

Hybrid Will Be the New Normal for Next Generation Enterprise WAN

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Public cloud services and mobility are driving business needs where the Internet and MPLS play an equally important role for enterprise connectivity. Network planners must establish a unified WAN with strong integration between these two networks to avoid application performance problems.

Key Challenges

- The Internet is increasingly becoming critical to enterprise connectivity, but there remains confusion regarding the role of the Internet in the enterprise WAN architecture.
- Internet and Multiprotocol Label Switching (MPLS) are both important elements of the enterprise WAN, thus making it difficult to establish a homogeneous WAN architecture that encompasses both the Internet and MPLS.

Recommendations

- Architect an integrated WAN to support evolving application deployment models using the Internet in concert with MPLS.
- Create a WAN solution that can optimize traffic flows between the Internet and the MPLS for all applications and between both internal and external users.
- Deploy a solution across all independent network services that can monitor, report, control and optimize end-to-end path forwarding for all endpoints.

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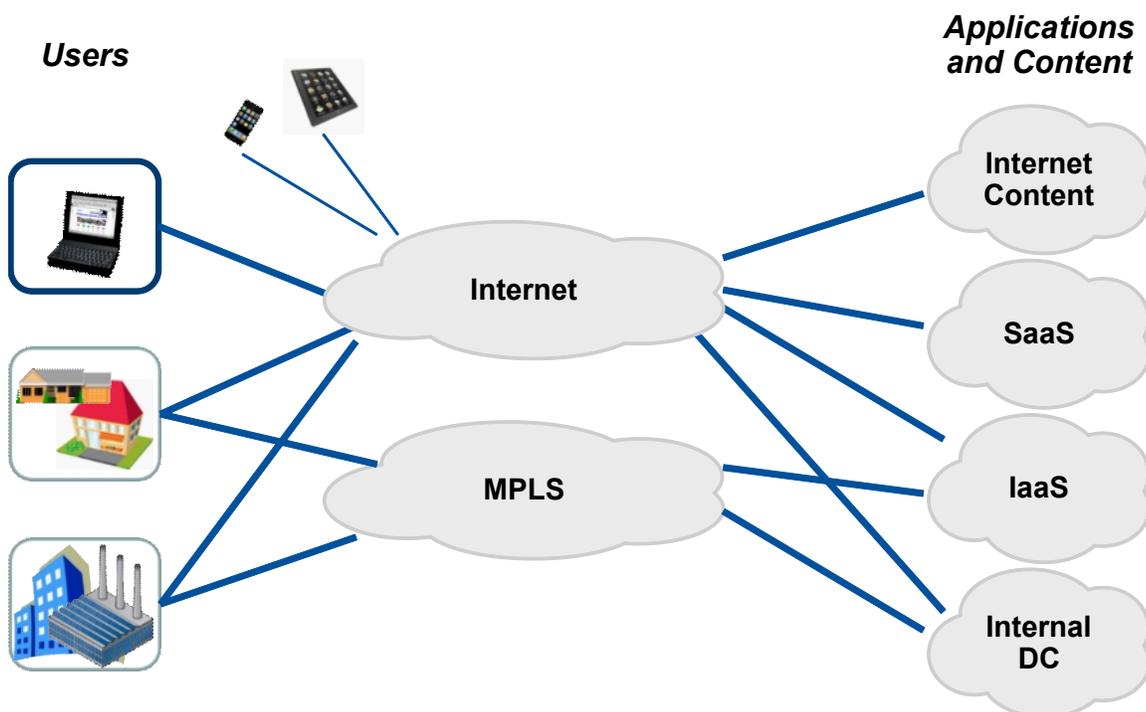
Introduction

Enterprise business needs for connectivity have evolved to such a point that network planners can no longer fulfill these needs by just sourcing a single private MPLS WAN service connecting branch offices to a Data Center:

- Although branch offices still need to be connected to enterprise data centers, they now also need to be connected to various external cloud services. These cloud services are often sourced via separate projects for specific application needs that also lead to project-specific WAN connections, often based on the Internet.
- Enterprise employees' typical method of conducting business and accessing applications is shifting from PC workstations to laptops, mobile phones and tablets. These are increasingly being used in a mobile context outside of the office both to access applications and to interact with colleagues, partners and customers via the Internet.

