

**Supercharging Small Business  
Networking with “Multinet” MPLS  
VPN Services**

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# Supercharging Small Business Networking with “Multinet” MPLS VPN Services

## Introduction

In an age of rapidly increasing bandwidth demand, mobile workforces and data protocols with limited resources, MPLS VPNs offer small businesses the potential for multi-protocol enterprise-class networking at very affordable rates. They represent an enhancement of the longstanding virtual network modality with MPLS routing technology.

This white paper introduces the MPLS VPN, describing its operation in some detail, along with Multinet MPLS, the specific adaptation of this powerful technology combination offered by Cbeyond, Inc., a leading provider of communications and IT solutions to small businesses, delineating its value proposition and benefits for small business customers.

**Executive Summary:** MPLS VPNs provide private network-like benefits at much lower cost, using the highly scalable and protocol-agnostic MPLS (Multi-Protocol Label Switching) routing system. Developed by the Internet Engineering Task Force (IETF, a large open international community of network designers, operators, vendors and researchers concerned with the evaluation of the internet architecture.) and Cisco to speed data routing over the Internet, MPLS allows for each packet's network layer header to be read only once. MPLS VPNs can combine IP, Ethernet and other protocols on one network while offering any-to-any communications, QoS and secure segmentation of network traffic. Affordable enterprise-class networking with high performance, multiple networks, global reach and multi-service capabilities are the advantages for small businesses.

# Supercharging Small Business Networking with “Multinet” MPLS VPN Services

## What is an MPLS VPN?

A VPN, or Virtual Private Network, is a public network service providing the economic and functionality benefits of private networking between dispersed locations without the high fixed cost and complexity of multiple separate dedicated point-to-point connections. While private networks leverage economies of scale, virtual networks leverage technology to disseminate enhanced benefits more widely.

Network intelligence and VPN functionality are provided by software and hardware at the network edge, typically a provider CO (central office) or other POP (point of presence) and extended out to multiple end-user locations. The V in VPN denotes both the service’s provision of private network-like functionality without dedicated lines, and their operation as multiple discrete end-user networks while physically residing on a single provider network. Customer services remain distinct, and individual customer networks are securely separated, though supported, over a physically unified network. Thus, the provider can serve a wide range of customers without greatly increasing its capital investment or operational expense.

## *What is MPLS?*

MPLS VPNs are VPNs, which use *Multi-Protocol Label Switching* (MPLS). MPLS is a highly scalable, protocol-agnostic network routing system that directs data between nodes by means of 20-bit labels. These labels are added to the header of each packet or frame and then transmitted across the VPN. Forwarding decisions are made solely based on the labels, without any need to further examine packets or frames. This facilitates the efficient creation of end-to-end circuits using any network protocol across any transport medium and avoiding dependence on any particular Data Link layer technology. *MPLS* was developed to speed packet routing over the Internet by the IETF and initially based largely on Cisco's proprietary tag-switching protocol.

## *MPLS VPNs' Current Market Role*

Today's MPLS VPNs provide secure private communications over public network infrastructure at lower cost than older legacy data networks using private line, frame relay, or ATM. Demand for MPLS VPNs has grown steadily since the technologies were introduced to the U.S. marketplace in

# Supercharging Small Business Networking with “Multinet” MPLS VPN Services

1999. Both enterprises and carriers have recognized the significant technical and economic advantages of MPLS VPNs, including high qualities of scalability, security, customer control and the ability to provide Quality of Service (QoS).

MPLS VPNs support a range of widely-sought value-added services and applications, including secure Internet access, remote user access, extranet and intranet connectivity, along with multicast capabilities on a single unified network platform. MPLS supports multiple protocols and applications, including voice and video, IP and Ethernet. It also facilitates interworking between service types, and lets traffic types be labeled for prioritization and differentiation.

