WHITEPAPER

VPLS for Any-to-Any Ethernet Connectivity: When Simplicity & Control Matter

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Veroxity Technology Partners®, LLC 6 Technology Park Drive Westford, MA 01886 1.877.VEROXITY

The Holy Grail: Achieving Simplicity and Control in the IT Infrastructure

Today's Information Technology decision-makers face a major challenge in striking the right balance between managing the complex exchange of data and the operational efficiencies required to support their IT resources. At first glance, this appears to be an almost insurmountable task – two concepts that are completely at odds with each other. Consider an organization with multiple locations, needing to send an abundance of data securely and in compliance with various regulations from and between local offices that have potentially varying levels of bandwidth requirements. How can such an organization achieve simplicity and control over its data networks?

Unfortunately, efforts to attain this level of simplicity and control have been hindered by the explosion of bandwidth requirements. To address this issue and enable quick, secure data transfer, various solutions have been brought forth over the years. But early technologies like Frame Relay and Asynchronous Transfer Mode (ATM) that were once useful have shown their limitations. As an initial stopgap, telecom providers developed Multi-Protocol Label Switching (MPLS) for multipoint, Ethernet-centric connectivity.

Many organizations use MPLS today to enable connectivity between a large number of sites. But tradeoffs in implementing MPLS translate to a high level of complexity for the enterprise. While MPLS might be the right choice for organizations that need low-bandwidth solutions between a large number of sites, it can be overkill for many companies.

There is an alternative: **a Layer 2 virtual private LAN service (VPLS), also called an Any-to-Any Ethernet solution.**

The Choices: MPLS Versus VPLS

Many organizations have opted for MPLS by default, not realizing there may be an option that makes more sense. To determine the optimal choice, organizations need to better understand how MPLS and VPLS differ.

What is MPLS?

MPLS was intended to solve the problem of bridging multiple, disparate protocols such as Frame Relay, ATM and Ethernet within a single infrastructure. As such, it's a Layer 3 mechanism enabling IP Networks to define virtual circuit services in a meshed configuration. A meshed architecture enables all sites to communicate directly with every other site in the architecture. In these configurations, organizations still maintain their LAN infrastructures and MPLS becomes their WAN solution (see figure 1). As such, organizations need to manage the network topology that enables the WAN connectivity.

