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Oracle Communications EAGLE Signaling Platform: An Intelligent Evolution to 4G Networks

Make Signal Transfer Point and Signaling Gateway assets viable in LTE, M2M and Wi-Fi domains for enhanced connectivity, capacity and revenue.

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Executive Overview

As operators build out the LTE portions of their networks, they need seamless connections to PSTN SS7/TDM transports. Currently, the IP portion of networks is small, and many Signaling System No. 7 (SS7) technologies are managed as individual components. This makes inter-technology handovers difficult and complicates unification of disparate platforms at the signaling level.

To successfully consolidate networks for economies of scale and to improve performance for end users, end-to-end signaling across 2G, 3G and 4G networks is needed. And rather than engage in costly fork-lift upgrades to achieve this, service providers need the ability to purchase capacity and connectivity on an "as-needed" basis.

An "intelligent evolution" toward LTE requires a convergence of key Signaling System 7 assets into a single platform; then, from one location, operators can manage critical functions, such as signal transfer point (STP), signaling gateway (SGW), number portability (NP), equipment identity registry (EIR), routing, and security.

Intelligent investments in long-lasting platforms makes it easier and more cost effective to reach necessary milestones:

- Evolution to 3G, 4G, IMS

- Migration of Voice from 3G to VoLTE

- Equipment Identity Register (EIR) for 2G, 3G, 4G

- Number portability (NP) for Voice, SMS, Prepaid, IMS

- Network and database evolution

The point here is the evolution toward LTE should not be mutually exclusive to enhancement of SS7, as it is strategically important to packet-switched technologies.

Most operators will roll out LTE first in small portions of their networks, which is why Informa Telecoms & Media forecasts North America will achieve 56% penetration by 2017, with the world's second-largest LTE region – APAC – expected to reach just 11% penetration by 2017 .

SS7 and related technologies will be around for many years, if not decades; it will remain a vital part of mobile networks. For these reasons, SS7 must be supported and enhanced so that service providers keep pace with demands for more connectivity, capacity, complex applications, and security.

This paper demonstrates Oracle's commitment to maintaining and enhancing SS7 assets, as important a facet of Oracle's Communications Global Business Unit as Diameter and SIP.

Oracle Communications EAGLE platform boasts SS7-focused Signal Transfer Point (STP) and Signaling Gateway (SGW) products. This same platform also enables next generation applications such as 3G-VoLTE migration, number portability (NP) and equipment identity registers (EIRs).

This means substantial efficiencies and costs savings for service providers using EAGLE assets, by combining the STP/SGW functionality with a platform that can handle many applications spanning the 3G and 4G domains.

