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Transforming Service Delivery with
Oracle Service Brokering
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Executive Overview

As operators evolve current network infrastructures — from Signaling System Number 7 (SS7) to IP-based networks, or from CAMEL Application Part (CAP) 1 or 2 to CAP 3 or 4 — they must continue to deliver legacy services to protect key revenue streams. While maintaining legacy functionality and changing signaling protocols, providers must also continue to innovate, developing new, compelling offerings that create strategic competitive advantage.

Complicating this effort is the way legacy services are often linked to specific networks, making it difficult to transition to new technologies, leverage existing investments, and deploy services cost-effectively. Adding to the urgency of migration is the approaching end-of-life of many in-house Service Control Point (SCP) platforms and the high cost of maintaining these aging systems.

To simplify network transitions, many providers are exploring “service brokering,” a new technology for bridging the deployment of legacy services and networks with next-generation services and networks. To this end, Oracle is investing in a cost-effective service brokering solution — one that is open, scalable, highly available, and able to reduce operational expenses significantly. More than simply a signaling gateway, the solution mediates across diverse network types and orchestrates multiple services in real-time, enabling the creation of blended service bundles. This paper describes the service brokering solution and how it tackles the challenges of transforming today’s service delivery environments.
Business Challenges around Service Delivery

In the telecommunications industry today, communications service providers strive to increase revenues in a fiercely competitive and volatile marketplace. The ready availability of mobile devices, smartphones, Internet applications, and collaborative social networking tools is fueling the demand for rich, multimedia communications services across a broad spectrum of fixed, mobile, and wireless networks. Voice services remain the largest volume segment by far, yet providers are increasingly challenged to innovate and expand service offerings to preserve customer allegiance, prevent churn, and increase average revenue per user (ARPU).

The range of available voice services (e.g., tele-voting, call screening, number portability, prepaid, VPN, interactive voice services, and so forth) is generating intense competition, highlighting the need for competitive strategies that add value for subscribers or differentiate service offerings. As service volumes continue to escalate — especially with rapid growth in next-generation converged services and applications that integrate mobile, voice, video, gaming, and data — vendors must scale service delivery effectively to keep pace with growth.

Supporting Legacy Networks and Services

As providers try to keep up with the demand for new services, core signaling networks are evolving. Operators are adopting new network technologies, migrating from SS7 protocols to IP-based, service-independent telecommunications networks — such as next-generation IP Multimedia Subsystem (IMS) networks — to drive market expansion into converged services. For operators to preserve the existing customer base (which can be quite large) and safeguard ongoing revenue streams, they must continue to deliver core legacy services on existing networks while they transition to next-generation networks. In addition, it may be desirable for some legacy services to be offered to new subscribers either as standalone services or as part of a combined service offering with next-generation services.

Maintaining legacy service environments and networks can often hamper strategic efforts to innovate and deploy breakthrough functionality. Frequently new services are developed in parallel on legacy networks at significant additional expense — even though they may not provide a user experience that is consistent with similar services on next-generation networks. Although provider networks for mobile, fixed, and wireless access have started to converge, many communications services have not, which sometimes translates into redundant investments to deploy next-generation services on both legacy and next-generation environments. The result is often closed, vertical service “silos” where specific services are tied to specific networks (see Figure 1).
Vertical service silos often emerge in today’s service delivery environments, isolating specific services to specific networks.

Challenges of Service Integration and Reusability

The vertical nature of legacy service delivery environments tends to isolate services to different domains. Thus, it is extremely difficult for providers to develop new services that leverage investments in existing services (such as new services that simply blend together existing service offerings). The inability to orchestrate new services in this way often translates into unnecessarily complex and costly service development efforts, longer time-to-market for new services, and lost revenues. In an effort to promote service reuse and integration of existing services, providers are looking for service delivery platforms and architectures that support service components that can be easily merged to construct new services.

