A SLEE for all Seasons

A discussion on JAIN SLEE as an execution environment for new revenue generating services across current and future networks

11 May 2007

Open Cloud Limited
Level 12, Sun Microsystems House
70 The Terrace
Wellington
New Zealand
http://www.opencloud.com

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Abstract

An open, standards based, service logic execution environment (SLEE) that integrates with current and future networks is the key to providing innovative and revenue generating services.

The JAIN™ SLEE specification defines how telecommunication services can be built, managed and executed. The JAIN SLEE specification has been designed explicitly to enable vendor products to address carrier grade requirements in a standard call-signalling environment.

This paper outlines the challenges faced by the service provider requiring new revenue generating services to be deployed on their current and future networks. How a JAIN SLEE compliant services platform can assist in meeting these challenges is discussed.

Providing one (standards based) carrier grade execution environment that integrates SS7, SIP, OSA/Parlay, OSS/BSS and J2EE™ environments offers significant benefits. One view presented is that a JAIN SLEE compliant platform provides a middleware or EAI for Telecommunications.

1 Introduction

Today's telecommunication services are delivered through separate, vertically integrated, service specific networks (Figure 1). For instance:

- Entertainment being delivered over broadcast, satellite and CATV systems.
- Mobile telecommunications being delivered via a number of base-stations.
- Fixed telecommunications (and most data communications) being delivered over the leased line and "telephony" access equipment.

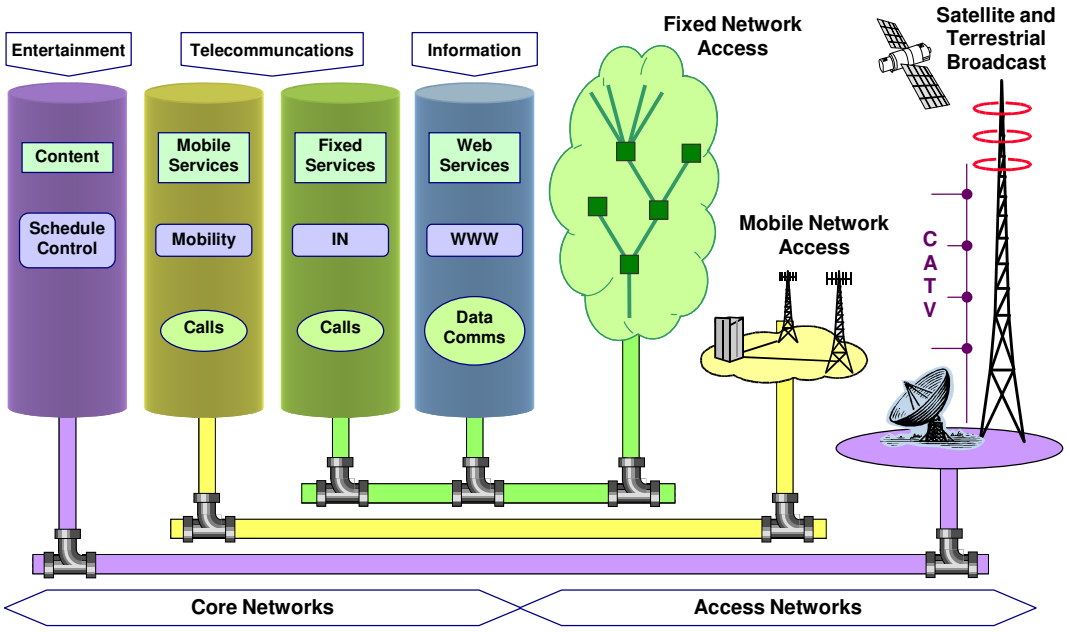

Figure 1 - Contemporary Telco Networks are Stovepipes

There is little convergence between the networks other than in the transport of the networks through the sharing of main trunks. At the service layer there are almost no shared services, specifically because each network has its own vendor proprietary services platform. To some extent this situation has evolved naturally but mostly the separation has been encouraged or mandated by regulators.

These contemporary stovepipes have an extremely debilitating effect on a service provider's ability to develop revenue streams from rich services that span the networks. For the operator who has acquired disparate networks, the cost of rolling out new network wide services that have unproven business models is daunting. However even now many of the proposals for deployment of next generation networks are following the same model of using proprietary vendor service platforms.

The current vertically integrated networks are expected to migrate to horizontally layered structures supporting markets and businesses of the future. However in the rollout of new networks (e.g. 3G) there is an obsession with finding the "killer" service or application that can economically justify new infrastructure. The validity of this approach is being questioned.