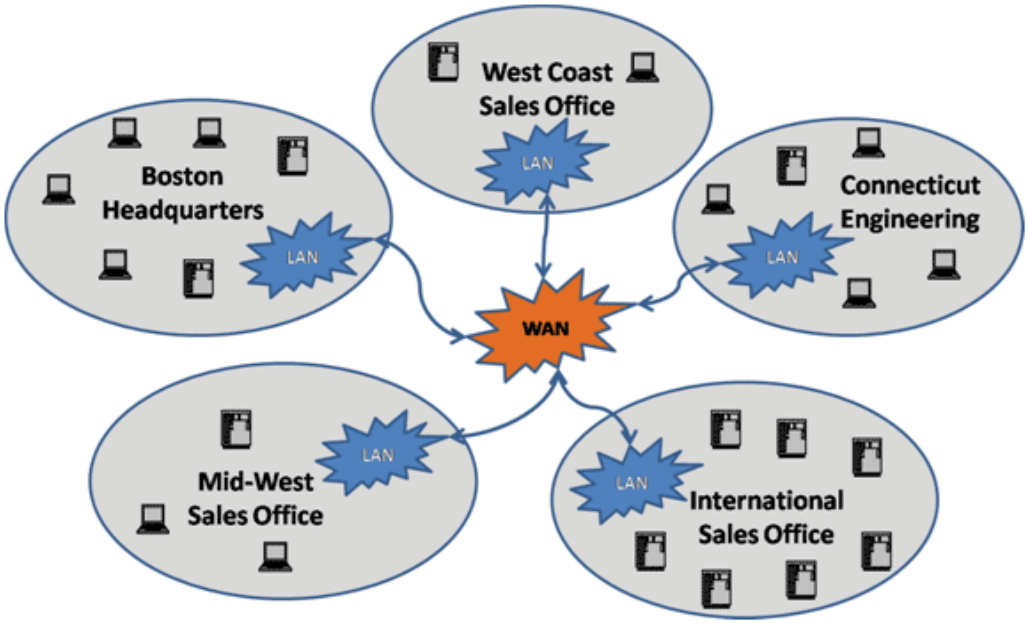

Figure 1. Organizations must maintain their WAN infrastructures in an MPLS deployment.

What is VPLS?

VPLS is a Layer 2 multipoint service enabled by a carrier's MPLS network. This service leverages the efficiencies and reliability of a Layer 3 MPLS network to provide secure, meshed connectivity. With VPLS, organizations can realize the advantages of MPLS without having to provision MPLS on their end devices. Plus, VPLS makes it possible to connect separate LAN locations so they appear – and can communicate – as a single Ethernet LAN (see figure 2).

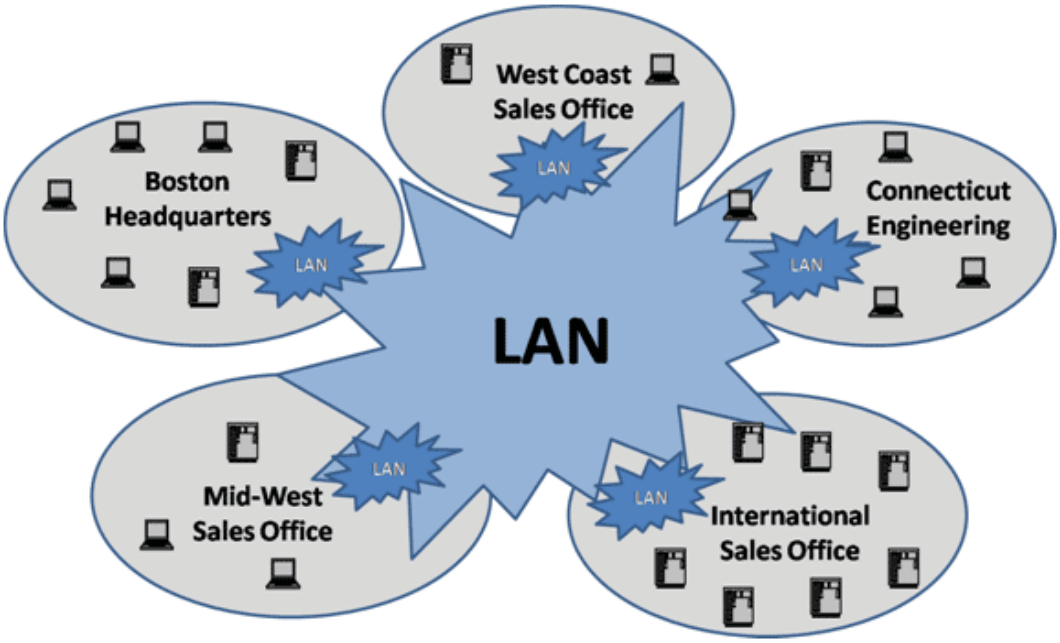

Figure 2. Organizations eliminate their WAN infrastructure by going with VPLS.

Four Critical Differences Between MPLS and VPLS

Though MPLS and VPLS both leverage MPLS technology and offer similar connectivity, the similarities end there. The following sections highlight key differences between the two services.

Implementation

When an organization purchases MPLS from a service provider, it must deploy MPLS on its WAN interface to interact with the carrier. Specifically, to configure an interface to interact at Layer 3, customers must coordinate IP schemas – and often, routing protocols and routing tables – with the service provider. Complicating matters, companies cannot layer complex protocols on top of a Layer 3 network – or increase bandwidth – without interacting with their provider, limiting their networking choices and delaying implementation.

