

Overcoming Single Provider MPLS Limitations



Summary:

In this paper, Frost & Sullivan reviews the limitations associated with taking a single-provider approach to MPLS networks and its impact on the enterprise. They then examine Virtela's Global Service Fabric multi-carrier network approach and how it overcomes these limitations to provide a best-of-breed global MPLS network solution.



Overcoming Single Provider MPLS Limitations

Introduction

Enterprises, regardless of size or industry, have concluded that network consolidation for some or all of their communication applications – voice, video, and several grades of data applications ranging from business critical to general Web surfing – onto a single network is inevitable. The reasons for this consolidation are straightforward. Multiple networks from multiple providers entail redundant and extensive cost components that can be reduced if fewer networks and providers are employed. Further adding to the rationale to consolidate networks is that legacy networks lack the architectural flexibility, means to dynamically prioritize traffic flows, and higher bandwidth levels at economical rates that are needed to accommodate the constantly evolving, geographically disperse, and increasingly stringent and diverse enterprise communication requirements.

For enterprises that have made the decision to consolidate networks, Multi-Protocol Label Switching (MPLS) is a leading technology choice for Wide Area Network (WAN) connections. Even so, an MPLS-enabled network is not the panacea for all enterprise WAN requirements. Why this is the case is not the MPLS technology itself, but the limitations associated with a single provider MPLS network deployment.

In this paper, Stratecast Partners will review the limitations associated with a single provider MPLS network and its impact on the enterprise. We will then examine the Global Service Fabric introduced by Virtela Communications (www.virtela.com) and describe how the unique attributes of Virtela's multi-provider network approach overcomes these limitations and provides a "best-of-breed" global MPLS network solution.

Limitations of a Single Provider MPLS Network

With a focus on attaining a best-of-breed network infrastructure, enterprise purchasers would select the network provider best positioned to meet the requirements for each application. In addition, with geographic reach being a major consideration for multinational corporations, multiple providers with denser networks in specific regions (e.g., U.S., Asia, or South America) would also be selected. Consequently, customer-provider relationships with multiple network providers, each with their own contracts, invoices, and customer support infrastructure, were established. While this was a justifiable approach when network technologies were tightly stratified by application, the validity of this approach is diminishing. The ability to prioritize network traffic based on Class of Service (CoS) designations position a MPLS network as an attractive alternative for consolidating many applications with differing performance requirements onto a single network. Even so, a single provider MPLS network has its limitations that weaken the potential value of network consolidation.

- **Availability** – Enterprise business requirements, not network providers, determine which enterprise sites should be connected to a MPLS network. Yet, the deployment of a MPLS network is constrained by each network provider’s business realities (e.g., restricted budgets, eroding financial margins, and on-going support of legacy networks), all of which prevent any network provider from creating a seamless and truly global MPLS network. As a result, no MPLS provider can justify building a MPLS network that reaches every conceivable enterprise site. Consequently for enterprises with global operations, several MPLS network providers would be required to deliver the optimal network coverage and performance (i.e., shortest local loops to a MPLS Point of Presence and most diverse routing) in each geographic region they operate.

Bridging this availability gap through a provider-led federation of interconnected MPLS networks is an alternative, but is unlikely. Again, the business realities of network providers to own as much of the enterprise relationship as possible has prevented large scale interconnection from occurring.

- **Reliable performance** – Voice and critical data applications have stringent performance requirements (e.g., availability, latency, jitter, and data delivery), that to be most effective for the enterprise, apply to every communication link on the MPLS network all the time. Even with growing network provider experience in the use of MPLS, the maturity of MPLS is far less than legacy networks (e.g., ATM, frame relay, and TDM). As a result, the possible occurrence of business-impacting sub-optimal performance somewhere at sometime within a provider’s MPLS network is possible.

Given these unattainable conditions by a single MPLS network provider, the enterprise has three options to consider. Each has consequences.

Enterprise Options	Consequences
Option 1: Limit MPLS use to locations the single provider’s MPLS network operates	Slows enterprise recognition of the benefits of consolidating networks.
Option 2: Subscribe to best-of-breed MPLS providers in each region the enterprise operates	May deliver the best possible network performance by a single provider within a region, but does not deliver a CoS-aware network for inter-regional communication and requires the enterprise to maintain multiple provider relationships.
Option 3: Subscribe to best-of-breed MPLS providers in each region and attempt to map CoS among networks	The cost of multiple provider relationships remains, but the goal of a unified MPLS network is reachable. However, the complexity of CoS mapping across provider networks (described below) renders this option only remotely practical for the very largest enterprises.

CoS mapping complexity - The underlying reason for this complexity is the absence of CoS standardization across MPLS provider networks. Essentially, CoS represents the priority routing of different types of traffic within the MPLS network. Application traffic labeled with a high CoS will receive premium network routing, resulting in lower latency and jitter and higher availability and packet delivery rates within a provider’s MPLS network versus application traffic labeled with a lower CoS in the same MPLS network.

