Voice Trunking in an IP World: Charting a Practical Path for PRI and SIP

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Information technology (IT) leaders understand that a converged Internet Protocol (IP) network is the endgame for innovative organizations. However, the real-world road to all-IP means leveraging existing technology investments as well as intelligently integrating leading-edge IP capabilities. Utilizing Session Initiation Protocol (SIP) trunks for IP PBX telephone systems is a practical step in the evolution of business networks.

The IP PBX Edge

Three out of four U.S. companies have adopted IP PBX solutions to reduce telephone system operating costs and complexity while enabling features that drive productivity.¹ IP PBXs use SIP—a signaling communications protocol for IP networks—to route voice, video and messaging traffic through an organization’s data network. With feature-rich SIP enabled IP phones that connect to the company LAN via Ethernet or Wi-Fi, office telephone extensions become virtual rather than physical. SIP phones are also offered as software clients for computers, laptops, smartphones and tablets, allowing workers to receive calls and messages anytime, anywhere across a range of wireline and wireless services.

According to a recent survey, seven out of ten companies currently use, or plan to use, SIP-based Unified Communications (UC) solutions.² The most valued UC applications include softphones, audio conferencing, enterprise voice, web conferencing, videoconferencing, unified messaging, presence and simultaneous ring (find me/follow me).³ (See Figure 1.)

Rather than guessing whether a colleague is ready to communicate, presence offers real-time information about individual availability and how best to reach that person—via office phone, mobile phone, instant messaging, videoconference or other means. With SIP, voice calls and messaging can also be linked with customer relationship management (CRM) applications. For example, as incoming call numbers are recognized, the customer service associate sees a pop-up window with information about the caller. Likewise, click-to-call features within CRM applications speed outbound dialing. As businesses increasingly leverage such features, SIP is expected to account for 76 percent of all outbound call traffic within four years.⁴

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**Figure 1**

SIP-Based UC Applications Currently Using or Planning to Use

<table>
<thead>
<tr>
<th>Application</th>
<th>Using/Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Softphones</td>
<td>75%</td>
</tr>
<tr>
<td>Audio Conferencing</td>
<td>73%</td>
</tr>
<tr>
<td>Enterprise Voice</td>
<td>71%</td>
</tr>
<tr>
<td>Web Conferencing</td>
<td>70%</td>
</tr>
<tr>
<td>Video Chat (Desktop)</td>
<td>65%</td>
</tr>
<tr>
<td>Instant Messaging</td>
<td>64%</td>
</tr>
<tr>
<td>Video Chat (Room)</td>
<td>62%</td>
</tr>
<tr>
<td>Unified Messaging</td>
<td>61%</td>
</tr>
<tr>
<td>Presence</td>
<td>59%</td>
</tr>
<tr>
<td>Simultaneous Ring</td>
<td>58%</td>
</tr>
</tbody>
</table>

Source: Webtorials 2014
Debunking Trunking
By using TDM-IP voice gateways that link their IP PBX to the Public Switched Telephone Network (PSTN), businesses have been able to realize many of the benefits of SIP without replacing existing connections with telecom carriers. These carrier connections, called trunks in telecom speak, are traditionally offered as Primary Rate Interface (PRI) services. PRI trunks deliver voice traffic as part of Integrated Services for Digital Network (ISDN) specifications that interface with the PSTN.

PRI trunks are usually offered in blocks of 24 channels (23 for voice and 1 for signaling) through T1 or DS3 circuits. This fixed-channel allocation has long been a source of frustration for IT managers. When it needs extra call capacity, a growing organization is often forced to buy a block of 24 channels, even when far fewer are actually required. Fortunately, some innovative carriers now offer fractional PRI services, enabling organizations to purchase digital voice channels in smaller increments, such as 8, 12 or 16.

SIP Trunking offers even more flexibility and granularity, enabling organizations to purchase the exact number of call paths needed. Better yet, there is no need for TDM-IP gateways that support the conversion of IP packets to PSTN traffic over an ISDN PRI circuit. With SIP Trunking, organizations can supplement or bypass PRI infrastructure, extending the benefits of IP and SIP beyond the internal IP PBX edge.

Five Key Benefits of SIP Trunks
As well as a future-proof network evolution path, SIP Trunking offers cost-savings on telephone service charges and legacy equipment upgrades, flexibility in scaling call capacity, enhanced business continuity capabilities, unified communications and efficiencies through converged networking.

Let’s look at the five key advantages of SIP Trunking in more detail.

