Enterprise IP Telephony and Unified Communications Interoperability
Introduction

Enterprises are deploying Internet Protocol (IP) telephony and unified communications (UC) solutions to improve collaboration, increase worker productivity, and contain telecommunications costs. But extending real-time IP communications—voice, video, and UC communications—across IP networks can be a challenge. Conventional IP networking products, such as firewalls, routers, and gateways, were not conceived with real-time IP communications in mind and leave enterprises vulnerable to security threats and service quality issues.

In addition, businesses often experience interoperability issues when connecting multivendor communications solutions, such as UC servers, IP private branch exchanges (IP PBXs), and endpoint devices; interfacing with service provider networks, for example, Session Initiation Protocol (SIP) trunking services and hosted services; or delivering UC services to internet users, for example, remote offices and teleworkers. Product incompatibilities can hamper IP telephony and UC initiatives and cause deployment delays and budget overruns.

The Oracle Enterprise Session Border Controller is designed to address the unique security, interoperability, and reliability challenges enterprises often encounter when delivering real-time, interactive communications over private IP networks, the internet, or SIP-based network services. This white paper focuses on the interoperability aspects of the Oracle Enterprise Session Border Controller. It describes common real-time IP communications interoperability and interworking issues and explains how the Oracle Enterprise Session Border Controller can help enterprises accelerate IP telephony and UC deployments by overcoming these obstacles.
Eliminate Unified Communications Interoperability and Interworking Barriers with the Oracle Enterprise Session Border Controller

The Oracle Enterprise Session Border Controller delivers a wide range of interoperability and interworking functions in a highly scalable and extensible platform. Deployed at the border between multiple IP communications networks, the Oracle Enterprise Session Border Controller is designed to provide a single point of management and control for resolving incompatibilities.

Figure 1. Oracle Enterprise Session Border Controller is deployed at enterprise network borders to overcome UC security, reliability, and interoperability challenges.

The Oracle Enterprise Session Border Controller incorporates a broad set of critical functions that would otherwise require multiple special-purpose devices and software with significantly higher capital and operating costs. It provides comprehensive SIP normalization and repair features, protocol interworking functions, transcoding and transrating capabilities, and Network Address Translation (NAT) and firewall traversal features that help businesses break down interoperability and interworking barriers.

SIP Normalization and Repair Capabilities

SIP has emerged as the standard signaling protocol for interactive IP communications. SIP is supported in a wide range of IP telephony platforms, UC servers, and videoconferencing systems, as well as in hardphones, softphones (software telephones), and tablet PCs. Even though SIP is an open standard, businesses often encounter interoperability issues when deploying multivendor solutions or interfacing with SIP-based services.

A number of factors contribute to these challenges.

- **Request for Comments (RFC) 3261 and other SIP-related RFCs are designed to be highly flexible.** They give engineers a variety of implementation choices and offer many optional features and functions. As a result, it is common for different vendors to introduce solutions that are fully SIP compliant yet incompatible. For example, some UC vendors use TCP for SIP signaling, while
many legacy IP PBX systems support only User Datagram Protocol (UDP). Oracle Enterprise Session Border Controller can convert transport protocols between the differing systems.

- **SIP has evolved from a single specification to a collection of dozens of remote function calls (RFCs) and internet drafts.** This ever-expanding set of specifications is often a source of multivendor interoperability issues. Support for SIP-related RFCs varies widely from vendor to vendor. The transport of dual tone multi-frequency (DTMF) tones is a good example. RFC 4733 specifies a standard mechanism for transporting DTMF over Real-Time Transport Protocol (RTP). Although some vendors have implemented RFC 4733, others transport certain DTMF tones using vendor-specific SIP signaling messages.

- **Staying current with the latest RFCs can be a challenge for developers.** It is not unusual for products to support obsolete or expired RFCs that are incompatible with newer specifications. It is also not unusual for vendors to introduce products that do not fully comply with the RFCs.

The Oracle Enterprise Session Border Controller provides comprehensive SIP normalization, repair, and interworking functions to help enterprises resolve product incompatibilities and eliminate SIP service deployment barriers. The solution performs SIP translation functions (SIP to SIP-T¹, SIP to SIP-I, and SIP-I to SIP-T) and protocol fixes to remove common interoperability impediments. It also supports DTMF extraction and interworking functions to enable conversion from in-band to out-of-band signaling methods.

Oracle supports a highly flexible SIP message header and parameter manipulation capability that can be used to resolve complex multivendor interoperability issues. Administrators can define granular SIP header and parameter manipulation rules to modify SIP request or response headers, change response status codes or reason phrases, or alter designated portions of SIP headers to mitigate vendor incompatibilities. This unique capability can save enterprises significant operating expenses by eliminating the need to apply software patches and configuration changes across many communications systems (UC servers, IP PBXs, and so on) and endpoint devices affected by incompatibilities.