> ***"For every day that passes with operators focusing on killer applications – an inherently narrow way of thinking – more damage will be done. We must, as an industry, make it abundantly clear to all commentators that we are in business to create the most potent and fundamental part of the social fabric of the 21st century" [Nicolas Foggin, Director of Strategy & Futurology, Orange SA - Alcatel Telecommunications Review, 2002]***

Section 2 outlines the challenges that service providers must meet using today's infrastructure while preserving the ability to evolve. Section 3 discusses the benefits of JAIN[1] SLEE[2] in a telecommunications environment that is comprised of disparate networks.

[1] http://java.sun.com/products/jain
[2] See jsr022 at http://www.jcp.org/jsr/detail/22.jsp

2 The Challenges of Deploying New Services using Current and Future Networks

> ***"Differentiation leads to improved margins. The carriers, particularly the ILECs and IXCs, are dominant players in the communications space. Their business objectives are in some ways quite simple, consisting of the need to (1) drive up subscriber numbers, (2) drive up average monthly revenues per subscriber (ARPUs), (3) increase customer loyalty (reduce churn rates), (4) introduce differentiated high-margin discretionary services, and (5) bring down the cost of operation (both capital expenditure and operating expenses)."***
>
> ***[Communications Software, Industry Analysis, JPMorgan2002]***

The business case for 3G mobile is the promise of the new network delivering greater value essentially through the delivery of new services at lower cost. However, it appears users do not believe 3G delivers enough additional benefit yet to justify upgrading. This is causing many operators to concentrate on extending the life of their existing infrastructure.

> ***"Only 10% of European mobile users will use UMTS in 2007, delaying industrywide payback until 2014. 2.5G will remain the centre of innovation for at least five more years"***
>
> ***[Forrester Research]***

The major challenge then is to find a way to develop, market and sell value added services in an evolutionary way. How can carriers enable the growth of revenues from new services either on their existing or new networks in a way that best meets their needs? This leads to several discussion points.

- **Delivering Services Over Proprietary End-to-End Solutions that Do Not Integrate**

  There is some convergence in core networks at the transport-level (the backbone). However the convergence at the service and OSS/BSS levels is limited. Convergence only exists if the same service provider owns both the fixed and mobile networks. (For instance, developing a new service probably requires multiple Service Creation Environments (SCEs) each targeting their own specific network. Also in cases where operators have been consolidated, the difficulties in being able to rapidly deploy a service multiply with the number of networks.)

- **Protecting Investment in Current Networks**

  There is a substantial investment in current telecommunications networks. It is difficult to justify writing this investment off in order to deliver revolutionary new services when existing networks continue to deliver value. Operators and service providers are investigating how to take an evolutionary approach when delivering new services.

- **Protecting Investment in the Development of New Services**

  New networks are coming. However to maintain revenue and profit growth it is preferable that new services continue to be developed for use on today's networks. Ensuring that services can be migrated to the new networks encourages their development by increasing the return on investment. (For instance how many times and on how many platforms does call forwarding need to be developed or purchased by the service providers?)

- **Differentiating on Service Offering**

  The massive growth in users connecting to mobile networks has slowed and in some parts of the world is close to saturation. The revenue growth from new connections will not fund new infrastructure (in particular the licensing costs of the new spectrum.) Operators and service providers are being forced to compete to prevent customer churn. Therefore new revenue growth and the retention of customers will come through new services that differentiate the service provider.

- **Delivering Services Rapidly in Response to the Market**

  A competitor may implement new services first. A rapid response to a competitor's service is critical to protect market share. Being able to deliver new services targeted at or requested by corporate clients is important for a service provider to increase market share.

- **Delivering Personalised Services Aimed at the Corporate and Individual**

  Service providers need to find an efficient way of delivering personalised services. Today's proprietary service platforms cannot achieve this.

- **Delivering New Services that Target Operational Efficiency**

Deploying new services able to utilise and manipulate the information contained within customer management, billing and provisioning systems offers much potential. Where a customer is able to access their own account profile they feel more in control and derive greater customer satisfaction. Meanwhile the service provider has reduced operational costs. However today's OSS/BSS platforms can be difficult to integrate with to deliver customer focused services.

- **Developing Innovative New Services by Using 3rd Parties**

  To achieve innovation, operators and service providers must find ways of enabling third parties to develop services for their networks. It is the application of technology to business problems that will grow revenue from new services. Therefore it is the business communities, and not the operators, service providers and equipment providers that are best placed to develop new services with appropriate business models.

- **Delivering Converged Web, Data and Voice Services**

"Instead of pouring money into 3G-only services, operators should: Enhance voice with data, Stimulate rich messaging, Enrich communication services with content" [Forrester].

Much focus has been on the delivery of data services to the handset. Some data services have been more successful (SMS) than others (WAP). With the advent of the Internet, data services have become well understood. The technologies and solutions for data delivery are straightforward given that data can be delivered in non-real time with minimal consideration for latency. Rich voice services are forecast[3] to generate significant revenues and the phone call will always remain an important part of any business process.

