The "Universal" IP Network for Videoconferencing

A Manager's Guide to the Deployment of Inter-Enterprise Videoconferencing

The "Universal" IP Network for Videoconferencing

A Manager's Guide to the Deployment of Inter-Enterprise Videoconferencing

Ira M. Weinstein
Wainhouse Research

March 2005

Table of Contents

List of Figures

Introduction

The deployment and proliferation of "converged" IP networks within the enterprise is well documented. For many organizations, intranet IP networks are the backbone for almost all data and communications applications. This trend has had a dramatic impact on telephony and videoconferencing, applications that previously rode over an overlay network (ISDN or the public switched telephone network), but are now (or soon will be) running over the corporate network.

Even a few years ago, network convergence was more a dream than an obtainable reality. Due to a lack of prioritization and traffic management, even networks with adequate raw bandwidth were unable to consistently provide the performance required by real-time applications. The problem was often highlighted by the inability to conduct high-quality videoconferences over seemingly "robust," high capacity corporate networks.

Today, due mostly to advances in end-to-end network management and prioritization capabilities, the majority of these issues have been resolved, bringing network convergence within the reach of most large and small enterprises (given adequate resources). For videoconferencing in particular, hosting the traffic on the corporate LAN/WAN simplifies system deployment and management, and yields a significantly lower total cost of ownership.

For the most part, it is not possible to ensure reliable performance for IP-based videoconferences between different networks.

Unfortunately, the news is not all good. For the most part, the performance benefits afforded by enhanced end-to-end network management do not extend outside the corporate private network. In other words, when data and communications traffic must flow between enterprises on different private networks, we quickly rediscover that the availability of raw bandwidth from point A to point B is not enough to ensure adequate performance. The result is inconsistent and unreliable performance for IP-based videoconferences between organizations on different networks. Thus many organizations still use ISDN for videoconferencing outside their organization.

This white paper discusses the problems related to the lack of end-to-end network management between enterprises, and highlights an innovative solution offered by one service provider.

The Problem: Inter-Carrier IP Connections

In today's increasingly data-centric environment, corporate Intranets are essential to the ongoing operation of every enterprise. These networks are typically extended over a wide area network (WAN) to provide network connectivity between most, if not all, regional and branch offices. Connecting all offices and employees to a common network infrastructure provides various benefits including:

- Enterprise-wide directory services
- On-demand access to corporate databases
- Various client-server and web-based applications
- Rich-media collaboration capabilities

In a truly converged network, all forms of data, ranging from email traffic that is not time-sensitive to real-time audio or video traffic, flow efficiently over the common network. Understandably, enterprises are careful about the type and volume of traffic hosted on their networks for fear of impacting the flow of mission-critical information. To ensure strong network performance throughout the enterprise, most organizations rely on one (or more) network service providers (NSPs) to create a wide area network (or WAN) connecting their regional and branch offices.

In order to provide consistent and reliable service, network service providers employ a variety of quality of service (QoS) network management techniques that allow many different types of traffic to be prioritized and routed over a common infrastructure. When properly deployed and managed, QoS networks do not suffer from the traffic bottlenecks, protocol mismatches, and inefficient routing issues that have plagued corporate networks for years. This makes QoS networks ideally suited to host time-sensitive applications such as audio and videoconferencing.

Some of the QoS techniques commonly deployed by NSPs include:

- ***Differentiated Service (DiffServ)*** — Prioritizes certain types of traffic over others, resulting in faster handling, more consistent throughput, and decreased packet loss.
- ***Multiprotocol Label Switching (MPLS)*** — Packets are labeled with specific routing and delivery parameters including destination, bandwidth, acceptable delay, etc., resulting in faster throughput for higher priority data.
- ***Reservation Protocol (RSVP)*** — Allows the reservation of network resources in each node, creating a reserved end-to-end path through the network for the data to travel.

With the effective deployment of these types of services, converged networks can accommodate all types of enterprise traffic, including rich-media traffic such as videoconferencing and VOIP.