Legacy End-of-Life Platforms

Complicating the support of legacy services and the transition to IP-based networks, many providers possess proprietary legacy Service Control Point (SCP) platforms that are nearing end-of-life. These aging Network Equipment Provider (NEP) platforms are typically subject to expensive maintenance contracts, which can add dramatically to the overall cost of service delivery. However, because older SCP platforms still support key subscriber services that are critical to revenue generation, service providers must cope with higher operational costs until they are able to migrate legacy services to open platforms. Given the high operational cost of maintaining these aging SCPs, providers have additional justification to move quickly to next-generation NGN/IMS services and networks.
Service Brokering

To respond to market pressures and customer demands for innovation, providers are anxious to start the migration process while delivering core legacy services — at the same time inventing new services and implementing new networks, all within tight operational (OPEX) and capital expenditure (CAPEX) budgets. Service brokering is emerging as an effective tool for bridging legacy and next-generation networks and services because it simplifies the transition process and lowers cost while transforming service delivery.

A significant advantage to a service brokering implementation is that it creates a horizontal approach to service delivery (see Figure 2). Service brokering enables a more gradual and graceful migration between legacy and next-generation networks and services because it connects new applications to old signaling networks as well as linking legacy services to new networks. More than just a signaling gateway, service brokering performs service orchestration in addition to network mediation — it blends services across network boundaries, allowing providers to add value by composing new services from existing services. As an example, a provider can easily modify a service bundle for prepaid subscribers by augmenting existing prepaid offerings with a new NGN/IMS service that enables personalized ringback tones.

![Figure 2. Service brokering enables a horizontal service delivery model, bridging legacy and next-generation services and networks.](image-url)
With service brokering, change becomes a more adaptive rather than disruptive force. Service brokering can help providers evolve networks and services incrementally within budget constraints, lowering costs since the technology preserves investments in existing networks and services while enabling a smooth transition path for implementing open, next-generation platforms.

Service brokering also extends today’s service delivery environments, enabling opportunities to leverage existing services and combine them into new offerings. The approach creates a flexible and extensible architecture that promotes service interaction — including the integration of third-party, commercial off-the-shelf (COTS) applications — which can help to lower service creation costs and speed time-to-market when deploying differentiated services. For example, available technologies for VCC (voice call continuity), prepaid, VPN, ringback tones, or conferencing could be integrated with existing service bundles to construct breakthrough offerings with rapid time-to-market.

For more information on generic service brokering technology, see the Service Broker Forum (servicebrokerforum.org), which is a vendor association formed to encourage the adoption of this technology.

An Oracle Solution for Service Brokering

In an effort to simplify the transformation of service delivery and meet the challenges of supporting both legacy and next-generation services and networks, Oracle has developed a solution that unites innovative Oracle Communications service brokering technology with Oracle’s high-performance Sun Netra carrier-grade hardware platforms.

The Oracle Communications service brokering solution performs two key functions: (1) mediation between services and networks, and (2) service orchestration to facilitate service interaction and blending. The solution creates a level of abstraction in connecting networks and translating divergent network protocols. Its real-time orchestration capabilities allow services on different platforms to interoperate according to defined configurations, even within a single call or session.

In conjunction with its service brokering technology, Oracle brings unprecedented performance, bandwidth, choice, and flexibility with the Sun family of Advanced Telecom Computing Architecture (ATCA) blade products. Oracle’s Sun Netra CT900 ATCA Blade Servers scale easily with growth in subscriber and application volumes, at the same time providing the performance and availability needed to sustain mission-critical telecommunications services. Certified as NEBS Level 3 systems, these ruggedized, rack-mountable servers are designed to operate in a Central Office environment within a low power envelope and small footprint, minimizing the need for cooling and conserving power and space, which helps to lower OPEX costs.
As shown in Figure 3, the solution is designed to link existing networks and services and next-generation NGN/IMS networks and services. The solution easily interfaces to BSS/OSS business systems to carry out appropriate charging logic in conjunction with billing and revenue management solutions like Oracle Communications Billing and Revenue Management (BRM). This gives providers greater control over service payment and usage, allowing them to personalize product bundles, offer flexible pricing models to attract and retain customers, and integrate service offerings with billing systems.