The result, as evident from Gartner client inquiries (see Note 1), is that enterprise WAN connectivity has evolved in an ad hoc manner based on project-by-project needs into what often are multiple independent solutions. This includes Internet used to offload MPLS, mobile broadband connecting to the Internet, and public cloud services added as application needs arise. This is illustrated in Figure 1.

Figure 1. The Enterprise WAN Is Evolving Based on Several Independent Connectivity Needs



IaaS: infrastructure as a service
DC: data center

Source: Gartner (September 2014)

The problem arising from this ad hoc approach to enterprise connectivity is that the enterprise ends up with multiple point solutions with no all-encompassing solution to manage, which makes it difficult to ensure consistently good application performance.

Frequent inquiries with Gartner clients demonstrate that network planners focus too much on basic access connectivity — that is, connecting branch offices or remote users to the WAN. In that process, they often forget to consider how application traffic will flow in the WAN or consider how the end user experience is perceived from the client end. The consequence is recurring application performance problems caused by incomplete WAN architectures that force high network latencies. This results in end-user dissatisfaction, which in turn leads to disenfranchisement and a lack of adoption. Ultimately, this has a productivity and cost consequence. In addition to inadequate WAN architectures, enterprises also suffer from inadequate tools to gain visibility and control of application traffic. This makes it difficult both to troubleshoot performance problems and to improve performance.

Analysis

Architect an Integrated WAN to Support Evolving Application Deployment Models Using the Internet in Concert With MPLS

The Internet is a permanent and integral part of enterprise WANs. The Internet continues to play an increasingly important role in the enterprise WAN. Network planners must establish a WAN strategy that can meet both evolving application deployment models and the performance requirements of these applications. Businesses are now increasingly relying on the Internet for connectivity to important business applications; this is especially driven by two key changes:

1. Gartner forecasts show that around 30% of enterprises are using public cloud services, such as Amazon, salesforce.com or Office 365. This is growing by around 17% annually, which means that business processes are becoming increasingly reliant on external cloud services. The majority of these applications reside in public cloud services that use Internet access. See Note 2.
2. Enterprises are increasingly mobilizing their applications for easy access from mobile devices outside of offices. Mobility is becoming critical to the business, and, for this reason, mobility has been the No. 2 priority on the CIO agenda for two years in a row. Although only a very small share of ultramobiles (clamshells, hybrids and tablets) are connected to mobile broadband today, Gartner forecasts that, by 2018, half of the installed base of these devices will use mobile broadband when a Wi-Fi connection is not available. Network planners must anticipate the escalating need to connect mobile users to the enterprise WAN. See Note 3.

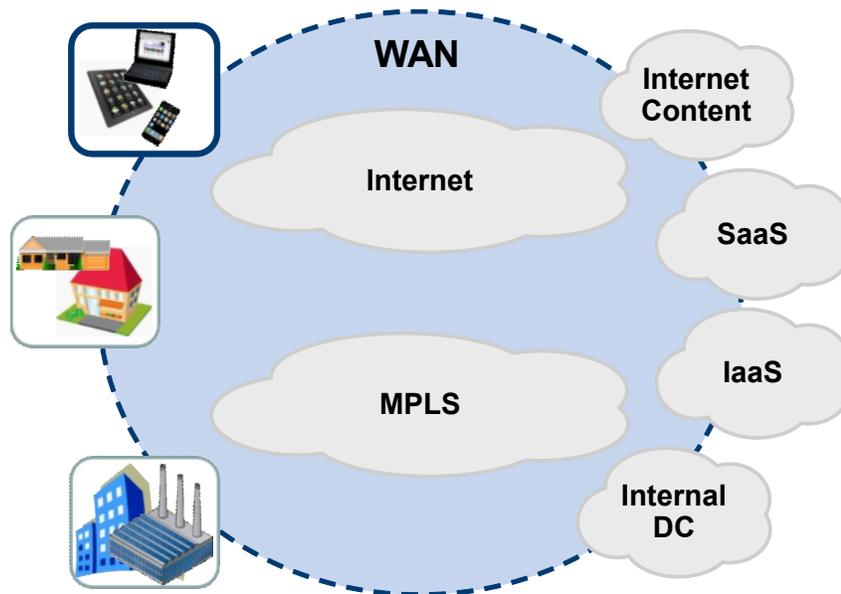
For network planners, this means that the Internet is no longer used just for casual or less mission-critical connectivity but as an important method for business connectivity in its own right. Because of this, network planners must plan for the Internet as a permanent and integral part of the enterprise WAN.

