E1-E2 UPGRADATION COURSE –CONSUMER MOBILITY

Mobile Intelligent Network

Chapter – Five
Mobile Intelligent Network

Intelligent Network: IN is an architectural concept for the operation and provision of new services quickly, flexibly, economically and efficiently. The IN feature is defined as an architecture where 'intelligence' is separated from core network switches and placed in distributed network nodes. It supports the provision, control and management of multiple telecommunication services.

Principle: The IN is an extension to the existing telephone network. The network is organised so that the telephone calls received by the IN are interrupted to query a database in order to determine what to do with the call. The call can then be re-routed based on a number of pre-defined conditions.

Users & providers of this Service:

- **Network Provider** -The company that is responsible for the telephony network planning and maintenance
- **Service Provider** -The Company or institution that purchases IN services from the network provider and provides it to Service subscribers. It is the organisation which creates, manages and markets the service**.**
- **Service subscriber** -The company, institution or individual that purchases IN services from the Service provider. One who subscribes for the service and registers with the service provider
- **Calling Subscriber**-A Party or Calling party, the person who dials IN number
- **Called Subscriber**- B party or Called Party, the person who answers the IN call. Calling and called party are collectively referred to as **users**
- **User-** One who uses the service. He does NOT require to subscribe to the service

Advantages to Network Provider:

- Additional network traffic-IN services stimulate the use of telephone network for new applications.
- Higher call completion rates-IN services target calls to destinations where they are most likely to be answered.

Advantages to Service Provider:

- Flexible and rapid deployment of new services-

- Wide range of services.
- New tariffed features.

Advantages to Service Subscriber

- Flexible charging.
- Call queuing.
- Flexibility in who maintains the database

Advantages to IN user

- Ease of access.
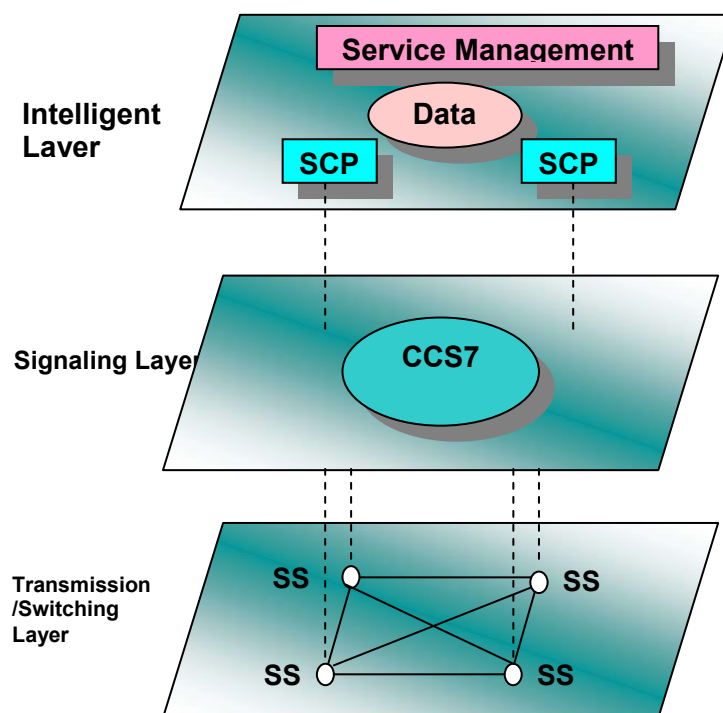- Facilities of advanced services.

Core Concept of IN

Fig. 1 Core Concept of IN Separating Service Control Function from Switching System

IN Conceptual Model:-

- Distributed Functional Plane
- Service Plane

- Global Functional Plane
- Physical Plane

Distributed functional frame:-

CCAF: Call Control Access Function
CCF: Call Control Function
SSF: Service Switching Function
SCF: Service Control Function
SRF: Special Resource Function
SDP: Service Data Function
SCEF: Service Creation Environment Function
SMP: Service Management Function

Physical Plane:-

Physical Plane contains the PEs and the interfaces between PEs
SCE   Service Creation Environment
SMP   Service Management Point
SCP   Service Control Point
SSP   Service Switching Point
IP   Intelligent Peripheral
SMAP   Service Management Access Point

