E2-E3:CONSUMER MOBILITY

CHAPTER -7

MOBILE INTELLIGENT NETWORK

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Mobile Intelligent Networks

Intelligent Network

In the Intelligent Network (IN) all of the elements in a digital telecommunications network are arranged into a unified, programmable system. The most coherent way to do this is to run a network of computers alongside the core telecoms elements - the switching and transmission equipment - and use this 'system' to control all the activities that take place. The system does not have to know about the intricacies of the network elements but instead instructs them through a standard language.

The digital switching and transmission equipment that telecoms operators have installed is made up of specialized computers designed to perform highly specific functions. These elements are, in effect, like specialized, ultra-reliable peripherals operating on a very grand scale:

- **The digital switches** : which direct the digital voice channels across the network, setting up connections between one telephone or network device and another, and
- **The transmission equipment** (the multiplexers): Which bundles the digital streams together to transport them in bulk across the core 'trunk' network between the switches.

Without an IN, however, they operate in pretty much the same distributed fashion as their mechanical predecessors, by signalling to each other across the network, rather than being controlled by a central processor running the equivalent of a computing application program.

In these traditional circumstances, each call operates as a self-contained process which ripples out from the originating telephone, via the local switch, to the next, and so on, until a circuit is arranged. This distributed operation is usually negotiated through a standard signalling system called SS7 (Signalling System Number Seven).

Each time a call is made the caller actually operates the network directly, by dialling a tiny program for it. When the call is terminated the local switch signals the time spent on the line to the billing system - and that, in a standard telephone call, is about all there is to it.

Such an approach worked perfectly well and formed a very robust framework when all the network did was set up circuits, time the calls and release the circuits when one of the terminals went on hook. But as service providers began to develop more complex

applications it became clear that a completely intelligent network would offer a whole range of advantages.

This IN architecture brings all of the switching and transmission functions under the control of a distributed computer system, so that a high level of sophistication can be built into services right across the network, instead of being applied only to specific parts. IN, for instance, can enable fixed and mobile network services to be integrated - at present mobile cellular services operate on completely separate networks because of the 'intelligence' required to operate the service.

To place a call to a cellular phone, the mobile network must log the requested number; look up the identity of the target terminal; identify if it is currently 'logged in' to the network and, if so, which cell it occupies. It then has to allocate a frequency or timeslot (if it's a digital system) and signal the handset to ring and connect.

But its intelligent activities don't end there. As the call progresses it must monitor the movement of the cellphone and assign new frequencies or timeslots as its user leaves one cell and enters another.

Ultimately, even 'fixed' users would like to have the same sort of mobility. If similar intelligence were applied to the standard network, users could, for instance, log themselves on to different fixed and mobile telephones at different times of the day and have all their inbound calls routed to the appropriate one. Just as importantly, they could take themselves 'off-line' by having most incoming calls automatically call-answered - with the system letting through only specified callers such as immediate superiors or close family.

In meeting the above requirements, the IN effectively changes the relationship between network and caller by interposing a structured system. The caller is no longer programming the network directly, but logging a request with a controlling system: basically a network of computers. Having requested a connection, or initiated a function (telling the service to put on call answering, for instance), by dialling a number in the usual way, the system decides what actions should be taken and generates the appropriate signals to all the network elements that need to know about it.

Benefits

Digitalization made the network elements 'intelligent', but IN will get them to work together as a team. This approach has several advantages.

Manageability

This modular environment, along with the development of other telecoms standards, enables operators to 'manage' services responsively. They are able to connect and disconnect customers, change numbers and institute complex billing criteria, all from a central terminal - whereas before they may have had to program individual exchange switches. This is a major benefit to operators, enabling them both to shed staff, reducing costs, and to improve customer service.