Today's Networks Are Islands

Today, a well-managed, properly provisioned enterprise network can carry video, voice, streaming, and data traffic from one corner of the enterprise to another while maintaining the necessary level of performance. Unfortunately, this comfort zone extends only as far as the edge of the corporate intranet – at which point the performance guarantees disappear. Do you want to extend your enterprise to a regional office that is not covered by your NSP? Are you seeking to conduct an IP video call with another enterprise? The fact is that you're asking for trouble if your traffic is going to jump from one NSP's network to another. For inter-enterprise data communications, you are at the mercy of inter-carrier handoffs, or worse … the public Internet.

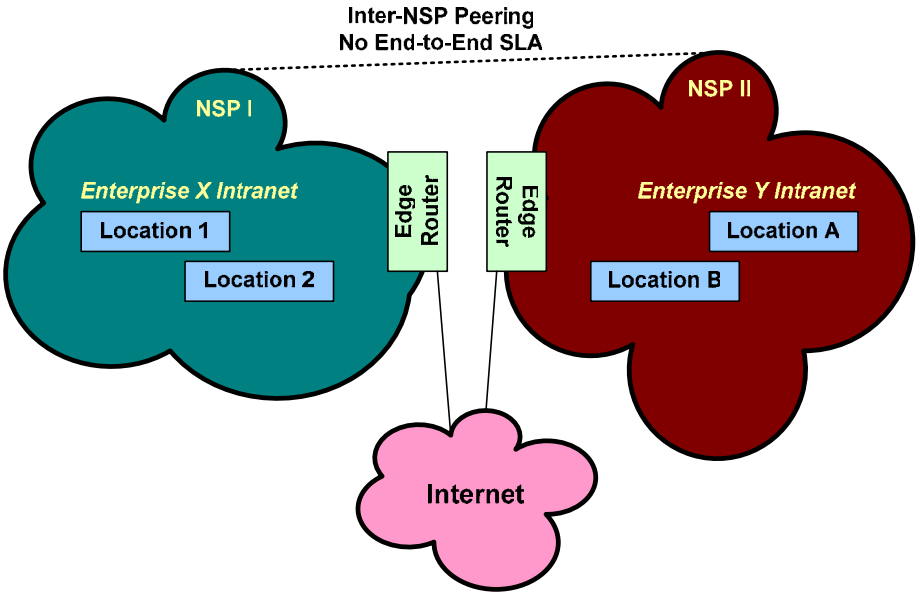

Figure 1: A Traditional Inter-Enterprise Connection Diagram

As shown above, packets traveling from one Intranet (NSP 1) to a second Intranet can traverse either an Inter-NSP peering point or the Internet. Unfortunately, the "intelligent routing" and prioritization benefits offered by QoS networks are typically lost as soon as the traffic traverses network boundaries, even if it is only an intermediate handoff between two well-managed networks.

The reason for the loss of prioritization is simple. The wide area network (WAN) that interconnects a particular enterprise's various locations is typically handled by one (or a very limited number of) NSP(s) that have implemented similar QoS methodologies throughout their networks. These providers can provide end-to-end traffic management and prioritization throughout their network footprint. Unfortunately, the QoS methodologies used by different service providers vary greatly, and therefore the method used to mark high-priority traffic on one network may not be usable on another provider's network. In fact, those markings may actually interfere with the other NSP's traffic control system. For this reason, as shown in the diagram below, NSPs typically remove all QoS markings at both the egress (exit point) and ingress (entry point) to their network.

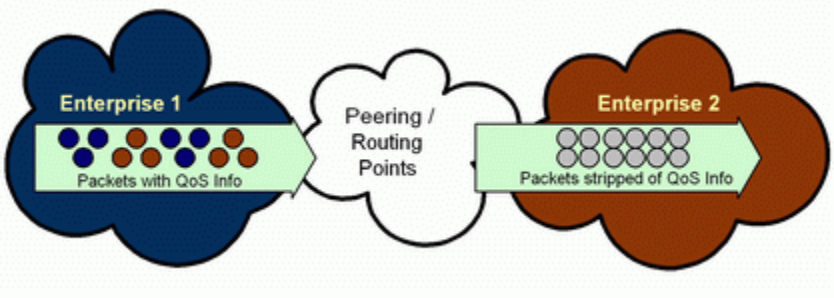

Figure 2: QoS Markings Are Lost Between Disparate Networks

As shown above, once the QoS marking "bits" are stripped from a data packet (or are modified in the handoff between disparate networks), they can never be restored, resulting in a total loss of prioritization. In many cases, this issue forces network managers to channel most, if not all, of their WAN network business to the single service provider whose footprint best matches their geographical presence. As a result, the enterprise network becomes an "island" unto itself.