## *Pre-MPLS Routing*

In traditional Internet routing, all packets were exchanged between the network's many router domains. Each router read each packet's network layer header, running a routing algorithm against its destination address to pick its next hop location. As packets traveled the Internet hop-to-hop, each router newly re-examined each packet's header until it reached its destination. As the Internet grew increasingly large and complex in the 1980s and early 90s, this

method appeared increasingly unwieldy, and the IETF felt it placed network stability at risk. The solution was MPLS. With MPLS, each packet's network layer header needs to be read only once, when it enters the network edge, increasing speed and efficiency

## *The Multi-Protocol, Multi-Location Network*

MPLS can also be used in a virtually limitless range of network circumstances because it can route using both IP versions, IPv4 and IPv6. One of the most attractive qualities of MPLS is its ability to handle multiple protocols simultaneously. It may connect as few as two facilities up to very large deployments of many thousands of locations, such as a retail firm transmitting transaction data to a headquarters data center.

## **How do MPLS VPNs work?**

### *Read Those Labels*

Each packet's network layer header is read at the network edge by an edge label switch router, which examines the header against a Forwarding Equivalence Class (FEC) mapping table and assigns each packet to the appropriate FEC. After that, MPLS uses the header to infer

# Supercharging Small Business Networking with “Multinet” MPLS VPN Services

the packet's class of service and pushes an MPLS label onto the incoming packet.

## *Hop to Hop to Hop*

From that point, the label automatically determines the packet's next hop and new labels automatically replace former ones at each hop. The new labels are based on Virtual Routing and Forwarding Tables and listing label values for each customer and site.

## *Routers Routing*

As a packet progresses between hops across an MPLS network, the network layer header no longer has to be re-examined by each router. Once a packet is assigned by the initial edge router, all forwarding decisions are automatically determined by the packet's labels. Subsequent routers receive packets, read and remove their labels, automatically determining from their tables the correct new labels for given old labels, and send them to the appropriate next hops, a process that repeats itself until the packet reaches its final destination.

MPLS builds virtual circuits between MPLS-enabled network-end-points, creating nearly instantaneous automated provisioning capabilities.

## *Labels Labeling*

In a sense, labels are exchanged between routers using what is called a Label Distribution Protocol (LDP). These label switch paths essentially create network-based IP VPNs.

## *Two Types of Routers*

Routers that function as VPN ingress and egress routers are called edge label switch routers and provider edge (PE) or edge routers, as they will be called here. Routers that route based only on labels as intermediate or transit routers are called label switch routers (LSRs) and also Provider (P) routers. P routers have simpler tasks and so are typically even more dependable since they are less complex.

## *The Service Provider Role*

In Layer 3-style VPNs, which form the majority of US-based MPLS VPNs today, the service provider manages customer routing. This lets business customers take advantage of provider technical expertise to ensure efficient routing. Each geographically dispersed customer site will typically connect a customer edge router to an interface on the

# Supercharging Small Business Networking with “Multinet” MPLS VPN Services

service provider's edge router for the two to exchange routing information.

## *VLANs Included*

An MPLS VPN can also work with Ethernet-based VLAN technology. The service provider edge router can analyze the VLAN tag of frames from the customer's edge router and assign it to the appropriate MPLS VPN for each VLAN.

## *Key Customer Demands: Multi-Networking & More*

There can be great customer flexibility within the MPLS VPN configuration. Customers can have multiple entry points into the service provider edge router. For example, customers might want multiple MPLS VPNs (multi-net capability) set up as extranets between themselves and major business partners and another for an intranet for their own geographically dispersed locations, controlling which traffic goes to which site through their own edge routers.

Today's enterprises generally look for MPLS VPNs to also provide:

- Any-to-any connectivity.
- Secure segmentation of network traffic.

- Class of service (CoS) prioritization.

## *Current Technology Trends as Drivers*

The contemporary market is being increasingly driven by a complex set of demands. With the implementation of more and more vital distributed applications in the contemporary marketplace, full-mesh any-to-any connectivity is increasingly required. Customer convergence of multiple applications over unified networks, meanwhile, increases requirements for a class of service and application prioritization needed for time-sensitive video and voice services.