Managing Critical SS7 Assets With EAGLE

SS7 and circuit-switched fallbacks are particularly important during times of device registration, authentication, and mobility management. EAGLE manages the communication and processes needed from inception to completion through a centralized solution in the Service Delivery Platform. It is from this platform that EAGLE can also provide next generation applications such as 3G-VoLTE, Number Portability and Equipment Identity Register.
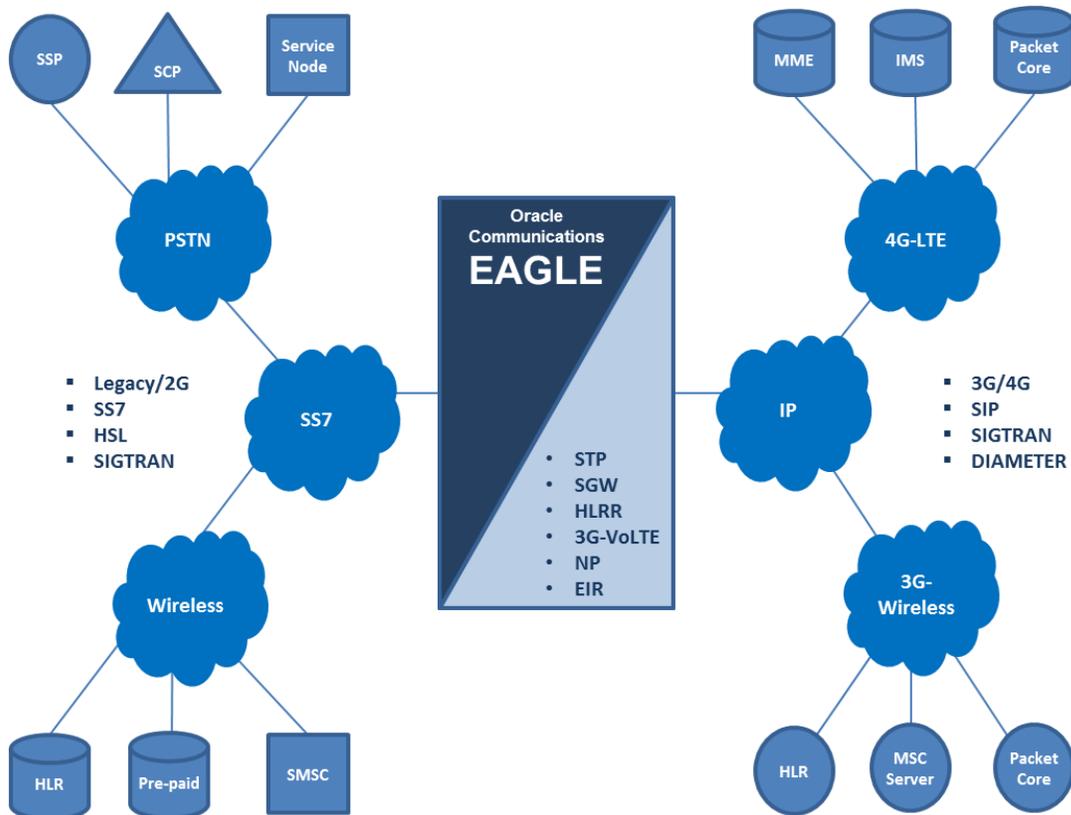

Figure 1: EAGLE works with multiple protocol across multiple networks providing signaling at the core plus next generation applications.

EAGLE: CORE FUNCTIONALITY

Signal Transfer Point (STP)

The STP delivers ANSI / International Telecommunication Union (ITU) international gateway functionality in addition to centralized signaling routing, and bridges the existing circuit-switched and packet networks.

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The STP supports key functions such as signal transfer, signaling gateway, number portability, and integrated monitoring. It offers advanced routing and screening functions and support for multiple link interface types and industry standards, fostering flexible configuration and connection of network devices.

Features of EAGLE
• Manage STP, SGW, NP, EIR, routing, and security from one platform
• Purchase capacity and connectivity "as needed" to meet network needs
• Experience built-in reliability with 99.99999+% field-proven results
• Support multiple link interface types and standards
• Centralize network security and foster intelligent migration to LTE
• Purchase software licenses rather than HLRs

The advanced routing functions enable operators to solve complex network routing problems. Using sophisticated routing schemes, operators can leverage a variety of features, including Global System for Mobile Communications (GSM) mobile application part (MAP) screening, advanced global title translation (GTT), origin-based routing, and subscriber-based applications such as home location register (HLR) router, voice mail router, and short message router.

Also sophisticated is the multi-layer screening capability, which prevents unauthorized access to valuable network resources.

And of course, network congestion control is a key feature, built into the solution to guard against propagation of network problems from other networks.

Signaling Gateway (SGW)

SGW is a complement to the STP; it transfers signaling messages relevant to call establishment, billing, location, short messages, address conversion, and other services.

Operators can migrate to a packet-based architecture without reconfiguring their networks, and, using the SGW's multi-protocol support, they can have the freedom to choose best-in-class products.

The STP delivers centralized signaling routing and provides seamless interworking between TDM resources, such as service control points (SCPs), and IP-enabled elements, such as soft switches and next-generation databases.