On the other hand, VPLS leverages an organization's existing infrastructure, including common Ethernet ports found on much of today's networking equipment. As a result, organizations maintain control over their service and network. For example, companies can layer complex protocols on top of the service provider's Layer 2 network for added flexibility. Because they can run any protocol/private IP schema across their locations, customers manage their network configuration. In many instances, the service provider can increase available bandwidth with a few keystrokes.

Network configurations

In addition to interacting with the service provider to get started with MPLS, all customer configurations need to be negotiated with the service provider. That's because Layer 3 – where MPLS operates – requires the exchange of complex information between network participants. This can lead to frustrating operations for customers. For example, assume a customer has 100 Mbps going into its facility and initially dedicates 10 Mbps to support VoIP traffic between sites. If the organization needs to boost that connectivity to 20 Mbps, it would have to contact the service provider and reconfigure its service to match the service provider's capabilities.

Because VPLS operates at Layer 2, which requires basic connectivity, customers can easily configure a device to interact with the VPLS service. Plus, customers can make network changes independently of the service provider. In other words, VPLS strips the

complexity out of carrier interactions, empowering organizations to control network configurations. Adding or deleting sites in an any-to-any connectivity model is quite simple. When a new site is added to the network, the service provider's VPLS address tables are updated, making it possible for all sites in the VPLS network to immediately communicate with one another.

VPLS also eliminates the complexity required to maintain the WAN – all that's needed is an Ethernet port. Organizations do not have to exchange VLAN or IP information with their service provider for any reason. Furthermore, companies can design a network that connects to national and international locations but still looks like a campus-based LAN.

Data Integrity

In an attempt to ensure data integrity, MPLS predetermines the path that data should take across the network. When choosing a path, MPLS leverages a number of variables, including traffic priority, bandwidth availability, and network congestion. Because of the variety of factors considered in this calculation, MPLS may change the predetermined path a fair number of times in the course of delivering data packets. In other words, MPLS traffic can take different paths. As a result, not all packets are received in order, leading to delays, or jitter.

With VPLS, a static path – called a virtual circuit – is established between sites as each site is added. All traffic traversing the cloud will take the same path each time. Because these predetermined routes take into consideration latency, hop count, and reliability, organizations are assured of consistent latency and zero jitter. Because data packets are received in the exact order in which they were transmitted, without losing any protection schemas, organizations can be certain of rapid interactions that ensure data integrity.

