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Addressing Challenges in Next Generation Session Routing Applications

Oracle Communications Session Router & Open Session Routing

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Introduction

There has been an explosive growth in SIP-based voice & multimedia traffic arising from the growth in SIP services, an explosion in use of mobile broadband, and the proliferation of smart phone devices with advanced capabilities. With growth come growing pains specifically related to challenges inherent in routing huge volumes of SIP messages.

The traditional SIP session routing approach, referred to as the “in-switch” or distributed routing approach, is inherently faulty as illustrated in Figure 1.

- » Complex network operations
  - » N-squared, distributed routing database administration complexity
  - » Impacts network growth
  - » Increased network operations cost
  - » Each application requires distinct routing tables
- » Degraded network performance
  - » Performance degradation with large, complex routing tables
  - » Additional resources (CPU and memory) to handle the replicated information
  - » Increased CapEx to offset performance declines (i.e., more boxes needed)
- » Hinders new service and vendor introduction
  - » Distributed or in-switch routing results in high total cost of ownership
  - » More complicated provisioning model as data validation or synchronization has to be effected across many elements
  - » Difficult for service design as applications have to potentially access several databases to get required information

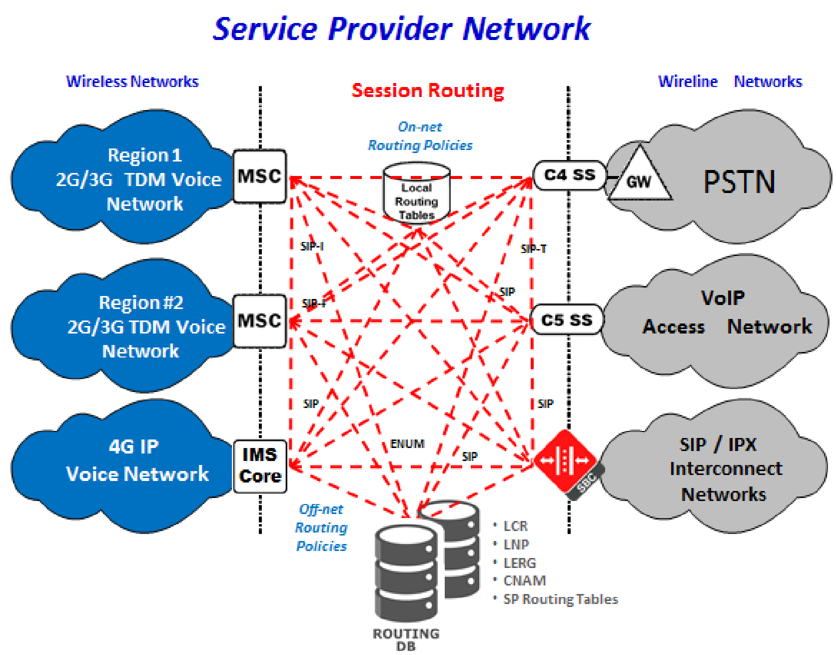

Figure 1: Signaling Core of Service Provider Networks

In addition to a complex and costly architecture, service providers face the following challenges managing SIP signaling in the current approaches:

- Limited scalability – the volume of messages for each communication session can be huge, requiring ability to process 10s to 100s of thousands of messages per second
- Complex provisioning and routing – given the number of elements, and the interconnected mesh, the programming of route tables and the effective routing of messages in a network can be daunting to provision, maintain and change as the network grows. This complexity is costly in two areas: it results in an OpEx nightmare and slows down growth
- Overload and network failure – many SIP servers involved in processing various SIP messages are not equipped to deal with spikes in volume and elements as well as network data centers can potentially go out of service due to heavy load. This can impact quality or availability of services. The complex relations and routing between nodes complicate resilience during overload and failure conditions. For example, if a single node experiences overload or failure, traffic may be re-routed by different upstream nodes causing the back-up node to overload and this has the potential of cascading through the network
- Multi-vendor interoperability – while SIP is a standard, there are numerous interpretations of that standard. Moreover, there are extensions such as SIP-I and SIP-T that are incompatible with one another. Transport protocols can also differ. Multi-vendor environments are long known for interoperability problems that add extra time or costs to an initial deployment and ongoing operations. The lack of interoperability hinders freedom of choice for service providers and detracts from the ability to converge networks/domains after acquisition
- Lack of visibility – the ability to collect and correlate all messages with the number of elements and vendors and volume of transactions is formidable if not impossible; the information from these messages is critical for network planning, troubleshooting and daily operations

As a result, service providers require greater scale and efficiency in handling the increasing volumes of SIP messages & large numbers of routing configurations. This document presents a comprehensive view on how the Oracle Communications Session Router and Open Session Routing (OSR) solution can help service providers overcome these challenges and issues. It presents a series of common use cases that create various challenges for today's communications service providers and describe Oracle's solutions.

Use Cases for SIP Session Routing

For each use case, Oracle provides a brief background on existing network deployments, identifies unique challenges on session routing as well as Oracle's solutions to address these challenges.