With its packet-based technology, the SGW can handle the signaling requirements of the most complex networks, delivering dynamic bandwidth sharing to support increases in signaling traffic without additional nodes. Support of advanced routing schemes both within the STP or as a standalone empowers operators to centralize signaling routing and to bridge circuit- and packet-switched networks. With IP connectivity, operators eliminate the need for long-haul SS7 links between network elements and enables existing network resources like SCPs to interwork with IP-enabled elements like soft switches and next-generation databases.

And because STP is supported from the same platform, a host of revenue-generating applications are possible (e.g., calling name, personal call manager, and mobile prepaid).

Decreased network congestion, reduced transportation costs and a migration path to next-gen networks are some of the benefits derived with this solution.

Home Location Register Router (HLRR)

The HLRR flexibly allocates numbers across multiple HLRs in a network and overcomes the limitations of traditional range-based routing that ultimately waste HLR capacity. The HLR Router provides the mapping between subscriber numbers and HLRs so operators can fill every HLR to 100-percent capacity, eliminating the need to maintain subscriber routing tables in every MSC.

The solution helps operators assign individual subscriber to any HLR in a network, as well as split subscriber number ranges over several HLRs. Operators can allocate numbers across multiple HLRs in networks, overcoming the limitations of traditional range-based routing.

In providing the mapping between subscriber numbers and HLRs, the HLR benefits include the ability to:

- Maximize HLR capacity

- Simplify HLR consolidation

- Reduce the time you spend updating routing tables

- Eliminate gaps in dialed-number ranges created by mobile number portability

EAGLE NEXT GENERATION APPLICATIONS

3G-VoLTE Migration

This solution identifies and routes calls destined for 4G/VoLTE subscribers. It supports routing by managing two critical variables:

- Identifying whether a call is destined for a 4G/VoLTE subscriber. This is static information (from a call routing perspective) that can be gleaned from a simple database updated with all the 4G/VoLTE subscriber's information.

- Establishing the location of the called 4G/VoLTE subscriber (that is, determining whether the subscriber is in a 4G or non-4G [3G] coverage area). This is dynamic information (from a call routing perspective) related to the expanse of the 4G/VoLTE coverage area in a carrier's network.

For example, if a call is destined for a 4G/VoLTE subscriber of Carrier A, the following sequence of checks would be performed to route the call:

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- Number portability check, which determines whether the called subscriber belongs to Carrier A;

- 3G versus 4G/VoLTE subscriber check, assuming the called number belongs to Carrier A, and checking to see if the called subscriber is a 3G or 4G/VoLTE subscriber;

- 3G versus 4G coverage area check, which assumes the called subscriber is 4G/VoLTE, and checks to determine whether the subscriber is in the 4G coverage area.

Since Eagle is already in the call routing path, it improves the migration of subscribers from 3G to 4G/VoLTE without sacrificing the user-experience. It supports subscribers with the new 4G/LTE handsets (through VoLTE service) and subscribers with the traditional voice over 3G service.

Because 4G/VoLTE routing requirements differ from 3G routing requirements, carriers use this solution to identify calls destined for 4G/VoLTE subscribers and route them accordingly. This efficient routing of calls avoids tromboning and enhances user experience.

Number Portability (NP)

NP for 2G, 3G and 4G networks translates into correct routing, messaging and billing. It enables subscribers to retain the same dialed number when switching from one service provider to another, switching between service types or categories, or moving from one geographic region to another. The most common implementations of NP address service provider and service type portability.

The NP solution simplifies NP by integrating advanced database management and signaling functions onto a single platform, providing superior throughput, and avoiding link congestion and bottlenecks in the network.

It also solves the NP problem for voice, short message service (SMS), multimedia messaging service (MMS), and prepaid calls, with triggered and triggerless solutions that benefit operators and subscribers on various networks.

The solution supports any size network and provides fully scalable transaction rates. It can scale from 850 to 310,000 transactions per second (TPS) with connectivity for up to 2,800 links, 1 million Global Title Translation entries, and 120 million NP subscriber records (International Telecommunication Union markets). A single provisioning feed can be replicated to up to 24 Eagle nodes.

