

White Paper



Intelligent Network

Evolution from Traditional Voice to Network agnostic architecture

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Abstract

With convergence of Telecom Networks due to all services and market demand moving to the IP world, Intelligent Network (IN) services which traditionally were based on SS7 networks are now moving to newer architecture.

This paper gives an overview of the traditional IN, its transition to network agnostic architecture and how this change would benefit telecom operators.

Traditional SS7 based IN Networks

In the traditional voice networks the Switch took care of routing, switching and CDR (Call Detail Record) generation of the calls. Based on digit analyses and services given to the end user, the call follows a predefined route and treatment.

For a Call to be dynamically treated an intelligence needed to be developed which could superimpose static treatment of calls as required under the present conditions.

This kind of intelligence is built and resides in a separate server which communicates with the voice switch.

A voice network supporting such functionality is called Intelligent Network.

Basics Components of Intelligent Network

1. **Service Switching Point (SSP)**

Service Switching point/function is the additional functionality built in a voice switch to provide trigger for a call to IN.

The triggers are- going Off-hook, dialing, answer, On-hook etc. The SSP encounters Detection points (DPs) when each state is traversed. At each DP the SSP sends a query to the IN for instructions to proceed further.

2. **Signal Transfer Point (STP)**

STPs are basically routers which route the signals to the SCP based on the best route. These are more useful in bigger networks where there are more number of SSP and SCPs

3. **Service Control Point (SCP)**

Service Control Point is the heart of the IN. It receives queries from SSP and provides direction based on criteria defined in the SCP application.

Other terms used in the IN

Service Creation Environment (SCE): this is the development environment used to create services on IN. The actual services may get created in low level languages as “C” or maybe a graphical utility provided to the service provider. The services created may be prepaid service, Advanced Routing services etc.

Service Data function/point (SDF/P): this is a database that contains the data of the subscribers and corresponding services offered. For e. g. the credit remaining with a particular prepaid customer. Sometimes this maybe collocated within the SCP.

Specialized Resource Function (SRF): This is the Node which takes care of functions like playing announcement or collect DTMF from the end users. SSP also communicates with this node for the announcements.

The Network:

Traditionally IN (primarily SCP) used to communicate with the SSP over CCS7 signaling using the following protocols

- INAP for fixed networks
- WIN for ANSI-41 wireless networks and
- CAMEL for GSM mobile networks

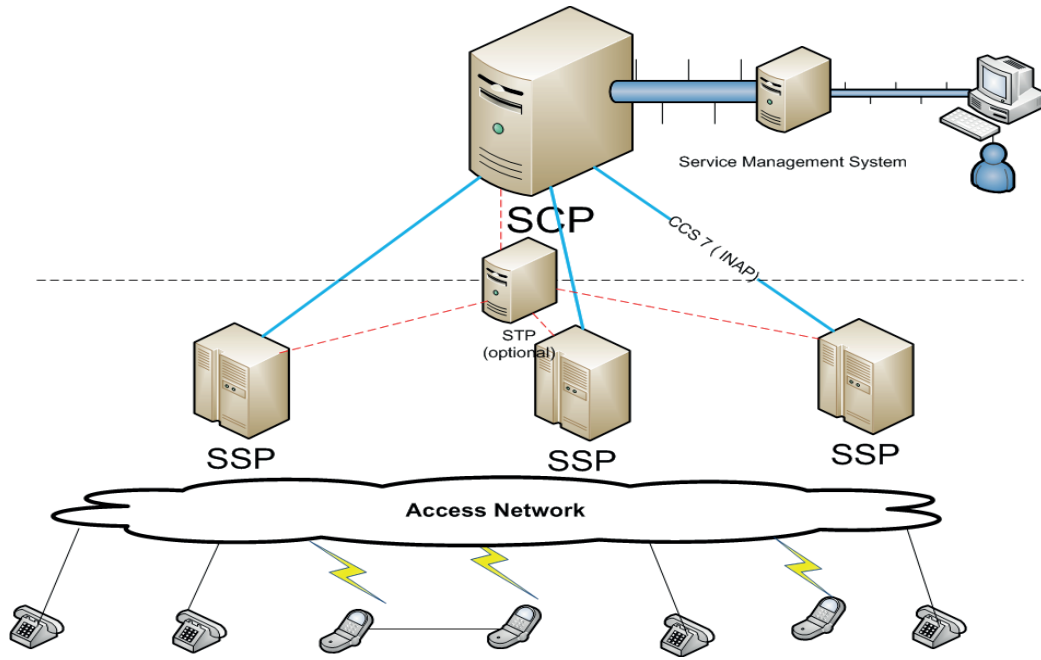
Even though these are standard protocols, vendors have created proprietary extensions to support non-standard services. This makes the IN tightly coupled to the SSP vendor.