3 A Standards Based Service Logic Execution Environment

"Operators must recognise that this wireless digital infrastructure will become embedded into everything that individuals and groups within our society undertake – not just a single service, like video or gaming.

Birth of the Killer Environment

By implication, therefore, wireless operators should be creating a killer environment."

[Nicolas Foggin, Director of Strategy & Futurology, Orange SA - Alcatel Telecommunications Review, 2002]

3.1 JAIN Service Logic Execution Environment

The JAIN SLEE specification defines a standard, service logic execution environment and specifies how portable, carrier grade telecommunication services can be built, managed and executed. The JAIN SLEE specification has been designed to support telecommunications services and to enable the implementation of carrier grade, call-signalling environments.

JAIN SLEE provides a standard programming model that can be used by the large Java™ developer community. The programming model has been designed to simplify the work of the application developer, eliminate common programmer errors and ensure that robust services can be developed rapidly.

JAIN is Java technology so the large family of standard Java APIs can be leveraged in signalling applications.

Figure 2 outlines the various layers that are specified or referenced within the JAIN SLEE specification. Central to JAIN SLEE is the component model, which specifies how service logic is to be built, packaged, receive outside events and execute. The management layer specifies the mechanism by which an administrator manages a SLEE (including subscription, service installation, system lifecycle etc) and allows service developers to define the data needed for a particular service. This SLEE framework enables multiple components from different authors to collaborate.

Resource adapters are responsible for the communication with a particular resource that is external to the JAIN SLEE programming model, communicating with the event routing logic in the SLEE implementation and for providing the application programmer with a suitable API. Resource adapter contracts are not defined in the 1.0 SLEE specification and will be addressed in a future revision of the specification.

[3] http://www.umts-forum.org/reports.html

Examples of resources that are of interest to the service provider and developer (e.g. SIP, SS7, OSA/Parlay, OSS/BSS) are detailed in section 3.3.

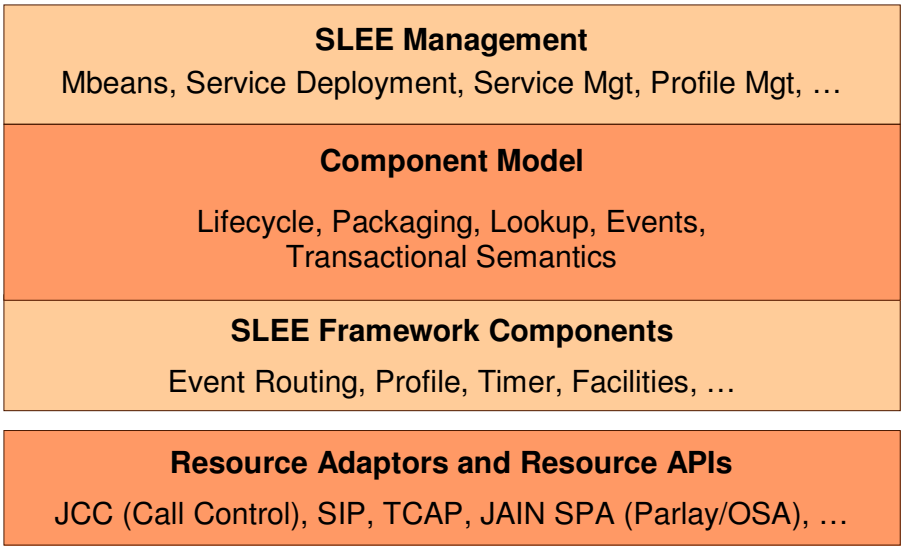

Figure 2 - The Architecture Layers of JAIN SLEE

3.2 Benefits of JAIN SLEE as an Execution Environment for Signalling Applications

JAIN SLEE solutions have the following advantages:

- **Portable Services**

  JAIN SLEE supports the Write Once, Run Anywhere™ philosophy of the Java programming language. Application components can be developed and then deployed on JAIN SLEE compliant platforms from different vendors without recompilation or source code modification.

- **Robust**

  The JAIN SLEE programming model eliminates many common programmer errors. This is due to the use of strong typing and the adoption of a model where the SLEE is aware of all 'call' or 'session' related state allocated by the application. Management of this state becomes entirely the responsibility of the SLEE, preventing application level errors related to state management.

- **Reliable**

  JAIN SLEE enforces the use of a transactional programming model. Applications written to the transactional programming model have well defined semantics under failure conditions. The transactional programming model is integrated with both synchronous and asynchronous invocations.