Global functional plane:-

- **CCF** (call control function) - this provides the basic call and connection handling in the exchange. It establishes, manipulates and releases the call.
- **SSF** (Service switching function)-It enables interaction between CCF and SCF. It recognizes service control triggers, through which it recognizes IN calls. It manages the signaling between the CCF & SCF.
- **SCF** (Service Control function) - Directs call control functions during the processing of an IN call. It contains the IN service call processing logic stored in the subscriber databases which specifies how to handle an IN service request. It interacts with the SSF and thje SRF to obtain information required to process an IN call. Sometimes the SCF is split into two functional entities
  - ➢ SDF(Service Data Function) --the database
  - ➢ SCF (Service Control Function) – Call processing and other logic
  Other functions are:
  - ➢ Collection of traffic and network measurements and sending to SMF
  - ➢ Sending of status and service maintenance messages to the SMF
  - ➢ Network management controls

> ➢ Sending of Billing Information to the SSF

- **SRF** (Specialized Resource Function)– It is used whenever an IN call requires direct interaction with the calling party in the speech path. It contains the logic and processing capability to send, receive and convert information

It has the following functions

> ➢ Play Announcement
> ➢ Collect digit
> ➢ Voice recognition
> ➢ Voice Back

- **SCEF** (Service creation Environment Function)– This function enables service developers to develop service logic, create and modify network databases. Downloading of service logic to the SMS. The purpose of SCEF is to create Service Packages (SPs). An SP is a container for one or more IN Services. It contains:

> ➢ Service logic
> ➢ Service data and service data schema
> ➢ Specification of which data and statistics to collect during service execution

- **SMF** (Service Management Function) – This function is responsible for provisioning and managing services created by the SCEF and downloading services & service related data to the SCF equipment

> ➢ Applying changes to the global (service wide) or subscriber data
> ➢ Downloading service logic onto the SCF
> ➢ Collection of service subscription measurements
> ➢ Receiving & logging unsolicited status and service management messages from SCF
> ➢ Producing reports
> ➢ Service data audits

Implementation of functional model:-

The Functional Model defines the entities in terms of functions and not in terms of physical network elements. The network elements which correspond to different functional entities are
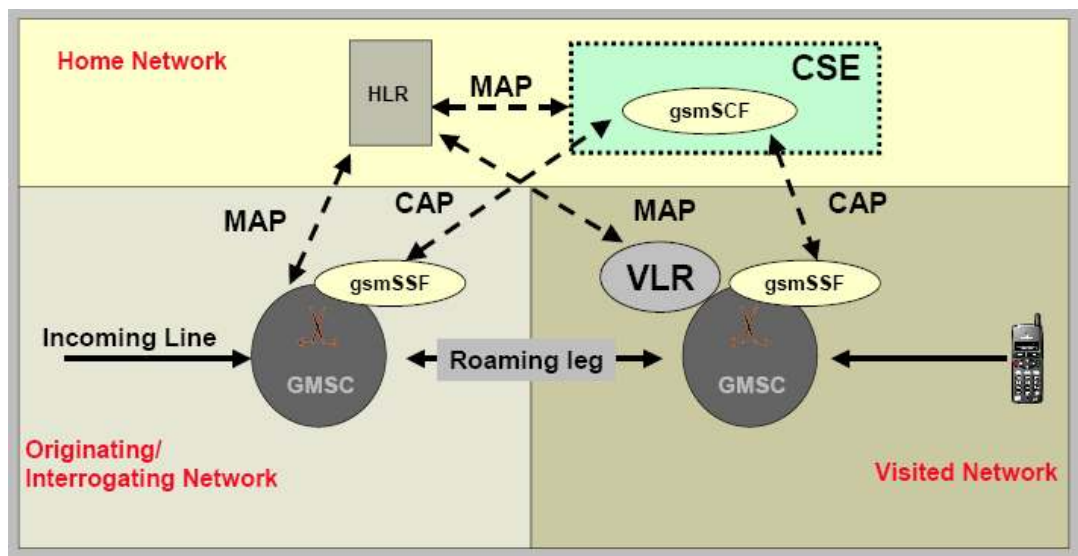
- **SCF** **SCP (Service Control Point)**
- **SRF** **IP (Intelligent Peripheral)**
- **CCF/SCF** **SSP (Service Switching Point)**

- **SCEF**   SCE (Service Creation Environment)
- **SMF**   SMS (Service Management System)