The End User Dilemma

So where does this leave the enterprise seeking a cost-effective, high-performance network that covers its geographical footprint? Basically it leaves one frustrated and without good alternatives. As a result, many enterprises are unable to deploy rich-media IP communications (like videoconferencing) throughout their global organizations.

In some industries, this problem is addressed through the establishment of a separate network optimized to support inter-enterprise traffic, such as Internet2 for educational institutions. But this approach, which requires a purpose-built, globally accessible backbone, has practical, financial, and logistical limitations that most industries and enterprises cannot overcome.

What would be helpful is a practical method whereby NSPs could easily peer with other networks and faithfully hand off QoS and routing parameters when exchanging traffic. Once in place, this would allow NSPs to provide end-to-end performance for traffic traversing multiple networks. One UK-based service provider, ICU Global, has recently deployed just such a service that simplifies videoconferencing connections between disparate enterprise IP networks. In the next section we explore the technical and practical aspects of such an approach.

The Universal IP Inter-Connection Method

Legacy Options

In hopes of maintaining consistent performance (and to enjoy simplified pricing and SLA agreements), most enterprises today host the bulk of their WAN traffic on a single NSP's backbone. In order to communicate between enterprises using different NSPs, the traffic must somehow move from one network to the next.

Option 1 – The Internet

Since virtually all NSPs maintain connectivity to the public Internet, inter-network traffic could be routed via the Internet. Unfortunately, this will most likely compromise performance (QoS markings will be lost) and security. Hence this is not a widely accepted option.

Option 2 – Peering Arrangements

The easiest way to pass data from one network to another is to establish a direct connection, called a peering arrangement, between those networks. Such an arrangement allows data to travel between those networks without having to use the standard Internet backbone. In some cases, enterprise managers using a small number of NSPs for their WAN may choose to create their own network peering as shown below. The benefit here is that the enterprise network managers control both sides of the peering, and therefore could (theoretically) translate QoS information between the networks to provide end-to-end performance.

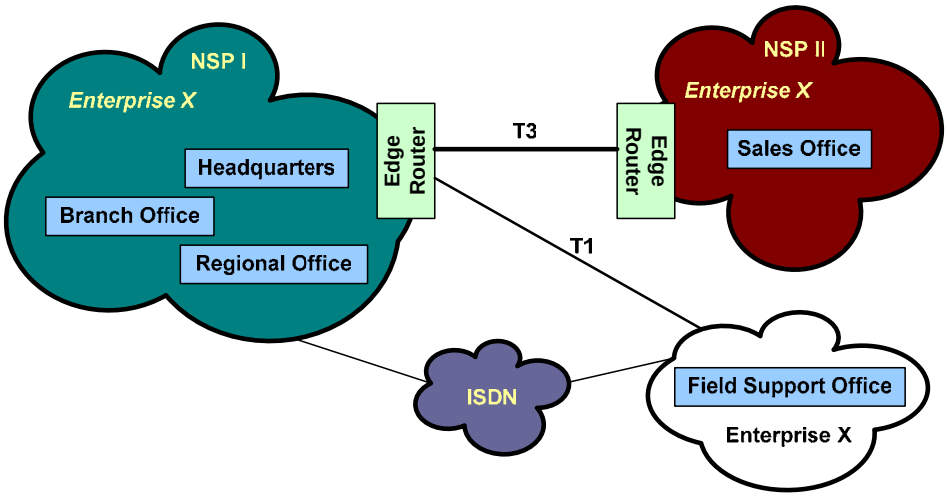

Figure 3: A "Home-Grown" NSP Peering Arrangement

Although this option does allow the enterprise to expand its footprint, the end user organization must shoulder significant hardware, bandwidth, and management costs as it in effect becomes its own NSP. In addition, this does not enable the enterprise to communicate easily with other enterprises outside of its newly expanded wide area network.

