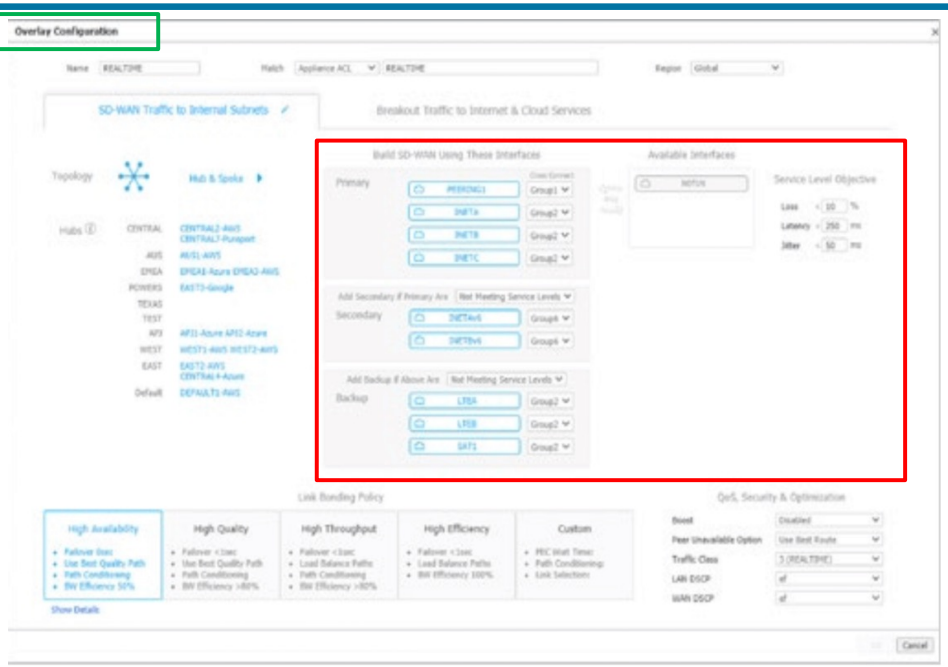

Source https://www.silver-peak.com/resource-center/unity-edge-connect-data-sheet-solution

Preferred Policy Order and Available Policies

- You can move policies back and forth between the **Preferred Policy Order** and the **Available Policies** columns. You can also change their order within a column. The defaults provided are **Backhaul via Overlay**, **Break Out Locally**, and **Drop**.
- When you choose **Break Out Locally**, confirm that any selected interface that is directly connected to the Internet has **Stateful Firewall** specified in the deployment profile.
- You can add services (such as Zscaler, Fortigate, or Palo Alto). The service requires a corresponding Internet-breakout (Passthrough) tunnel for each appliance traffic to that service. To add a service, select the **Edit** icon next to **Available** Policies.
- The **Default** policy you configure for internet breakout is pushed to all appliances that use the selected Overlay. However, you might want to push different breakout rules to your hubs.

Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 20 of 431

U.S. Pat. No. 6,816,464 – Claim 1 e,f

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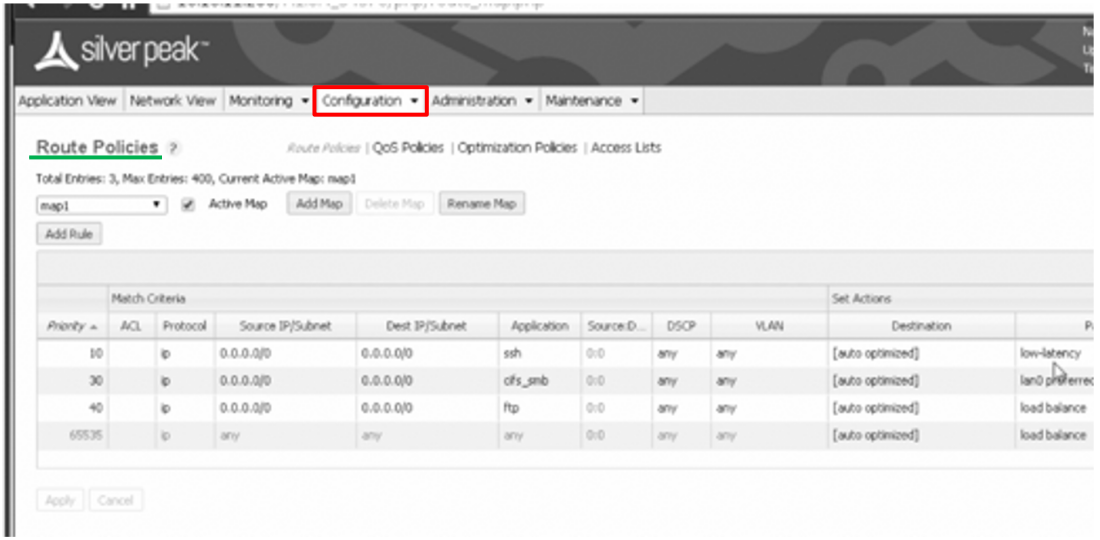

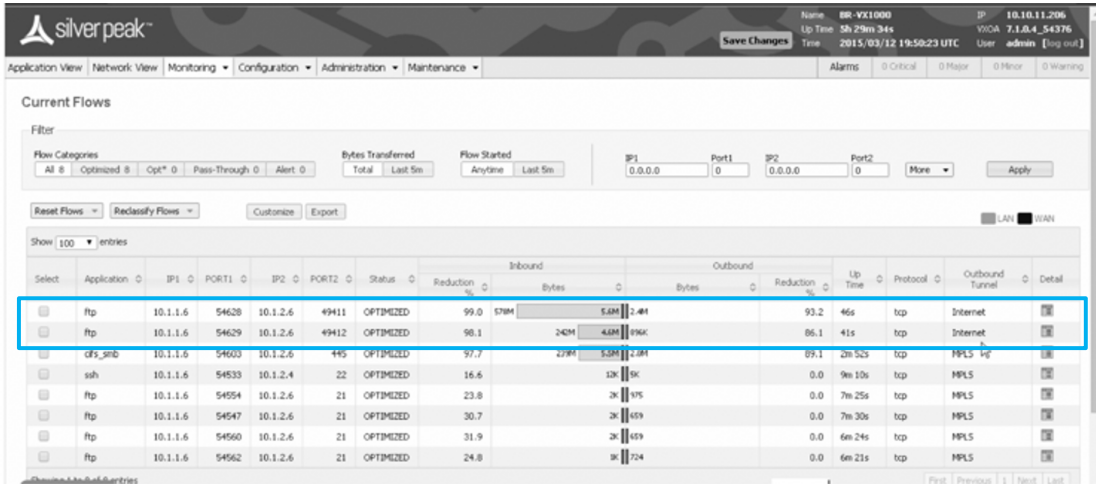

Source https://www.silver-peak.com/resource-center/sd-wan-dynamic-path-control-demo

U.S. Pat. No. 6,816,464 – Claim 1 f(i)

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Often customers provision two or more WAN links from remote branch sites to increase network and application availability and performance. To optimize utilization of the provisioned WAN internet links, EdgeConnect monitors the performance of the links in real-time by continuously measuring packet loss, jitter, latency, and mean opinion score (MOS). EdgeConnect uses statistical learning to dynamically determine the optimal link for breaking out traffic, thus maintaining peak application performance. This optimizes internet break out traffic to deliver the highest SaaS and cloud application performance (see Figure 1). Configuring these policies is fully automated within the Silver Peak Unity Orchestrator™ management interface and doesn't require any manual configuration. Orchestrator also enables configuration of an automated policy for finding the best path for that traffic over the SD-WAN fabric, across MPLS or another WAN service, in the rare case that both underlying internet links are underperforming or unavailable (see Figure 2).

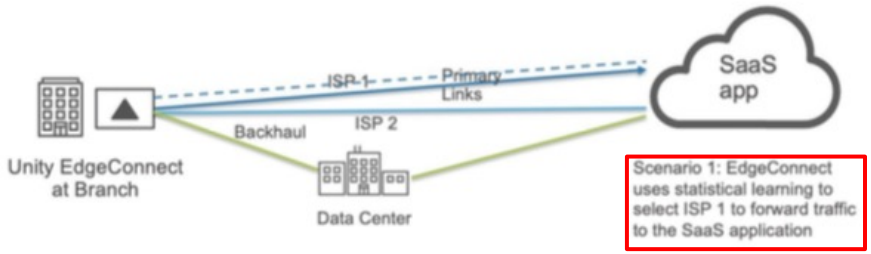

Figure 1: To optimize utilization of the provisioned WAN internet links (ISP 1 and ISP 2), EdgeConnect monitors the performance of the two links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in real-time. Using statistical learning, EdgeConnect dynamically select ISP 1 to send traffic to the SaaS application.

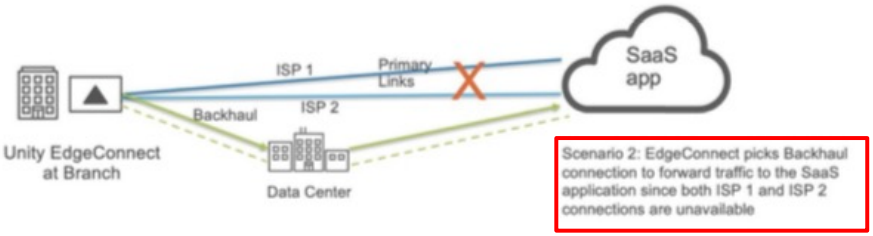

Figure 2: If both ISP 1 and ISP 2 connections become unavailable, EdgeConnect automatically chooses the configured backup transport service that backhauls traffic through the data center.