Interconnect & Peering

In today's service provider's network interconnect POP, there exist a number of VoIP interconnection models, points and building block/configurations. VoIP networks, including IMS and non-IMS, interconnected via the circuit-based public switched telephone network (PSTN), in addition to interconnect at the IP level using session border controllers.

Service providers can peer at the IP protocol (Layer 3) level for the routing of IP packets and SIP (Layer 5) level for the routing of session signaling between carriers' networks. Typically, service providers that wanted to interconnect their VoIP networks would develop an agreement on the types of services to be provided over the interconnection, and then developed a variety of business and technical agreements on requirements such as billing, SLA, traffic routing, and on problem identification and resolutions.

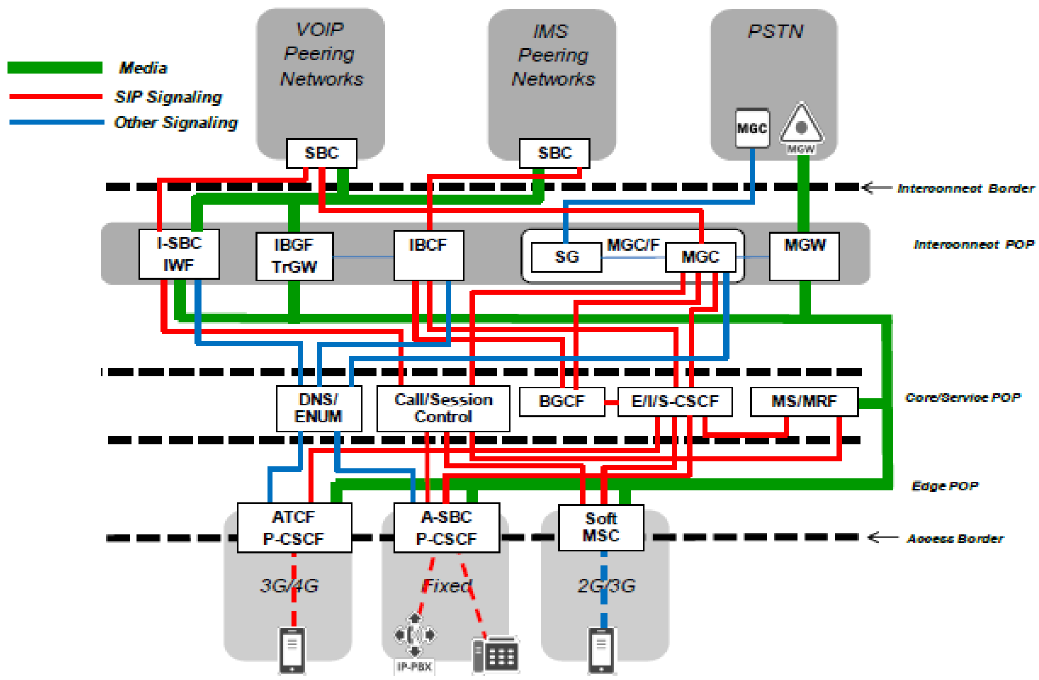

Figure 2: VoIP Interconnect and Peering Architecture

A detailed mapping of interconnect functions and building blocks that are implemented in an Interconnect POP is depicted in Figure 2. The figure shows the VoIP Interconnect & peering architecture with a layered view on the different building blocks and its associated interfaces and ports (and IP addresses) across multiple types of protocols that have to be configured when provisioning for SIP/IP layer routing.

The Challenges: Operational Efficiencies with Overlay SIP Session Routing

The major challenges and limitations faced by this model are as follows:

- » There are multiple building blocks that need to get updated with routing information on at least one interface for each new network permutation. The complexity of operating & maintaining this routing architecture therefore increases as more building blocks are added to support each new permutation (i.e. traffic expansion & growth)
- » There exist disparate routing algorithms across multiple platforms & different load-balancing systems. This results in operational inefficiencies as well as a lack of overall network and resource control
- » The lack of centralized policy control for call admission control like bandwidth-based routing on the distributed network of SBCs results in operational inefficiencies, inconsistent service performances & can affect SLA compliancy

Deployment of centralized Session Routing Proxy enables service providers to build a scalable, next generation SIP session routing architecture to economically and efficiently control and route signaling streams that cross the borders of the service provider's networks.

The Solution: Oracle Communications Session Router

Oracle Communications Session Router (SR) enables an overlay SIP routing model that copes with all these issues, as shown in Figure 3.