More than one of these functional entities may be implemented on one physical network element.
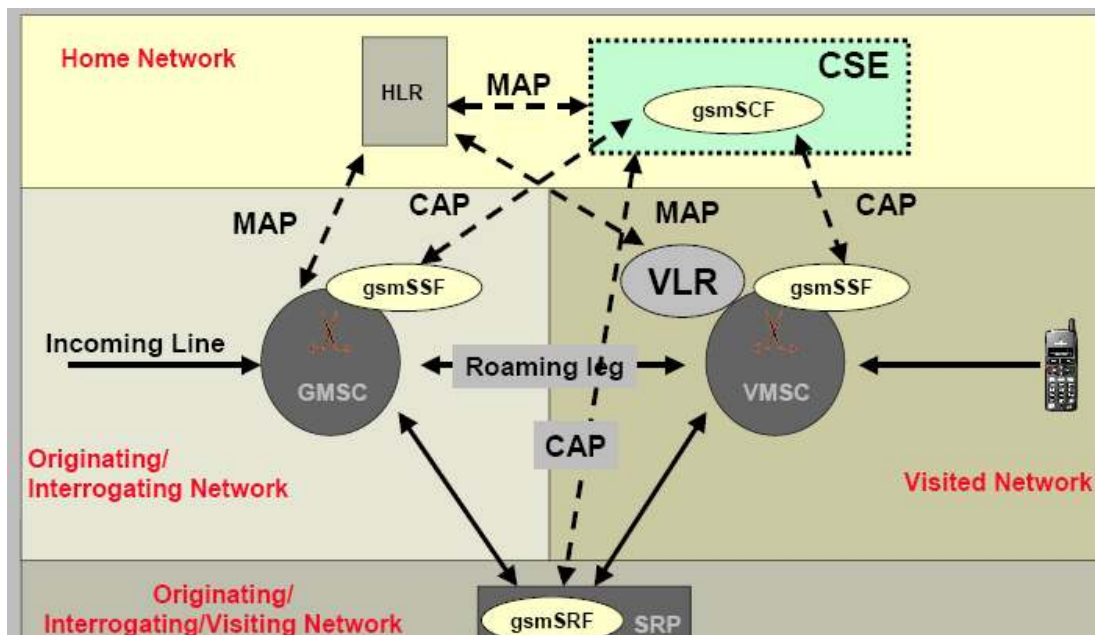
CAMEL

Finalized in 1997, CAMEL phase I introduced improved capabilities as mobile operators could begin to offer services and features to their customers that could work while roaming. Phase I of CAMEL does not offer the ability to interact with the Specialized Resource Function (SRF). The SRF is a functional capability found in Voice Response Units (VRU). CAMEL based networks and applications are based on the technology
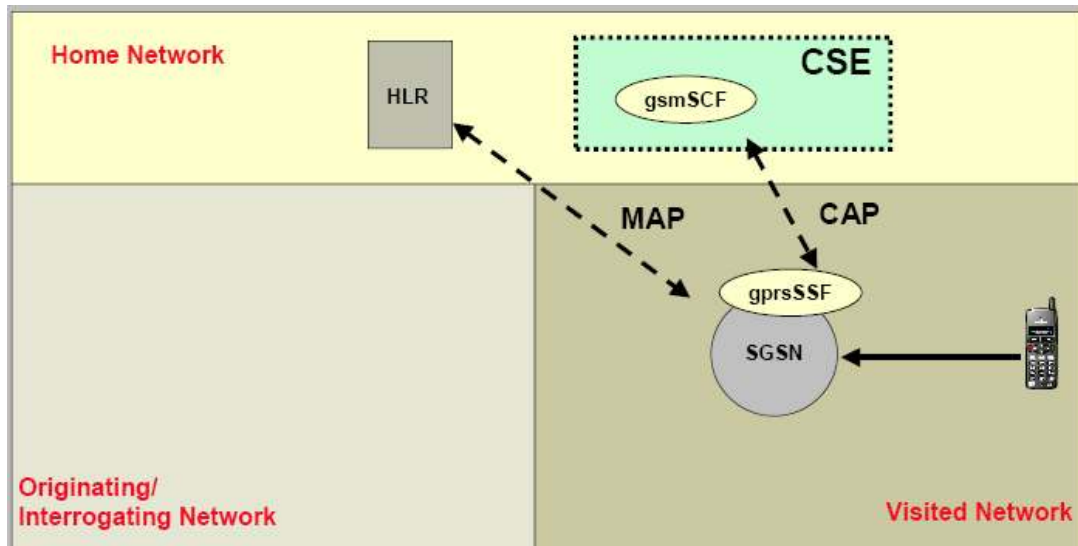

CAMEL Phase-1

Completed in 1998, CAMEL phase II built on the basic call control capabilities provided with phase I. Phase II provided many additional INAP capabilities, but perhaps the most significant is support for SRF which allows interaction with specialized network resources such as the Voice Response Unit (VRU). The VRU is an important network element for certain applications such as IN based mobile prepay service. The VRU plays voice prompts during prepay account recharge and announcements such as a low balance warning before or during the call to alert the subscriber of that condition. In CAMEL

phase I, a call is simply cutoff in progress when an account balance reaches zero. The SRF issue is resolved in CAMEL phase II wherein SRF is supported. The future of CAMEL will be largely determined by its ability to evolve to support data. CAMEL capabilities mostly support voice services. As wireless data applications driven by GPRS, EDGE, and UMTS proliferate, there will be a need to manage the interaction between voice and data networks and call sessions. It is likely that CAMEL will also need to evolve to support various multimedia applications. While there is certainly a need for CAMEL in the foreseeable future, its long-term utility lies in its ability to adapt to the world of mobile data. (In CAMEL Ph-III data charging in prepaid mode is supported)