U.S. Pat. No. 6,816,464 – Claim 1 f(ii)

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Highest End-user Quality of Experience

Selecting the best path to direct packets eliminates any additional latency experienced by your SaaS applications and IaaS workloads. This delivers the highest quality of experience to users and results in happy customers, prospects, and employees. In addition, intelligent internet breakout can also be used to automatically address brownout or blackout conditions on any link. For instance, if a branch is served by one MPLS connection and one internet connection, before sending any packets over the internet connection, the EdgeConnect appliance confirms the connection quality. If for some reason, the internet connection is experiencing loss, latency, jitter or MOS greater than a pre-configured threshold, the EdgeConnect appliance will automatically select the MPLS connection to send packets. This ensures that no matter what happens, enterprise applications, whether hosted in the data center, hosted in IaaS, UCaaS, or SaaS, always operate at peak performance. The new Silver Peak intelligent internet breakout feature dramatically improves business productivity while enabling businesses to increase efficiency.

Source https://blog.silver-peak.com/modern-cloud-first-enterprises-require-intelligent-internet-breakout

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Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 187 of 431

U.S. Pat. No. 6,816,464 – Claim 1 f(iii)

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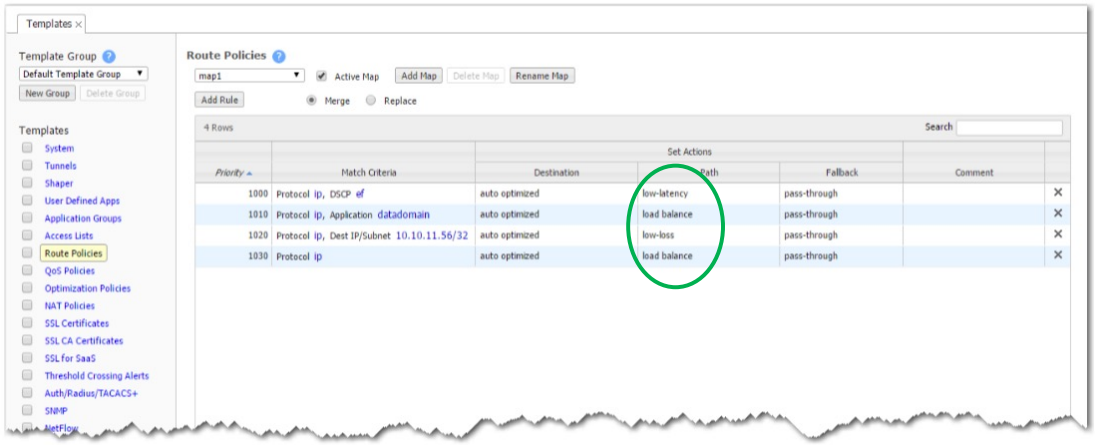
You may also want to create a Route Policy entry when multiple tunnels exist to the remote **peer**, and you want the appliance to dynamically select the best path based on one of these criteria:

- load balancing
- lowest loss
- lowest latency
- specified tunnel



Silver Peak Unity Orchestrator Operator's Guide

A comprehensive dashboard (Figure 1) provides a complete at-a-glance view along with customizable widgets to monitor network attributes and applications in real time. IT defined widgets provide granular details on SD-WAN appliances, including their location, active tunnels, logical topology, appliance health heatmap, top talkers, alarms, mean opinion score (MOS), applications and domains accessed, bandwidth consumed, flow count, latency, jitter, and packet loss (Figure 2).

Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf
Page 117 & 206 of 431

Source
https://www.arubanetworks.com/assets/so/SO_Simplify-WAN-Operations.pdf

U.S. Pat. No. 6,816,464 – Claim 1 f(v)

1. A method for assessing network routes for use in establishing a communications link within a communications network, comprising the steps of:

(1) identifying a plurality of candidate routes that can be used to establish said communication link, wherein a terminating gateway associated with each of said plurality of candidate routes is identified;

(2) transmitting quality measurement packets for each of said candidate routes, wherein said quality measurement packets can be used to determine at least one route quality metric;

(3) receiving returned quality measurement packets for each of said candidate routes, wherein said returned quality measurement packets can be used to determine route statistics;

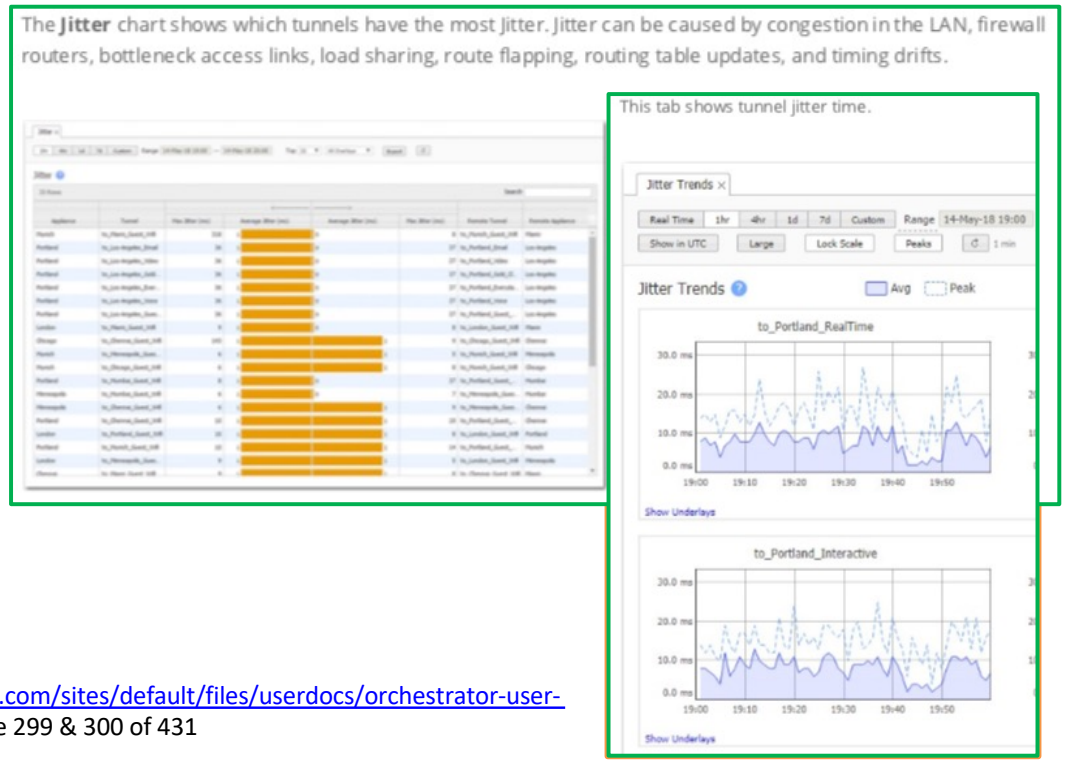
(4) determining route statistics, wherein said route statistics are based on routing information contained within said quality measurement packets;

(5) configuring a route ordering schedule based on user set levels of route characteristics; and

(6) scoring each of said candidate routes based on route statistics and said route ordering schedule, wherein a scoring table is configured that includes a quality score and one or more of packet loss, average delay, and average jitter.

application performance, EdgeConnect monitors the performance of all links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in realtime. EdgeConnect uses statistical learning based on jitter, latency, loss and MOS on all provisioned internet links to dynamically determine which link is performing the best before sending traffic. This optimizes internet break out

Source https://www.silver-peak.com/resource-center/sd-wan-performance-matters-solution-brief



Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 299 & 300 of 431

U.S. Pat. No. 6,816,464 – Claim 1 f(vi)

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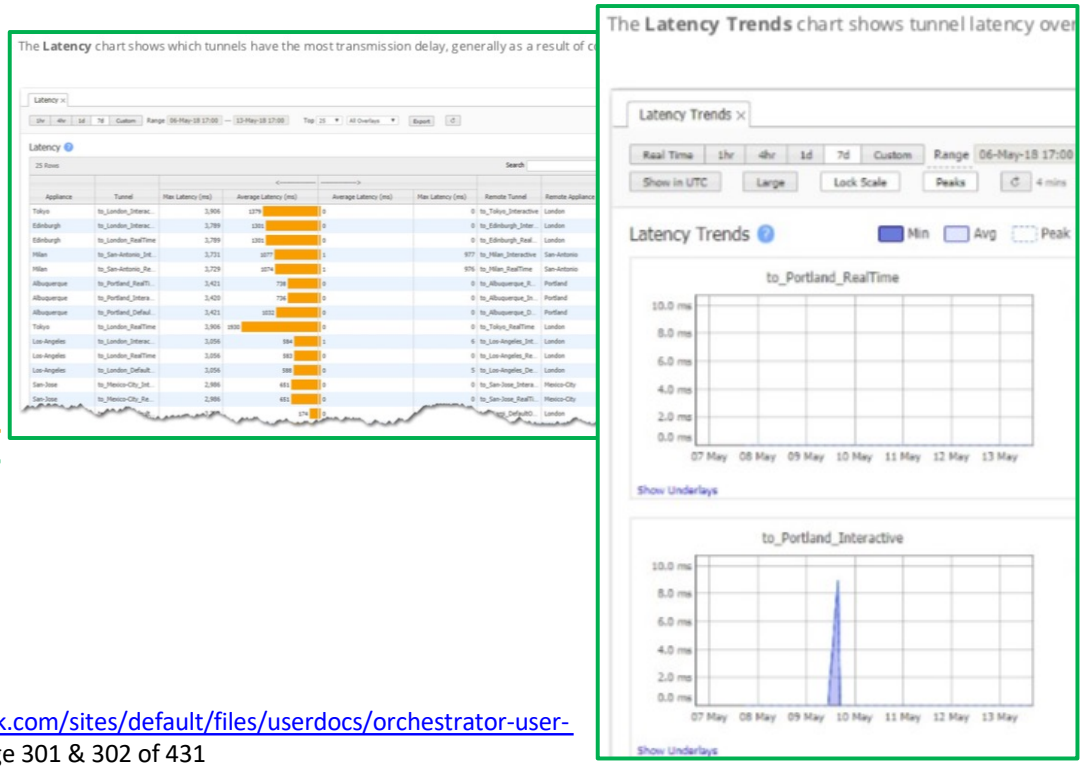

Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 301 & 302 of 431

U.S. Pat. No. 6,816,464 – Claim 1 f(vii)

1. A method for assessing network routes for use in establishing a communications link within a communications network, comprising the steps of:

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Source https://www.silver-peak.com/resource-center/sd-wan-performance-matters-solution-brief

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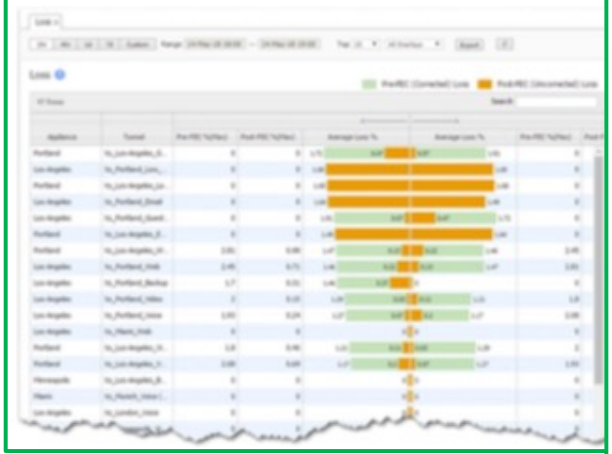
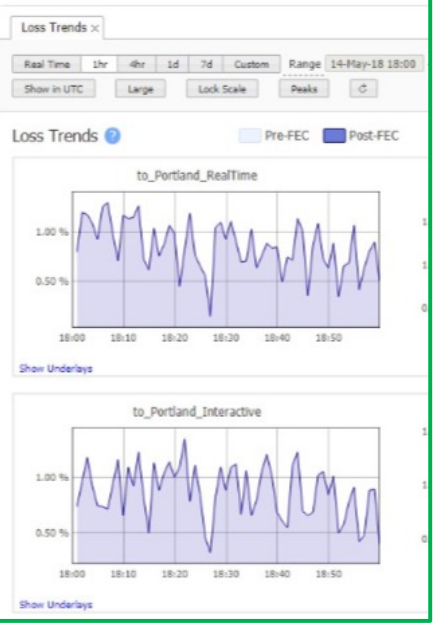


The **Loss Trends** chart shows tunnel packet loss over t



Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 297 & 298 of 431

U.S. Pat. No. 6,816,464 – Claim 1 f(viii)

1. A method for assessing network routes for use in establishing a communications link within a communications network, comprising the steps of:

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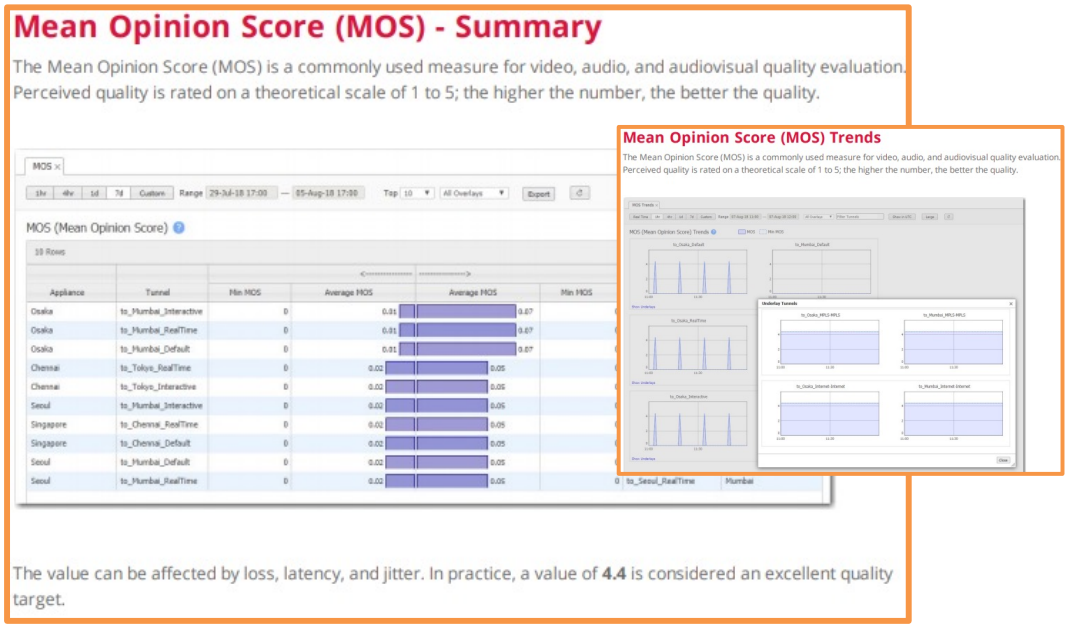

Source https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 305 & 306 of 431

U.S. Pat. No. 6,816,464 – Claim 2(i)

2. A method of claim 1, wherein said communications network includes a packet-switched network.

Intelligent Internet Breakout

Often customers provision two or more WAN links from remote branch sites to increase network and application availability and performance. These links are used for breaking out traffic locally at each branch. Using the internet as an underlay transport is less expensive than private leased line connections such as MPLS since it offers much higher bandwidth at a given price point. To optimize utilization of the provisioned WAN internet links and to optimize SaaS application performance, EdgeConnect monitors the performance of all links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in realtime. EdgeConnect uses statistical learning based on jitter, latency, loss and MOS on all provisioned internet links to dynamically determine which link is performing the best before sending traffic. This optimizes internet break out traffic to deliver the highest SaaS and cloud application performance (see Figure 11). Configuring these policies is fully automated within Silver Peak Unity Orchestrator™ and doesn't require any manual configuration. The Orchestrator also enables configuration of an automated policy for finding the best path for that traffic over the SD-WAN fabric, across MPLS or another WAN service, in the rare case that both underlying internet links are underperforming or are unavailable (see Figure 12).

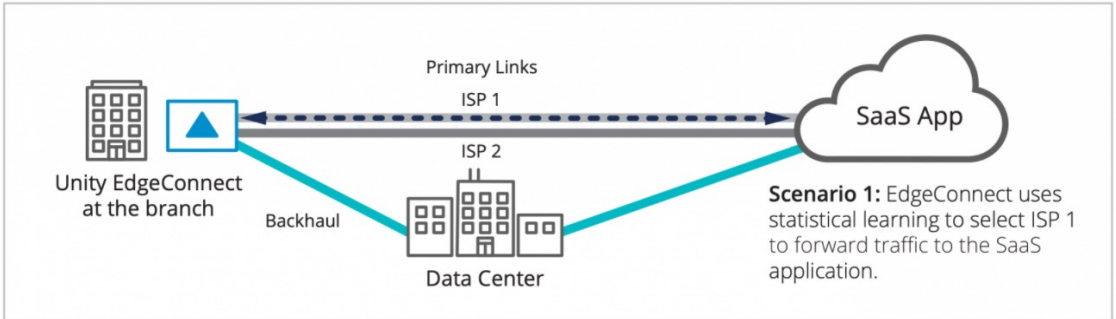

Figure 11: To optimize utilization of the provisioned WAN internet links (ISP 1 and ISP 2), EdgeConnect monitors the performance of the two links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in real-time. In this example, based on statistical learning, EdgeConnect dynamically selects ISP 1 to send traffic to the SaaS application since it is performing better than the ISP 2 service.

Source: https://www.silver-peak.com/resource-center/sd-wan-performance-matters-solution-brief

U.S. Pat. No. 6,816,464 – Claim 2(ii)

2. A method of claim 1, wherein said communications network includes a packet-switched network.

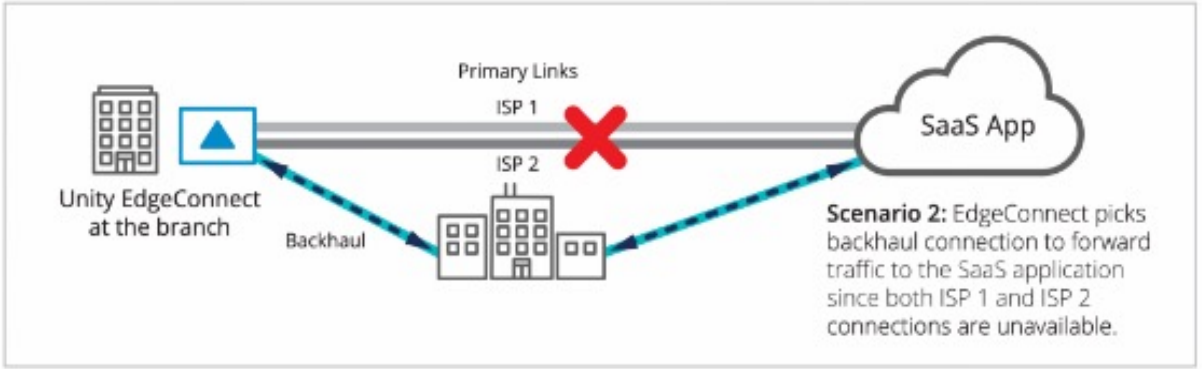

Figure 12: If both ISP 1 and ISP 2 connections become unavailable, EdgeConnect automatically moves application traffic to the transport service configured as a backup that backhauls traffic through the data center.

