WHITE MPLS and Ethernet VPN Services

Two sides of the same coin



For many enterprises, particularly those with multiple locations, private carrier-grade networks are the preferred networking solution to get the data performance and security (peace of mind) they need, along with the speed, flexibility and easeof-management they desire to achieve and sustain optimal business performance. And those private network services are increasingly based on Multiprotocol Label Switching (MPLS) and Carrier Ethernet Virtual Private Network (VPN) services. In fact, the purpose of this white paper is to provide:

- A basic understanding of MPLS and carrier-grade Ethernet VPNs and their value
- Understanding the difference between Layer 2 and Layer 3 VPN services
- Why not all MPLS or Ethernet VPN services are created equal
- A brief introduction to MPLS and Ethernet VPN solutions from TPx

My goal is to fill in knowledge gaps so your organization can accelerate to success.

MPLS & CARRIER ETHERNET VPNS AND WHY THEY ARE POPULAR

We have already explained why MPLS-based IP VPN is popular in the previous paper, What You May Not Know But Should About MPLS Virtual Private Networks. To recap, most of us are by now familiar with that big public IP network, the Internet. We also are all too familiar with why it is called a "best effort" network, because it works when it works and when it doesn't, it's just too bad. There is no such thing as Internet Quality of Service (QoS) and there are no service agreements that guarantee anything other than the access link, or on-ramp,

to the Internet superhighway. And of course, there are all those security breaches that we hear about every day such as network intrusions and denial of service attacks that are made possible by the fact that we are all connected to this one huge global network.

It is true that IP-VPNs that run over the public Internet can protect your data from prying eyes, but at the cost of encryption and the need to manage point-to-point 'tunnels' and CPE (hardware) for every location that wants to connect to another location. All of that translates into overhead, both network and operating, which makes Internet-based IP VPNs useful mainly for connecting remote employees or locations to the corporate network.

Because of the inconsistent performance and security risks that are inherent to the Internet, most larger enterprises and many of the smaller ones depend on private networking services to a large extent. These private network services, which in the previous decade were comprised of Leased Lines, Frame Relay and ATM services, have now shifted almost entirely to IP VPNs based on MPLS.

The reason for this popularity is that MPLS VPNs provide the security and control that enable guaranteed service quality while keeping the flexibility of fully meshed or hub and spoke networking that made VPNs so popular in the first place. In short, MPLS combines the best aspects of Layer 2 Frame Relay with Layer 3 IP services, such that it is sometimes referred to as 'Layer 2.5.' Meanwhile, carrier-grade Ethernet has been emerging as an alternative to MPLS and has actually been one of the fastest growing data network services over the past few years.

AT THE LOCAL LEVEL, ETHERNET CAN BE PROVIDED VIA COPPER, FIBER AND FIXED WIRELESS ACCESS LINKS.

Fixed Wireless



IN THIS WAY, CARRIER ETHERNET SERVICES HAVE TAKEN ON CHARACTERISTICS SIMILAR TO MPLS, AND IN FACT CERTAIN ETHERNET VPN SERVICES SUCH AS ETHERNET VIRTUAL PRIVATE LAN SERVICE AND ETHERNET VIRTUAL PRIVATE WIRE SERVICE (EVPLS AND VPWS) RUN OVER THE SAME MPLS NETWORK INFRASTRUCTURE. MPLS AND ETHERNET VPNS COULD THUS BE CONSIDERED TWO SIDES OF THE SAME COIN.

ETHERNET VPN: FROM LAN TO WAN

Most of us are familiar with the Ethernet local area networks (LANs) that interconnect our office computers, servers and printers. Although based on the same technology, carriergrade Ethernet has undergone considerable technological evolution and now bears little resemblance to its LAN roots other than the basic frame and addressing formats. Today's Ethernet VPN services can support multiple classes of service just like MPLS and is deployed on fully redundant carrier-grade switching platforms. Although it has been mainly deployed as a Metropolitan area service, which led to the wide spread acceptance of "Metro Ethernet," Ethernet VPN services can extend nationally and even globally over fiber optic transport networks. At the local level, Ethernet can be provided via Copper, Fiber and Fixed Wireless access links.