Competition

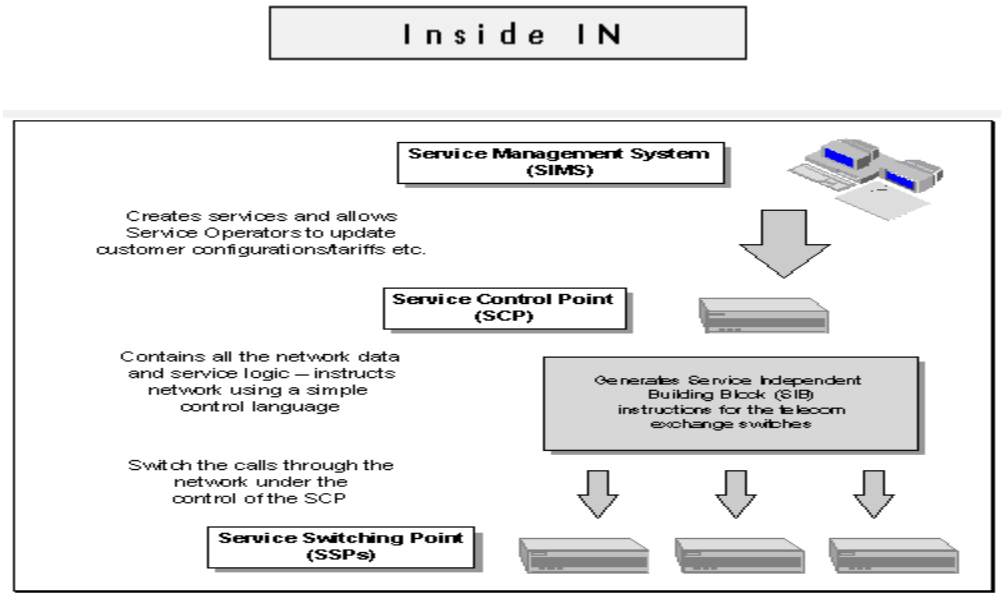
IN also helps to create a competitive market in the business of supplying the network infrastructure. The consumers of this technology - in this case the telecoms operators and service providers - therefore avoid being 'locked in' to their suppliers.

Enhanced Services

It will make the network itself intelligent and capable of offering a whole range of complex services and extra features to its users in a coherent way.

Competitive Service Framework

And last, but certainly not least, the IN concept changes the basis on which networks are managed and services are provided.



IN - How it Works

The basis of the IN is to define the indivisible events and functions which, when put together in sequence, dictate the way individual services should operate. These lowest common denominators are called Service Independent Building blocks (SIBs) and under IN they are represented by standard messages which initiate all the independent network events like 'notification announcement completed' or 'insert data'.

The IN itself then takes an overall view and runs the services by initiating the right SIBs in the right place at the right time to set up a circuit, say, between two telephones. In effect it instructs all the elements involved in a call on what to do.

The key element in the structure from the Service Operator's point of view is the Service Management System (SMS) which manages billing or access authorization. This function allows the service operator terminal access to the database to manage the services and subscriber details on an ongoing basis.

The Service Control Points (SCPs) sit between the SMS and the various functional elements - databases and various 'intelligent peripherals' and control services like automated announcements. They control the procedures put into operation under the instructions of the SMS, and do this through the Service Control Functions (SCFs) undertaken at the SCP - these include a Specialized Database Function (SDF) and a Specialized Resource Function (SRF). Service Switching Points (SSPs) switch the calls through the network under the control of the SCP.

Service Definition is at the top of the hierarchy. This is carried out by linking to the SMS through a Service Management Access Function and allows service providers to build and test services as abstract models.

Under this flexible modular architecture, new services can be modelled and constructed without reference to the peculiarities of the switches and other elements which must physically carry out the tasks.

Mobile IN

Mobile intelligent network (IN) pertains to the concept of intelligence in mobile networks. The notion of network intelligence is evolving beyond the traditional model of centralized control and processing, and expanding to network edge devices such asmobile

terminals and servers. However, the use of the term mobile IN will be used in this paper to refer to more traditional centralized network intelligence.

MIN Concepts

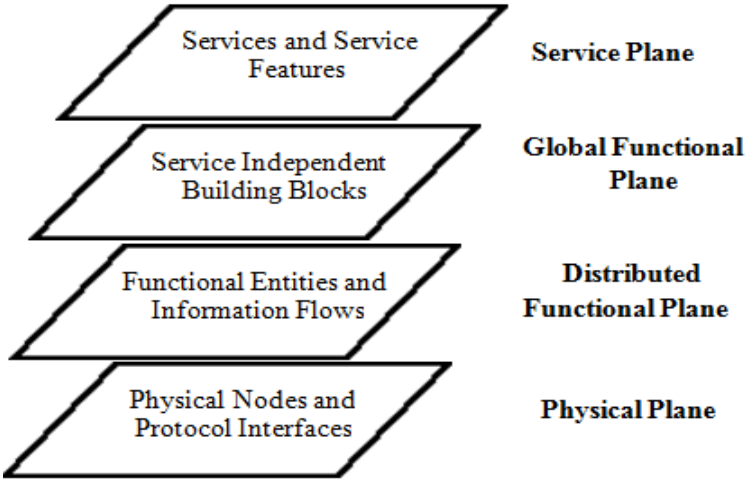
All intelligent networking for telecommunications involves the concept of a "query/response" system. This system entails the notion of distributed intelligence wherein a database is queried for information necessary for call processing. For example, a mobile communication switch or Mobile Switching Center (MSC), that is equipped with mobile IN call logic, can launch a message or "query" to a database hosted by a network element called a Service Control Point (SCP). The SCP processes the request and issues a "response" to the MSC so that it may continue call processing as appropriate.