Next-generation hybrid WANs interweave multiple WAN services. We have for several years seen network planners make use of the Internet for various point solutions, such as connectivity of smaller branch offices, ad hoc connectivity of remote workers, or off-loading traffic from MPLS to the Internet. Although enterprises hereby already incorporate the Internet in a multiservice WAN architecture, it is critical that network planners recognize that they still treat the Internet and the MPLS as two separate networks. They typically also only plan to use the Internet for less critical purposes and to control WAN services expenses. This has a number of consequences:

- Application traffic can't move freely between the two networks, which leads to poorly performing applications.
- Lack of ubiquitous visibility prevents proactive monitoring and inhibits fault seeking.
- Difficulty rolling out new cloud services without initial performance glitches.

Network planners must design a WAN architecture that incorporates both the Internet and the MPLS in an integrated hybrid WAN solution, as illustrated in Figure 2, in order to overcome these issues.

Figure 2. Conceptual Model of the Next-Generation Hybrid WAN Architecture



Source: Gartner (September 2014)

The enterprise network planner needs to create a platform, or toolkit of functionality, within this hybrid WAN architecture whereby it is possible to:

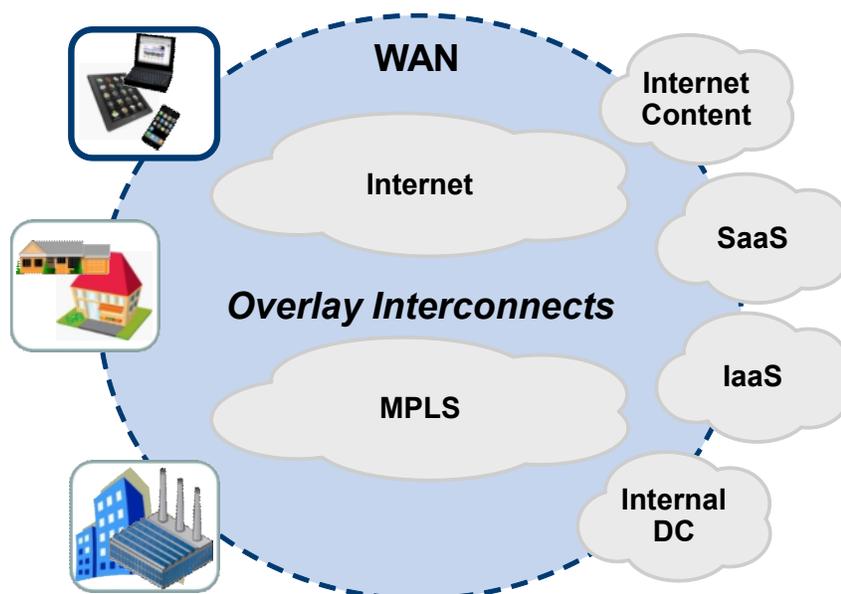
- Connect users anywhere for instant access to any application
- Connect a new cloud service anywhere for instant availability to any user
- Monitor any traffic flow in the network, regardless of where the users or applications are located
- Measure and compare end-user experience based on device/location regardless of whether the application has been accessed via the Internet or MPLS

Create a WAN Solution That Can Optimize Traffic Flows Between the Internet and the MPLS for All Applications and Between Both Internal and External Users

Because of the highly distributed nature of many enterprises and the source of the applications they employ, traffic must be able to flow freely across a hybrid network. Both end users and applications will be connected to either the Internet or MPLS, and this means that traffic may stay within the Internet, stay within MPLS or flow between the two networks (see Note 5).