Oracle provides an extensive library of preconfigured header manipulation rules (HMRs) that mitigate known multivendor interoperability issues. The HMR library reflects Oracle’s large installed base of SBCs.

As the leader in network session delivery and control infrastructure solutions, Oracle SBCs are installed in more than 1,900 customer networks worldwide. As a result, the solutions have been field proven to

¹ SIP for Telephones (SIP-T) and SIP with Encapsulated ISUP (SIP-I) define extensions to SIP for carrying legacy ISDN User Part telephony signaling. SIP-T is an Internet Engineering Task Force framework. SIP-I is an International Telecommunication Union protocol suite.
interoperate with a wide array of interactive communications products, including Cisco, Alcatel-Lucent, Siemens, Avaya, Microsoft, and IBM solutions.

Highly Extensible SIP Back-to-Back User Agent Implementation

The Oracle Enterprise Session Border Controller operates as a SIP back-to-back user agent (B2BUA) for ultimate flexibility and control. It statefully terminates, manipulates, and re-establishes all SIP signaling streams and associated RTP media flows. This powerful capability enables the Oracle Enterprise Session Border Controller to resolve interoperability and interworking issues as sessions traverse network borders.

RFC 3261 defines a B2BUA as “a logical entity that receives a request and processes it as a user agent server (UAS). To determine how the request should be answered, it acts as a user agent client (UAC) and generates requests.” Unlike a proxy server, a B2BUA is able to maintain session state and participate in all requests for the sessions it has established.

Protocol Interworking Functions

Although SIP has emerged as the signaling protocol of choice for contemporary IP telephony and UC solutions, many enterprises still use legacy H.323 systems and endpoints (especially for videoconferencing applications). The Oracle Enterprise Session Border Controller provides comprehensive protocol interworking functions for interconnecting H.323 and SIP environments to help businesses protect and extend previous investments.

The Oracle Enterprise Session Border Controller can tie together fractured communications architectures that often result from mergers and acquisitions or autonomous purchasing decisions. It can also enable businesses to implement “cap and grow” plans to migrate to new SIP-based products.
and services in a graceful manner. The Oracle Enterprise Session Border Controller provides SIP-to-H.323 signaling interworking functions, status and codec mapping, and response code translations, as well as interworking for supplementary features such as call forwarding, transfer, and hold. It can also provide interworking between Internet Protocol version 4 and version 6 environments.

The Oracle Enterprise Session Border Controller supports UDP, TCP, and Stream Control Transmission Protocol (SCTP) transport interworking functions for interconnecting dissimilar SIP-based solutions. For example, a customer running Microsoft Lync that carries SIP over TCP could leverage the transport interworking function to interface with a SIP trunking service or an IP PBX that supports SIP over UDP.

![Figure 3. Oracle Enterprise Session Border Controller enables businesses to interwork legacy H.323-based solutions with newer SIP-based products and services.](image)

**Security Interworking Functions**

Many enterprises need to secure IP communications sessions, especially when communicating over untrusted internet connections. A number of standards-based methods can be used for encrypting media and signaling flows. Support for these protocols varies widely among vendors and products.

The Oracle Enterprise Session Border Controller provides extensive encryption protocol (Transport Layer Security [TLS], Multiplexed Transport Layer Security [MTLS], Internet Protocol Security [IPSec], Secure Real-Time Transport Protocol [SRTP]) interworking functions to help customers overcome product incompatibilities and enjoy greater choice in SIP endpoints. The function also enables enterprises to run a mix of security options—for example, using TLS and SRTP to secure communications over untrusted internet connections while using unencrypted communications over a trusted private enterprise network.
Transcoding, Transrating, and Codec Renegotiation Features

The Oracle Enterprise Session Border Controller provides comprehensive transcoding capabilities to enable interoperability between products that support dissimilar codecs. The solution also supports transrating to convert media streams from one bit rate to another. These features can help enterprises eliminate product incompatibilities, ease the transition from standard definition to high-definition voice, and improve end user experience. The features can also enable the use of cost-saving, bandwidth-efficient codecs over wide area network (WAN) links or SIP trunks.

Codec support can vary widely among vendors and endpoints. Oracle transcoding capabilities enable IT organizations to decouple SIP system and endpoint purchasing decisions so they can avoid vendor lock-in and choose from a broader selection of endpoints. The transcoding functions also enable businesses to force the use of different codecs or bit rates for different segments of a session—for example, employing a low-bandwidth codec such as G.729 over a WAN link while using G.711 across a legacy campus IP telephony network. The Oracle Enterprise Session Border Controller can renegotiate codecs during a session. For example, in contact centers, a G.711 codec may be used while a session is connected to an IVR and changed to G.729 when connected to the contact center agent in order to optimize bandwidth efficiency.