Another alternative is to leverage the existing (or request the creation of new) inter-NSP peering points between NSPs as shown below.

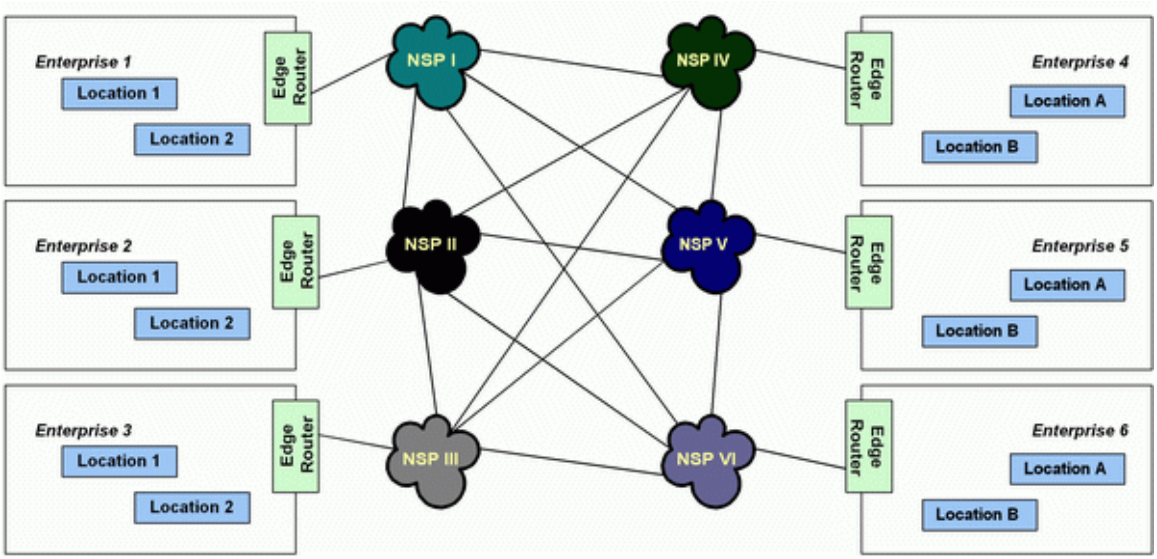

Figure 4: Direct Peering Relationships between NSPs

In the above example, NSP-I has a peering arrangement in place with each of the other five NSPs. Unfortunately, this peering methodology doesn't scale well as the number of interconnections increases exponentially as new providers join the network.

In addition, for both competitive and cost reasons, carriers are not interested in facilitating easy and effective inter-carrier connections. Specific issues include:

- The need for each carrier to deploy a separate direct connection to each competitor, which results in unacceptably high costs and management requirements.
- In order to properly hand-off QoS markings, carriers would need to share competitive information about their current routing and prioritization methods.
- Large NSPs may pressure smaller carriers to partner only with their network, thereby creating several competing "affiliate" networks, each still isolated from the others.

A Centralized Peering Arrangement

In contrast to the very complicated, fully cross-peering method shown above, ICU Global has released a centralized peering service that allows the preservation of QoS markings between carriers. The basic network architecture for this "universal IP network," which ICU Global calls the Global IP Index, is shown below.