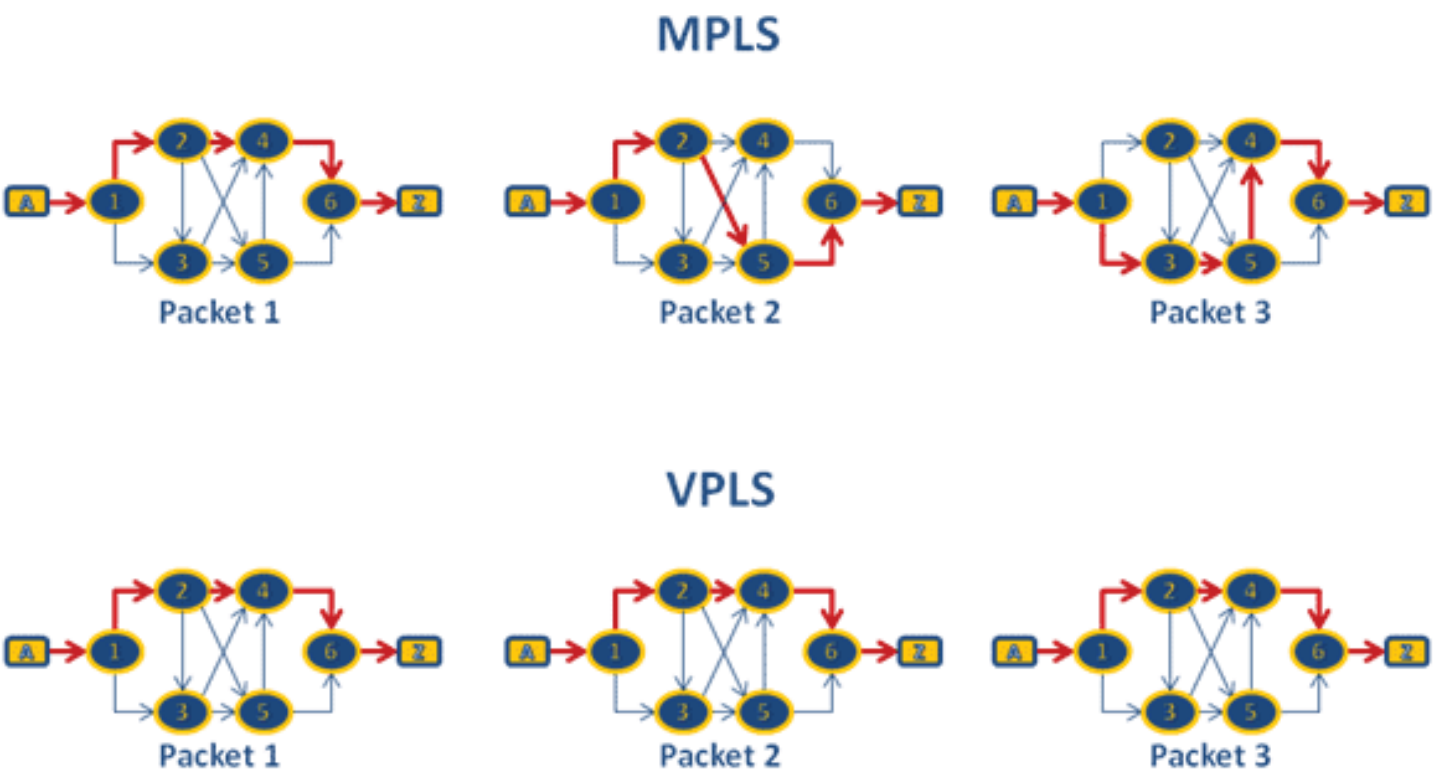

Figure 3. While VPLS establishes – and maintains – static paths, MPLS paths can vary.

Security

While many perceive MPLS to be more secure than VPLS, the services actually offer similar levels of security, as they both leverage MPLS technology. That said, a few differences bear mentioning:

- VPLS networks ensure security by assigning a unique customer ID
- Because VPLS customers manage routing, they do not have to coordinate Layer 3 routing tables with service providers
- Organizations can restrict communications between a certain number of locations, limiting access to sensitive information

VPLS in Action

Organizations in a VPLS network are assigned a unique identifier, similar to a VLAN ID. This customer-specific identifier creates traffic segmentation between customers to ensure security. Every time the customer wants to add a new location to the VPLS configuration, the service provider assigns this unique ID to the appropriate Ethernet port connected to the customer. The VPLS service then dynamically establishes static paths between each port based on optimal routes.

The service provider is able to ensure efficient network operations because it maintains a media access control (MAC) address table – corresponding to the customer's equipment – instead of complex routing tables needed to route traffic in an MPLS service. The MAC address of the packet determines the virtual circuit it will traverse. If the packet destination is unknown or labeled as broadcast, the service provider transmits the data across all virtual circuits assigned to the specific customer to ensure that it ultimately gets to its intended location. In cases of network, link, or node failure, the VPLS service re-establishes each static path, again based upon optimal network routes.

When customers want to add a new location, they simply connect it to the service provider's network. As soon as the unique identifier is assigned to the new customer port, static paths are instantly created between the new port and all other customer ports.