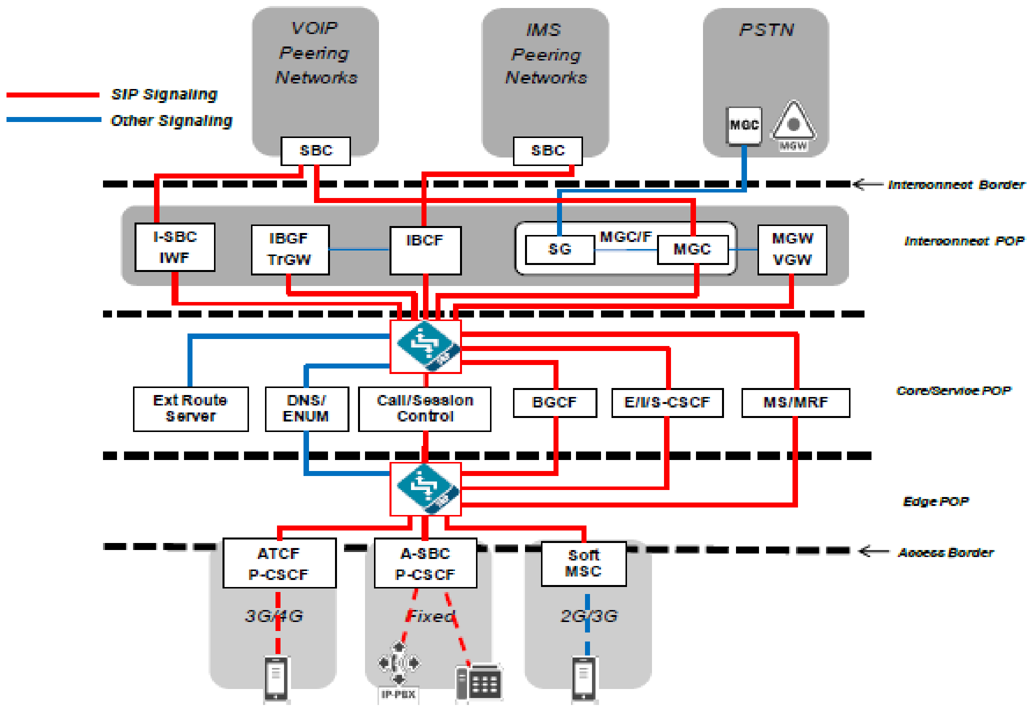

Figure 3: VoIP Interconnect and Peering Architecture Evolution

Oracle Communications Session Router (OCSR) deployed in the Core/Service & Edge POPs is in charge of routing session signaling traffic across the various building blocks at the different network layers. Each building block in the respective POP only needs to be provisioned with one route interface towards the SR instead of supporting multiple route addresses & interfaces. OCSR simplifies route provisioning and operations by transforming session signaling network with full meshed endpoints to a network with one centralized device.

OCSR is the signaling interconnection point between the different POPs. It receives SIP messages and performs interworking functions and load balancing techniques towards the interconnect SBCs, communications servers and media/voice gateways. OCSR performs call admission control and SLA monitoring between inter-operator connections. Call admission control based on bandwidth, session capacity and session rate policies are thus centrally managed from a common platform.

OCSR offloads “local routing” from the network building blocks and utilizes industry standard ENUM, DNS protocols as well as open APIs to an external Route Server to make dynamic routing decisions within the core IP network and to the PSTN and other IP networks through a wide selection of parameters and routing policies.

With centralized SIP session routing, service providers have a common platform to configure and troubleshoot SIP session routing configurations. The benefit of OCSR lies in its ability to manage dynamic routing policies end-to-end from access to interconnect networks of the service providers.

Residential and Mobile

A leading U.S. mobile service provider with a large, geographically diverse subscriber base required a new architecture that would reduce capital and operational expenditures and provide a strong foundation to deliver high-quality voice services across 2G, 3G and 4G networks.

This service provider designed a transcoder free operation (TrFO) network to meet CapEx reduction goals and to improve voice quality. The service provider also wanted to migrate to IP-based interconnects in order to realize further cost savings for off-network call termination and prepare for IP interactive communications with Long Term Evolution (LTE).

The service provider chose Oracle to build an Open Session Routing architecture and SIP interconnect solution that ultimately provided them with hundreds of millions of dollars in cost savings and a future-ready network for voice over LTE (VoLTE) and other IP Multimedia Subsystem (IMS) services.

The Challenges: Cost Reduction and Network Transformation

With 3G network expansion, subscriber growth and LTE on the horizon, the mobile service provider needed to reassess its network architecture with the objective of reducing overall network costs and prepare for an all-IP network future. The company identified a network with transcoder free operation (TrFO) as way to improve voice quality and lower capital requirements.

A thorough analysis of the network identified the transcoder equipment requirements, one of the single most expensive elements in the voice switching network, as a significant cost center due to the wide reach of the mobile network. Traditionally, transcoders are required to compress phone calls to accommodate the scarce bandwidth in the radio network. However, the service provider's core network utilized standard G.711 codecs over 64 Kbps circuit-switched links, requiring transcoding at multiple hops in the network. This transcoding added cost and decreased call quality by adding round trip delays.

In addition, the service provider wanted to further leverage its nationwide MPLS backbone and prepare its network for future investments in LTE and IMS. Network planners wanted to increase investment in all-IP technology given the lower capital and operational costs and the ability to deploy new multimedia communication services. Leveraging IP would allow the company to reduce fees paid to other service providers for off-network and long distance call termination. SIP-based interconnects were identified as way to realize cost savings for 3G circuit switched voice that was also future proof and ready for VoLTE.