The solution supports a variety of codecs, including G.711, G.722, G.723.1, G.726, G.729a/b, AMR-NB, AMR-WB, and iLBC.
Figure 5. Transcoding can be used to enable different codecs or bit rates over varying segments of a session. In this example, G.729 is used over the internet segment of a session to conserve bandwidth, while G.711 is used for the enterprise leg of the call.

Network Address Translation and Firewall Traversal Capabilities

Many businesses want to use the internet to extend corporate communications services to remote offices and users, but establishing SIP sessions across private and public IP network address domains can be a challenge. SIP endpoints embed locally administered IP address and port information into message payloads. These addresses become irrelevant when packets traverse a firewall or NAT device between address domains.

The NAT device maps IP network and port addresses between domains; however, it does not map the addresses in SIP message payloads. The Oracle Enterprise Session Border Controller must be used to map message payload addresses to values assigned by the destination network. The Oracle Enterprise Session Border Controller’s job is made complicated by NAT devices that assign address mappings dynamically. This can create challenges when a SIP endpoint establishes a session, suspends communication, and later resumes communication. Because NAT devices do not maintain session state, they may assign a new address mapping to the packets when communication resumes.

The Oracle Enterprise Session Border Controller solves the challenges created when one or more firewalls or NAT devices separate SIP endpoints. The E-SBC resides in the destination network address domain and maps locally assigned addresses to SIP message payloads. It uses periodic registration messages to create address bindings between endpoints. Registration messages are issued with frequency sufficient to maintain a pinhole in the NAT device for the duration of the session.
Industry Interoperability Initiatives

Oracle is dedicated to advancing the interoperability of IP communications products and services. As such, it belongs to the SIP Forum, the Unified Communication Interoperability Forum, and the Internet Engineering Task Force. The company regularly participates in events such as the SIP interoperability test to foster vendor collaboration.

The Oracle Enterprise Session Border Controller has been field proven to interoperate with a wide range of IP communications products and services in some of the world’s largest networks. Oracle works directly with the following leading IP telephony and UC vendors to ensure product interoperability.

Strong Partnerships, Vendor-Neutral Solutions

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- **Avaya Aura.** As an Avaya DevConnect partner, Oracle has access to Avaya engineers, technical data, and other resources. The two companies have completed extensive integration testing.

- **Microsoft Lync and Microsoft Office Communications Server.** Oracle and Microsoft work in close partnership to enable seamless interoperability between their solutions. The Oracle Enterprise Session Border Controller is fully qualified as part of the Microsoft Unified Communications Open Interoperability Program (UCOIP) for Lync Server 2013. The companies have also collaborated to enable direct SIP connectivity between Lync Mediation Servers and Oracle Enterprise Session Border Controller, and they perform regular interoperability testing as part of the Microsoft UCOIP.
• **Cisco Unified Communications Manager.** Cisco recommends using a border controller element to address the security, interoperability, and reliability challenges of an all-IP network. As the market-leading session border control solution, the Oracle Enterprise Session Border Controller has been field proven to deliver interoperability between Cisco Unified Communications Manager and disparate network services and third-party systems. Oracle also participates in the Cisco Developer Network program to ensure complete and continuous interoperability with Cisco solutions.

• **IBM Lotus Sametime.** The Oracle Enterprise Session Border Controller has been tested and validated by the IBM Lotus Sametime Unified Telephony Validation Center as part of the Lotus Sametime Unified Telephony interoperability testing program.

• **Alcatel-Lucent OmniTouch 8660 My Teamwork.** Alcatel-Lucent recommends the use of a SBC when extending interactive IP communications across external IP networks or untrusted internet connections, and has certified the Oracle Enterprise Session Border Controller as part of the Alcatel-Lucent Application Partner Program.

• **Siemens OpenScape.** Siemens Enterprise Communications recommends SBCs to mitigate IP communications security, interoperability, and reliability challenges. Oracle and Siemens have verified interoperability between the Siemens OpenScape UC Server and the Oracle Enterprise Session Border Controller.

**Conclusion**

Extending interactive communications across IP networks can be a challenge. Businesses often run into interoperability issues tying together diverse IP PBXs and UC servers, implementing SIP trunking services, or delivering SIP-based services to remote offices and teleworkers. The Oracle Enterprise Session Border Controller provides comprehensive protocol normalization and translation functions, extensive session transcoding and transrating capabilities, and rich NAT and firewall traversal features, to help businesses eliminate interoperability and interworking obstacles, save time and money, and accelerate UC deployments.

The Oracle Enterprise Session Border Controller offers field-proven interoperability with a wide range of IP communications solutions in the world’s largest IP telephony and UC networks. The products are deployed by the largest service providers across the globe, including the majority of SIP trunking service providers. With a history of SBC innovation and a large installed base with experience connecting to enterprise IP PBX and UC systems, Oracle is uniquely positioned to help enterprise customers overcome product interoperability barriers and streamline IP telephony and UC initiatives.