Reliance on data networks and the growing threat of network attacks add a sense of urgency to the need for security to protect sensitive data.

## *Value proposition for small businesses*

In essence, the basic value proposition of MPLS VPN technology is: Affordable enterprise-class networking for small businesses that facilitates secure multi-service connectivity, high performance, and global reach.

## *Simplifying the Model*

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MPLS VPNs simplify networking to a model in which each customer router only peers with an associated service provider edge router. Locations require need only a connection to the network for direct connectivity with all other enterprise sites. This simplification allows for much greater scalability and lower equipment costs.

## *Lowering Costs*

Less complex and less costly customer equipment with equivalent functionality is needed to reduce capital investment and operational expense. Often customers can gain provider management of their CPE to the extent required along with QoS and SLA support.

## *Combining Protocols*

MPLS offers the inherent ability to manage traffic or multiple service models along with a robust recovery framework beyond Sonet's. MPLS VPNs let businesses as well as service providers combine different protocols rather than building multiple different networks, allowing major savings. Layer Two and Layer Three VPNs can be configured on a single box and leveraged for increased revenue streams for subscribers.

## *Segregating Traffic*

MPLS's multi-network capability corresponds with an ability to segregate traffic, a capability especially useful for those developing production and test environments, as well as for the development of corporate Web sites.

## **Multinet: The Cbeyond Difference**

Cbeyond is focused on delivering Multinet MPLS, a powerful enterprise-class networking service, to SMBs at highly affordable rates.

## *Robust Application Support*

Multinet MPLS provides an SMB VPN that supports all the data customers typically seek from MPLS VPNs between their dispersed locations and those of their trusted partners. Multinet MPLS focuses on the important applications that companies use to run their businesses, including voice and video over IP, remote access, imaging, point of sale, transaction processing, back-up networks, file sharing, and private access to cloud services.

Multinet MPLS is particularly suitable for customers with multiple sites and remote, telecommuting, or mobile

# Supercharging Small Business Networking with “Multinet” MPLS VPN Services

workers, including those with international connections. Such customers can include medical practices, law firms, small financial organizations, retail businesses, school systems, local governments, and companies with sophisticated technology requirements.

## *Flexible Service Options*

Multinet MPLS takes traditional MPLS offerings to a new level of flexibility and usefulness for today’s demanding networking requirements. Multinet MPLS supports point-to-point, point-to-multipoint and full mesh Layer 3 network configurations, and point-to-point Ethernet, Internet connectivity, and private networking to Cbeyond cloud services. The related ancillary Multinet MPLS Voice Package provides integrated SIP trunking and digital and analog voice services where needed.

## *One Connection, Many Networks*

One defining and unique feature of Cbeyond’s Multinet MPLS service is its ability to support a combination of separate Layer Three VPNs and point-to-point Ethernet connections on the same network connection. At each location on a Multinet MPLS network, a company can maintain up to 5 separate layer VPN networks that encompass any set of

other locations on the network. These networks are completely separate from one another at Layer Three and are handed off to local equipment on up to four separate Ethernet ports or separate VLANs on the same physical Ethernet connection.

In addition to multiple Layer Three VPNs, customers can also create point-to-point Ethernet connections between any two sites on their Multinet MPLS networks that can easily coexist with other Layer Three VPNs. Layer Two connections are delivered on a dedicated Ethernet port with up to 2 such connections per location.

This feature is very useful for creating a secure network configuration and otherwise separating unrelated classes of network traffic. For example, some customers create separate networks for guest Wi-Fi connections to protect internal systems, while others create multiple networks to service the needs of subtenants in their business location, like a partner area in a retail area. Development firms can even use this capability to manage separate product and development environments.

## *Cloud Connect*

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Many customers value the ability to securely join virtual servers, dedicated services, and Cloud PBXs offered by Cbeyond Cloud Services to any of their Layer Two or Layer Three Multinet MPLS networks. The flexibility of locating servers within a private network, which can be securely accessed with a defined quality of service, is a unique aspect of Cbeyond’s service.