With this target architecture identified to overcome the business challenges, the US mobile service provider faced some technical hurdles implementing it, including:

- Complex, distributed routing – the multi-vendor environment and the number of MSCs proved too difficult and costly to support the target architecture. Updating route information on all MSCs due to changes in a single local market would have been unmanageable
- Security – the potential for attacks and overloads at the IP interconnection points threatened network availability. Data firewalls were inadequate to protect the SIP signaling infrastructure
- Diverse signaling environment – the different signaling protocols (SIP and SIP-I) and varying protocol implementations in the multi-vendor network and a multi-service provider interconnect environment would incur additional cost and delays

In short, relying on the legacy equipment vendors would have proved costly, complex to build and even more difficult to scale.

The Solution: Open Session Routing Architecture

The mobile service provider, discussed in the previous section, chose a streamlined, pure-IP architecture leveraging next generation session routing proxies (SRPs), ENUM-based routing databases and session border controllers (SBCs). This Open Session Routing (OSR) solution from Oracle included:

- » Oracle Communications Session Router, a high-performance session routing proxy, that processes all SIP signaling in the mobile service provider's core network— between MSCs in different serving areas as well as for off-network traffic. Oracle Communications Session Routers are deployed in each geographic serving area for processing inter-regional calls. The session routing proxies will also be used in the heart of its VoLTE network to handle off-net calls and provide the Breakout Gateway Control Function (BGCF) in IMS
- » Oracle Communications Session Border Controller, the industry's most widely deployed session border controller, secures and controls the IP network-network interface and SIP interconnect border with other service providers. Oracle Communications SBCs are deployed at the interconnect borders to provide security and protocol interworking between the varieties of SIP, speeding time to market while protecting the critical infrastructure. They will provide the Interconnect Border Control Function I-BCF and Transition Gateway (TrGW) functions in the VoLTE IMS network as well

To round out the solution, the Oracle OSR architecture is complemented by ENUM-based routing databases for number portability and a wide-scale SIP/IP upgrade of MSCs throughout the US mobile service provider network. Key capabilities of the solution include:

- » Simple, scalable routing – the SIP routing architecture was streamlined providing a highly scalable centralized overlay design that was not dependent on its diverse MSC suppliers
- » Portability corrected routing – using ENUM queries to a centralized database all routes are sent to the proper network
- » SIP normalization and mediation – powerful and flexible signaling protocol manipulation provides SIP and SIP-I interoperability across vendors and networks and accelerates time to market
- » Fully secure interconnects – topology hiding, rate limiting and denial of service protects the mobile network from threats and directed attacks where it is connected to external IP networks
- » Geographical redundancy – the solution architecture is designed to fail-over to another site and handle all calls in the event of a disaster or downtime at a primary site

With the combination of these products, the mobile service provider deployed a more simplified and cost-effective solution for direct MSC interconnect and nationwide routing management. When fully implemented, this extensive deployment— totaling over 200 highly available SBCs and SRs—will support 25 billion minutes per month and handles all mobile-to-mobile and mobile-to-PSTN calls. As SIP interconnects with different peering partners are brought online, this solution provides a powerful platform for achieving seamless and rapid connectivity.

The Oracle solution provides a cost-effective design that eliminates the need to use transcoders for mobile-to-mobile calls, enables IP interconnects, and provided the framework for seamless LTE/IMS deployment. This put the mobile service provider in a strong position to deliver high quality voice services across 2G, 3G, and 4G networks.

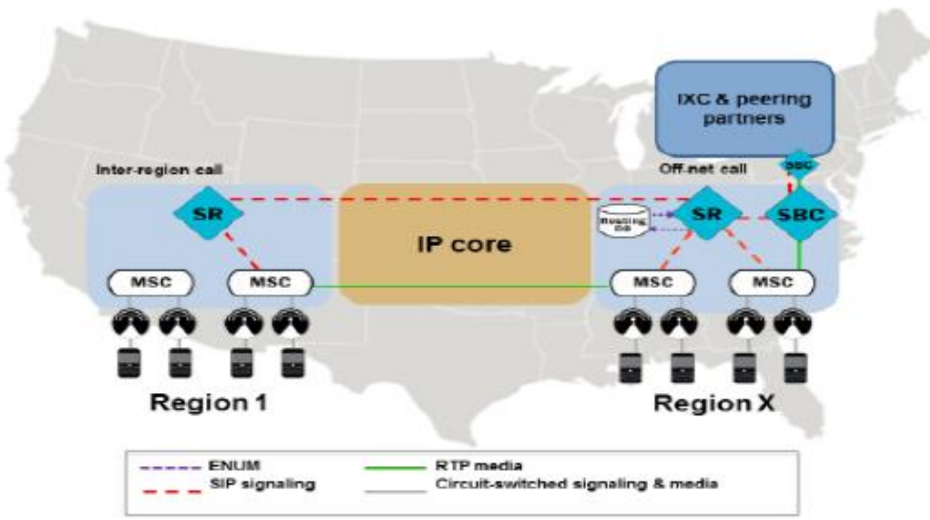

Figure 4: Tier-1 US Mobile SP Simplifies Network and Lowers Cost with OCSR

Value Add: SIP Network Services

There are a number of SIP network services that have been deployed and under consideration:

- Call handling for VoLTE WiFi E911 and regular location based routing
- Locates “local” Media Server in close proximity to the roaming VoLTE subscribers to reduce media path for improved network performances
- TPS throttling of Presence messages for overload protection of the IMS Core
- SIP-based voicemail integration for voicemail deposit and retrieval

As OCSR can function as a stateful proxy to maintain call context, call state and transaction state, it is able to support enhanced services that required state status for executions.