- **Consistent, Flexible and Dynamic Event Model**

  Signalling applications make heavy use of asynchronous invocations. JAIN SLEE provides strong support for asynchronous applications with a consistent, flexible and dynamic event model. Application components receive events from event channels that are established at runtime. Network resources (such as protocol stacks) create representations of 'calls' and pass events generated by the calls to the SLEE. Application components are in turn invoked by the SLEE to process these events in a transactional context. Event channels can be used to communicate in an asynchronous manner with other application components. This event model is dynamic. For example, conferencing applications are supported through components attaching to event channels at runtime.

- **Composable Object Orientated Component Architecture**

  JAIN SLEE is the standard component architecture for building distributed object-orientated communications applications in the Java™ programming language.

  The JAIN SLEE specification defines a component model for structuring application logic of communications applications as a collection of reusable object-orientated components, and for composing these components into higher level, richer services. The specification also defines the contract between these components and the container that will host these components at runtime.

- **Simple Application Development**

  A JAIN SLEE implementation is responsible for systems level features such as memory replication, check pointing, process restarts, managing transactions and clustering infrastructure. Application developers do not have to understand low-level transaction and state management details, multi-threading, connection pooling, and other complex low-level APIs. JAIN SLEE based application code is only responsible for application logic.

  JAIN SLEE based applications have reduced complexity, are simpler to develop, require less development time and exhibit increased reliability.

- **Network Independence**

  The JAIN SLEE programming model is independent of any particular network protocol, API or network topology. This is supported through the resource adaptor architecture. Many network technologies can be integrated into a SLEE. Therefore, JAIN SLEE can be used to address business problems that involve multiple networks.

- **Supports Complex Applications**

  JAIN SLEE application components can have state, can be composed from other components, can create and destroy other application components, can invoke other application components both synchronously and asynchronously, and can invoke resource adaptors. These features enable the modular development of complex applications.

- **Supports Rich Voice and Web Services**

  JAIN SLEE enables interoperability with J2EE™; thereby enabling standards based converged voice, web and data services solutions.

- **Supports Integration with Existing Management Systems**

  The JAIN SLEE specification defines a management API that allows a SLEE to be controlled by an external management system. Interfaces are defined to support the installation and management of services and the management of provisioned profile data (for example per subscriber, operator and service), provisioned service life cycle and the JAIN SLEE implementation itself.

- **Industry Standard**

  JAIN SLEE is specified via the Java Community Process (http://www.jcp.org), which allows multiple companies and individuals to collaborate in developing Java technology specifications. As JAIN SLEE is a standard, it has the potential to attract more developers than any proprietary execution environment.

3.3 Integrating JAIN SLEE into the Telecommunications Environment

As JAIN SLEE is a high performance, flexible and open standards based event-processing engine, it is finding use in a number of communications environments. (Figure 3).

- A JAIN SLEE can be used a services platform in the traditional sense. However it is also flexible in being able to support both current (SS7) and future (3G, NGN) networks.
- A JAIN SLEE provides connection to operational and business support systems (OSS/BSS). Services can be created that provide operational efficiency for the operator as well as interesting self-management services for the consumer.
- A JAIN SLEE provides an open execution environment externally connected to an operator's secure environment via a Parlay/OSA/JSPA gateway.
- A JAIN SLEE is able to interoperate with J2EE such that rich services based on the combination of both call control and web services can be deployed.
- Considering the above integration capability and depending on perspective and requirement, a JAIN SLEE can also be viewed or treated as a middleware, or EAI, for telecommunications.