Source: https://www.silver-peak.com/resource-center/sd-wan-performance-matters-solution-brief

U.S. Pat. No. 6,816,464 – Claim 4(i)

4. A method of claim 1, wherein said at least one quality metric includes one or more of latency, time jitter, and lost packet information.

Intelligent Internet Breakout

Often customers provision two or more WAN links from remote branch sites to increase network and application availability and performance. These links are used for breaking out traffic locally at each branch. Using the internet as an underlay transport is less expensive than private leased line connections such as MPLS since it offers much higher bandwidth at a given price point. To optimize utilization of the provisioned WAN internet links and to optimize SaaS application performance, EdgeConnect monitors the performance of all links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in realtime. EdgeConnect uses statistical learning based on jitter, latency, loss and MOS on all provisioned internet links to dynamically determine which link is performing the best before sending traffic. This optimizes internet break out traffic to deliver the highest SaaS and cloud application performance (see Figure 11). Configuring these policies is fully automated within Silver Peak Unity Orchestrator™ and doesn't require any manual configuration. The Orchestrator also enables configuration of an automated policy for finding the best path for that traffic over the SD-WAN fabric, across MPLS or another WAN service, in the rare case that both underlying internet links are underperforming or are unavailable (see Figure 12).

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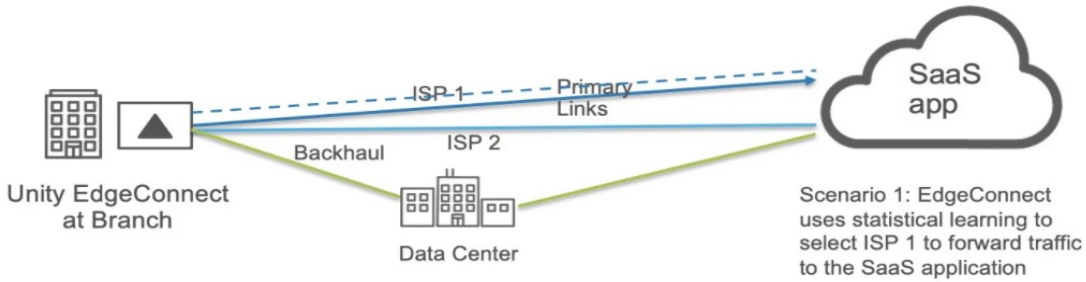


Figure 1: To optimize utilization of the provisioned WAN internet links (ISP 1 and ISP 2), EdgeConnect monitors the performance of the two links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in real-time. Using statistical learning, EdgeConnect dynamically select ISP 1 to send traffic to the SaaS application.

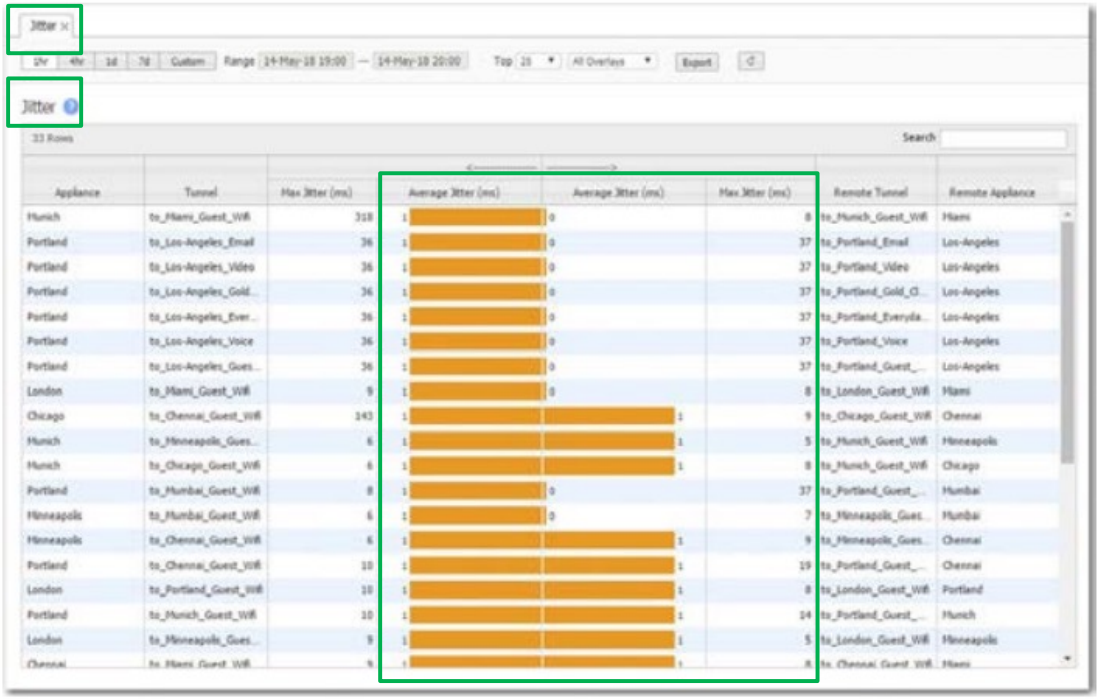
Source: https://blog.silver-peak.com/modern-cloud-first-enterprises-require-intelligent-internet-breakout

U.S. Pat. No. 6,816,464 – Claim 4(ii)

4. A method of claim 1, wherein said at least one quality metric includes one or more of latency, time jitter, and lost packet information.

Jitter Summary

The **Jitter** chart shows which tunnels have the most Jitter. Jitter can be caused by congestion in the LAN, firewall routers, bottleneck access links, load sharing, route flapping, routing table updates, and timing drifts.



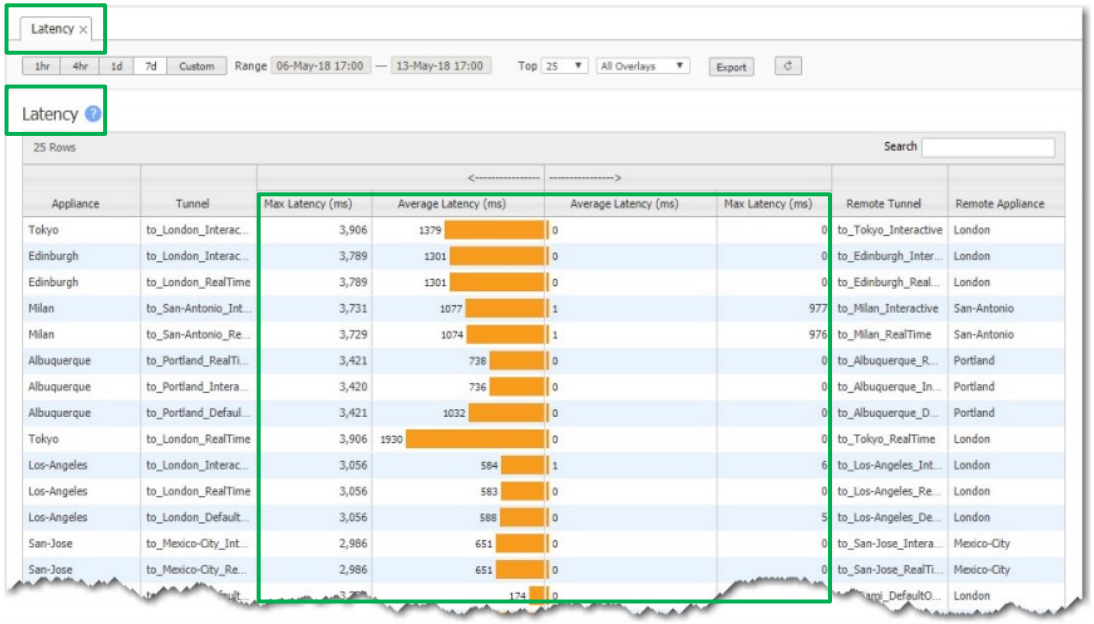
Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 299 of 431

U.S. Pat. No. 6,816,464 – Claim 4(iii)

4. A method of claim 1, wherein said at least one quality metric includes one or more of latency, time jitter, and lost packet information.

Latency

The **Latency** chart shows which tunnels have the most transmission delay, generally as a result of congestion.



Appliance	Tunnel	Max Latency (ms)	Average Latency (ms)	Average Latency (ms)	Max Latency (ms)	Remote Tunnel	Remote Appliance
Tokyo	to_London_Interac...	3,906	1379	0	0	to_Tokyo_Interactive	London
Edinburgh	to_London_Interac...	3,789	1301	0	0	to_Edinburgh_Inter...	London
Edinburgh	to_London_RealTime	3,789	1301	0	0	to_Edinburgh_Real...	London
Milan	to_San-Antonio_Int...	3,731	1077	1	977	to_Milan_Interactive	San-Antonio
Milan	to_San-Antonio_Re...	3,729	1074	1	976	to_Milan_RealTime	San-Antonio
Albuquerque	to_Portland_RealTi...	3,421	738	0	0	to_Albuquerque_R...	Portland
Albuquerque	to_Portland_Intera...	3,420	736	0	0	to_Albuquerque_In...	Portland
Albuquerque	to_Portland_Defaul...	3,421	1032	0	0	to_Albuquerque_D...	Portland
Tokyo	to_London_RealTime	3,906	1930	0	0	to_Tokyo_RealTime	London
Los-Angeles	to_London_Interac...	3,056	584	1	6	to_Los-Angeles_Int...	London
Los-Angeles	to_London_RealTime	3,056	583	0	0	to_Los-Angeles_Re...	London
Los-Angeles	to_London_Default...	3,056	588	0	5	to_Los-Angeles_De...	London
San-Jose	to_Mexico-City_Int...	2,986	651	0	0	to_San-Jose_Intera...	Mexico-City
San-Jose	to_Mexico-City_Re...	2,986	651	0	0	to_San-Jose_RealTi...	Mexico-City
			174	0		ami_DefaultO...	London