The consequence of this is that network planners must focus on enabling application traffic flows between all endpoints with acceptable performance levels. To do this, network planners must establish interconnectivity between the core networks in proximity to the end users and to the applications in order to minimize end-to-end network latency and thereby optimize user experience. This is illustrated in Figure 3.

Figure 3. Generic Model of Interconnectivity Directly Between the Two Core Networks



Source: Gartner (September 2014)

Network planners can use a number of approaches to establish these physical points of network interconnect:

- Deploy both direct Internet access and MPLS access in all branch offices, which will direct connectivity to all applications for users based in branch offices. Gartner finds that at least 30% of enterprises use this option. However, this will not enable Internet/MPLS traffic flow for mobile and remote users.
- Use carriers' Secure Internet Gateway services to provide Internet Protocol (IP) VPN termination points for traffic to and from the Internet and interconnect with the same carrier's MPLS VPN. Although these services offer a convenient method to interconnect MPLS with the Internet, most carriers only support a few such gateways internationally, making it difficult to optimize all network traffic flows. Also, these gateway services are often designed for IP VPNs initiated from an end-user device connecting to the Internet and need to be extended to public cloud services for traffic initiated by users on MPLS ports. Gartner estimates that more than 50% of international enterprises use these services.
- Deploy interconnection points in strategically located hosting facilities or colocation hubs. Although this will provide opportunity to locate interconnection points close to applications, it leads to additional complexity and cost for larger distributed international networks. Using such hosting facilities is an emerging trend, and Gartner estimates that less than 10% of international enterprises use this option now.

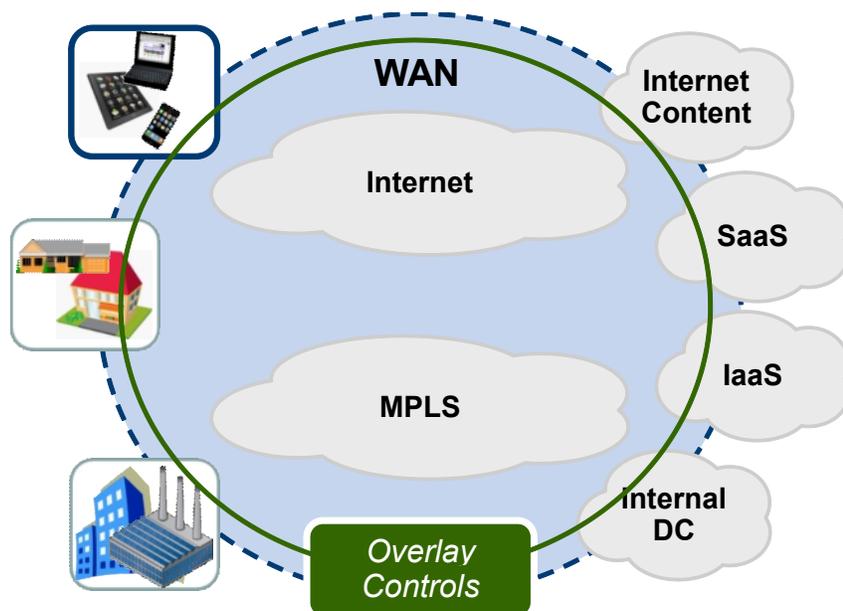
In order to design a cost-effective solution that can optimize traffic flow for all endpoints, Gartner believes most network planners will use a mix of these options, depending on their actual connectivity needs.