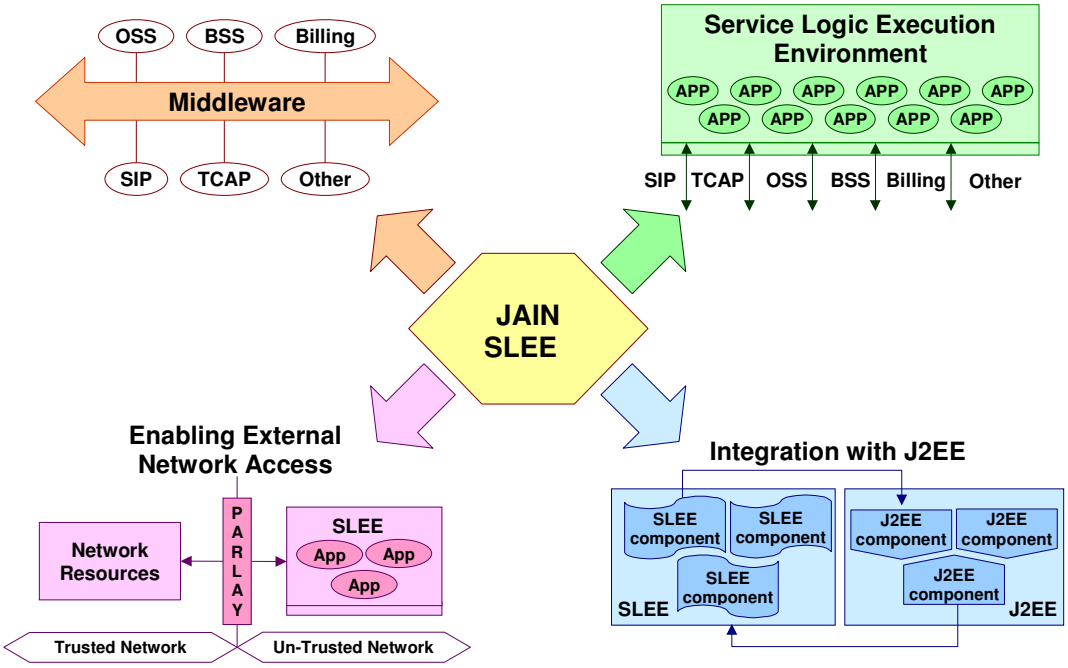

Figure 3 – JAIN SLEE in a Telecommunications Environment

3.3.1 JAIN SLEE and Current Networks (SS7)

There is huge investment in existing telecommunication networks. SS7 networks continue to provide the bulk of telecommunications revenues. The ideal solution would provide an evolutionary path to future networks while prolonging the life of the existing infrastructure.

Integrating known SS7 stack products with JAIN SLEE via the resource adapter framework has a number of benefits:

- Rich mobile and fixed voice, data and web services can be developed using current SS7 networks.
- Services developed today can be migrated to 2.5 and 3G as they become available making this an evolutionary and not a revolutionary approach to 3G services.

3.3.2 JAIN SLEE and Next Generation Networks (NGN)

> ***"According to Synergy Research, the soft-switch market is expected to reach US$2.7billion by 2005, a five-year CAGR of 146%."***
>
> ***"There is significant debate in the industry about the definition of soft switch - over its role in the network, how it should interface with other gateways and soft switches, and how it should interface with the IP and SS7 networks."***
>
> ***"A soft switch moves the service intelligence out of the switch into a database or application server."***
>
> ***[Convergence 101, Industry Analysis, JP Morgan, 2001]***

The large growth forecast for soft-switches was based on the expectation that voice networks would migrate rapidly from circuit switched to packet switched. For a number of reasons this migration has not occurred at the rate forecast. A major factor was the lowering of toll charges by the incumbent operators when faced with competitive local exchange carriers (CLECs). This competitive response drove many of the CLECs out of business and consequently reduced the demand for soft-switches.

Another major reason is the lack of soft-switch and gateway interoperability making the migration from circuit to packet switched networks too difficult and expensive. Certainly the lack of clearly differentiated services caused many incumbent operators to stick with the status quo.

Most equipment vendors promote the need for a distributed environment where the service logic is moved out of the switch and into a SLEE or application server. This is analogous to the AIN, where the service

logic is executed in the SCP and not in the switch.

Commercial execution environments that support call signalling based services for next generation networks tend to be closely coupled with the underlying soft-switch. Indeed, the same vendors often create them. This restricts the carriers' technology supplier options – something next generation networks should be addressing.

To obtain market acceptance, the next generation network requires relevant standards for SLEE and services. JAIN SLEE is the one specification that defines an open and standard SLEE. It is therefore highly significant for the delivery of portable services in the next generation network.

3.3.3 JAIN SLEE and Third Generation (3G) Mobile Networks

Session Initiation Protocol (SIP) is the main signalling and call control protocol of third generation mobile networks. SIP is used in IP networks to establish a session between end points. A session could be as simple as a telephone call or it could be a rich multimedia conference.

Providing SIP capability for JAIN SLEE via the resource adapter framework enables service developers to develop open and standards based services for 3G.

The Third Generation Partnership Projects (3GPP[4]) has selected SIP as the main signalling protocol of the IP Multimedia Subsystem (IMS) in the UMTS Release 5 architecture. This means every call made in a 3G network will be established using SIP.