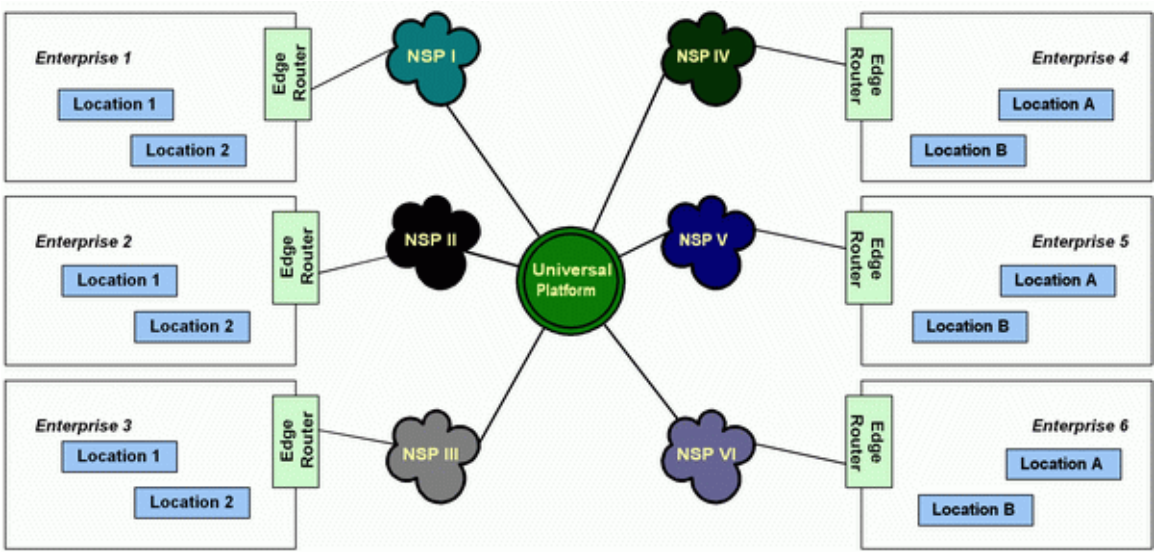

Figure 5: The Universal IP Network

This solution is much easier to implement in a scaleable fashion than the direct peering method between NSPs, as highlighted in the diagram below.

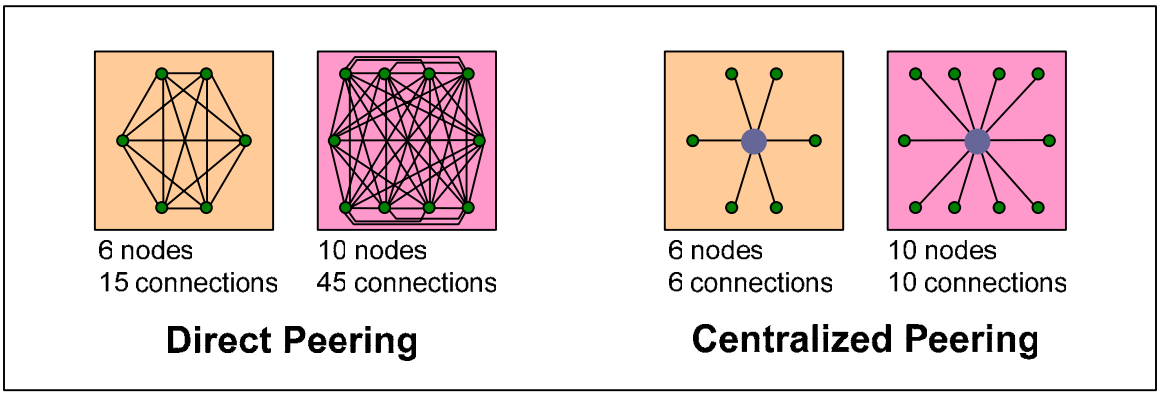

Figure 6: "Direct" Peering vs. "Centralized" Peering

As shown above, when using the direct peering method, the number of interconnections required quickly grows as new NSPs join the network. On the other hand, the centralized peering approach allows for the addition of additional network "members" with only the need for a single inter-connection, resulting in faster deployment and significant cost savings.

The diagram below highlights another perspective on the relationship between the number of connected networks and the required number of interconnects for both the direct peering and centralized peering methods.