To optimize performance, network planners need to deploy a path selection solution that can identify the end-to-end path with the lowest network latency and best network performance between users and applications. Predeployment simulation and load testing tools can assist in the analysis of this exercise. By doing this, network planners will ensure that the optimal point of interconnection is being used. Network planners need to deploy a path selection solution for branch office users as well as for mobile and remote users. Solutions for this purpose are evolving from vendors such as Cisco, Glue Networks, Ipanema Technologies, Riverbed, Silver Peak, CloudGenix and Viptela, as well as services from providers such as Aryaka, NTT Communications and VeloCloud.

Deploy a Solution Across All Independent Network Services That Can Monitor, Report, Control and Optimize End-to-End Path Forwarding for All Endpoints

As described above, as application traffic increasingly flows outside of enterprise offices and no longer just within the MPLS VPN between branch offices and enterprise data centers, it becomes more difficult to monitor, manage and optimize traffic flow to and from all users and applications. Because of this, it is difficult for network managers to ensure performance of the network and applications and to troubleshoot in case of poor performance. This requires collaboration across the enterprise IT organization because the network planners need to establish an overlay of controls across all networks and ensure the relevant network performance monitoring and diagnostics (NPMD) and application performance monitoring (APM) tools are in place that can monitor all endpoints regardless of their location, access services and the core they connect to, as illustrated in Figure 4.

Figure 4. Generic Model of the Control Overlay for All Endpoints Connected to Any Core and Access Network



Source: Gartner (September 2014)

There are several options to establish such an overlay of controls:

- Devices deployed in branch offices and data centers: This is the currently typical solution where routers, WAN optimization controllers (WOCs) and WAN path controllers are deployed within the enterprise. Traffic flow monitoring and NPMD and APM tools offer granular visibility and controls to aid in problem detection and resolution as well as optimization. However, for most remote users and many external data centers, it is not possible to deploy such appliances and network planners; therefore, organizations need to deploy a different solution, as outlined in the following options.
- Devices embedded within WAN services: Many carriers have plans to embed control and optimization functionality within their WAN infrastructure, thus making it possible to support remote users and cloud services. However, only a few providers, Aryaka and NTT Communications, have yet launched such services, and only in a more limited scale. Most carriers focus on enhancing their MPLS services and ignore the challenges of mobile users and Internet-based connectivity.
- Devices deployed in strategically located hosting facilities: Although this will provide flexibility in the location, it will add complexity and cost for larger distributed international networks. The use of external hosting facilities is an emerging trend, and, as before, Gartner estimate that less than 10% of international enterprises use this option.
- Software deployed in users' personal devices: As business applications become mobilized, it becomes imperative to deploy visibility and control on end-user devices. Most WOC vendors support such WOC softclients, but the capabilities of these softclients are still evolving, and network planners need to specifically evaluate vendor support of the needed capabilities.

None of these options can, on their own, support all use cases as described previously. Thus, network planners need to design solutions that combine many or all of these options into one solution. Vendor solutions that enable all options are emerging from vendors such as Cisco, Glue Networks, Ipanema Technologies, Riverbed, Silver Peak, CloudGenix, VeloCloud and Viptela, but Gartner expects that there will not be comprehensive solutions available until the end of 2015. Although several carriers have outlined plans for network-based solutions, Gartner expects that it will be at least the end of 2016 before a broader selection of services is available.

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"Forecast Analysis: Enterprise Network Services, Worldwide, 2Q14 Update"

"Forecast Analysis: Public Cloud Services, Worldwide, 1Q14 Update"

"Cloud Services Will Establish the Foundation for Next-Generation Solutions"

"Taming the Digital Dragon: The 2014 CIO Agenda"

"Is Your Network Design the Weak Link in Cloud Computing?"

"How Internet Access Architecture Redesign Can Enhance External Cloud Service Performance"

"How to Pick the Right WAN Optimization Solution for Your Organization"

"Cloud Network Services Are Essential Enablers of Cloud Computing"

"Optimize Enterprise Networks to Improve SaaS Performance"

"Four Steps to Optimize Your Network for IaaS"

"WAN Path Controllers Add Flexibility and Efficiency to Hybrid Networks"

"Vendor Landscape for Mobile Application Performance Monitoring"

"Communications Hubs Improve WAN Performance"

"Is MPLS Dead?"