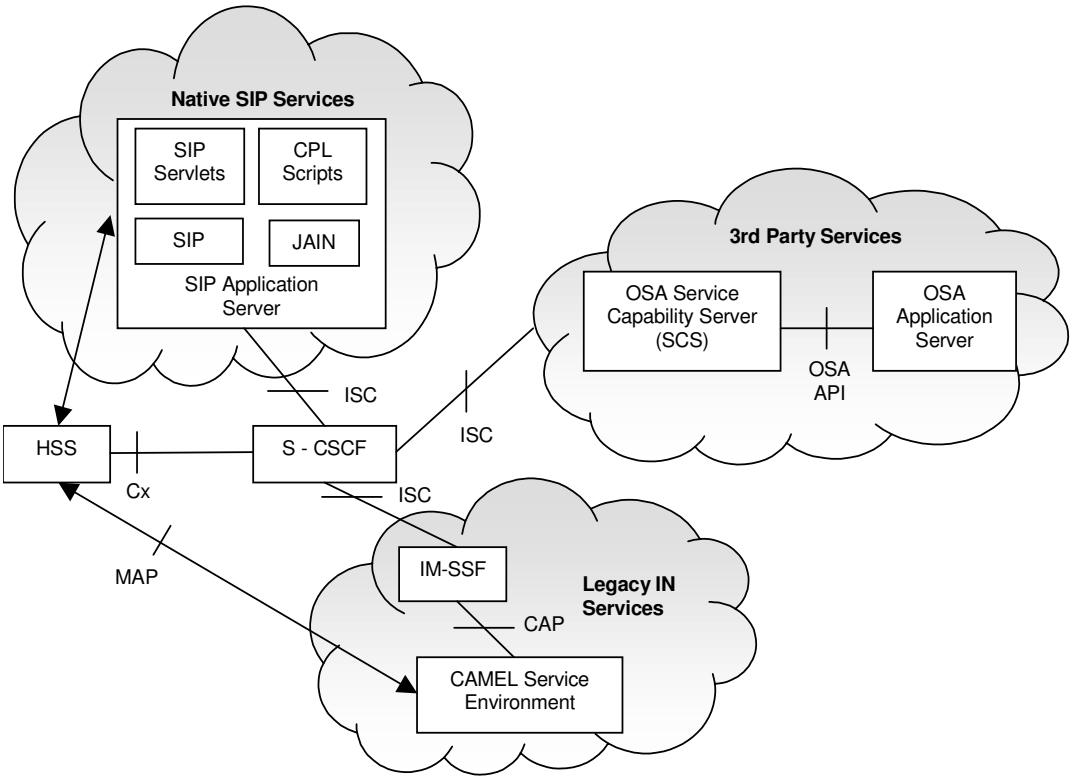

Figure 4 - IMS Services Architecture[5]

Figure 4 is an overview of the IMS architecture. As well as providing for native SIP based services, the IMS architecture also provides for interoperability with legacy IN services and for interoperability with 3rd party services (see section 3.3.4). Of the open standards available for delivering native SIP based 3G services, JAIN SLEE is highly significant as it enables the implementation of carrier grade products.

3.3.4 Use of JAIN SLEE as an OSA/Parlay Application Server

[4] http://www.3gpp.org
[5] Advanced SIP Series: SIP and 3GPP - http://www.awardsolutions.com/research/white_papers.shtm

3GPP, ETSI and the Parlay Group working collectively are specifying the Open Service Access (OSA) for applications to access the capabilities of a network without owning it or knowing its technology.

JAIN SPA (Service Provider API) defines the Java technology realisation of the Parlay specification. This standardised mapping is essential if operators are not to be bound to a single vendor's proprietary mapping.

From a business perspective OSA/Parlay:

- Provides incentives to innovate, develop and deploy new services over carrier networks that reach beyond the carriers and their immediate partners.
- Minimises the risk the carrier takes in the development of new services.
- Minimises the investment the carrier needs to make in the new services.
- Encapsulates ideas for new services from a wider community

While OSA/Parlay addresses the requirement to extend the carrier's development and deployment environment securely, it does not define a standard service logic execution environment (or application server) in which portable, carrier grade, telecommunication services can be built, managed and executed.

A JAIN SLEE platform, when integrated to an OSA/Parlay gateway via the resource adapter framework, is the one standard that can deliver this capability. Additionally, JAIN SLEE combined with an OSA/Parlay gateway provides the following benefits (Figure 5):

- 3rd party portable services can be innovated and developed on standard, carrier grade platforms with trusted links to the carrier.
- Services developed can be deployed externally using OSA/Parlay or internally using SS7 (section 3.3.1) or SIP (section 3.3.2). The operator or service provider is able to determine where the service is deployed based on their requirements (e.g. performance, availability, security etc.).
- Rich services that use the concept of SLEE as a middleware for telecommunications (section 3.3.7), can be built that use external OSA/Parlay connected services.
- A development and testing environment for new services can be created securely for a partner outside the carrier's normal domain of operation.
- The risk and cost of development of the service is shifted from the operator to the service providers and developers. This encourages the development of a large number of services that are focused on the individual corporate or organisation and reduces the requirement for "the killer service." It enables new converged services to be developed and deployed securely beyond the carrier's normal domain of operation.