Business Services

Current enterprise VoIP/SBC networks are built around Points of Presence (POPs), which deploy Session Border Controllers (SBCs) connected to access networks supporting IP PBXs/customers traffic from tens of thousands of customer instances. This network design is completed by a set of IP Communications servers dealing with the intelligence of the network, located in a core POP within a Telecom Center.

Today, IP communications servers such as softswitches and SIP Application Servers/Service Delivery Platforms for call control, call features and session handling, have two applications:

- SIP trunking : Able to conduct On-Net to On-Net calls with custom private dial plans
- Hosted business services: Able to integrate Centrex, UC, conferencing, recording, etc.

A call entering the core/service POP is routed based on its called number, and a number of routing functions. The routing functions provide screening, blocking, number translation, digit modification for network wide routing services. For off-net calling it incorporates the Media Gateway Controller/Media Gateway functionality with external interfaces to legacy networks including networks of a different operator located in a network interconnect POP.

The core/service POP also implements various services in order to deliver value to VOIP networks and offer interworking with SIP Application Servers so that advanced services can be offered to premium VoIP users.

At the edge POP, Access SBCs are used in conjunction with SIP trunks to provide security, call control and to make routing/policy decisions on how calls are routed through the LAN/WAN. The picture below describes the different functionalities that are implemented within Enterprise VOIP network today.

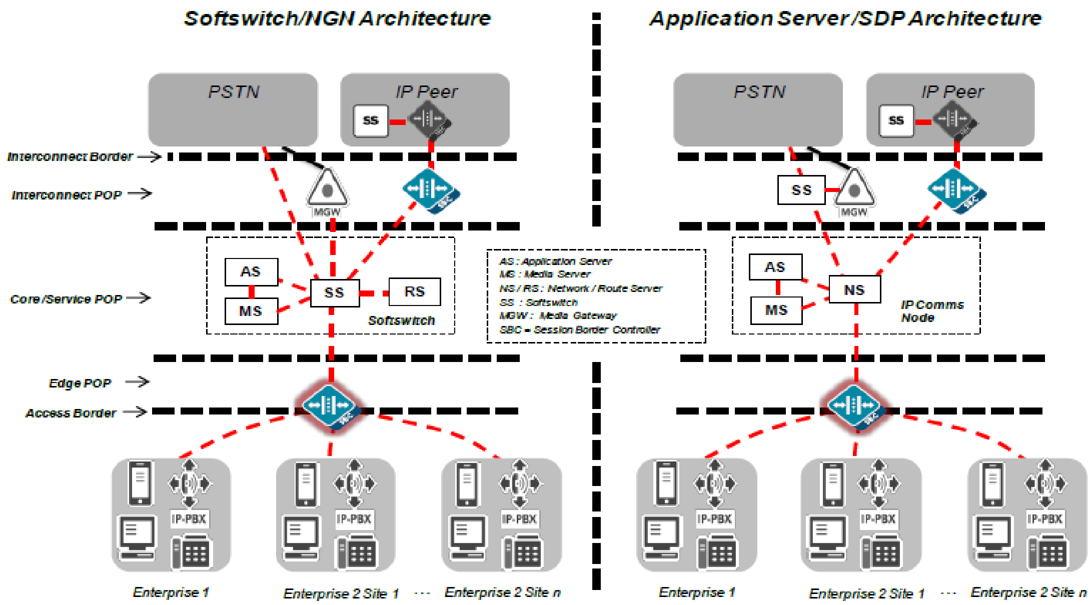

Figure 5: Enterprise VoIP/SBC Architecture

SIP trunking or IP Toll Free helps enterprises save costs associated with routing traffic through the internal IP networks of an enterprise, rather than routing calls through a traditional circuit-switched phone network. This model has been deployed successfully throughout the world, but there are major limitations associated with it.

The Challenges: Addressing Scaling, Complexity, and Operational Limits

Configuration & Capacity Management

In Enterprise VoIP deployments, the trunk capacities are pre-reserved by the service providers on their designated SBC. This reserve supports today's traffic while allowing for future growth. At call time, the SBC's capacity pool is shared by all trunks. Significant growth of traffic on an existing trunk could override capacity at assigned SBC or at the NNI to the core network, which results in poor call quality for all trunks at the exhausted SBC. Insignificant growth of traffic on SBC that is 'full' due to pre-reservation results in untapped capacity all over the service provider's network.

Current approaches for scalability only operate on a "box" level and require new hardware build-out to install, configure, test and commission purpose built equipment. As businesses move their communications to all IP, they want cloud services that address their rapidly changing needs. They want bandwidth to immediately adjust with service demand. They do not want to wait weeks for a service order to process. When service needs change, customers want the ability to adjust their bandwidth without the need for a truck roll implementation.