The Oracle and Sun service brokering solution bridges IN, IMS, and OSS/BSS domains. The combination of Oracle Communications service brokering technology and Sun Netra carrier-grade hardware platforms brings these benefits to providers as they transform the current service delivery environment:

- Service brokering technology facilitates continuity and simplifies extensibility of legacy services, improving time-to-market and lowering the cost of developing new services since it enables service orchestration. The solution masks the complexities of integration, exposing unified access points for service access.

- The solution supports rapid development of next-generation, differentiated services and a smooth, incremental transition to next-generation networks. Additional services can be purchased and integrated to enhance value, such as bonus and promotions management.
services, third-party embedded streaming video, personalized VOIP, network address book, unified messaging, parental controls, or collaborative tools for conferencing.

- The solution helps to lower OPEX and CAPEX for delivering legacy and next-generation services. Sun Netra servers offer a low-cost, scalable alternative to aging proprietary platforms that command high maintenance costs, with low power requirements that undercut current levels of power consumption and minimize energy-related costs. Implementing an Oracle service brokering solution on Sun Netra servers can help to achieve higher margins and create strategic competitive advantage.

- The solution is backed by experts — from the combined companies of Oracle and Sun — who are responsible for engineering reliable technologies for the telecommunications industry. Joint testing has demonstrated the overall scalability of the solution, and the combined companies share significant experience in supporting business-critical telecommunications applications with stringent service level requirements.

Figure 4 (below) shows the overall solution architecture and key components, which are described in more detail in the following pages. The deployment architecture consists of three tiers: the applications tier, the service brokering tier, and the network/signaling tier. To achieve high levels of reliability, session state data is replicated in the service brokering tier and software modules execute on clustered Sun Netra server blades.

**Oracle Communications Service Broker Solution**

In the service brokering tier, the Oracle Communications service broker solution enables stateful mediation between services and network technologies in a redundant and reliable fashion. The solution is protocol-agnostic, translating from legacy protocol variants — such as INAP, AIN, CAP, and WIN — to next-generation Session Initiation Protocol (SIP) and NGN/IMS protocols. The solution provides more than simple protocol mediation since it also performs real-time orchestration, allowing multiple applications to be blended into unified services. For example, combining an automated Interactive Voice Response (IVR) service with prepaid subscriber services allows the triggering of voice alerts to notify subscribers of certain conditions, such as alerts for roaming so that customers can avoid “bill shock”.
The Oracle Communications service brokering solution uses a tiered architecture on clustered Sun Netra Blade Servers, providing mission-critical availability for signaling, service brokering, and application services.

The solution architecture encompasses the following core components:

- **The Service Brokering Orchestration Engine (OE).** The Orchestration Engine forms the nucleus of the service brokering solution, routing service and charging requests that arrive from the network to one or more service platforms. The OE manages interactions between different service platforms and handles session routing across applications.

- **Interworking Modules (IMs).** Interworking modules are a set of configurable and interchangeable modules that enable the OE to communicate with various application platforms and session control entities in the network. Each IM interacts with a specific network element through the element’s native protocol. There are two types of IMs: network-facing IMs, which enable connectivity between the service broker and session control entities (such as Mobile Switching...
Centers), and application-facing IMs, which enable connectivity between the service broker and application platforms (such as IN SCPs, SIP and IMS application servers, online charging servers, etc.). Both network-facing IMs and application-facing IMs maintain a stateful front-end that interfaces to either session control entities or to applications, respectively. Figure 4 depicts examples of network-facing IMs and application-facing IMs within the service brokering tier.

- **Application Modules (AMs).** AMs are configurable applications that implement specific service logic, allowing the service broker solution to deliver particular services to session control entities. Sample AMs are provided with the service brokering solution.

- **Supplementary Modules.** Supplementary modules are a set of configurable and interchangeable modules that facilitate and complement service broker solutions. For example, certain supplementary modules implement profile services, retrieving subscriber orchestration profiles from Local Subscriber Server (LSS) and Home Subscriber Server (HSS) databases.

Within the Oracle Communications service brokering logic, interaction is normalized to a common session and event model — each IM converts between an internal representation of the session and the applicable external protocol. Through the extensive set of network- and application-facing IMs, the OE extends service orchestration beyond IMS, to pre-IMS (for example, to IN and SS7 networks), and to other non-IMS domains (for example, to SOA, IPTV, etc.). The architecture enables orchestration and mediation between various application and charging platforms across different domains.