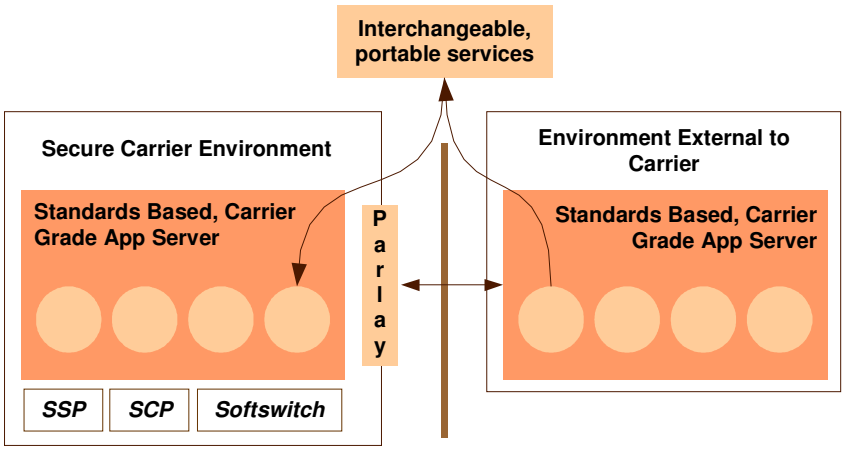

Figure 5 - Services developed externally to the network can be deployed internally without being re-developed

- Having evaluated the technology and business model in action the operator can deploy the service on a SLEE inside or outside the network.
- The operator, service provider and developer have a choice of JAIN SLEE implementations and are not tied to a single vendor.
- JAIN SLEE compliant services are portable between JAIN SLEE vendor implementations. Therefore service developers have a larger market of service providers in which to sell into, while the service

providers have a larger choice of innovative rich services.

The strategy of using a JAIN SLEE in combination with an OSA/Parlay gateway has similar business drivers to the open development environment for message based services strategies that exist today[6]. As voice based services will remain a key part of most business communication processes, this strategy has the same power to deliver wide financial benefits.

JAIN SLEE in combination with an OSA/Parlay gateway is the one way to deliver open and standards based telecommunications services on a carrier grade platform outside the secure carrier environment.

3.3.5 JAIN SLEE and Operational and Business Support (OSS/BSS)

> ***"OSS Architecture at the SP Is Generally Very Complex"***
>
> ***"OSS Must Straddle Multiple Vendors and Technologies"***
>
> ***"The OSS systems must be agnostic and able to interface to this heterogeneous environment."***
>
> ***"… we believe successful OSS vendors will have to develop solutions that are compatible with and exploit the JAIN and Microsoft.net application frameworks."***
>
> ***[Communications Software, Industry Analysis, JPMorgan2002]***

The support infrastructure of the typical carrier is very complex. Mostly the architecture suffers from being cobbled together as a result of a number of acquisitions. Many times this legacy results in multiple technologies and products from different vendors being deployed to support a single OSS function (e.g. billing).

In order to address the needs of a new network technology a dedicated OSS system would normally be deployed. However the service providers are increasingly seeking integrated views of the customer and services across multiple network domains.

Through integrating the OSS/BSS via resource adapters in a JAIN SLEE, the service provider creates re-useable interfaces. All future services, on current and future networks can use these interfaces - in effect creating something akin to a middleware or "EAI" for telecommunications (see section 3.3.7).

The service provider and consumer obtain real value from the use of OSS/BSS information within a rich service. The service provider is able to pro-actively manage the customer. Incorporating not just billing but provisioning and CRM capability in a consumer accessible service gives the consumer control over their account profile and the provider operational efficiency.

3.3.6 Integration between JAIN SLEE and J2EE

The J2EE family of specifications and the JAIN SLEE specification are designed for different application domains. J2EE has features that JAIN SLEE does not and vice versa.

As signalling applications are evolving to include newer features (such as integration with web services and customer information systems) it is desirable to use both SLEE and J2EE. An example of such a service is a conferencing application where a website displays attendee information visually at the same time as the conference is in progress.

The EJB inter-op appendix of the SLEE Public Final Draft (PFD) specification provides recommendations for integrating JAIN SLEE with J2EE.

3.3.7 JAIN SLEE as a Middleware, or EAI, for Telecommunications

With the capability of JAIN SLEE to integrate and inter-operate in a telecommunications environment comes the logical step of using SLEE as a telecommunications middleware, or EAI, for services that have carrier grade requirements.

Enterprise Application Integration (EAI), is focused on the integration of IT systems. Given convergence and the potential use of OSS/BSS data in new services, the challenges facing telecommunications core networks are similar to IT.

The reasons why EAI has become so important in the telecommunications industry are historical. A large

[6] http://www.via.vodafone.com

carrier typically has multiple networks both through evolutionary growth and merger and acquisition.

