An Oracle White Paper
February 2014

# Centralized vs. Distributed SIP Trunking: Making an Informed Decision

# Executive Overview

Businesses across the globe are migrating from TDM access services to SIP trunks to reduce telecommunications expenses and improve service agility. SIP trunks offer significant financial, operational, and functional advantages over conventional PRI circuits. Highly flexible, SIP trunks can be deployed in a centralized or distributed fashion to satisfy diverse business requirements. Each deployment model has distinct merits and drawbacks. IT planners should carefully examine the pros and cons of each approach when formulating a migration plan.

This white paper reviews SIP trunking service benefits, deployment options, and implementation challenges and explains how enterprise session border controllers can help IT teams streamline SIP trunk installations and ensure high reliability and service quality for IP communications.

## SIP Trunking Reduces Communications Cost and Complexity

SIP (Session Initiation Protocol) has emerged as the signaling protocol of choice for IP telephony and unified communications (UC). The industry-standard protocol is supported in a wide variety of IP communications products including IP-PBXs, UC servers, and videoconferencing systems as well as desk phones, softphones and UC clients. By replacing legacy telephony infrastructure with SIP-based solutions and converging voice, video, and UC traffic onto a common IP backbone, enterprises can contain costs and simplify operations.

Many service providers now offer SIP trunking services – cost-effective alternatives to conventional PRI (Primary Rate Interface) circuits for PSTN connectivity. By switching to a SIP trunking service, IT organizations can eliminate TDM (time-division multiplexing) gateways, reduce monthly service fees, and improve service agility (SIP trunks can be installed and re-provisioned more quickly and easily than conventional PRI circuits). SIP trunks also provide efficient access to hosted and cloud-based communications offerings such as audio or video conferencing services.

SIP trunking services are far more flexible than traditional PRI services; they can be deployed across the enterprise in a distributed or centralized fashion. In the distributed topology, each enterprise site connects to the PSTN independently via its own SIP trunks. External calls (PSTN calls outside the company) are terminated locally. Interoffice calls are routed through the SIP trunking service or over the corporate IP wide area network (WAN).

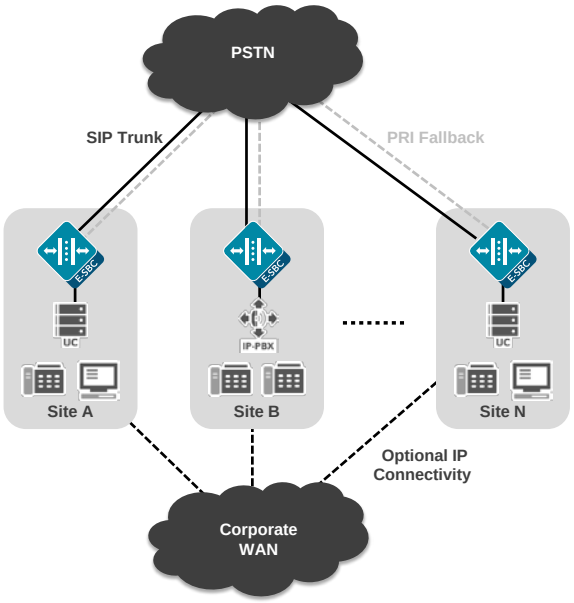


Figure 1: Distributed SIP trunking architecture – SIP trunks are terminated at each enterprise site

In the centralized topology, SIP trunks are installed in data centers hubs. External calls are backhauled across the corporate WAN, aggregated, and handed off to the SIP trunking service provider. Interoffice calls are carried over the corporate WAN.

