Service providers wanting to deliver end-to-end VoIP services and higher-value IP-based services must interwork across multiple networks with different protocols and protocol implementations, writes John Longo

The dimensions of future network interconnects: multiprotocol, multilateral, multiservice

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Service providers face multidimensional challenges as they evolve their networks to support a variety of IP-based services, with different business models and technology variations, and different states of evolution.

First among these services is voice over IP. Carriers have been transitioning their networks from time division multiplexed to VoIP service for over five years.

Today, a significant share of the world's voice traffic is carried via VoIP. According to iLocus, in its February 2007 industry update, there were an estimated 82.6 billion minutes of VoIP international long distance traffic and 686.7 billion minutes of national long distance traffic in 2006. During 2006, iLocus estimates, over 40% of the total ILD traffic worldwide was carried via VoIP.

To deliver end-to-end VoIP services and higher-value IP-based services, service providers must interwork across multiple networks with different protocols and protocol implementations that may require different business models and possibly new partners. "Getting it right" with VoIP is an essential first step to enter future service markets.

Pursuing standardised interconnects

Initially, carriers introduced VoIP services by installing media gateways at their network edges to interconnect with the public switched telephone network. Now, with VoIP carrying such a significant share of voice traffic, it no longer makes sense to transcode voice between VoIP and TDM just to interconnect.

In fact, service quality suffers with multiple transcodings for each call. Increasingly, carriers are interconnecting their VoIP traffic directly with trading partners.

Yet the benefits of VoIP can be derailed due to the complexity of differing standards implementations.

In the TDM world, 64 kilobits a second digitised voice has a standardised format and interface; Signalling System 7 protocol is fairly standardised, allowing for some national variation.

VoIP and Session Initiation Protocol implementations, however, can vary significantly by carrier. In fact, when implementing SIP-based signalling for VoIP, a carrier must consider over 28 requests for comments and over 100 active draft specifications, which in themselves allow for great variation considering the SIP specifications contain, for example, 2,607 "must" statements, 1,386 "should" statements, 1,158 "may" statements, and 250 "recommended" statements.

Efficient interconnects

Session border controllers were designed to facilitate interconnects and provide security at the network edge. They solve the issue of addressing disparate protocols by providing translations between signalling protocols, including the two primary protocols: SIP and H.323, the International Telecommunication Union's standard for signalling on packet-based networks, and implementation variations in each.

SBCs can also provide many other functions such as quality of service monitoring, policy enforcement, and session routing due to their unique position at the network edge. They can also give carriers the benefit of interconnecting with trading partners in ways not possible with the PSTN.

Interoperability challenges can be turned into assets according to Alan Bugos, vice president for advanced technology and engineering at iBasis. Bugos notes: "Over the past 10 years since iBasis pioneered VoIP interconnects, the single biggest challenge we have faced is interoperability in an expanding multi-vendor VoIP environment. With the right interconnect technology partner and our operational experience, we have been able to turn this challenge into a competitive advantage."

Cost savings

VoIP interconnects also provide cost savings by enabling more efficient trunking. With traditional TDM interconnects, typical trunk group utilisation may be as low as 30% resulting from discrete trunk groups engineered in 24-channel increments to handle peak traffic loads.

With VoIP, traffic to and from different locations can be brought into a carrier's network through a common IP port. Overall utilisation of this port is much higher than with discrete trunk groups due to increased volume and the effect of multiplexing traffic from different locations.

As a result, VoIP trunk group utilisation can be as high as 70-80%. In addition to better use of band-

width, carriers can avoid the capital expenses associated with underused softswitch and media ports.

VoIP network architecture provides modular network components that can scale independently to provide a more economical growth path. Thus, as network traffic grows, more ports are required at the edge of the network to handle media and signalling with more customers, yet core signalling functions do not need to grow at the same rate.

VoIP also enables operators to realise operational cost savings. With the movement to common IP backbones, network operation is streamlined with inherent IP resilience with fewer discrete facilities to manage.