Tunnel latency - measured in milliseconds, the maximum latency of a one-second sample within a 60-second span

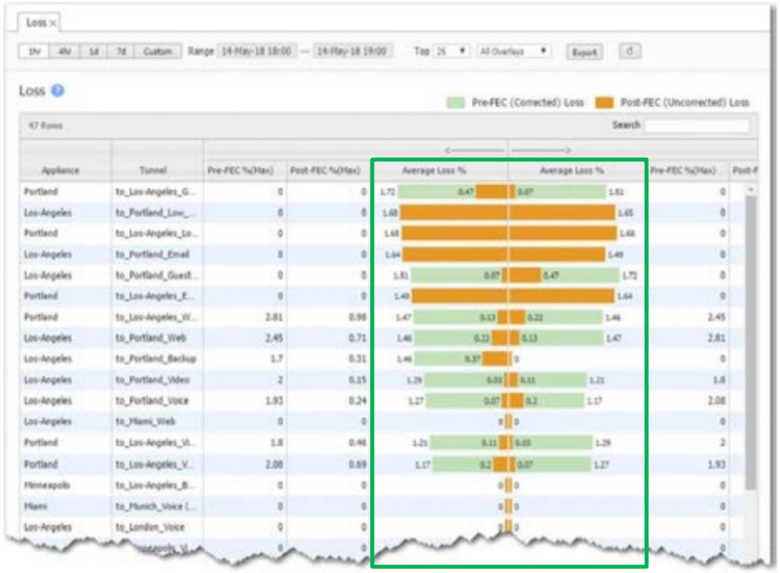
Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 149 & 301 of 431

U.S. Pat. No. 6,816,464 – Claim 4(iv)

4. A method of claim 1, wherein said at least one quality metric includes one or more of latency, time jitter, and lost packet information.

Loss

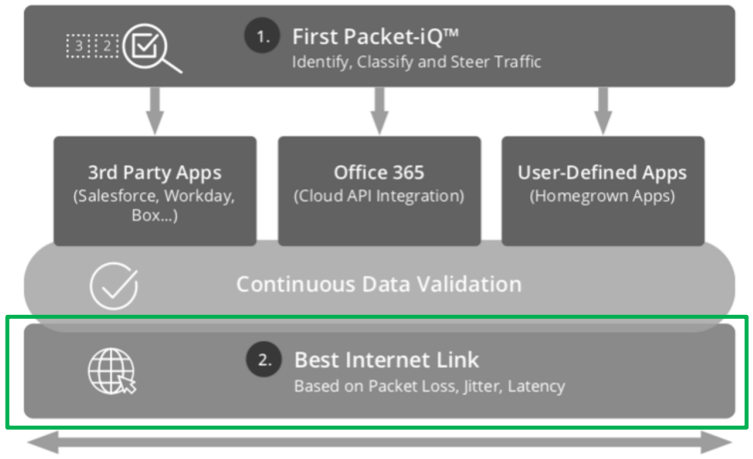
The **Loss** chart shows which tunnels have the most dropped packets.



Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 297 of 431

U.S. Pat. No. 6,816,464 – Claim 4(v)

4. A method of claim 1, wherein said at least one quality metric includes one or more of latency, time jitter, and lost packet information.



Source
https://www.silver-peak.com/sites/default/files/infoctr/silver-peak-datasheet-unity_edgeconnect-sd-wan-solution-service-provider.pdf

Latency	The amount of latency measure in MS.
Loss	The amount of data lost measured in percent.
Jitter	The amount of jitter measured in MS.

Requirements for Supporting Voice

VoIP is a real-time application, based on UDP, that is highly sensitive to WAN traffic quality—jitter, latency, and packet loss. As a result, companies considering VoIP and consolidation projects will require an acceleration platform that is specifically structured to support UDP, including advanced QoS capabilities to minimize jitter, latency, and packet loss.

networks can range from 5 to 40 msec. Most VoIP gateway products can compensate for jitter up to 160 msec with dynamic buffering. When network jitter exceeds these buffer tolerances, packets are typically dropped, resulting in poor voice quality for end users. As a general rule of thumb, jitter should remain below 200 msec to avoid noticeable degradation in VoIP quality. Silver Peak makes jitter a non-issue in enterprise VoIP scenarios.

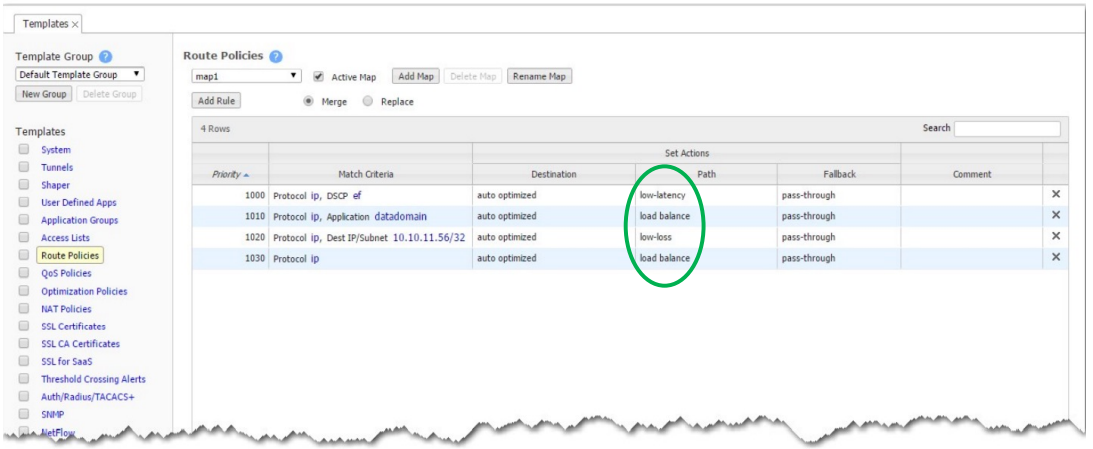
Source: https://www.silver-peak.com/sites/default/files/infoctr/silver-peak_ss_voip.pdf Page 1 & 3 of 3

U.S. Pat. No. 6,816,464 – Claim 4(vi)

4. A method of claim 1, wherein said at least one quality metric includes one or more of latency, time jitter, and lost packet information.

You may also want to create a Route Policy entry when multiple tunnels exist to the remote **peer**, and you want the appliance to dynamically select the best path based on one of these criteria:

- load balancing
- lowest loss
- lowest latency
- specified tunnel



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A comprehensive dashboard (Figure 1) provides a complete at-a-glance view along with customizable widgets to monitor network attributes and applications in real time. IT defined widgets provide granular details on SD-WAN appliances, including their location, active tunnels, logical topology, appliance health heatmap, top talkers, alarms, mean opinion score (MOS), applications and domains accessed, bandwidth consumed, flow count, latency, jitter, and packet loss (Figure 2).

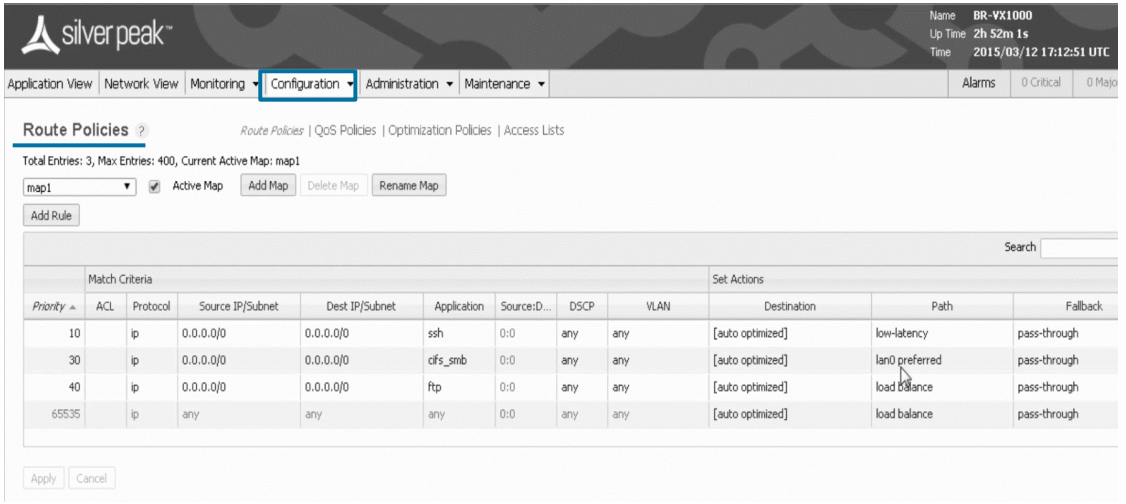
Source: https://www.arubanetworks.com/assets/so/SO_Simplify-WAN-Operations.pdf