In a multivendor scenario (which is widely prevalent among service providers) it is very difficult for the IN to work across vendors. In such cases software patches and customization is the only solution; this typically leads to non-standard and untidy way of operating.

The unified service operators, who offer bundled services around fixed as well as mobile, find it technically unfeasible to offer seamless services as there are different IN systems for fixed, wireless ANSI 41 & mobile networks.

The following figure shows a logical set up of a typical Intelligent Network.

Figure 1: Logical IN architecture

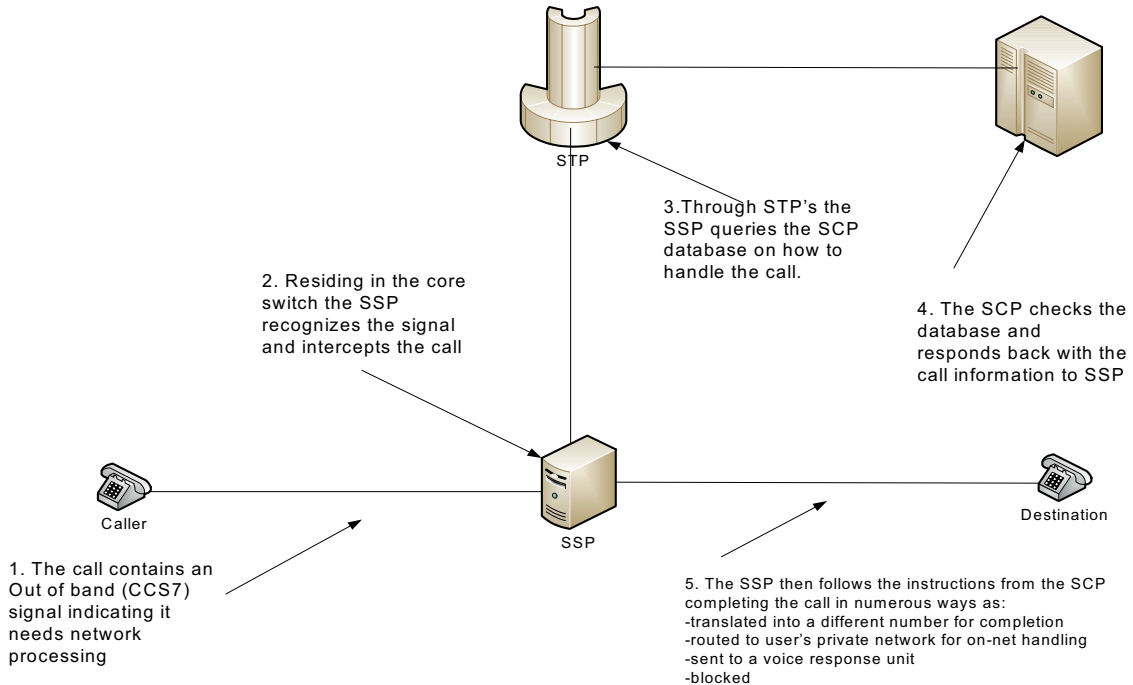


Call Flow

The following illustration depicts the role of each network element in a typical IN call (for any service e.g. prepaid, free phone etc),