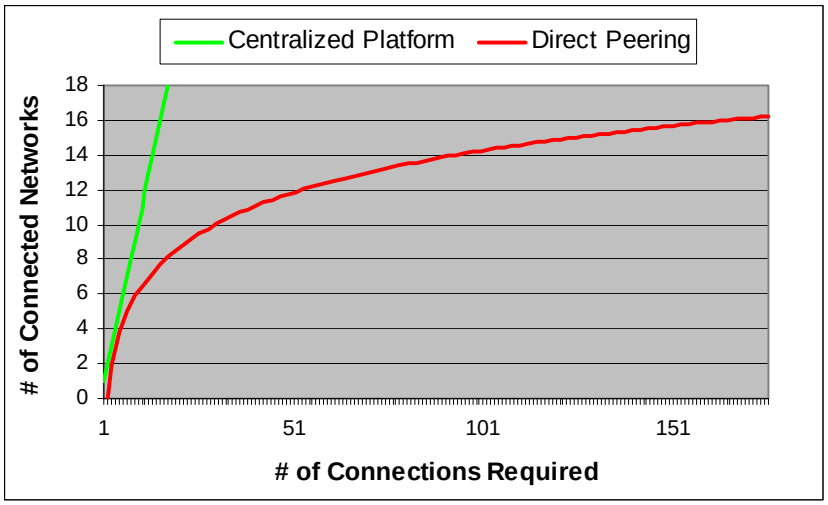

Figure 7: Connections Required (Direct Peering vs. Centralized Platform)

Maintaining Network Performance

Under this approach, each NSP would still handle its customers' enterprise traffic, but would automatically route specially designated "inter-carrier" traffic (like videoconferencing data) from their core routers through the centralized peering platform and on to the "target" carrier's network. This approach bypasses the public Internet and eliminates the need for exhaustive, prearranged peering relationships among the carriers as illustrated below.

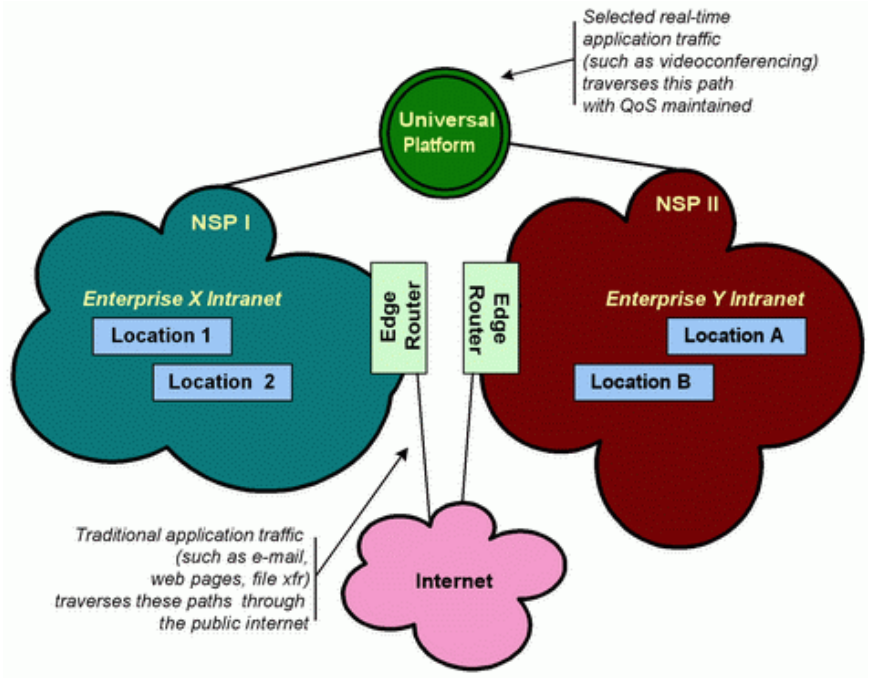

Figure 8: Inter-NSP Traffic Flow via the Universal IP Platform

In order to maintain consistent performance, the universal platform would act as a "QoS marking translation service" between the various member NSPs. As shown above, traffic that does not require QoS is routed via the Internet, while QoS traffic (videoconferencing, VoIP, etc.) travels between NSPs via the Universal Platform.