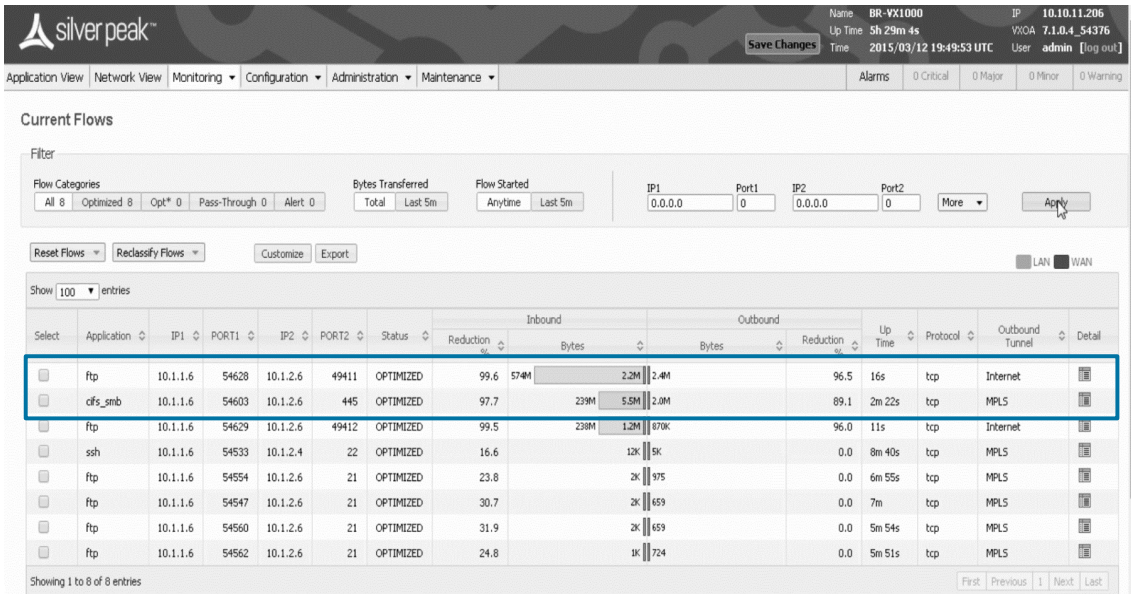
U.S. Pat. No. 6,816,464 – Claim 5(i)

5. A method of claim 1, further comprising the steps of:

(7) prioritizing each of said candidate routes among other tested routes based on a score obtained in said step of scoring; and

(8) storing said score related to each of said candidate routes for use in route selection.





Source: https://www.silver-peak.com/resource-center/sd-wan-dynamic-path-control-demo

U.S. Pat. No. 6,816,464 – Claim 5(ii)

5. A method of claim 1, further comprising the steps of:
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(8) storing said score related to each of said candidate routes for use in route selection.

Often customers provision two or more WAN links from remote branch sites to increase network and application availability and performance. To optimize utilization of the provisioned WAN internet links, EdgeConnect monitors the performance of the links in real-time by continuously measuring packet loss, jitter, latency, and mean opinion score (MOS). EdgeConnect uses statistical learning to dynamically determine the optimal link for breaking out traffic, thus maintaining peak application performance. This optimizes internet break out traffic to deliver the highest SaaS and cloud application performance (see Figure 1). Configuring these policies is fully automated within the Silver Peak Unity Orchestrator™ management interface and doesn't require any manual configuration. Orchestrator also enables configuration of an automated policy for finding the best path for that traffic over the SD-WAN fabric, across MPLS or another WAN service, in the rare case that both underlying internet links are underperforming or unavailable (see Figure 2).

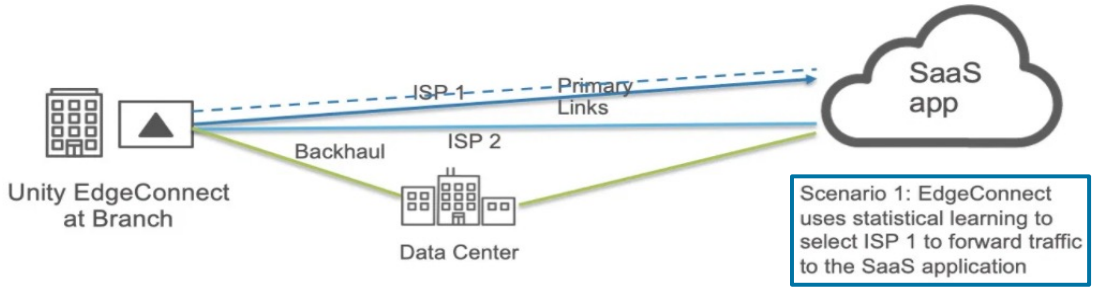

Figure 1: To optimize utilization of the provisioned WAN internet links (ISP 1 and ISP 2), EdgeConnect monitors the performance of the two links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in real-time. Using statistical learning, EdgeConnect dynamically select ISP 1 to send traffic to the SaaS application.

Source: https://blog.silver-peak.com/modern-cloud-first-enterprises-require-intelligent-internet-breakout

U.S. Pat. No. 6,816,464 – Claim 5(iii)

5. A method of claim 1, further comprising the steps of:
(7) prioritizing each of said candidate routes among other tested routes based on a score obtained in said step of scoring; and
(8) storing said score related to each of said candidate routes for use in route selection.

- Thresholds for **Latency**, **Loss**, or **Jitter** are checked once every second.
  - Receiving 3 successive measurements in a row that exceed the threshold puts the tunnel into a brownout situation and flows will attempt to fail over to another tunnel within the next 100mS.
  - Receiving 3 successive measurements in a row that drop below the threshold will drop the tunnel out of brownout.

Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 187 of 431

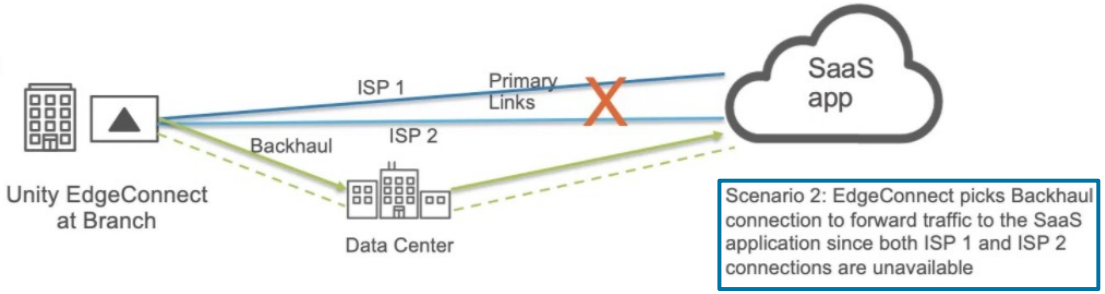

Figure 2: If both ISP 1 and ISP 2 connections become unavailable, EdgeConnect automatically chooses the configured backup transport service that backhauls traffic through the data center.

Source: https://blog.silver-peak.com/modern-cloud-first-enterprises-require-intelligent-internet-breakout

Highest End-user Quality of Experience

Selecting the best path to direct packets eliminates any additional latency experienced by your SaaS applications and IaaS workloads. This delivers the highest quality of experience to users and results in happy customers, prospects, and employees. In addition, intelligent internet breakout can also be used to automatically address brownout or blackout conditions on any link. For instance, if a branch is served by one MPLS connection and one internet connection, before sending any packets over the internet connection, the EdgeConnect appliance confirms the connection quality. If for some reason, the internet connection is experiencing loss, latency, jitter or MOS greater than a pre-configured threshold, the EdgeConnect appliance will automatically select the MPLS connection to send packets. This ensures that no matter what happens, enterprise applications, whether hosted in the data center, hosted in IaaS, UCaaS, or SaaS, always operate at peak performance. The new Silver Peak intelligent internet breakout feature dramatically improves business productivity while enabling businesses to increase efficiency.

Source: https://blog.silver-peak.com/modern-cloud-first-enterprises-require-intelligent-internet-breakout

U.S. Pat. No. 6,816,464 – Claim 5(iv)

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(7) prioritizing each of said candidate routes among other tested routes based on a score obtained in said step of scoring; and

(8) storing said score related to each of said candidate routes for use in route selection.

Tunnel Bonding: Configured from two or more physical WAN transport services, bonded tunnels form a single logical overlay connection, aggregating the performance of all underlying links. Real-time traffic steering is applied over any broadband or MPLS link, or any combination of links based on company-defined policies based upon business intent. In the event of an outage or brownout, Aruba EdgeConnect automatically continues to carry traffic on the remaining links or switches over to a secondary connection. Network traffic traversing an Aruba EdgeConnect SD-WAN can be tuned for availability, quality, throughput and efficiency. This is accomplished on a per-application basis through the use of Business Intent Overlays. Multiple business intent policies can be created, each with its own specific bonding policy. As part of this policy definition, the customers have the ability to customize the link prioritization and traffic steering policies based on multiple criteria, including physical performance characteristics, link economics, link resiliency characteristics and customer-definable attributes.

Source: https://www.silver-peak.com/resource-center/unity-edge-connect-data-sheet-solution

U.S. Pat. No. 6,816,464 – Claim 5(v)

5. A method of claim **1**, further comprising the steps of:
(7) prioritizing each of said candidate routes among other tested routes based on a score obtained in said step of scoring; and
(8) storing said score related to each of said candidate routes for use in route selection.

A comprehensive dashboard (Figure 1) provides a complete at-a-glance view along with customizable widgets to monitor network attributes and applications in real time. IT defined widgets provide granular details on SD-WAN appliances, including their location, active tunnels, logical topology, appliance health heatmap, top talkers, alarms, mean opinion score (MOS), applications and domains accessed, bandwidth consumed, flow count, latency, jitter, and packet loss (Figure 2).

Source: https://www.arubanetworks.com/assets/so/SO_Simplify-WAN-Operations.pdf

application performance, EdgeConnect monitors the performance of all links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in realtime. EdgeConnect uses statistical learning based on jitter, latency, loss and MOS on all provisioned internet links to dynamically determine which link is performing the best before sending traffic. This optimizes internet break out

Source: https://www.silver-peak.com/resource-center/sd-wan-performance-matters-solution-brief

U.S. Pat. No. 6,816,464 – Claim 5(vi)

5. A method of claim **1**, further comprising the steps of:

(7) prioritizing each of said candidate routes among other tested routes based on a score obtained in said step of scoring; and

(8) storing said score related to each of said candidate routes for use in route selection.