As a result, service providers are presented with unique configuration and capacity management challenges. They are looking to the cloud to reduce operational complexity and cost, to accelerate service configuration/activation and enhance capacity management with elastic scaling capabilities.

Complex Routing Architecture

A single voice-over-IP or Unified Communications call can involve tens of SIP messages and several different network elements. As the VoIP network grows and UC traffic volume increases, service providers are adding more and more SBCs and core server nodes to cope with the explosion of session signaling messages that traverse through SBC devices to the core/service POP. Adding more systems means increased management complexity such as route provisioning, as well as more complex programming models and issues such as throughput and latency between nodes.

Service providers therefore desire to reduce the signaling path complexity by simplifying routing approaches. A service provider that provides trunking services to several enterprises would allocate each enterprise a VPN and to interconnect the VPN through SBCs. A VPN-aware SBC may perform this function at the edge of the VPN network, rather than sending all the traffic to the core.

By offloading core routing functions towards the edge, application/network servers can focus on call feature management and softswitches can focus on call state management of Class 4 trunking. There are a variety of ways to address these new scale requirements which include the use of a separate, transaction and session aware routing & load balancing system that sits in front of SBC clusters and the core/service elements. Able to function as a stateful proxy, the session router maintains call context and therefore can offer a wide range of SIP network services as required for various network deployment scenarios when compared with a centralized SIP redirect server approach.

The Solution: Adoption of NFV Architecture and Framework

Service providers envision an SBC evolution towards a next-generation border controller to answer the needs of a session delivery environment that enables on-demand services, dynamic bandwidth and maximizes operational efficiencies in a multi-vendor network. This architecture will allow service providers:

- To move trunks to new platform that responds to traffic conditions in real-time
- To avoid holding excess capacity in reserve which may only see seldom use
- To support widely distributed hardware platform from customized hardware, off-the-shelf computing or use virtual machine architecture
- To decouple and centralize session routing for simplifying the overall network routing complexity

The next generation border control solutions are based on NFV (Network Function Virtualization) architecture as illustrated in Figure 6, and are focused around carrier-grade reliability, scalability, rapid service provisioning and multi-vendor Virtual Network Functions (VNF) interoperability.

The Border Controller routes SIP/RTP between a core network and a VPN. Each VPN could represent a unique customer or different locations for the same customer. SIP for a call leg is always routed exactly one VPN and the core network. A core and access session router (SR) will be introduced and server as the primary signaling point for both customers and the core to perform optimized SIP session routing.

Oracle offers a comprehensive portfolio of NFV solutions for the telecommunications carrier marketplace – both in virtual network functions (VNFs) and in management and network orchestration (MANO) areas. These solutions cover virtual IMS Core, virtual SRP and virtual SBC.

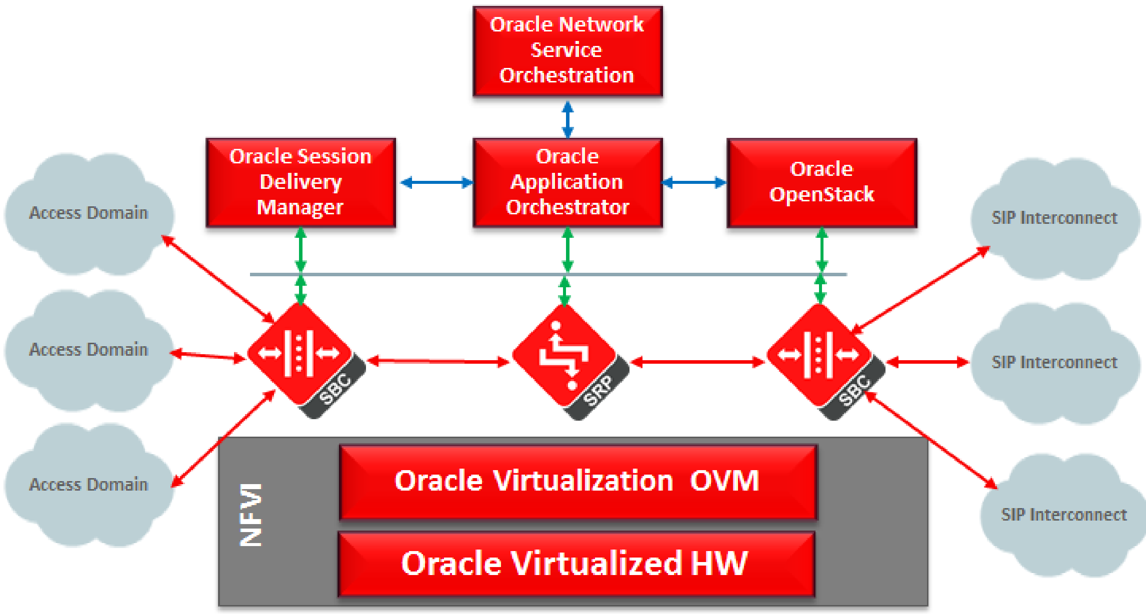

Figure 6: Service Provider Network Evolution

The Session Router is a strategic component of Oracle NFV transformational initiatives. SR will be extended from an integrated network appliance to add two additional configurations to run on COTS (with hardware and software separation), and to run as VNF on any elastic cloud (with software virtualization). The SR is available today on purpose built hardware and on COTS server and will be fully virtualized by Q1 of 2015.