1. **Cost Savings:** SIP Trunking helps organizations save on costs for carrier PRI voice circuits and legacy voice gateway hardware and support. Gartner, a lead IT research firm, estimates that SIP Trunking services can reduce business telecom expenses by up to 50 percent.²

2. **Scalability:** Rather than buying PRI trunks in fixed blocks of 24 channels, SIP Trunking capacity can be scaled more flexibly. As it adds PRI channel blocks, the organization may also need to add capacity to the legacy voice-gateway hardware interconnecting its IP PBX with PRI circuits—an approach that can be more costly and cumbersome. SIP Trunking provides a native SIP interface between the customer IP PBX and the service provider IP network and allows granular scaling of call capacity over IP data connections.

3. **Alternate Routing and Business Continuity:** The enhanced failover capabilities of SIP Trunking benefits business continuity and disaster recovery strategies. For example, SIP Trunking can be configured to automatically route calls to another telephone number or trunk group during a connection failure and, following restoration, return call traffic to the primary destination. (See Figure 2.) SIP Trunking can be programmed to support automatically triggered alternate routes by phone number or trunk group in the event of a system, PBX or network failure. Many providers offer customer administration portals for ease of setup and management.
4. **Unified Communications**: Businesses are embracing UC to enhance collaboration and responsiveness. SIP is an essential element in many UC applications, such as instant messaging and presence, unified messaging and audio/video/web conferencing, as well as mobile softphone apps. SIP Trunking helps keep UC applications on the IP network, avoiding charges associated with PSTN termination and interconnection.

5. **All-IP Networking**: SIP Trunking may serve as an essential building block for migrating to a flexible all-IP network that delivers voice, data and video traffic. By handling SIP voice calls as IP data, SIP Trunking provides a next-generation solution for supporting your network evolution needs.

**The Hybrid Path**

All-IP network idealists can learn lessons from the energy-efficient vehicle market. While all-electric vehicles are the ultimate approach, they account for less than 15 percent of electric-capable vehicle sales. Hybrids dominate the industry. Likewise, while 75 percent of U.S. companies have adopted IP PBXs, only 20 percent of organizations exclusively employ SIP Trunking to link their IP PBX with telecom service providers. To leverage their legacy voice investments, organizations often pursue a hybrid path that includes both PRI and SIP Trunking solutions as part of a phased migration of their network to IP services. That said, SIP Trunking is poised to overtake PRI services as organizations steadily evolve toward converged IP networks.

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**Figure 2**

**SIP Trunk Alternate Routing & Business Continuity**

SIP Trunking can be programmed to support automatically triggered alternate routes by phone number parameters in the event of a system, PBX or network failure. Many providers offer customer administration portals for ease of setup and management.

Currently, half of businesses use SIP Trunks. That total is expected to reach 78 percent in 2016. According to Infonetics Research, “SIP Trunking is becoming more mainstream with North American businesses, but it’s important to remember that few companies have done a 100% cutover.”
Therefore, service providers that can aid in this evolution by offering both PRI and SIP Trunking solutions may prove to be preferred partners.

**Loading SIP Trunking**

Some carriers bundle bandwidth and quality of service (QoS) with SIP Trunking to simplify network cost and capacity planning. Other service providers require the customer to handle SIP trunk traffic engineering and QoS considerations. For those organizations that must do their own traffic engineering for SIP trunks, the required bandwidth is calculated based on the projected number of concurrent voice calls. One simple formula for this calculation can be expressed as:

\[ \text{SIP Trunk Peak Bandwidth} = \text{Maximum Simultaneous Calls} \times 100 \text{ kbps} \]

With this formula SIP Trunking capacity for 10 concurrent calls equates to 1 Mbps of bandwidth.

**Trunks and Branches**

A key decision for organizations with multiple operating locations is whether to centralize or distribute their SIP trunks. This choice is driven by several factors, including the current and planned PBX architecture, the use of unified communications, the geographic distribution of branch office locations, branch office bandwidth utilization and redundancy needs.

With a centralized IP PBX, SIP call traffic can be transported over the organization's local and wide area networks. Internal “on-net” call traffic is delivered as IP data within the company—minimizing carrier trunk and toll charges—and external “off-net” traffic destined for the PSTN is terminated with centralized SIP or PRI trunks. (See Figure 3.)

**Figure 3**

SIP Trunks Enable IP PBX Extensions for On-net Calling and Support for SIP/VoIP Phones

SIP Trunking supports “on-net” call traffic delivered as IP data over the company network to other locations. An array of SIP-enabled IP phone types that connect to the company LAN are supported along with IP PBX-based 4-digit dial plans that increase efficiency and reduce costs.