"Magic Quadrant for Network Performance Monitoring and Diagnostics"

"Magic Quadrant for Application Performance Monitoring"

"Know the Challenges of Voice, Video and Unified Communications for Network Management"

Evidence

Note 1

Enterprises Continue to Express Uncertainty About Their WANs

Gartner continues to experience a continued stream of inquiries related to the future of the enterprise WAN. Questions such as the following are representative of the types of discussions we have with our client base:

- How do I reduce my WAN spend?
- How should we approach our WAN design? Are there any new WAN topologies emerging?
- How do other enterprises use the Internet for their WAN connectivity?
- Do other enterprises move direct Internet to the branch office?
- Should we reduce our Internet exposure by limiting the number of entry points?

A key aspect of these discussions is distinct uncertainty about how to manage the increased use of the Internet and how to create a WAN design that incorporates both the Internet and the traditional MPLS.

Note 2**Use of Public Cloud Services Continues to Grow**

Gartner's latest CIO survey "Taming the Digital Dragon: The 2014 CIO Agenda" shows that almost one quarter of businesses have made significant investments in public cloud services. Gartner forecasts ("Forecast Analysis: Public Cloud Services, Worldwide, 1Q14 Update") that the public cloud services market will grow at a five-year compound annual growth rate (CAGR) of 17.3% through 2018. Most common is SaaS, but infrastructure as a service (IaaS) and platform as a service (PaaS) are also reasonably prevalent. The dominant reason for pursuing public cloud is agility, with 50% of businesses citing it as their main reason. Cost is a distant second at 14%.

According to "Forecast Analysis: Enterprise Application Software, Worldwide, 1Q14 Update," SaaS and cloud-based business application service revenue will grow from \$22.5 billion in 2013 to \$53.3 billion in 2018, a five-year CAGR of 18.8%. However, on-premises deployment continues as an important priority across all regions, with an average of 63% of application software budgets. Considering that 40% of cloud services investments are in private cloud service, it is clear that MPLS will remain a key WAN service while use of the Internet is growing.

Note 3**Application Mobility Has Become Business Strategic**

Most mobility projects so far have been small-scale efforts. However, as described in "The Future of Enterprise Applications Is Mobility," the drive for pervasive access to information on the part of consumers and enterprise employees continues to accelerate. With the near-ubiquitous availability of adequate bandwidth and rapid increase of smartphone and tablet adoption, enterprises are planning to utilize these devices to access enterprise applications, as well as enterprise unified communications, making mobile one of the top priorities on a CIO's priority list. See also "Predicts 2014: Mobile and Wireless."

"Forecast: Mobile Services, Worldwide, 2011-2018, 2Q14 Update" shows that mobile data revenue will grow by more than 12% annually through 2018, constituting 61% of total mobile services. Use of data cards will continue to grow during the forecast period. Demand for mobile broadband access using USB dongles or embedded modules in notebook PCs and ultramobiles (including tablets) will grow steadily during the forecast period. Although only a very small share of ultramobiles (including tablets) are connected to mobile broadband today, by 2018, half of the installed base of these devices will use mobile broadband when a Wi-Fi connection is not available, thus showing that network planners need to plan for increased need to connect mobile users to the enterprise WAN.

Note 4**Network Traffic Will Be Harder to Monitor**

Because of the highly distributed nature of many enterprises, the WAN traffic created by the end-users and applications will be very distributed and often not even touch an enterprise office. These traffic scenarios will involve internal employees as well as external customers and partners connecting via the Internet:

- Mobile and remote users connected to the Internet will need to communicate to and collaborate with other mobile and remote users connected to the Internet, as well as users located in branch offices.
- Mobile and remote users connected to the Internet will need to use applications based in data centers connected to the Internet, as well as data centers connected to MPLS.
- Users located in branch offices will need to communicate and collaborate with other users located in branch offices as well as mobile and remote users connected to the Internet.
- Users located in branch offices need to use applications based in data centers connected to MPLS, as well as applications based in data centers connected to the Internet.

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