Mobile IN Technology

The two primary forms of mobile IN technology employed in GSM networks are the Intelligent Network Application Part (INAP) and Customized Applications for Mobile network Enhanced Logic (CAMEL). INAP is a technology developed for fixed networks. CAMEL was designed strictly for mobile networks.

INAP and CAMEL are both based on the Intelligent Network Conceptual Model (INCM). The INCM forms a framework for design and capabilities for IN design and is represented by a Service Plane, Global Functional Plane, Distributed Functional Plane & the Physical Plane.

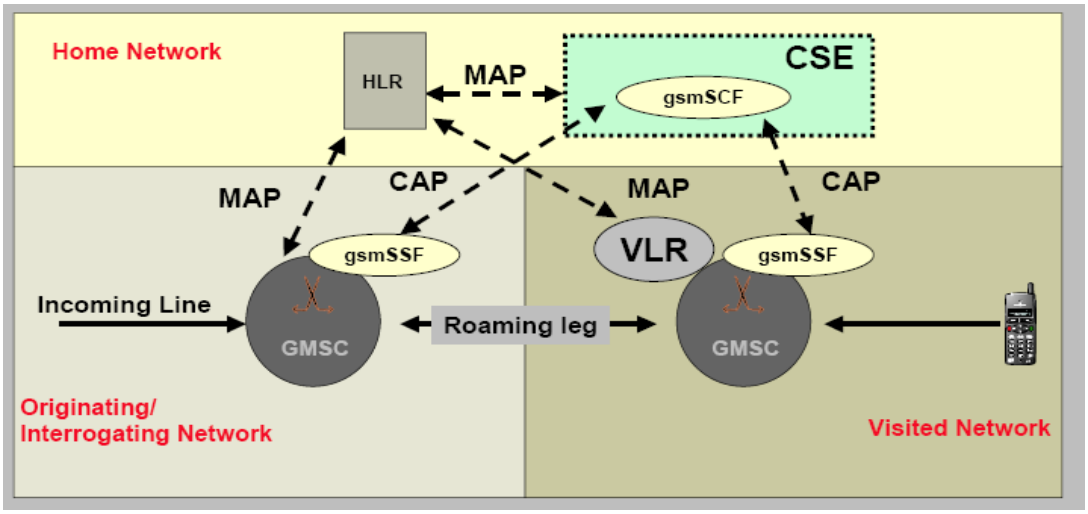
Intelligent Network Conceptual Model



These planes are the domains of the services and service features, service physical nodes and protocol interfaces respectively. The design of INAP and framework defined by the INCM. Many GSM network operators still rely on operator specific IN solutions and/or proprietary extensions of core INAP capabilities for services such as mobile virtual private network, virtual PBX, personal number service, and call screening. The primary reason for this is that INAP preceded CAMEL, and because of this, it had greater functionality. On the other hand, CAMEL (Customized Applications for Mobile network Enhanced Logic) was developed to provide a standard for mobile intelligence across varying vendor equipment for GSM networks. This means that independent building blocks, functional entities and information flows, and participating mobile network operators who deploy CAMEL based services may provide advanced services to each other's respective roaming mobile users.