Figure 1: The Aruba Orchestrator dashboard provides complete observability of network health and application performance

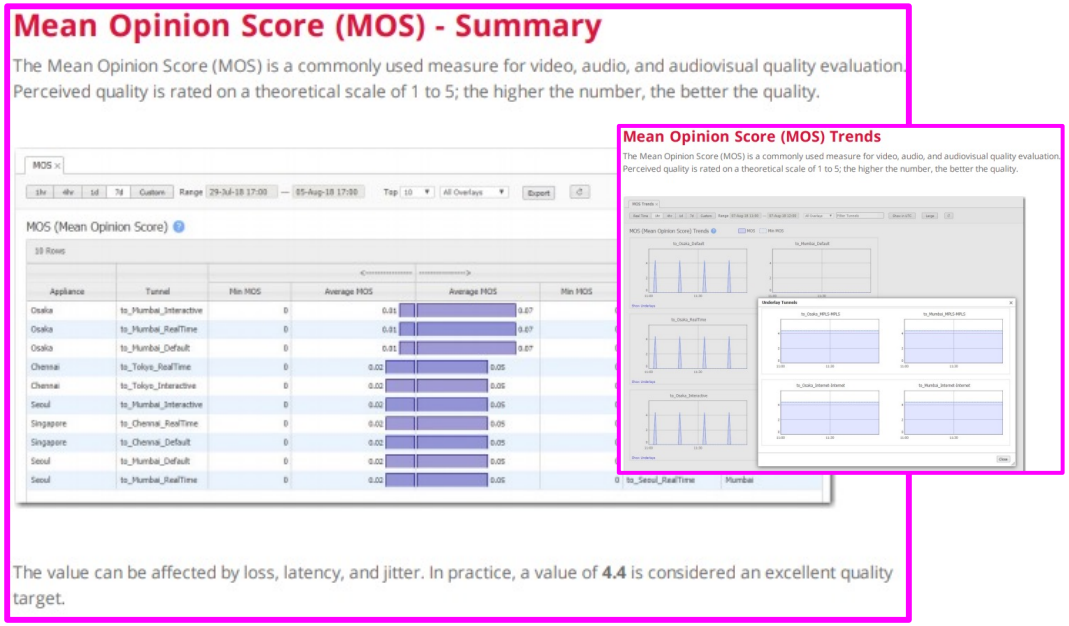
Source: https://www.arubanetworks.com/assets/so/SO_Simplify-WAN-Operations.pdf Page 3 of 9

U.S. Pat. No. 6,816,464 – Claim 5(vii)

5. A method of claim **1**, further comprising the steps of:

(7) prioritizing each of said candidate routes among other tested routes based on a score obtained in said step of scoring; and

(8) storing said score related to each of said candidate routes for use in route selection.



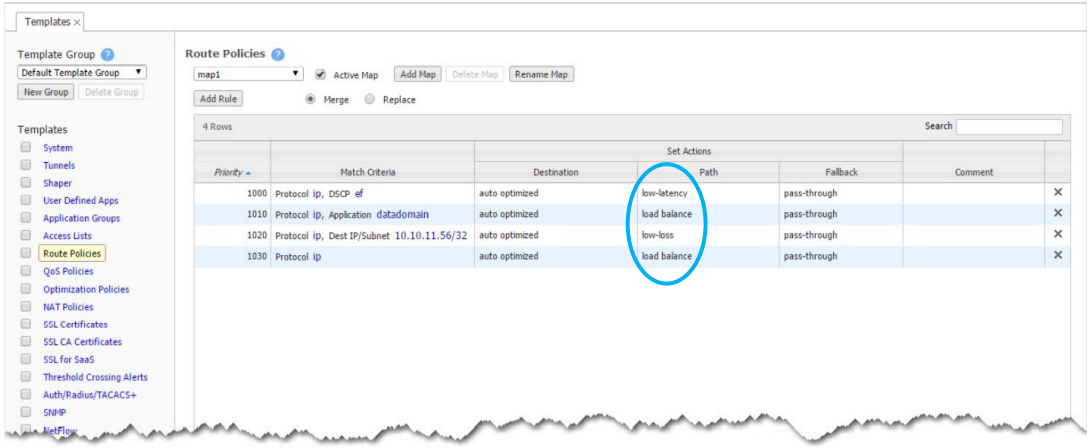
Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 305 & 306 of 431

U.S. Pat. No. 6,816,464 – Claim 19(i)

19. A method of claim 1, wherein step (5) further comprises configuring a scoring table that includes a quality score, packet loss, average delay, and average jitter.

You may also want to create a Route Policy entry when multiple tunnels exist to the remote **peer**, and you want the appliance to dynamically select the best path based on one of these criteria:

- load balancing
- lowest loss
- lowest latency
- specified tunnel



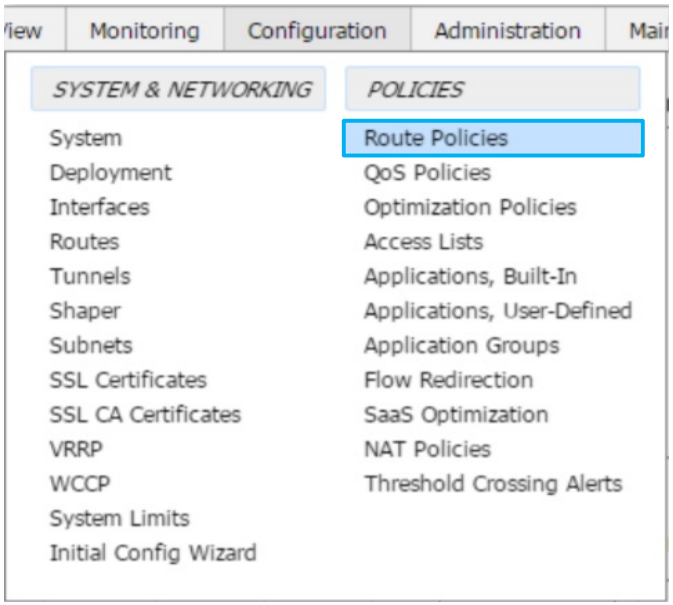
Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 117 & 206 of 431

A comprehensive dashboard (Figure 1) provides a complete at-a-glance view along with customizable widgets to monitor network attributes and applications in real time. IT defined widgets provide granular details on SD-WAN appliances, including their location, active tunnels, logical topology, appliance health heatmap, top talkers, alarms, mean opinion score (MOS), applications and domains accessed, bandwidth consumed, flow count, latency, jitter, and packet loss (Figure 2).

Source: https://www.arubanetworks.com/assets/so/SO_Simplify-WAN-Operations.pdf Page 2 of 9

U.S. Pat. No. 6,816,464 – Claim 19(ii)

19. A method of claim 1, wherein step (5) further comprises configuring a scoring table that includes a quality score, packet loss, average delay, and average jitter.



Set Actions Fields

The Route Policy template's SET actions determines where to direct traffic and what the fallback is when a tunnel is down.

Where the appliance directs traffic

- In the **Destination** field, you specify how to characterize the flow. The options are a specific overlay, **auto-optimized**, **pass-through** [shaped], **pass-through-unshaped**, or **dropped**.
- When **auto-optimized**, a flow is directed to the appropriate tunnel. If you choose, you can specify that the appliance use metrics to dynamically select the best path based on one of these criteria:
  - load balancing
  - lowest loss
  - lowest latency
- When configuring the Route Policy for an **individual** appliance when multiple tunnels exist to the remote **peer**, you can also select the path based on a preferred interface or a specific tunnel. For further information, see the Appliance Manager Operator's Guide.

Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 208 of 431

How to configure DPC in the Route Policy

The examples below show how to configure the three available types of dynamic path control: **load balancing**, **low-loss**, and **low-latency**.

Although we've used CIFs, SSH, and FTP traffic to illustrate, the steps work with any application. Note that these examples are not intended to be recommendations about how to handle that specific traffic in your network.

For all DPC configuration, go to **Configuration > Route Policies**.

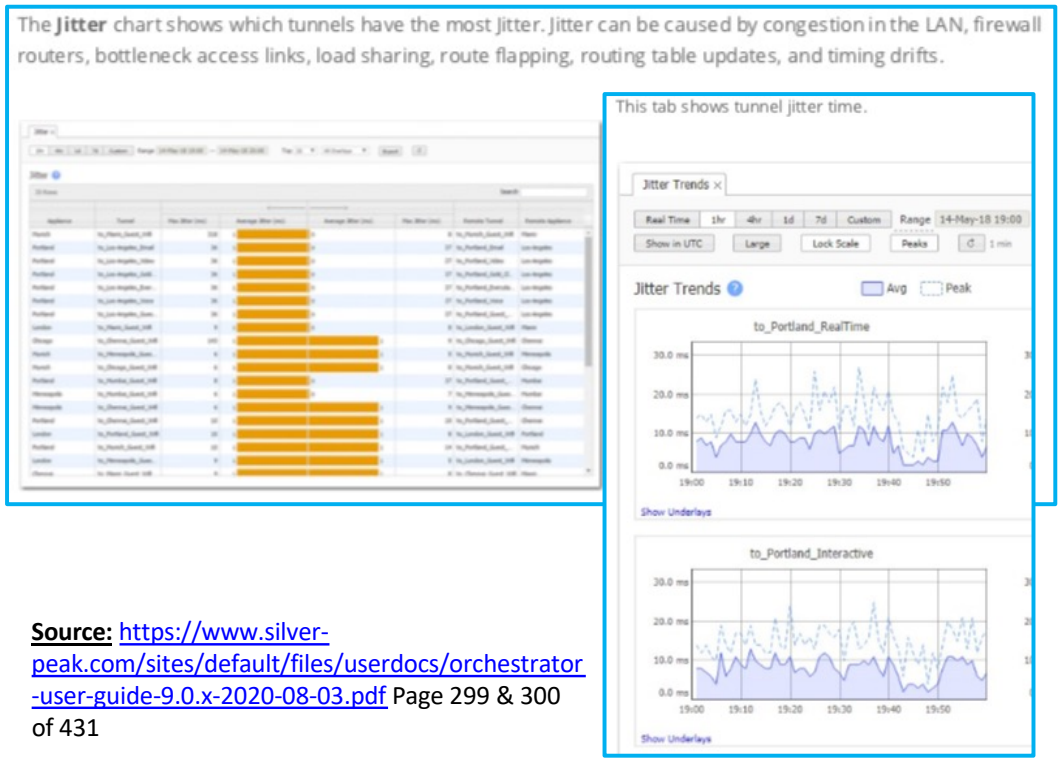
Source: https://www.silver-peak.com/sites/default/files/userdocs/network_deployments_r7-3_revm_november2015.pdf Page 17 of 270