The main difference between MPLS and Ethernet is that Ethernet is a Layer 2 technology that uses the Ethernet MAC addresses, which are embedded in every computer, to forward traffic. MPLS relies on the customer's IP address list to forward and route traffic from source to destination, with the addition of special "labels" that are used to make sure that each customer's VPNs are isolated from each other since they all share the same infrastructure. Similarly, customer separation on carrier-grade Ethernet is enabled through numbered VLAN labels that are added by the service provider.

STANDARDS & MORE STANDARDS

In the previous paper we noted that the Internet Engineering Task Force (IETF) developed specifications for MPLS that imposed circuit-like behavior onto what had been a connectionless service. These 'connections' enable service providers to offer multiple classes of service and also allowed the network provider to rapidly reroute traffic around link failures as if they never happened.

Likewise, Carrier Ethernet services have also been addressed by a number of standards groups including the ITEF, the IEEE and the Metro Ethernet Forum (MEF) for Layer 2 — the data link layer which deals with framing, physical addressing, flow control, error control, access control and media access control (MAC). In this way, Carrier Ethernet services have taken on characteristics similar to MPLS, and in fact certain Ethernet VPN services such as Ethernet Virtual Private LAN Service and Ethernet Virtual Private Wire service (EVPLS & VPWS) run over the same MPLS network infrastructure. MPLS and Ethernet VPNs could thus be considered two sides of the same coin. REALITY IS, SOME ENTERPRISES WILL BE BEST SERVED BY A HYBRID MPLS/EVPLS APPROACH; MPLS TO INTERCONNECT A LARGE NUMBER OF SMALL BRANCH OFFICES; EVPLS TO INTERCONNECT A SMALLER NUMBER OF CORPORATE HUBS AND DATACENTERS WITH HIGH BANDWIDTH OR LOW LATENCY REQUIREMENTS.

CONSIDER THE OPTIONS

Each option runs over an underlying MPLS infrastructure, but what you may not know is why each of these options is popular.

Ethernet Virtual Private LAN Services (EVPL)

We have already explained why MPLS-based IP VPNs are popular. It is worth noting the attraction of the alternatives. There are many types of Ethernet VPNs; VPLS is one that shares many similarities, and a few differences, with MPLS. First, to a customer, all E-VPNs look like a basic Layer 2 LAN (bridged) network, but extended over a geographically wide area. Its attraction is to those companies with internal IT shops who are used to managing the routing functions of Layer 3. In contrast, MPLS services outsource IP routing to the service provider. Ethernet VPNs have no knowledge of the customer's Layer 3 IP addresses or routing tables, which some IT managers will prefer for its simplicity. It should be noted that EVPLS in particular operates over the same carrier network infrastructure as MPLS, but that aspect is not visible to the customer. There are several reasons why Ethernet VPN may be preferred to MPLS IP VPN:

- Customer network managers deployed an extensive IP routed network with large IP address lists and wish to retain control.
- Customer network managers have security requirements that prevent them from revealing their IP addressing and routing policies to a 3rd party.
- Businesses with a small number of high-bandwidth locations may prefer the simplicity of interconnecting those locations at Layer 2 (Ethernet).
- Conversely, enterprises with a large number of small bandwidth locations, such as retailing or branch offices, will find that MPLS scales more easily to large numbers of end-points.

Reality is, some enterprises will be best served by a hybrid MPLS/EVPLS approach; MPLS to interconnect a large number of small branch offices; EVPLS to interconnect a smaller number of corporate hubs and datacenters with high bandwidth or low latency requirements.