A relevant example of CoS non-standardization is some MPLS providers offer three classes of services while others offer four, eliminating the means for a direct mapping of one provider's CoS to another. In addition, even in instances where service providers support the same number of classes, the network Quality of Service characteristics (i.e., latency, jitter, availability, and packet delivery) associated with each CoS may differ. This introduces inconsistency in transferring packets in one CoS to another provider and ensuring the same QoS characteristics are retained throughout.

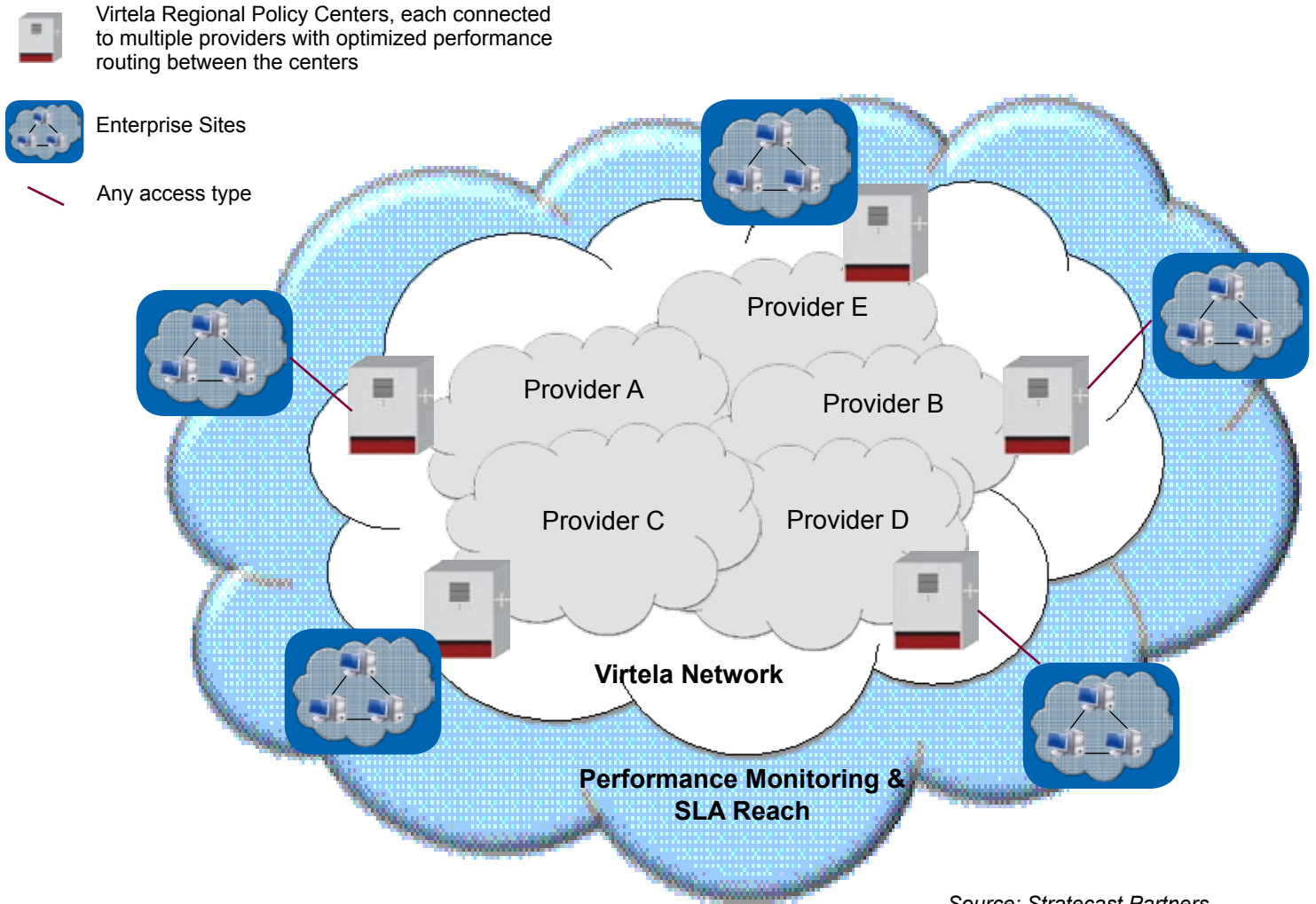
Virtela's Global Service Fabric Overcomes Single Provider Limitations

Virtela's approach to offering premium network services is as a Virtual Network Operator (VNO). As a VNO, Virtela is not an owner of long-haul network infrastructure. Rather, Virtela establishes logical and dynamic connections across multiple top-tier provider networks from its carrier-grade Regional Policy Centers deployed around the world. Connectivity to these centers is accomplished by leveraging access node infrastructures of the backbone and access networks Virtela connects to. In serving its enterprise customers, Virtela leverages the combined purchasing strength of its customers and the company's intelligent best path routing across multiple underlying MPLS infrastructures to deliver premium network services with the following attributes:

1. best-of-breed network performance end-to-end (customer edge router to customer edge router),
2. cohesive single source vendor environment resulting in one bill, one contract, one reach number, and, one global set of end-to-end Service Level Agreements,
3. network resiliency of many rather than just a single provider,
4. sum of the parts network footprint (the combined footprint of all network providers),
5. universal coexistence with customer's current and future access network selections,
6. complete network performance monitoring and reporting across multiple provider networks, and
7. with Virtela's new multi-provider MPLS service, CoS consistency across multiple MPLS networks.