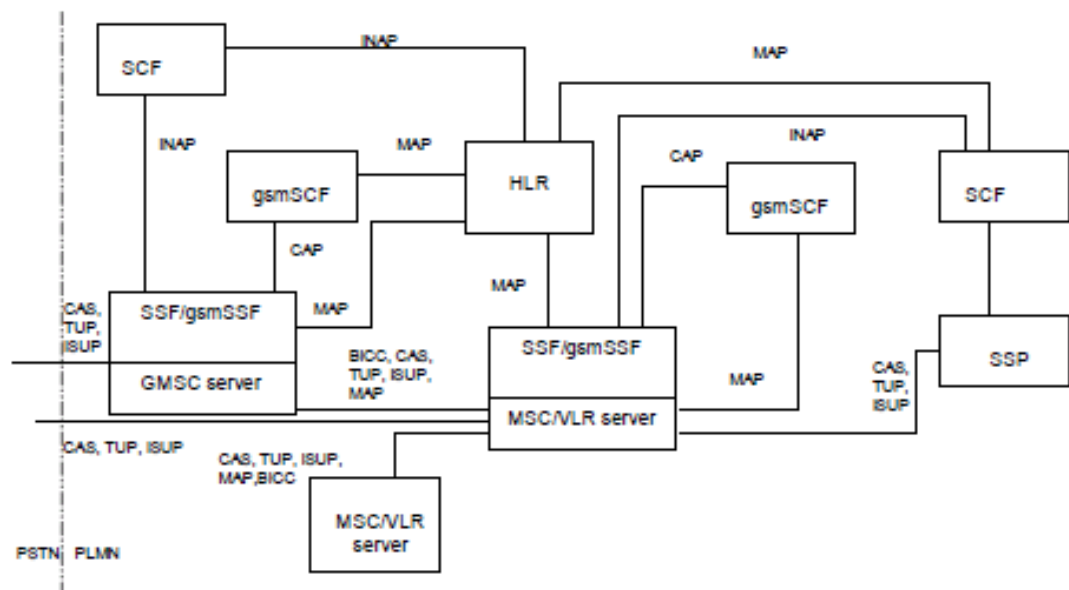CAMEL Phase-2

CAMEL Phase-3

Network structure:-

Fig 2. Mobile Intelligent Network

Network structure:-

IN service switching functionality (SSF) and CAMEL Service Switching Functionality (gsmSSF) can be included in the network nodes GMSC Server and MSC/VLR Server. The IN service control functionality (SCF) can be co-located in the same physical node or in a different node. However, all communication between SSF and SCF will be done through Intelligent Network Application Protocol (INAP).The CAMEL Service Control functionality (gsmSCF) is a separate node in the network located in the subscriber's home PLMN. The gsmSCF can be co-located in the same physical exchange or on a separate server. All communication between gsmSSF and gsmSCF is done through CAMEL Application Part (CAP) protocol

SSF:- SSF represents the switching functions of the IN network. It detects IN service invocations (ISTs) and interrogates the appropriate SCF for instructions how to handle the call. SSF can be located within the (G)MSC Server. In this case it is not a separate physical node in the network. In case it is located in a separate transit exchange (without mobile functionality), then it is called a (stand-alone) SSP and can be seen as a separate node in the network. The gsmSSF represents the switching functions of the CAMEL Service Environment (CSE). It detects CAMEL calls and interrogates the appropriate gsmSCF for instructions how to handle the call. The gsmSSF is located within the (G)MSC Server and it cannot be a separate physical node in the network.

SCF:- SCF is the control function of the IN network. It contains the logic and data of the IN services and executes them accordingly, if requested by the SSF. During execution of an IN service, the SCF orders SSF to perform certain actions as defined by INAP (INAP operations). SCF can be located within a (G)MSC Server or it can be a separate node in the network.The gsmSCF is the control function of the CSE. It contains the logic and data of the CAMEL services and executes them accordingly, if requested by the gsmSSF. During execution of a CAMEL service the gsmSCF orders gsmSSF to perform certain actions as defined by CAP.The gsmSCF is a separate node in the network located in the subscriber's home PLMN, except for N-CSI that is located in the visited PLMN.