Note: An EVPLS WAN acts as a single LAN subnet, so all customer routers connected to the VPLS WAN will appear to be directly connected, or adjacent, to every other customer router. Depending on the routing protocols involved, some network managers may wish to limit the number of routers attached to a single LAN subnet, which may impose a limit on scalability in large networks.

Ethernet Private Line (EPL)

Ethernet Private Line (EPL) offers a third VPN alternative to both MPLS and E-VPLS, and of course to traditional TDMbased private line services. As the below chart shows it has virtually all of the features of EVPLS except that it is is point-topoint only. From a network perspective it is most efficient when the customer simply wants to connect two locations together.

A good application for EPL is data mirroring between two datacenters to perform server or storage array backups and synchronization. These links are typically high-bandwidth and low-latency requirements and so there is no reason to add the complexity of IP routing to this simple network topology.

Knowing what your various options are for connecting your various locations with secure and high-performance data networking solutions is important. Getting to where you want to go depends on where you are and what you need. The chart on the following page illustrates the capabilities available for connecting disparate locations over an MPLS network with IPVPN or through Ethernet services.

ETHERNET VIRTUAL PRIVATE LAN

AN EVPL LOOKS LIKE A BASIC LAYER 2 LAN (BRIDGED) NETWORK, BUT EXTENDED OVER A GEOGRAPHICALLY WIDE AREA. ITS ATTRACTION IS TO THOSE COMPANIES WITH INTERNAL IT SHOPS WHO ARE USED TO MANAGING THE ROUTING FUNCTIONS OF LAYER 3. ETHERNET VPNS HAVE NO KNOWLEDGE OF THE CUSTOMER'S LAYER 3 IP ADDRESSES OR ROUTING TABLES, WHICH SOME IT MANAGERS WILL PREFER FOR ITS SIMPLICITY.



MPLS & ETHERNET VPN SERVICES

All network solutions are not created equal

What you may not know but need to know is that, while MPLS and Ethernet are standardized — and the quality of experience (QoE) and performance of network elements from leading vendors such as Cisco, Juniper and others is well documented and certified that does not mean that all MPLS or carrier Ethernet VPN services and service provider experiences are alike.

Attribute	MPLS	EVPLS	EPL
Protocol (customer)	Layer 3 - IP Routing	Layer 2 - Ethernet	Layer 2 - Ethernet
Customer Interface	Ethernet	Ethernet	Ethernet
Addressing	IP	Ethernet MAC	Ethernet MAC
Address Structure	Hierarchical	Flat	Flat
Connectivity	Multipoint Point to Multipoint	Multipoint Point to Multipoint	Point to Point
Scale	High 100s of endpoints	Medium 50 endpoints*	Low 2 endpoints
Bandwidth	1Mbps – 1Gbps	1Mbps – 1Gbps	1Mbps – 1Gbps
Complexity	Higher	Lower	Lowest
Multiprotocol	Yes	Yes	Yes
IP Routing Mgmt	Service Provider	Customer	Customer
Classes of Service	Yes – Max 8 Typically 3 - 6	Yes – Max 8 Typically 3 - 6	Max – 8 Typically 3 - 4
QoS	MPLS EXP/Label	IEEE 802.1p/q	IEEE 802.1p/q
CPE	Router	Router or L2 Switch	Router or L2 Switch
Typical Application	Many low-bandwdith branch office or retail sites connected to corporate hub or datacenter	Small number of high-bandwidth end-points connecting corporate hubs or datacenters	High bandwdth link connecting headquarters or datacenter

 * EVPLS Scalability based on recommended number of router adjacencies in single OSPF area.

Actual network size can vary by customer preference and routing protocols employed.

PRIVATE NETWORK VPNS CAN DELIVER PARTIALLY OR FULLY MESHED PRIVATE AND SECURE COMMUNICATIONS AT LESS COST AND MORE EFFICIENCY, AND DO SO QUICKLY. IN FACT, TPX RECENTLY DEPLOYED A 40-LOCATION SOLUTION IN JUST 30 DAYS.