It supports voice, SMS and prepaid applications, as well as global protocols such as GSM, ISUP, SIP, WIN, CAMEL and IS-41.

Equipment Identity Register (EIR)

Equipment Identity Register can be used to "blacklist" stolen handsets on 2G, 3G or LTE networks and to track stolen devices in compliance with the FCC and other regulatory bodies.

Network operators enter the International Mobile Equipment Identity (IMEI) of stolen handsets into a "blacklist," thus preventing them from being registered on the network. Oracle simplifies IMEI screening by integrating advanced database management and signaling functions with its Equipment Identity Register solution. EIR data can be provisioned in the same database as the NP or HLR Router application. This integrated approach provides several advantages over other solutions that rely on HLRs or general purpose servers.

It reduces costs and eliminates the operating and recurring costs associated with external databases. It also reduces total time to screen and process calls by minimizing signaling hops.

IN SUMMARY

The Oracle Communications EAGLE platform goes beyond just signaling at the core; it offers a highly reliable, well-supported, and easily extensible platform at the core of the network to handle the problems of both today and tomorrow's networks:

- Voice, SMS, Prepaid

- Mobility, Roaming, Authentication

- Number Portability, EIR, HLR Selection

- Reliability, Screening, Security

- Scalability, Load Sharing, Robustness

- Interworking, Troubleshooting, Visibility

Most importantly, Oracle's EAGLE offers investment protection, providing a migration path to next-gen networks through the building blocks of its integrated Signal Transfer Point (STP) and Signaling Gateway (SGW) products.

Benefits of EAGLE:

- Single platform supporting integrated monitoring, signal transfer, signaling gateway, advanced routing applications, screening and security, and number portability;
- Scalability enabling CSPs to purchase the capacity and connectivity needed to meet existing network needs;
- Reliability that is field-proven in wireless/wireline networks worldwide;
- Flexibility to support multiple link interface types and industry standards when configuring and connecting network devices;
- Network security since signaling connectivity to other service providers is centralized;
- Investment protection, providing a migration path to next-gen networks.

The system's high capacity and scalability enable it to grow gracefully from a single- shelf to a 2,800-link system.

And, its distributed processor design eliminates the need for a separate central processing unit – a potential bottleneck of traffic throughput and eliminates a single point of failure.

For both the STP and SGW platforms, there is support of multiple link interface types and industry standards, enabling quick configuration and connection of network devices. That translates into cost-efficient growth and network evolution. Future link capacity growth does not impact the systems' performance.

Field-proven in hundreds of networks is the STP/SGW's sophisticated routing functions, which leverage GSM mobile application part (MAP) screening, advanced global title translation (GTT), origin-based routing, and subscriber-based applications such as home location register (HLR) router, voicemail router and short message router.

Additionally, there is an advanced, multi-layer screening capability that prevents unauthorized access to valuable network resources, and a network congestion control feature guards against propagation of network problems from other networks.

The STP/SGW software architecture is built on telco-grade operating systems and applications, and its application and interface cards provide plug-and-play functionality for seamless growth.

All in all, Oracle Communications EAGLE will make it possible for CSPs to make small enhancements of existing assets during their migration to VoLTE, LTE EIR, and SIP-based number portability.

From this comprehensive platform, operators can support integrated monitoring, signal transfer, signaling gateway, advanced routing applications, screening and security, and number portability.

The can also build in scalability and reliability, as CSPs can purchase the capacity and connectivity needed to meet existing network needs. There is 99.99999+%* field-proven reliability in wireless/wireline networks worldwide for the Eagle family of solutions.

Oracle is committed to industry standards and interface types, which further guarantees continued flexibility in configuring and connecting network devices.

Using EAGLE, there's no reason CSPs cannot protect their original investments and pursue an intelligent migration path to LTE and all-IP networks.

For further information, please visit the Oracle Communications homepage.

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