Figure 2: Role of each Network Element in the architecture

Basic Advanced Intelligent Network



Networks Agnostic Intelligent Networks

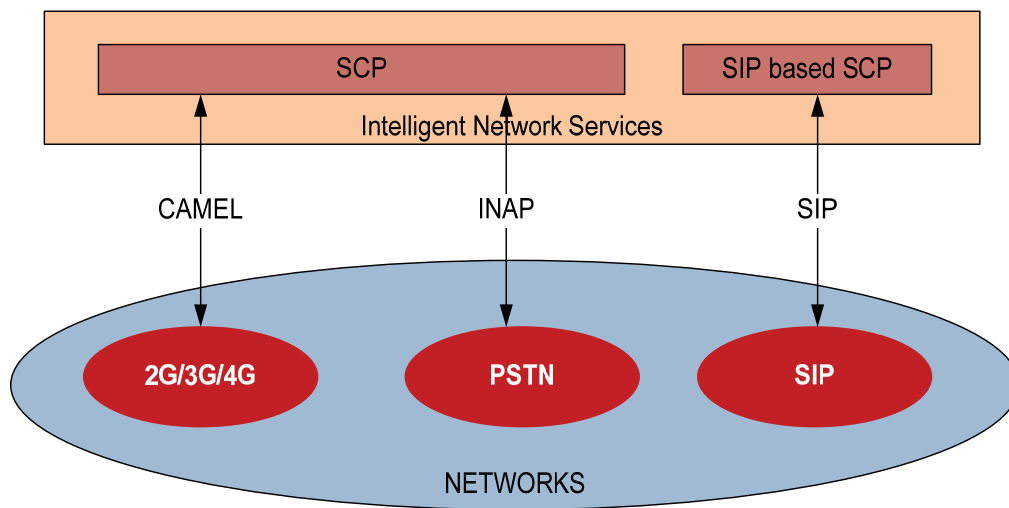
With the market driving towards converged services and therefore networks, there is an intense desire for IN to be technology as well as network agnostic.

With newer technologies coming in, the IN can now support VOIP with SIP enabled interfaces along with the traditional INAP and CAMEL based.

For operators to support the existing deployed network for all kind of services starting from traditional INAP/WIN/CAMEL based to SIP based, the evolution of IN from traditional to all IP is desired.

Today each service is being built on a separate vertical network, e.g. Mobile, fixed telephony, broadband, WLAN and SIP based as shown in the diagram below.

Figure 3: Traditional Separate vertical Networks



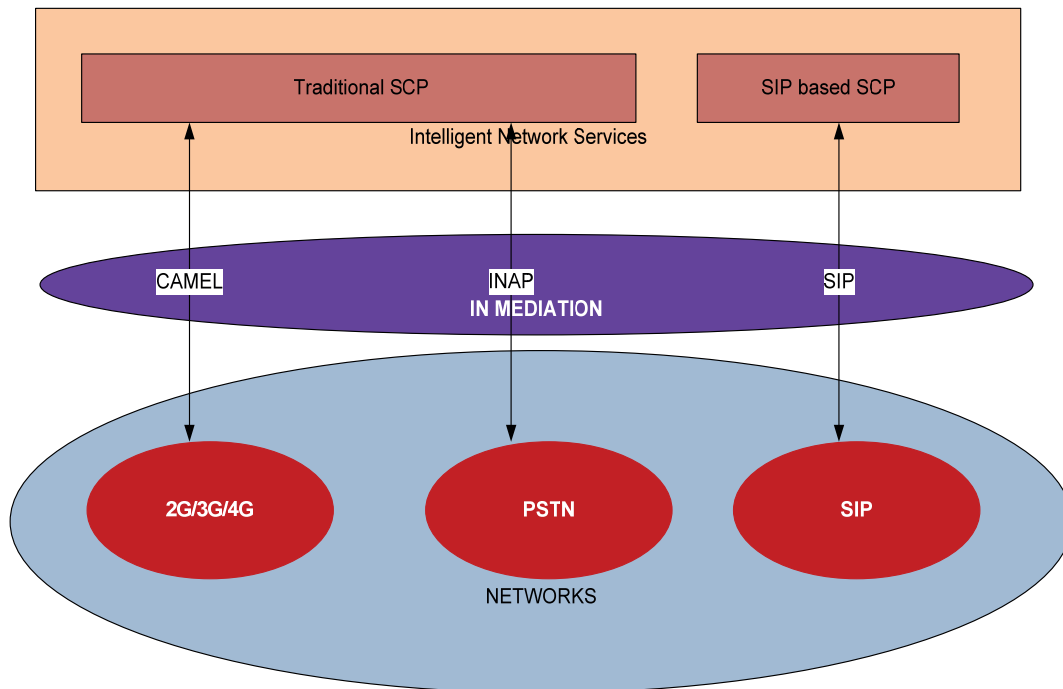
In such an environment, a middle layer which can be treated as “IN Mediation” is placed. This layer is Network agnostic and translates all signaling to their respective modules in Intelligent Networks.