VPLS is the right choice when organizations want to:

- Control routing
- Manage network and connectivity
- Ensure lowest latency and packet loss
- Use in-house resources and expertise to configure their network

What to Look for in a VPLS Solution

While VPLS offers an attractive alternative to MPLS, not all VPLS offerings are created equal. Look for a service provider that meets the following requirements at a minimum:

- **Dedicated bandwidth.** Whenever possible, make sure the service provider doesn't oversubscribe its access networks. Oversubscription can lead to packet loss during high demand times. While the carrier may offer prioritization to ensure high-priority traffic traverses its oversubscribed network, traffic will still have to compete with other traffic on the network. The best choice is a carrier that equally prioritizes all traffic without oversubscription.
- **Traffic shaping.** The service provider should make it possible for organizations to shape their own traffic before it enters the network – or shape it for them. By shaping traffic on the network edge to ensure optimal performance, the service provider makes it possible to support bandwidth-hungry video and VoIP applications.
- **Service Level Agreement (SLA) strength.** The service provider should be willing to guarantee bandwidth via an SLA. In addition, make sure the SLA reflects the highest levels of service and support, including availability, agility, and mean time to repair.
- **Extensive reach.** Some carriers are limited in their reach because they only offer VPLS via connectivity to Ethernet networks. Look for a service provider that links to a large base of networks throughout the country and in other parts of the world. Ideally, the carrier takes advantage of traditional circuits in addition to Ethernet networks, but enables the customer to connect using only an Ethernet interface. This translates into lower costs for customers, while ensuring connectivity to even remote locations.
- **Willingness and ability to expand.** Find out if the carrier is willing to build new fiber routes, if needed, such as to connect multiple facilities. The provider should offer a streamlined approach to the long and complicated process of building a network, and should communicate the progress of each phase in understandable terms, every step of the way. Make sure the service provider has a strong reputation for being

reliable and trustworthy, and is able to negotiate the bureaucratic complexities associated with public projects. Support from city officials and regulators in the field is essential to avoiding project delays.

- **Responsiveness.** From beginning to end, organizations want a trouble-free experience. Look for a nimble carrier that can help quickly provision the service. Key criteria include a customer focus exemplified by a consultative approach that helps organizations choose and implement the best solution for them, along with dedicated customer service throughout the implementation process. Because organizations can't afford delays in troubleshooting delivery issues, make sure the service provider maintains personnel focused on service delivery and is responsive to urgent issues.

Conclusion

Many organizations are seeking ways to seamlessly and easily interconnect their Ethernet networks across multiple geographic locations. MPLS has proven to be a good choice when companies need to connect a large number of sites with low-bandwidth requirements. However, MPLS is overkill for smaller deployments requiring high throughput – it's more difficult to deploy, more expensive to maintain, and offers limited flexibility in terms of adding sites and bandwidth.

VPLS offers a simple and logical alternative for organizations that require high- throughput connectivity between numerous locations. By choosing the best VPLS solution and network provider, organizations can realize the following benefits:

- *Better bandwidth usage* – Enjoy the same throughput using the same amount of bandwidth as deployed with an MPLS-type solution – without the need to deploy costly Layer 3 protocols.
- *Uniform reach* – Leverage existing Layer 1 and Layer 2 networks to connect remote sites.

VPLS offers a simple and logical alternative for organizations that require high-throughput connectivity between numerous locations.

- *Well positioned for future needs* – Tap into a pure Ethernet-based solution to take advantage of continual improvements in the price and performance offered by Ethernet switching technology.
- *Lower total cost of ownership* – Use familiar Ethernet ports to connect geographically separated locations, while maintaining the look and feel of a LAN connection.

Ready to find out how VPLS can enable your organization to easily establish connections between locations while maintaining network control? Listen to our webinar that discusses the benefits and architecture of our Flexible Any-to-Any Ethernet solution: Veroxity's Any to Any VPLS Connectivity.

"Our organization saved an estimated $90,000 annually in ATM maintenance equipment contracts as a result of deploying a VPLS solution."

- Network Architect, Financial Services firm

Contact Veroxity Technology Partners at:
1.877.VEROXITY
sales@veroxity.com
www.veroxity.com

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