Oracle Communications Solution for Highly Scalable SIP Session Routing

The product overview and end-to-end positioning of Oracle Communications Session Router within a next generation SIP session routing architecture is as described.

Oracle Communications Session Router

Oracle Communications Session Router (OCSR) is an advanced session routing proxy that incorporates both IETF SIP proxy & 3GPP Breakout Gateway Control Functions (BGCF) that is specifically design to control the routing of large volumes of session signaling messages. Industry leading OCSR is deployed by the largest Tier-1 customers in the world to build their next generation SIP session routing architecture for handling the explosive growth of voice & IMS-enabled multimedia signaling traffic.

Oracle Communications Session Router enables service providers to optimize its SIP session routing architecture, perform call admission control and enable SLA monitoring and accounting functions in order to achieve the scale and efficiency of handling large volumes of SIP traffic.

Key capabilities/features of OCSR include:

- Oracle Communications session routing proxy
  - SIP proxy
  - IMS Breakout gateway Control Function
- Multiple platforms meet scale, form factor and security requirements
  - Acme Packet 3820, 4500, 6100, and 6300

    - Software only on approved 3rd-party server platforms
    - Virtualized version on Sun Netra X3-2, X5-2 servers
- Operational mode flexibility: higher performance to greater control
    - Stateless and redirect
    - Transaction Stateful
    - Session Stateful
- Routing and load balancing coupled with key features
    - SIP mediation
    - Traffic management
    - Accounting
    - IPv4 to IPv6
- Scalable to 400,000 messages per second
- Local and external routing database support
- High availability

Based on Acme Packet OS, OCSR operates on a range of purpose-built hardware platforms or general purpose servers to deliver a unique combination of performance, capacity, high-availability and manageability. Delivered in a variety compact form factors, Session Router provides industry leading performance resulting in reduced costs for rack space, power and cabling. The high-performance SIP processing of Oracle Communications Session Router results in a fewer number of elements required to purchase, provision and manage, minimizing capital equipment and operating expenses.

As an entry level system, Acme Packet 4500 platforms provide service providers with performance matched with hardware intensive processing requirements, such as DoS/DDoS attack prevention or encryption. Session Router on Acme Packet 6000 series provides highly scalable performance by leveraging the latest multi-core processor platforms and technology advancements. Aligning with industry NFV evolution, Oracle provides a software-based solution to implement Session Router using commercial off-the-shelf (COTS) software.

TABLE 1: ORACLE COMMUNICATIONS SESSION ROUTER PERFORMANCE BENCHMARKS

	Acme Packet 4500	Acme Packet 4600	Acme Packet 6000 family	SUN Netra X3-2
Maximum number of messages per second (in HA mode)	7,200	7,200	15,000	15,000
Maximum session capacity (in HA mode)	20,000	20,000	400,000	400,000
Local route table capacity (number of routes)	2 million	2 million	8 Million	20 million
DoS/DDoS protection	Hardware	Hardware	Hardware	Software
Encryption	Hardware	Hardware	Hardware	Software
Form factor	1 RU purpose-built system	1 RU purpose-built system	3 RU purpose-built system	2 RU x86 based server

Oracle Communications Open Session Routing

The overall positioning of the Oracle Communications Session Router in next generation SIP session routing architecture is depicted in Figure 2. The figure shows the Oracle Communications Open Session Routing (OSR) architecture with a layered view on the linkage of the network functions and how the different nodes interact with the Session Router. OSR is a standards based architecture comprised of session stateful access and interconnect session border controllers, state-less or transaction stateful session routing proxies and best-of-breed stateless routing databases.

In OSR architecture, Oracle Communications Session Border Controller is the SBC that provides session stateful control of SIP signaling and media for session based communication services. It resides at the access borders to manage subscriber registration and use of the network or at the interconnect border to manage exchange of traffic between service providers of VoIP and IMS networks.

ENUM and DNS servers are used in core IMS networks to resolve queries from OCSR for telephone number to URI or URL translation. With ENUM and DNS, any SIP user can be associated with one or more communications addresses (Internet addresses for VoIP services, E.164 numbers, email & instant messaging addresses) for IMS convergent services. Oracle Communications Session Router provides a session routing proxy that works in conjunction with these best-of breed routing database products and services from Oracle OSR ecosystem partners. OCSR utilizes industry standard ENUM, SIP and DNS protocols to make dynamic routing decisions within the core IP network and to the PSTN and other IP networks through a wide selection of parameters and routing policies.