**Real-Time Orchestration**

For each session, the OE selects and retrieves an orchestration profile according to configuration settings. Using information from the profile, the OE obtains the appropriate orchestration logic, which defines the set of applications through which the OE should route the session and the order in which applications should be invoked.

Thus, service orchestration supports the blending of multiple services within a single session because the OE forwards the session as needed through multiple applications. The chain of services through which the session is passed enables each application platform to perform its role in turn. For example, suppose a provider offers a ringback tone service to prepaid subscribers. The set of services for a call session might first verify the subscriber's account balance prior to retrieving the personalized ringback tone.
The OE handles session processing as follows:

1. The OE is triggered on its southbound interface through network-facing IMs from legacy and IMS domains. Interaction with session control entities is provided by the service control interworking module (IM-SCF) for the legacy domain and the reverse application service interworking module (R-IM-ASF) for the IMS domain.

2. The OE routes the session to multiple applications on its northbound interface, through application-facing IMs. Interaction with applications is provided through the IM-SSF (towards IN SCPs), IM-OCF (towards online charging servers), and IM-ASF (towards application servers). The route through multiple applications is not static, but is rather determined in real-time by the orchestration logic, which the OE retrieves dynamically.

3. Finally, after the session passes the last application in the chain, the OE finalizes the session according to the configuration profile, usually returning the session back to the session control entity.

For more information on the Oracle Communications service broker solution and how it operates, see the Oracle service brokering solution documentation.

**Sun Netra Carrier-Grade Hardware**

The other key component in the service brokering solution is Oracle’s Sun Netra carrier-grade hardware platform. The Sun Netra ATCA family offers a choice in blade servers, allowing providers to select the server configuration and compatible operating system that best matches application needs. In a single Sun Netra CT900 ATCA Blade Server, multiple blade processing technologies can be combined — blade servers with UltraSPARC® T2 processors with CoolThreads technology or dual-socketed quad-core Intel® Xeon® processors — with a corresponding choice of operating systems, including Oracle® Enterprise Linux or the Oracle Solaris Operating System. Built-in virtualization and consolidation capabilities can often support a rack’s worth of applications, even within a single shelf.

Oracle integrates 10 Gbps Ethernet throughout the Sun ATCA product line at the processor, chip, switch, and midplane level. All server processing blades support an extended 10 Gbps Ethernet fabric with multiple interfaces. Blade I/O capabilities can be expanded through optional Advanced Rear Transition Modules (RTMs). These modules use the Zone 3 connector (at the rear of the Sun Netra CT900 ATCA Server) to provide expanded I/O capacity such as multiple Gigabit or 10 Gigabit Ethernet connections, hard disk storage through SAS connections, and/or balanced access to external Fibre Channel disk storage.
To eliminate single points of failure and enable “six nines” reliability, the Sun Netra CT900 Blade Server is designed with dual redundant Gigabit Ethernet switches, 10 Gigabit Ethernet switches (optional), shelf managers, power supplies, and fan modules.

For testing in a proof-of-concept environment, Oracle engineers selected Sun Netra blade servers built with dual high-performance, embedded-class Intel Xeon processors that leverage Intel virtualization, I/O acceleration, and energy efficiencies. With significant performance advantages, these processors adhere to the next-generation Intel® Core Microarchitecture (formerly codenamed Nehalem) with Intel® HyperThreading technology, integrated Northbridge functionality, Intel® Quickpath Interconnect technology, and an advanced 45nm manufacturing process. These dense blade servers offer high performance and large memory capacities in a low-power envelope, reducing power consumption and the need for cooling.

Solution Features and Benefits

When Oracle Communications service brokering technology and Sun Netra CT900 ATCA Blade Servers are implemented together as a comprehensive service brokering appliance, the solution offers:

- **High availability** — To yield high levels of availability and protect against service failures, the solution is deployed as a multi-node cluster that replicates relevant data between nodes. Thus one or more physical nodes can become unavailable without impacting service availability. The Oracle Communications service brokering software also replicates session state data to enhance reliability.