The above diagrams are logical depictions of transition from legacy IN to Advanced IN wherein a layer is introduced which will accept any network, legacy / new to converse with the services layer. This intermediate layer would also enable technology independent service logic creation.

Context to JAIN SLEE and PARLAY

The middle layer in Figure 4 is realized by products like JAIN SLEE and PARLAY.

Figure 4: Introduction of Middle layer in Traditional set up



Java based Service Logic Execution environment (JAIN SLEE)

Java based Service Logic Execution environment (JAIN SLEE) has been designed to support telecom services and enable the implementation of carrier grade, call signaling environment. It is an open standards based event processing engine.

JSLEE was standardized by Sun Microsystems and Open Cloud with the participation of more than 80 operators and software vendors.

Currently, development is being carried out under the terms of Sun's Java Specification Participation Agreement (JSPA), Java Community Process (JCP) and Sun Community Source Code Licensing (SCSL). This means that any feature that will ultimately be provided with JAIN has to be endorsed by an expert group.

The JAIN initiative consists of two expert groups:

- **The Protocols Expert Group (PEG):** specifies interfaces to wire line, wireless, and IP signaling protocols.
- **The Application Expert Group (AEG):** addresses the APIs required for service creation within a Java framework spanning across all protocols covered by the PEG.

It provides standard programming model to support the JAVA developer while creating and modifying services. The Architecture of JAIN SLEE is shown in the following illustration:

Figure 5: Architecture of JAIN SLEE



Resource adaptors are responsible for communication with a particular resource which is external to JAIN SLEE programming model. Various possible resources such as SIP, INAP can communicate to Resource adaptors of this architecture.

Further the Resource adaptors communicate with SLEE framework components to define event routing and other specifics of the service.

The management layer specifies the mechanism by which the administrator manages functions like service installation, system lifecycle etc. This layer is front end for the administrator.

PARLAY/OSA (Open Services Architecture)

The Parlay Group is a technical industry consortium (founded 1998) that specifies APIs for the telephone network. These APIs enable the creation of services by organizations both inside and outside of the traditional carrier environment. In fact, the aim is to have services created by IT developers, rather than telephony experts.