U.S. Pat. No. 6,816,464 – Claim 19(iii)

19. A method of claim 1, wherein step (5) further comprises configuring a scoring table that includes a quality score, packet loss, average delay, and average jitter.

application performance, EdgeConnect monitors the performance of all links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in realtime. EdgeConnect uses statistical learning based on jitter, latency, loss and MOS on all provisioned internet links to dynamically determine which link is performing the best before sending traffic. This optimizes internet break out

Source: https://www.silver-peak.com/resource-center/sd-wan-performance-matters-solution-brief



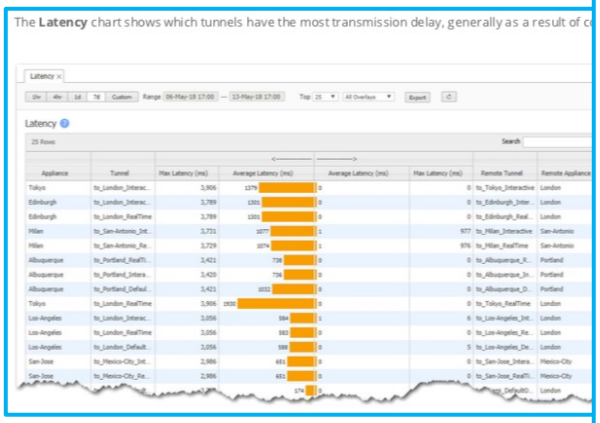
Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 299 & 300 of 431

U.S. Pat. No. 6,816,464 – Claim 19(iv)

19. A method of claim 1, wherein step (5) further comprises configuring a scoring table that includes a quality score, packet loss, average delay, and average jitter.

application performance, EdgeConnect monitors the performance of all links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in realtime. EdgeConnect uses statistical learning based on jitter, latency, loss and MOS on all provisioned internet links to dynamically determine which link is performing the best before sending traffic. This optimizes internet break out

Source https://www.silver-peak.com/resource-center/sd-wan-performance-matters-solution-brief



Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 301 & 302 of 431

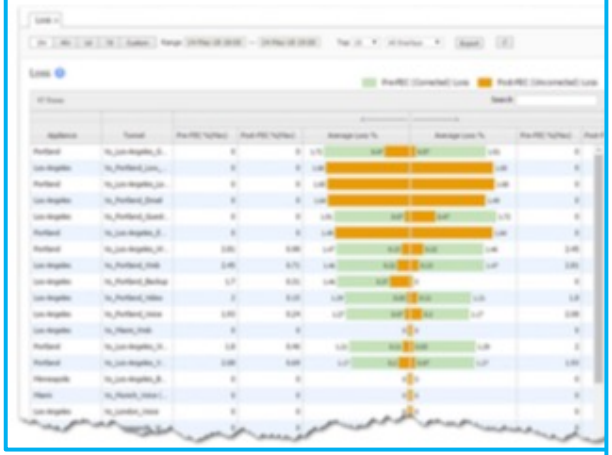
U.S. Pat. No. 6,816,464 – Claim 19(v)

19. A method of claim 1, wherein step (5) further comprises configuring a scoring table that includes a quality score, packet loss, average delay, and average jitter.

application performance, EdgeConnect monitors the performance of all links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in realtime. EdgeConnect uses statistical learning based on jitter, latency, loss and MOS on all provisioned internet links to dynamically determine which link is performing the best before sending traffic. This optimizes internet break out

Source https://www.silver-peak.com/resource-center/sd-wan-performance-matters-solution-brief

The **Loss** chart shows which tunnels have the most dropped packets.



The **Loss Trends** chart shows tunnel packet loss over t

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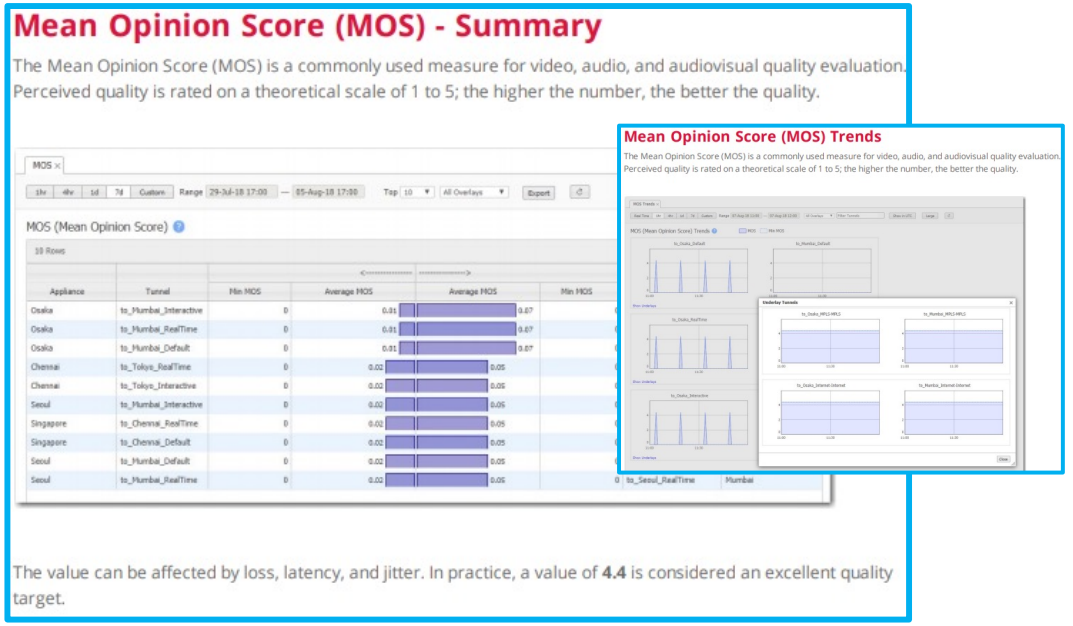
U.S. Pat. No. 6,816,464 – Claim 19(vi)

19. A method of claim 1, wherein step (5) further comprises configuring a scoring table that includes a quality score, packet loss, average delay, and average jitter.

application performance, EdgeConnect monitors the performance of all links by continuously measuring the packet loss, jitter, latency and mean opinion score (MOS) in realtime. EdgeConnect uses statistical learning based on jitter, latency, loss and MOS on all provisioned internet links to dynamically determine which link is performing the best before sending traffic. This optimizes internet break out

Source https://www.silver-peak.com/resource-center/sd-wan-performance-matters-solution-brief



Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 305 & 306 of 431

U.S. Pat. No. 6,816,464 – Claim 20

20. A method of claim **1**, wherein said communications link establishes a VOIP connection.

Overview of SD-WAN Prerequisites

With Orchestrator, you create virtual network overlays to apply business intent to network segments. Provisioning a device is managed by applying profiles.

- **Interface Labels** associate each interface with a use.
  - **LAN** labels refer to traffic type, such as **VoIP**, **data**, or **replication**.
  - **WAN** labels refer to the service or connection type, such as **MPLS**, **internet**, or **Verizon**.
- **Deployment Profiles** configure the interfaces and map the labels to them, to characterize the appliance.
- **Business Intent Overlays** use the Labels specified in Deployment Profiles to define how traffic is routed and optimized between sites. These overlays can specify preferred paths and can link bonding policies based on **application**, **VLAN**, or **subnet**, independent of the brand and physical routing attributes of the underlay.

  This diagram shows the basic architecture and capabilities of **Overlays**.

Source: https://www.silver-peak.com/sites/default/files/userdocs/orchestrator-user-guide-9.0.x-2020-08-03.pdf Page 14 & 93 of 431

Requirements for Supporting Voice

VoIP is a real-time application, based on UDP, that is highly sensitive to WAN traffic quality—jitter, latency, and packet loss. As a result, companies considering VoIP and consolidation projects will require an acceleration platform that is specifically structured to support UDP, including advanced QoS capabilities to minimize jitter, latency, and packet loss.

networks can range from 5 to 40 msec. Most VoIP gateway products can compensate for jitter up to 160 msec with dynamic buffering. When network jitter exceeds these buffer tolerances, packets are typically dropped, resulting in poor voice quality for end users. As a general rule of thumb, jitter should remain below 200 msec to avoid noticeable degradation in VoIP quality. Silver Peak makes jitter a non-issue in enterprise VoIP scenarios.

Source: https://www.silver-peak.com/sites/default/files/infoctr/silver-peak_ss_voip.pdf Page 1 & 3 of 3