## *Quality of Service*

The Cbeyond Multinet MPLS network matches the appropriate QoS level to customer applications. Across each connection, customers can divide their bandwidth as they see fit between multiple separate QoS classes to support differing performance levels on multiple service attributes including availability, latency, jitter and packet delivery.

The initial two on-net classes of service are Premiere Business Class and Best Efforts. Premiere Business Class is for mission-critical data as well as on-net VoIP and imaging, and Best Efforts is for ordinary site-to-site data transmission with less need for prioritization, such as Internet access and e-mail.

The Cbeyond Multinet MPLS network is also QoS Aware, with the proactive ability to dynamically assign customer

traffic to the right class by customer traffic type and application. For example, Cbeyond can automatically recognize Real Time Protocol (RTP) voice and video traffic and place it in the Business Class queue with little configuration required.

## *Off-Net Voice*

Off-net voice, available with a subscription to Cbeyond’s Multinet MPLS ancillary Multinet Voice bundle, will function similarly to Cbeyond's longstanding and widely-heralded SIP voice network. Voice traffic will be instantly transmitted and prioritized over all other traffic; meeting Cbeyond current network performance standards for prioritized voice traffic.

Cbeyond has also added enhancements to Multinet Voice that provide a high degree of flexibility. Companies can now combine SIP trunking service, analog ports and PRI *at the same time using a single shared call capacity*. This allows customers to support multiple on-site voice platforms such as a legacy PBX with PRI, a newer IP PBX using SIP Trunking, and up to 8 analog lines as needed. In addition, customers can buy only what they need by purchasing call capacity and ports independent of one another.

# Supercharging Small Business Networking with “Multinet” MPLS VPN Services

This feature makes upgrading from a legacy PBX with analog or PRI connections to a new SIP trunking-capable platform an extremely simple proposition. Since the service supports SIP trunking, customers only need to configure the new IP PBX to use the SIP trunking interface while the legacy PBX uses the PRI or analog ports. Once the new system is running to their satisfaction, Cbeyond moves the phone numbers from the analog or PRI ports to their SIP trunk.

## *Wireless Backup*

4G or 3G wireless backup is also available at any Multinet MPLS location where network coverage allows. Available for only \$50 per month per location, Cbeyond can provide an additional level of reliability for data applications that require the highest levels of availability. Point of sale applications, monitoring systems and many other scenarios are the perfect candidates for this option.

## *Premium Equipment and Service Level Guarantee*

Cbeyond Business Class standards for MPLS Multinet include 99.99% (4 9's) availability; 4 hours MTTR; 25-35

millisecond one-way latency supporting VoIP; and 99.95% packet delivery. In addition, Cbeyond also provides Service Level Agreements (SLAs) for Multinet MPLS service, which provide customers with service credits in the unlikely event of outages or other lapses in service.

To support Multinet’s high availability and reliability standards, Cbeyond provides a 100% Cisco-powered network with every core MPLS node provided by Cisco Systems. And each Multinet MPLS service location is configured with a Cisco Integrated Services Router (ISR) 2911 or better.

## *A Popular and Reliable SMB Provider*

Cbeyond has historically achieved extraordinarily positive feedback from its small business customers, who have rated their experience with Cbeyond far superior to that of other communications service providers. Major competitors are hobbled by outdated legacy networks, distracted by mergers and internal realignments, and known for a customer service approach that dumps SMBs unceremoniously into offshore call centers.

## **Conclusion**

# Supercharging Small Business Networking with “Multinet” MPLS VPN Services

In summary, Cbeyond’s emerging Multinet MPLS service is setting the standard for a new breed of virtual network: MPLS routing technology specifically adapted to meet the needs of small businesses. Multinet MPLS is designed to realize the full potential of this powerful melding of technologies, offering enterprise-class multi-protocol networking to small organizations at extremely affordable rates to help them deal better with the ongoing and intensifying challenges of limited resources, multiple protocols, myriad new applications, mobile workforces and massively increasing bandwidth demands.

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