The Universal IP Network Business Model

Although there are various business models that could be used for this type of centralized NSP peering arrangement, ICU Global has selected the following methodology:

- Each NSP offers the Inter-Network QoS service to enterprises for a fixed monthly fee (with price determined by SLA and capacity)
- The customer subscribes to the fixed-rate service from its current NSP
- The platform provider (in this case ICU Global) enters into SLAs and buys bandwidth from each NSP to accommodate traffic from that NSP's subscribing customers
- The platform provider offers an end-to-end SLA based on the SLAs of the connected NSPs
- The platform provider charges each NSP a fixed fee for the managed service (fee determined by the capacity required by the NSP's subscribers)
- The NSPs and platform provider work together to configure all edge routers to prioritize traffic entering and leaving the Universal IP network

From the end user's point of view, its chosen carrier is the vendor behind this service; the universal platform itself is hidden in the background.

The Benefits of a Universal IP Network

The adoption of a centralized peering / universal IP inter-connection service would help eliminate the performance problems that typically plague inter-enterprise connections. It scales well, and would allow NSPs to provide end-to-end QoS between networks without having to reveal proprietary information to competitors.

Benefits to End Users

The universal platform provides the following real benefits to end users:

- Provides turnkey access to multiple networks from a single connection
- Allows end users to expand their WANs beyond the limits of a single NSP
- Simplifies network contracts by allowing end users to deal with only one NSP and one SLA for their entire WAN footprint (regardless of the number of NSPs actually involved)
- Routes traffic through multiple NSPs (without the need to arrange for peering or direct connections)
- Maintains QoS and bypasses the public internet when inter-connecting to sites and enterprises served by other NSPs
- Provides a simple, fixed-rate pricing model for access to all carriers through a single platform
- Enables secure (via generic routing encapsulation / GRE tunneling), reliable IP connections between endpoints without having to establish a point-to-point VPN
- Allows end-users to run all video traffic over IP networks, thereby decreasing (or ideally eliminating) the need for ISDN lines or gateway services.

Benefits to Service Providers

For service providers, the universal platform offers a variety of benefits:

- Greatly simplifies and decreases the costs associated with peering arrangements between NSPs
- Allows NSPs to peer with multiple other NSPs via a single connection and a single contract
- Enables QoS markings to traverse multiple NSPs without divulging proprietary information
- Provides a simple business model, with fixed monthly costs and recurring revenue for NSPs
- Enables NSPs to effectively increase their global footprint and service offering by leveraging and selling the resources of other NSPs (without giving up their primary role on that account)
- Provides NSPs with access to the ancillary services (audio and video bridging, monitoring, etc.) offered by other NSPs, resulting in another potential source of recurring revenue

The Need for Critical Mass

As described by Metcalf's law, the "value" or "power" of a network increases in proportion to the square of the number of nodes on the network. Thus, as new NSPs join this centralized peering network, the value of the total network increases exponentially as shown in the diagram below.

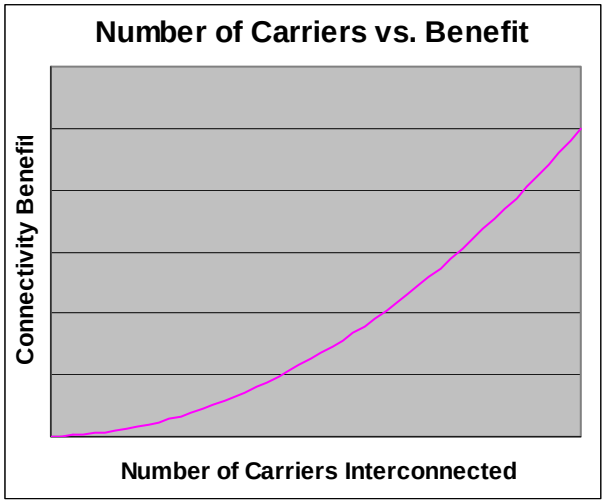

Figure 9: Benefits Grow Exponentially as New NSP are Connected

Unfortunately, the flip side of this argument is that in order for a centralized peering solution to be successful, it must attract a critical mass of service providers and end users. The challenge for universal IP network providers, like ICU Global, will be to achieve this critical mass.

Conclusion

The migration of videoconferencing from ISDN to IP has been slowed by the inability of network service providers (NSPs) to provide end-to-end quality of service guarantees for traffic that travels beyond their network footprint. In all fairness, it is quite understandable that a carrier would not be willing to guarantee the performance of another NSP's network. But, for fear of losing their competitive edge, NSPs have been slow in their efforts to resolve these inter-connection issues.