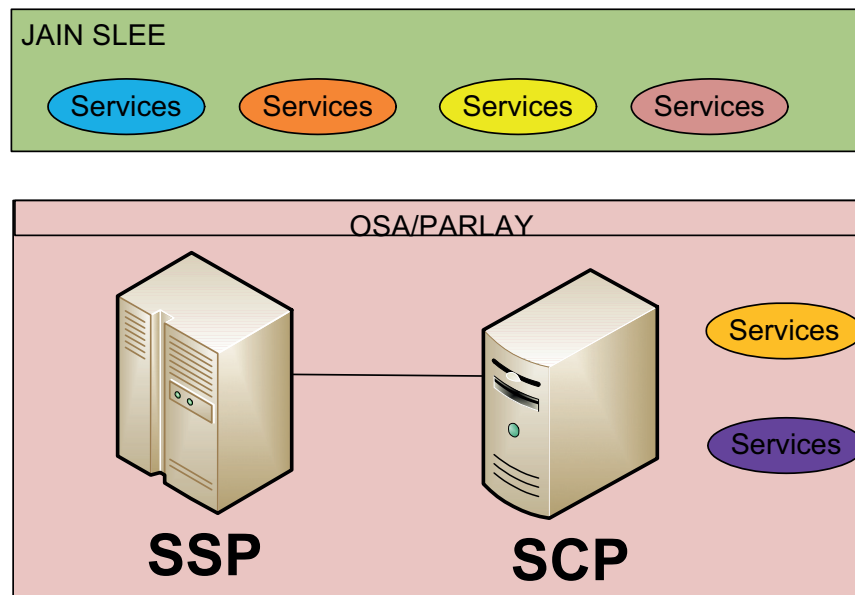
JAIN SLEE provides Java based application environment for applications whereas Parlay provides Gateway for network connectivity.

Parlay does not define an application environment and JAIN SLEE does. JAIN SLEE does not define network connectivity and Parlay does.

The following gives a pictorial representation of JAIN SLEE and PARLAY being used for Intelligent Network.

Both these are complementary technologies and together provide technology independent connection for providing Intelligent Network services.

Figure 6: Logical placement of JAIN SLEE and OSA/PARLAY in reference to IN



Business Benefits of using PARLAY/OSA and JAIN SLEE combination

The traditional SS7 networks provide bulk of the telecom revenues and hence cannot be removed from the network easily. To provide newer services on top of existing network would require integration of SS7 stack with JAIN SLEE through OSA/PARLAY.

This would have the following business benefits:

- Tight coupling of the service creation environment with the underlying soft switch will be avoided.
- Initially the services created on the IN service creation environment were syntactically and technically in accordance with the vendor providing the SSP-SCP combination.
- Making changes at a later stage proves to be cumbersome and involved procedures specific to the vendor. This also posed constraints while launching new features.
- Features offered are totally vendor dependent.
- With this suggested middle layer, the service creation environment will become independent and user friendly. Thus, service creation will be independent of any vendor providing SSP-SCP combination.
- Vendor independence would be achieved; additionally, there will be healthy competition between vendors.
- Initially, the telecom service providers were largely dependent on the equipment as well as technology vendors. The services offered by the Telecom service provider were purely what vendor offered; so practically, it was a vendor competition in the market rather than the service provider.
- Now with the middle layer forcing vendors to provide an open Interface, the telecom service providers have an opportunity to create and maintain services independently.
- The above situation has given the end user and telecom service provider an advantage of best of the services.
- Since the testing of the services does not rely on the network type Testing of such services can be done outside the network; thus, saving infringement of the live network
- Since now the telecom operator will have a choice to look upto any vendor for IN new services will be independent of the base network technology, and will be an attractive benefit.
- The above benefit would also minimize the investment and operating costs of the operator.
 - The existing operations team and equipment can be augmented to support the new base network which actually would be cost effective for the telecom service provider.
- 3rd party portable services can be plugged to the existing network through OSA/PARLAY.

The overall gain for a telecom operator lies in the fact that the risk and cost of the services is shifted from Operator to the service providers and developers.

About the Author

[Shalini Upadhyaya](#) is a Lead Consultant with Infosys's Communication, Media and Entertainment business unit. She has a total of 13 years of experience; out of which ten years are from operations in various telecom service providers in India and 3+ in the consultancy area of OSS/BSS with large telecom service provider in Europe. Her last assignment involved solution design of launching VOIP network and related products across new geographies for the European operator. She can be reached at Shalini_Upadhyaya@infosys.com.



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