Bilateral to multilateral

Another benefit of VoIP interconnects is the flexibility they provide carriers to move from bilateral to multilateral interconnects. Prior to liberalisation of global telecommunications markets, interconnects were bilateral facilities with treaties between nations and telecommunications authorities to address regulatory and business terms.

Competition brought pressure on these bilateral settlement rates, and a wholesale segment emerged to facilitate interconnects with point-to-point TDM facilities and business terms for interconnection.

With the emergence of VoIP, carriers can continue to interconnect with major bilateral and wholesale partners with traditional PSTN business and regulatory terms, but they have the added benefit of VoIP networking and traffic aggregation efficiencies.

Unlike TDM, IP provides a full mesh network. Hence, an IP edge point can easily connect to many other IP edge points.

VoIP also introduces the opportunity for different business models. Many believe that global interconnects will follow more of the 80/20 rule with carriers directly connecting the bulk of their traffic — perhaps 80% — with their major trading partners, which may only represent 20% of all global operators. These interconnects will follow business terms directly negotiated between the carriers.

The remaining traffic — perhaps 20%, destined for a much larger number of operators globally — may be sent to third-party, wholesale service providers that provide physical interconnects and negotiate business terms with a greater number of operators.

Implementing the right VoIP interconnect facility enables both business models to be served from a single VoIP interconnection point as Jeff Bak, vice president of marketing at VSNL International notes.

According to Bak: "Over the past six years, most of our VoIP interconnects have been with international wholesale carriers in hard-to-reach destinations, but lately our traditional bilateral interconnects with incumbent operator partners are rapidly beginning to move to VoIP interconnects."

Peering

While some industry experts refer to any type of VoIP interconnect as "peering," others have a more limited definition. According to Heavy Reading's report, VoIP Peering and the Future on Network Interconnect, published in August 2006, VoIP peering is defined as follows:

"VoIP peering refers to interconnection between originating and terminating service providers for the completion of a seamless session between subscribers on their networks. Third-party resources — transmission, switching, database, or otherwise — may be used to facilitate the session connection, but they are not bundled and sold in a wholesale fashion along with the termination."

Since VoIP networking is more flexible than TDM networking, carriers find it more economical to interconnect and exchange traffic directly under terms negotiated between them. There are also third-party peering platform operators such as Arbinet, Stealth Communications' Voice Peering Fabric, and XConnect that provide a variety of services to facilitate multilateral operator interconnections.

Services include the physical facilities to interconnect carriers' signalling, media or both; commonly negotiated business terms and legal structure, whether zero-cost peering or fee-based; and routing database services such as access to common ENUM databases or traditional PSTN routing databases.

While multilateral peering may not be appropriate for the bulk of a carrier's traffic, it may make sense for some of it.

Future services

Carriers are moving to VoIP interconnects not just to support VoIP traffic, but also to pave the way for future IP services. VoIP is the first application to migrate to the common IP service infrastructure. Yet service providers are challenged to introduce new services to meet demands for choice, innovation, and service ubiquity.

Fixed-line services must be augmented as "lifestyle-enabling" technologies such as Instant Messaging and mobile pervade the market.

IM started as text chat with presence, but IM service providers have expanded the capabilities to include voice, video, file transfer, gaming and other services.

Mobile phones initially offered only voice service. They now support short message service for text messaging, multimedia messaging service for picture transfer, mobile IM for text messaging with presence, and capabilities such as email and calendar synchronisation when combined with personal digital assistants.

With fixed-mobile convergence, service providers seek to integrate mobile services with fixed-line services — initially with service bundles and call transfers; ultimately with fully integrated services.

Likewise, voice over IM providers offer access to and from the PSTN for their services, and some voice over broadband providers are providing greater feature transparency with VoIM service.

With increasing sophistication of other service platforms, fixed line operators are challenged to upgrade their platforms to VoIP technologies and direct IP interconnects. This will be the first step in enabling introduction of advanced services.

IP interconnects can support new media such as video, messaging, gaming, and so on. Carriers have to adopt IP interconnects to future-proof their networks. They will be essential to provide services between operators since the PSTN will only provide connectivity at the lowest common denominator, a traditional 3 kilohertz telephone call. ■