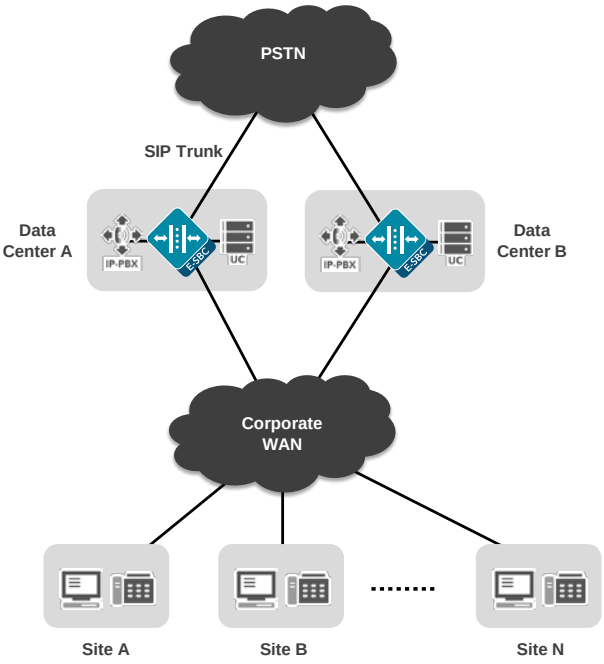


Figure 2: Centralized SIP trunking architecture – SIP trunks are consolidated into central data centers

Each SIP trunking topology has distinct advantages and disadvantages. Network planners should weigh the pros and cons of each approach carefully to determine which model best addresses their organization's specific business requirements. Some enterprises implement hybrid models, for example, consolidating branch office traffic into regional data centers, and installing dedicated SIP trunks at sites with high call volumes such as contact centers.

## Centralized Topology Considerations

Research by Oracle indicates enterprises favor centralized SIP trunking topologies. A blind survey of over 100 medium to very large enterprises in the US and Europe indicates nearly 60% are planning or implementing a centralized SIP trunking topology. Centralized trunks offer the greatest long-term cost savings. The approach is a natural fit for organizations that have consolidated IP-PBXs or UC servers into central data centers. The centralized model minimizes CAPEX and OPEX by consolidating trunks, eliminating inefficiencies, leveraging economies of scale, and centralizing administrative functions.

But the centralized model does require more up-front traffic engineering and capacity planning. Central SIP trunking pools must be properly sized to support aggregate session demand across the enterprise. And the corporate WAN must be properly engineered to ensure low-latency site-to-site connectivity for delay-sensitive traffic like IP video[1].

The network design must also avoid single points of failure to ensure continuous service availability for business-critical communications. To that end, most IT organizations install SIP trunks in at least two geographically distributed data centers to maintain continued PSTN connectivity in the event of interface or equipment failures at one of the hubs (some leverage multiple providers for added redundancy). Fallback PRIs at some remote sites may be desirable to ensure PSTN access in the event of corporate WAN outages.

[1] With the centralized model site-to-site traffic is "tromboned" through a central data center. This approach adds latency to a session, which can potentially degrade the user experience.

## Distributed Topology Considerations

The distributed approach is typically employed by enterprises with decentralized IP-PBX or UC implementations. It offers a straightforward migration path that requires far less network engineering and planning than the centralized model. For all intents and purposes, legacy PRI circuits are simply replaced with SIP trunks – sometimes from the same service provider. Each site acts as an island with its own SIP trunks (some organizations install fallback PRI trunks, too). SIP trunk outages or performance bottlenecks are isolated to an individual site. Traffic engineering and call routing considerations are nominal. All calls are handed off to the SIP trunking service provider[2] and call capacity at any site can be easily increased by simply adding sessions.

But the distributed model does not deliver all the financial benefits of the centralized approach. The distributed approach is more CAPEX and OPEX intensive (SIP trunks are terminated, configured, and administered independently at each site). And the distributed approach tends to squander SIP trunking capacity – each site is engineered to support local peak traffic demand, and session capacity cannot be shared across sites.[3]

[2] Some organizations route interoffice calls across the corporate WAN

[3] Some service providers offer SIP session pooling and bursting across sites to optimize network utilization, free up stranded capacity, and reduce costs