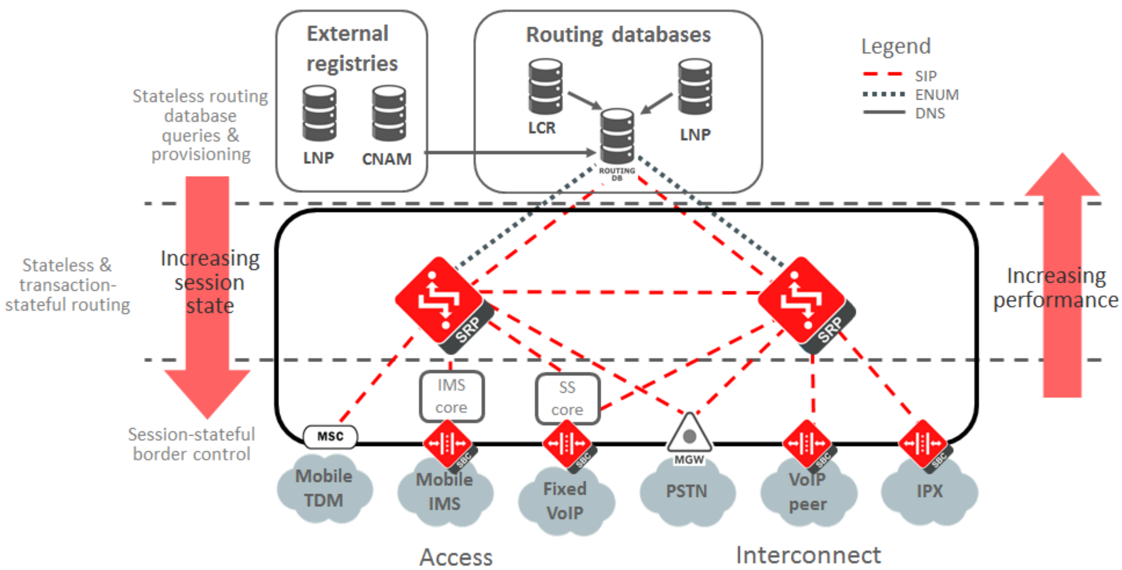

Figure 7: Open Session Routing Architecture

OSR architecture leverages stateless routing databases from OSR ecosystem partners to offload translation and routing tables from individual elements in the network (e.g., CSCF, Class 4 and Class 5 softswitches) to provide a more flexible, scalable and efficient solution. These complementary product vendors and service providers offer centralized routing databases and database provisioning tools for dynamic route selection.

As SIP session routing proxies, the OCSRs are deployed in the core to route SIP messages between elements within a single service provider. SRs centralize routing logic, offload or enhance edge routing and replace interconnect mesh networks with star/hub topologies. They manage traffic to and from the core service elements and the access & interconnect borders. Oracle Communications Session Routers eliminate the N-squared route provisioning problem of distributed routing; greatly simplifying the operation and maintenance of a SIP session routing solution.

Oracle Open Communications Session Router includes the Breakout Gateway Control Function (BGCF) in 3GPP IP Multimedia Subsystem (IMS) architecture.

As a BGCF, OCSR routes SIP session signaling, forwarded from an S-CSCF, via an MGCF to the PSTN or an IBCF to another IP network. OCSR is also able to determine if breakout to internal or external circuit switched (CS) network is needed:

» If internal CS network : BGCF selects a MGCF instance in own network
» If external CS network: BGCF forward session to BGCF in selected network

OCSR provides break-in functionality, and is able to offload the CSCF core by receiving SIP session signaling directly from an MGCF or I-BCF and by performing an ENUM dip, route to the appropriate next-hop.

OSR architecture provides flexibility to support transit scenario as well as IMS traffic. OCSR can be configured to support routing of transit traffic only. This configuration is applicable when an operator does not expect any termination to IMS endpoints.

Conclusion

Oracle Communications Session Router provides key competitive advantages within today's market - cost reduction and value added services, and is therefore a must have for the following applications / use cases:

» VoIP Interconnect & Peering - Service providers who use Oracle Communications Session Router to interconnect peering partners simplify the inherent SIP routing complexity associated with early generations of VoIP deployments. OCSR centralizes session routing and policy management functions to provide a holistic view and management of the end to end media and signaling resources
» Network Transformation - Service providers who want to leverage their nationwide MPLS backbone and prepare their network for future investments in LTE and IMS. Network planners wanted to increase investment in all-IP technology given the lower capital and operational costs and the ability to deploy new multimedia communication services. Leveraging IP would allow the company to reduce fees paid to other service providers for off-network and long distance call termination. SIP-based interconnects were identified as way to realize cost savings for 3G circuit-switched voice that was also future proof and ready for VoLTE. This includes service provider's networking architecture evolution towards NFV
» Enterprise VoIP / SBC Evolution - This architecture evolution is driven by service providers who are looking to offer on-demand services, dynamic bandwidth and maximize operational efficiencies in a multi-vendor SIP trunking network. The predominant carrier interests are to scale services up and down quickly, use standardized servers to reduce cost and to speed service introduction
» Introduction of innovative VoIP services - The initial use of VoIP as a way to provide cheap long distance and International Voice services will come to an end. Today, Unified Communications (UC) is taking off with "SIP type" of services which results in high complexity associated with the routing of high volumes SIP signaling traffic

Oracle Communications Session Router model is in commercial deployments in several operators' networks. Initially the main focus of the service providers was to use it to address routing inefficiencies by building a next generation voice signaling architecture for SIP. NFV/VNF evolution is considered when there is a need to leverage on cloud computing technologies to run virtualized software on commodity hardware in an elastic cloud.

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