The figure that follows is a simplified diagram on how Virtela's network model delivers the first six attributes listed above.

Virtela's Multiple-Provider Network



Inter-provider CoS consistency is a new capability Virtela introduced with its Global Service Fabric. To deliver CoS consistency across multiple MPLS networks, Virtela leverages the lowest common denominator in the packet field – the Differentiated Services Code Point (DSCP). Although all MPLS network providers also utilize this DSCP field as the defining element in labeling a packet for routing in their MPLS networks, differing labeling schemes exist across MPLS networks. Subsequently, ensuring inter-provider CoS consistency based solely on each provider's MPLS labels is unreliable.

Virtela overcomes this limitation by first examining how each of its MPLS network providers associate QoS characteristics with each CoS designation. With this assembled knowledge, Virtela created a detailed and proprietary map of DSCP fields to QoS characteristics for all of its MPLS network providers. By intercepting MPLS traffic in-line from one MPLS network to another, Virtela's policy router examines the underlying DSCP field and remarks the bits in this field to a similar if not better set of QoS characteristics recognized on the next MPLS network in the traffic path. When more than one MPLS network is available, Virtela chooses the MPLS network demonstrating the highest performance characteristics. By combining this detailed understanding of CoS-to-QoS mapping for multiple MPLS networks with intelligent best path routing, Virtela delivers a unique MPLS service to the market.

Furthermore, by following a VNO service delivery model and with the company's multiprovider CoS mapping, Virtela addresses all the limitations of a single provider MPLS network: reliable performance and availability. In addition, by maintaining redundant MPLS provider relationships, Virtela provides inherent network redundancy for automatic failover, an essential requirement for always-on applications, and dynamic re-routing to automatically offset performance disruption or degradation in any of Virtela's provider networks. For all but the very largest enterprises, the cost and expertise required to accomplish the same network objectives are prohibitive. With Virtela's multi-provider MPLS service, enterprise recognition of the benefits of consolidating networks and providers is accelerated.

Virtela as a Provider of Choice

To be expected, the critical and strategic implications of a migration from one provider to another cannot be understated and a decision not solely based on current technological merits. Several other variables are included in making this decision. In this section, we will briefly outline aspects of Virtela's business that positions the company as a strong provider choice.

- **Not a new network services provider** – Virtela has been offering its VNO-based services for over four years and has demonstrated steady customer and traffic volume growth.
- **Other communication providers have chosen Virtela** – For nearly as long as the company existed, IBM has successfully been reselling Virtela's network services to its multi-national customers and, more recently, SingTel and NTT began using Virtela to extend its local customer's global network reach.
- **The Global Service Fabric is built on proven Virtela core competencies** – Those competencies include: developing and maintaining multiple network provider relationships, demonstrating intelligent best path routing and serving customers through all stages of managed network services (consulting, implementation, and on-going support).
- **Expanding suite of services** – Virtela offers a steadily expanding suite of premium managed network and security services, a valuable enterprise attribute in minimizing multiple vendor relationships.
- **Market-tested ISPF service further expands network reach** – Despite multiple MPLS provider relationships, the fact remains that cost effective access to a MPLS network is not available for all locations throughout the world. Virtela's Global Service Fabric, delivers a premium performance IP network to expand the network reach for performance-demanding applications.
- **Singularly focused business strategy** – Unlike traditional network service providers, Virtela is not distracted from its business objective of delivering premium global managed services. Excessive levels of debt and/or balancing the challenges of expanding into new service lines while attempting to serve an eroding base of customers in service categories that have reached the end of their technology life are not Virtela issues.

Conclusion

Achieving the benefits of consolidating networks and providers is no longer a future possibility, but is now highly achievable if an optimal mix of technology and service delivery is chosen. As we described in this paper, MPLS is an enabling technology for network consolidation. However, in a single provider form, MPLS has real limitations that circumvent an enterprise from realizing the entire benefits network and provider consolidation promises. Virtela's Global Service Fabric melds MPLS technology and service delivery together in a manner that reliably delivers the full benefits of performance routing MPLS technology with the comprehensive geographic reach and route diversity of multiple MPLS providers. Best of all for the enterprise, Virtela delivers this coordinated service seamlessly through a single provider relationship, contract, and administrative environment, thereby maximizing the benefits of multiple providers for the enterprise without the pain.

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