**Centralized vs Distributed SIP Trunking Topologies**

| | Centralized Model | Distributed Model |
|---|---|---|
| **Approach** | • SIP trunks are installed in central data centers<br>• All calls are backhauled across the corporate WAN | • SIP trunks are installed at each site<br>• External calls are handed off locally<br>• Interoffice calls are carried over the SIP trunking service or the corporate WAN |
| **Pros** | • Lower PSTN connectivity costs<br>• Lower operations costs<br>• Lower CAPEX | • Minimal traffic engineering<br>• No single point of failure<br>• Local control |
| **Cons** | • More complex traffic engineering and capacity planning<br>• Loss of local administrative control<br>• Extra equipment may be needed if remote office survivability is required | • Higher PSTN connectivity costs<br>• Higher operations costs<br>• Higher CAPEX |
| **Considerations** | • Ensure service provider can meet E911 routing requirements<br>• Ensure existing DIDs can be easily transferred | • Seek a service provider that supports session pooling and bursting across sites<br>• Ensure service provider offers consolidated billing |

## The Role of the Enterprise Session Border Controller

Most UC vendors and SIP trunking service providers recommend customers use enterprise session border controllers (E-SBCs) to terminate SIP trunks. Installed on the customer site, the E-SBC serves as the demarcation point for the SIP trunking service and mitigates common SIP trunk connectivity, security, and control issues.

- **Connectivity** – SIP trunking services are not always fully compatible with enterprise UC systems. Service interworking and protocol interoperability issues (dissimilar codecs, encryption schemes, SIP options) can impede SIP trunk installations. E-SBCs accelerate service deployment by normalizing SIP messages and providing media transcoding, encryption, and DTMF interworking functions.

- **Security** - SIP trunks expose the enterprise to numerous security threats and service quality concerns including denial of service (DoS) attacks, viruses, and IP telephony spam. Conventional security products like firewalls weren't designed to protect IP telephony and UC services. E-SBCs were specifically conceived to secure real-time IP communications flows and safeguard enterprise networks.

- **Control** – SIP-based networks must deliver the high service levels and call quality users have come to expect from traditional TDM-based networks. E-SBCs route sessions around SIP trunk or

equipment failures to ensure continuous service availability, distribute traffic across trunks and communications servers to balance performance, and police flows to optimize service quality. E-SBCs can also provide PRI fallback to ensure remote office survivability in the event of WAN or SIP trunking failures.

## Conclusion

IT organizations can improve business agility and reduce spending by migrating conventional PRI circuits to SIP trunks. When formulating a migration strategy it is important to consider the advantages and drawbacks of various SIP trunking deployment options. The centralized topology offers the greatest potential cost savings, but requires more up-front analysis and network engineering. The distributed approach provides a simpler transition, but may not save as much money over the long run.

Regardless of which deployment model is chosen, enterprise session border controllers can help streamline the transition to SIP. It is important to select a flexible and scalable E-SBC family that supports both distributed and centralized architectures and offers robust connectivity, security, and control features.

## About Oracle Enterprise Session Border Controllers

Oracle Enterprise Session Border Controllers are specifically designed to resolve the complex connectivity, security, and control issues IT organizations typically encounter when introducing SIP trunks and extending real-time IP communications sessions across network borders. The products provide extensive signaling and media control functions to mitigate service interworking and protocol interoperability issues, deliver strong security features to protect IP telephony and UC infrastructure against malicious attacks and system overloads, and support high availability configurations and flexible session routing capabilities to ensure high service quality and reliability.

Specifically designed to support distributed or centralized SIP trunk topologies, the comprehensive product portfolio includes models for remote and branch offices, as well as large data centers. Remote site survivability features and optional TDM interfaces ensure high levels of availability.

Oracle E-SBCs are part of a family of solutions for the Hyper-connected enterprise. Oracle is enabling the hyper-connected enterprise with a communications architecture that seamlessly connects fixed and mobile users to each other, enabling rich multimedia customer interactions and automating business processes for significant increases in productivity, efficiency and ROI.

Centralized vs. Distributed SIP Trunking: Making an Informed Decision

February 2014

Oracle Corporation
World Headquarters
500 Oracle Parkway
Redwood Shores, CA 94065
U.S.A.

Worldwide Inquiries:
Phone: +1.650.506.7000
Fax: +1.650.506.7200

oracle.com

Oracle is committed to developing practices and products that help protect the environment



**Hardware and Software, Engineered to Work Together**