TPX: ETHERNET ECOSYSTEM AT ITS BEST

Knowing what best practices are and what questions to ask when considering transforming your networking capabilities is obviously important. That is why knowing about a company, TPx, and its VPN services is a case where knowledge is power, and understanding what is possible could be invaluable as your company accelerates to IP.

First, what you may not know, if you are a multi-location enterprise in California and Nevada, is that TPx boasts the largest MPLS and Ethernet capable broadband network footprint in region. The company has an extensive owned and operated network in the aforementioned states and in Texas. Interconnection agreements with best in class partners enable seamless private networking across the U.S. and around the world. Customers get one point of contact, i.e., more responsiveness and less hassle.

With one of the densest access footprints in its operating region, TPx can provide Ethernet or MPLS VPNs over Copper, Fiber and Fixed Wireless, access links from hundreds of colocated central offices and wireless base stations in its multi-state area. And TPx has recently increased its maximum Ethernet access speed to 200Mbps by bonding multiple copper pairs to act as a single wire. The company can also offer Fiber Optic Ethernet access up to 1Gbps through network interconnections with the leading fiber providers in its region, through which it can also provide direct connections to 24,000 buildings in its tri-state area.





Here's what you need to know about the kinds of MPLS and Ethernet VPN capabilities we provide that you should consider when evaluating services for your multi-location operations:

- MPLS and Ethernet VPNs enable customers to reduce or eliminate the need for multiple firewalls through centralization at a single site, reducing costs and administrative overhead.
- MPLS and Ethernet VPNs enable customers to reduce or eliminate the need for CPE-based encryption and tunnels at every location, improving performance while cutting costs and administrative overhead.
- Ethernet VPNS allows customers to preserve existing IP addressing and routing systems which means less work on implementation.
- MPLS outsources IP routing management to the service provider, saving the customer the expense and time of managing and maintaining a network of IP routers.
- With MPLS, EVPLS and EPL, customers get an equivalent level of security and performance as private line, ATM and frame relay services for fewer dollars.
- MPLS and Ethernet VPNs provide multiple classes of service for different types of applications ranging from real-time to best effort.
- Network performance and quality of service is guaranteed by industry-leading Service Level Agreements (SLAs).

As noted, whether your business has multiple sites locally, nationally or internationally, private network VPNs can deliver partially or fully meshed private and secure communications at less cost and more efficiency, and do so quickly. In fact, TPx recently deployed a 40-location solution in just 30 days.

The facts of the matter are that what you don't know can cause you to make less than optimal decisions.

TPx's MPLS and Ethernet VPN services are known for their the reach, reliability, features, functionality, performance, security, customization and value that are becoming table stakes for multi-location enterprises of all sizes looking to accelerate their move to IP. And, TPx's service and support organization has also earned praise from the company's diverse customer base of over 40,000 businesses.

When it comes to decisions regarding MPLS and Ethernet VPNs you have questions, and need answers so you can have the peace of mind necessary for moving mission critical business processes and applications online where they can improve business operations, the delivery of superior customer experiences and sustainable value. The best advice is to ask, compare and contrast and go with the company that best fits your unique needs. TPx not only has best in breed solutions, but also gives you a yardstick for your decisions on accelerating application performance via MPLS and Ethernet.



ABOUT TPX

TPx is the premier managed services carrier that delivers comprehensive communications solutions to 75,000 business locations nationwide. Businesses nationwide trust TPx to manage their mission-critical network services. TPx's awardwinning, enterprise-grade unified communications, managed IT, and network connectivity services empower companies to unleash productivity by streamlining processes, proactively monitoring systems, and staying current with rapidly-changing technology. TPx backs its services with a zealous commitment to Customer Care, including a network uptime guarantee and 24/7/365 live-answer technical support.

Ready to move your business communications to the cloud? Call us at 800-399-4925.