- **Density** — Up to 12 processing blades can be plugged into a single Sun Netra CT900 ATCA Blade Server, enabling up to 96 UltraSPARC T2 or 96 Intel Xeon processor cores within 12 rack units of vertical space.

- **Scalability** — Adding Sun Netra processing blades to individual application, brokering, or signaling tiers easily scales the solution to accommodate growth in service and subscriber volumes. The solution can also scale beyond a single Sun Netra CT900 ATCA Blade Server chassis.

- **Extensibility** — The solution creates a service delivery environment that normalizes interaction via a common session and event model and compartmentalizes services as reusable components. Existing services from INAP, AIN, CAP and WIN networks can be blended to create composite offerings. Services can also be extended through the purchase and integration of third-party COTS offerings.

- **Ease of use** — Oracle Communications service brokering technology is easily configured through an administrative GUI console, or programmatically using Java Management Extensions (JMX) Configuration MBeans through an API or via an XML-based scripting engine.

- **Standards-based** — To help lower TCO and speed time-to-market, the Oracle Communications service brokering solution adheres to industry standards. For example, the solution is designed to interface with industry-standard protocols, including SIP, CAP, INAP, DIAMETER, JMX, and SNMP. In addition, Sun Netra ATCA systems adhere to PICMG ATCA, SA Forum, and DMTF standards for systems management.
Proof-of-Concept

At Mobile World Congress 2010, Oracle is demonstrating a proof-of-concept (POC) environment that showcases the service brokering solution (see Figure 6). The POC consists of a single Sun Netra CT900 Blade Server chassis populated with server blades that use Intel Xeon processors. This compact, low-cost, high-performance hardware solution supports Oracle Enterprise Linux, the Oracle Communications service brokering technology, and example applications that illustrate prepaid services and the integration of next-generation voice, video, and mobile gaming capabilities. In addition, the solution demonstrates how billing and revenue functions are easily integrated to complement service delivery.

In the POC, subscribers can make prepaid phone calls while checking account balances online. At the end of a call, a prepaid application can send a Short Message Service (SMS) text with the latest balance. Alternatively, a subscriber can access mobile gaming or remote application services, make purchases, or download movies from an online store, debiting from the prepaid account for downloads or purchases made. Innovative call management services, such as a service that provides the ability to pause a game or IPTV movie during an incoming call, or a service that notifies the user and identifies the inbound call on screen, are implemented through real-time orchestration capabilities of service brokering. When the subscriber’s account balance decreases to zero and all payments are withdrawn from the account, no additional calls or purchases can be made until more funds are deposited into the account.
As shown in the POC, the Oracle Communications service brokering solution creates a service delivery environment that allows services to be introduced with minimal disruption to existing networks, at the same time permitting current IN subscribers to easily take advantage of IMS and SIP applications. Because the service brokering solution requires minimal configuration, it features low initialization and setup costs. Since it leverages eco-friendly, off-the-shelf Sun Netra servers from Oracle, it can significantly reduce OPEX and CAPEX costs during network transitions. In addition, because the solution replicates session state and relies on clustered, NEBS Level 3-certified Sun Netra processing nodes, it can provide highly reliable and consistent quality of service.

Summary

Oracle has merged best-of-breed technologies to create a new service brokering solution that has been fully integrated, tested, and tuned. The solution brings significant competitive advantage to providers who are looking to transform their legacy and next-generation network and service environments. The solution:

• Enables cost-effective network evolution and scalability
• Supports rapid service development on both legacy and NGN/IMS networks for faster time-to-market and quick ROI
• Enables consistent end-to-end management
• Reduces OPEX by eliminating aging (and expensive to maintain) SCPs, and decreases CAPEX by implementing high-performance, ruggedized hardware with low power, cooling, and space requirements
• Conforms to industry standards and implementation on open platforms, enabling flexibility and choice when creating low-cost yet breakthrough solutions
• Delivers a highly reliable solution to achieve high availability and consistent quality of service

Lastly, the service brokering solution gives providers a trusted single point of contact with years of experience and significant expertise in implementing best practices for mission-critical telecommunications industry services.
## References

**TABLE 1. REFERENCES FOR MORE INFORMATION.**

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