Organizations may consider a distributed approach when geographic distance adds network delay, undermining call quality, or when bandwidth usage strains links between remote sites. A common design guideline is to centralize SIP Trunking if branches consume less than 20 percent of wide area network bandwidth.
When branch-location WAN-bandwidth utilization approaches or tops 50 percent, a distributed SIP Trunking approach may be preferred. Distributed SIP trunks may also be selected as a way to add redundancy by avoiding a single point of failure for PSTN interconnection.

**Choosing a Provider**

SIP Trunking can deliver reliability and security comparable to PRI trunks while offering cost savings and innovative features. Whether the potential of SIP Trunking is fulfilled depends on the service provider selected. Organizations should consider the following six factors in the decision-making process.

1. **Facilities-Based Foundation:** When evaluating SIP Trunking services, select a provider that owns its last-mile network and can offer future-proof fiber and Ethernet solutions. Facilities-based providers with broad network reach are better able to guarantee service quality. Using a variety of access technologies, they may also be able to serve a wide range of business locations, from office parks and business centers to small office, branch office, retail, medical and municipal buildings. In a 2015 survey, more than half of businesses said they have chosen to fully consolidate their telephone service, broadband Internet connections and SIP Trunking with a single provider.

2. **Service Level Agreements:** Because voice reliability is so critical to business productivity, be sure to select a SIP Trunking provider that offers service level agreements (SLAs). Such agreements set performance benchmarks for service reliability and, should an unplanned outage occur, responsiveness for repair and restoration as well as compensation.

3. **Circuit and Packet Support:** Because most organizations employing SIP Trunking still use PRI services to connect to the PSTN, partnering with a provider that offers both solutions may simplify service management and yield cost savings.

4. **Call Path Bandwidth:** While it may be beneficial for some organizations to converge SIP Trunking into their carrier data connections, others find doing so may create bandwidth contention and traffic management challenges. Avoid this problem with voice-only SIP Trunking that provide dedicated and scalable call paths, simplifying network cost and capacity planning while ensuring voice application performance. (See Case Study.)

5. **Alternate Routing and Trunk Overflow:** Alternate routing automatically switches incoming calls to another telephone number in the event of a service outage, even when due to a PBX failure. Similarly, SIP Trunking overflow solutions automatically reroute inbound calls to a designated phone number when all provisioned call paths are in use. Some service providers offer similar features for PRI as well. Because these call failover capabilities impact network uptime, be sure a prospective service provider supports them for both PRI and SIP.

6. **Equipment and Interoperability:** To simplify installation and integration, some providers include customer-premise equipment (CPE) for SIP Trunking connectivity and pre-test IP PBX system compatibility. With this “plug-and-play” deployment option, organizations need not navigate the SIP Trunking terrain alone.
Flexible and Future-Proof
SIP trunks extend the benefits of IP communications beyond the company LAN and WAN into carrier networks. Organizations may choose to deploy SIP Trunking to supplement or bypass PRI infrastructure, offering a flexible and future-proof approach to IP network evolution. Selecting the right service provider is an essential ingredient in the success of any SIP trunk deployment.

Case Study: SIP Trunks Reduce Costs, Add Features
After more than 50 years in business as an electrical contractor, Lexington, KY-based B&B Electric Company, Inc., recently refocused on commercial utility and power line projects. After shifting to a niche market, the company’s telephone call volume dropped dramatically. B&B Electric wanted to unload its underutilized and expensive PRI circuits without losing the advanced phone features that supported its operations and professional appearance, such as individual direct inward dialing (DID) numbers for staff.

After researching the available options, B&B Electric selected a SIP trunk solution from Time Warner Cable Business Class (TWCBC is now Spectrum Enterprise). The move to SIP Trunking reduced service costs by 69 percent and preserved valued voice features while offering new ones, such as automatic call rerouting. Oliver Ackermann, B&B Electric’s IT Engineer, also valued TWCBC’s* SIP Trunking service for including dedicated call path bandwidth and QoS. This means SIP Trunking traffic does not consume data capacity on the 35-Mbps Business Internet connection B&B Electric relies on from TWCBC*.
About the Author
Michael Harris is principal consultant at Kinetic Strategies, Inc. Applying more than 15 years of experience as a strategist, research analyst and journalist, Michael consults with select clients in the networking, Internet and telecommunications industries.

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Spectrum Enterprise, a division of Charter Communications, is a national provider of scalable, fiber-based technology solutions serving many of America’s largest businesses and communications service providers. The broad Spectrum Enterprise portfolio includes Internet access, Ethernet access and networks, Voice and TV solutions extending to Managed IT solutions, including Application, Cloud Infrastructure and Managed Hosting Services offered by its affiliate, Navisite®. Our industry-leading team of experts works closely with clients to achieve greater business success by providing these right fit solutions designed to meet their evolving needs.

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