The centralized peering method, also known as the universal IP network, allows for multiple NSPs to peer via a neutral, third-party inter-connection service. Such a service allows for a clean hand-off of rich-media traffic between carriers, without the need to route traffic over the public Internet, and without forcing the carriers to divulge confidential information. From this perspective, such an offering makes good sense.

In reality, the prospect of partnering with competitors in order to better serve their customers is a slippery slope. Today, most service providers have preferred to address the problem on their own, either through expensive point-to-point links, or through "SLA-less" peering relationships with other NSPs. While this may address the requirements of specific customers, this solution is expensive and does not scale.

The centralized peering solution proposed by ICU Global with their Global IP Index could potentially resolve many of these issues. In fact, as of this writing, there are already several major carriers and a significant number of end user organizations connected to and using the Global IP Index solution. That said, there are certain hurdles (such as achieving critical mass) that must be overcome in order for this type of solution to be truly effective. Also, one has to wonder whether there is room in the marketplace for more than one or two universal IP network providers.

Ultimately, end user demand for end-to-end, high-performance global network services will drive NSPs to enter into teaming arrangements as described in this document. While not the only solution currently available to address these types of issues, Wainhouse Research believes ICU Global's patented IP Index offering provides a practical, cost-effective way for NSP's to partner without losing their competitive advantage.

About Wainhouse Research

Wainhouse Research (www.wainhouse.com) is an independent market research firm that focuses on critical issues in rich media communications, videoconferencing, teleconferencing, and streaming media. The company conducts multi-client and custom research studies, consults with end users on key implementation issues, publishes white papers and market statistics, and delivers public and private seminars as well as speaker presentations at industry group meetings. Wainhouse Research publishes Conferencing Markets & Strategies, a three-volume study that details the current market trends and major vendor strategies in the multimedia networking infrastructure, endpoints, and services markets, as well as a variety of segment reports, the free newsletter, The Wainhouse Research Bulletin, and the PLATINUM (www.wrplatinum.com) content website.

About the Author

Ira M. Weinstein is a Senior Analyst and Consultant at Wainhouse Research, and a 14-year veteran of the conferencing, collaboration and audio-visual industries. Prior to joining Wainhouse Research, Ira was the VP of Marketing and Business Development at IVCi, managed a technology consulting company, and ran the global conferencing department for a Fortune 50 investment bank. Ira's current focus includes IP video conferencing, network service providers, global management systems, scheduling and automation platforms, ROI and technology justification programs, and audio-visual integration. Mr. Weinstein holds a B.S. in Engineering from Lehigh University and is currently pursuing an MBA in Management and Marketing. He can be reached at iweinstein@wainhouse.com.

About ICU Global

ICU Global Ltd. was founded in 2002 on three guiding principles:
• To understand, before being understood
• To be recognized as a company with four Cs – clear, concise, continuous communication
• To overcome problems that customers do not even know they have

The above three principles have helped ICU Global to become, in just over two years, one of the most positively-aggressive companies in the videoconferencing business. The launch of their patented video over IP product is just the next step towards meeting customer needs by addressing communications issues that ensure those customers can concentrate on achieving their own business objectives.

As Cisco Systems, one of ICU Global's partners, explains, "With Telecom Service Providers supporting rich media conferencing (video, voice, web) over their IP-VPNs, ICU Global's Cisco-based IP platform is firmly positioned to provide end-to-end IP interconnectivity between multiple Service Providers. This combination of the Global IP Index with Service Provider IP-VPNs has the potential to offer enterprises a global, 'carrier independent,' rich media conferencing service with greater reliability, and at a predictable cost, when compared to legacy ISDN based Video Conferencing. Ultimately, this could provide rich media IP conferencing connectivity, not just within an enterprise, but out to that enterprise's customers and suppliers, securely over IP end-to-end."

Additional information about ICU Global and the Global IP Index can be found on the web sites: http://www.icuglobal.co.uk or http://www.ipplatform.com