> ***"With no grand unifying architecture readily available to help telecommunication stovepipes reach out and touch each other, EAI provides the best hope of helping the telecommunications industry."***
>
> ***"With EAI, you don't have to have this grandiose scheme in place. You tackle the problem piece by piece and integrate a few systems together where it makes sense. You don't have to do it all at once. That's a compelling idea for the whole telecommunications market, which is getting more complex and moving a lot faster than it used to."***
>
> ***[Dan Baker, "Can EAI Save the Telecommunications Industry?", Technology Research Institute, eAI Journal, April 2000]***

In a core network the real challenge is finding an open standards based EAI that can deliver the necessary performance, scalability and reliability required for carrier grade services. JAIN SLEE enables the implementation of such a platform.

4 How a Standards Based Architecture Addresses the Challenges

The following table summarises the challenges faced by the service provider and how JAIN SLEE helps to address them.

The Challenge	How JAIN SLEE Helps to Address the Challenges
Delivering Services Over Proprietary End-to-End Solutions that do not Integrate	• Enables the choice of a standard services platform while encouraging vendor competition. • Unlocks the limitations imposed by a single vendor equipment provider. • Enables innovative portable services. • Enables a high performance, low latency, EAI for Carrier Grade Services.
Protecting Investment in Current Networks	• Enables rich new services to be built that span existing disparate networks. • Generates new revenues and business models from services built today that can be migrated to the new networks.
Protecting Investment in the Development of New Services	• Abstracts the logic of the service and minimises dependencies on the underlying networks.
Differentiating on Service Offerings	• Better service customer requirements through faster modification and development of services and access to a large and diverse developer community.
Delivering Services Rapidly in Response to the Market	• Opens the development of the new services to a wide developer pool. • Enables standard "EAI" interfaces for OSS/BSS to be built. • Enables the purchase of "off-the-shelf" services from 3rd parties.
Delivering Personalised Services Aimed at the Organisation and the Individual	• Gives the organization and the individual control over their service profiles – e.g. via a web based service. • Encourages 3rd party development of new services.

Delivering New Services that Target Operational Efficiency	• Enables OSS/BSS information to now be included in services. • Provides the consumer self-management over their network services. • Automates services that the service provider would normally deliver manually. • Reduces the reliance of the consumer on manual support services.
Developing Innovative New Services by Using 3rd Parties	• Provides an open standards based execution environment for OSA/Parlay/JSPA. • Opens the network for 3rd parties to develop and offer new services. • Minimises the cost and risk of the service provider developing new untried services • Delivers innovative new services from organizations who understand specific market verticals.
Delivering Converged Web, Data and Voice Services	• JAIN SLEE provides recommendations for integrating JAIN SLEE with J2EE.

Table 1 – How JAIN SLEE Helps to Meet the Challenges Faced by Service Providers

5 Conclusion

JAIN addresses many of the challenges that operators and service providers face due to the "stove-pipe" nature of current networks and the uncertainty and risk associated with the development of new services on both current and next generation networks.

JAIN SLEE is an open, standards based specification that defines how telecommunication services can be built, managed and executed. The specification has been designed explicitly to enable the implementation of carrier grade platforms required in a call-signalling environment.

With the uncertainty surrounding the adoption and growth of future networks, JAIN SLEE provides an evolutionary path for the delivery of new services. Operators and service providers need to deliver revenue-generating services across disparate networks today while leaving open the ability to migrate these services to future networks. Using JAIN SLEE as an open and standards based execution environment in combination with an OSA/Parlay gateway, encourages 3rd party innovation and delivers flexibility of service deployment to the operators. Additionally, J2EE interoperability enables the deployment of rich voice and web services.

Finally, an open and standards based service logic execution environment that supports portable and network independent telecommunication services is essential if service providers are to use differentiated, revenue generating services to compete successfully.

Open Cloud (http://www.opencloud.com) creates innovative software infrastructure for Telecommunication and Internet services. Open Cloud is the co-specification edit lead with Sun Microsystems on the JAIN SLEE (http://java.sun.com/products/jain) specification and is responsible for producing the Reference Implementation (RI) and Technology Compatibility Kit (TCK). Open Cloud works with partners to deliver, integrate and support end-to-end solutions to operators and service providers.

Open Cloud Rhino is the Carrier Grade Service Logic Execution Environment (SLEE) for SS7, OSA/Parlay, SIP, JCC and other telecommunications protocols as well as providing a high performance and low latency single point of integration with OSS/BSS. Rhino enables operators and service providers to execute new service deployment strategies cost effectively and independently from current and future underlying networks, providing an evolutionary path for the delivery of revenue generating services.