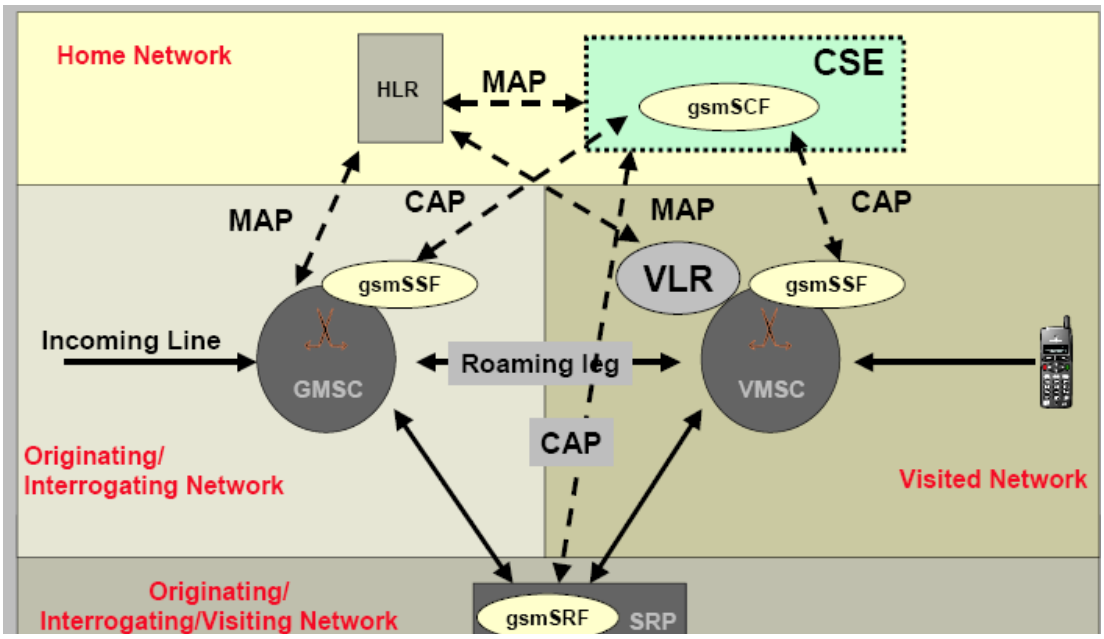
CAMEL

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

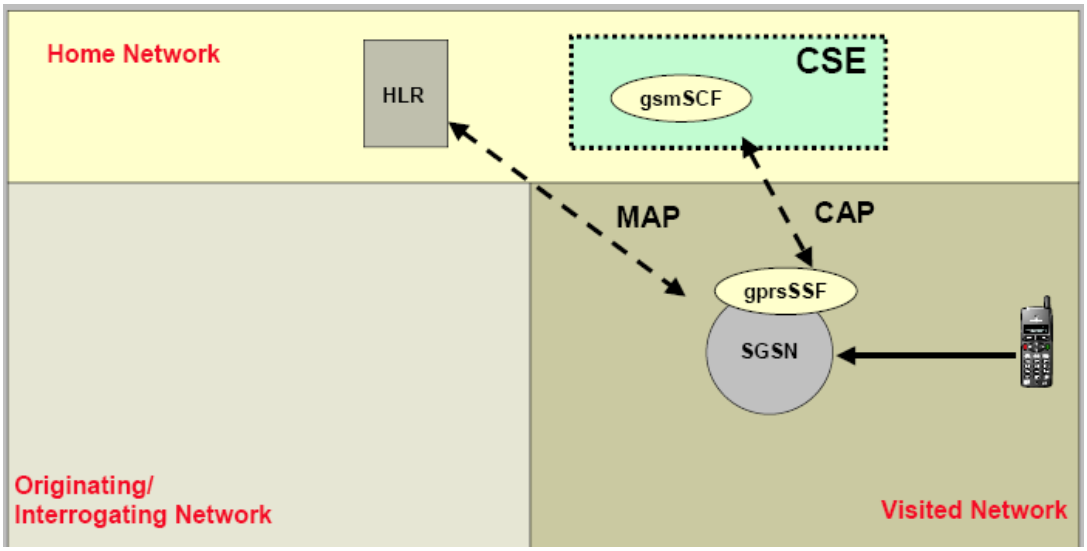


CAMEL Phase 1

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

Mobile IN Capabilities

Capabilities may be network based, user terminal based, server based, or any combination therein. New capabilities that add value to existing capabilities can be referred to as value-added capabilities. The reasons for deploying mobile IN technologies are to provide value-added capabilities for purposes such as cost reduction, improved service delivery, increased variety and quality of services, and rapid service creation and deployment. These capabilities rely on underlying mobile networking technologies to handle mobility management functions. Together with mobile networking, mobile IN capabilities allow the mobile network operator to deploy a variety of advanced and/or value-added applications. In camel

Mobile Intelligent Networking

Value-added Applications

All value-added applications share the same characteristics:

1. Not a form of basic service but rather adds value total service offering
2. Stands alone in terms of profitability and/or stimulates incremental demand for core service(s)
3. Can sometimes stand alone operationally
4. Does not cannibalize basic service unless clearly favorable
5. Can be an add-on to basic service, and as such, may be sold at a premium price

6. May provide operational and/or administrative synergy between or among other services

– not merely for diversification.

Mobile IN enables value-added applications such as:

- One number service
- Prepay service
- Location based services
- Call management services
- Free Phone

Implementation Issues

The first step to implement mobile IN is to migrate intelligence away from the MSC, VLR and HLR, and introduce functionality similar to that used by wire-line networks for signaling to SCPs. Eventual ubiquitous availability of software logic will allow roaming mobile users to have greater access to services. The next step can take place concurrent with the first step and involves deployment of applications into SCPs along with more advanced call control logic. This second step is critical as simply deploying triggers and supporting messages is not enough. In order for services to be truly ubiquitous and available, mobile operators must deploy standards based applications.

MIN in BSNL

CDMA Network: BSNL now has CDMA 1X 2000 & EVDO network across the country. ZTE make IN platform has been installed at three locations namely Baroda, Kolkata and Bangalore. This platform is based on ANSI wireless Intelligent Network (WIN) protocol. CDMA IN platform is not integrated with GSM IN platform. Presently only pre-paid for voice and data cards are offered through CDMA IN.

GSM Network: Mobile IN network in BSNL is distributed zone wise like North Zone ,East Zone etc.

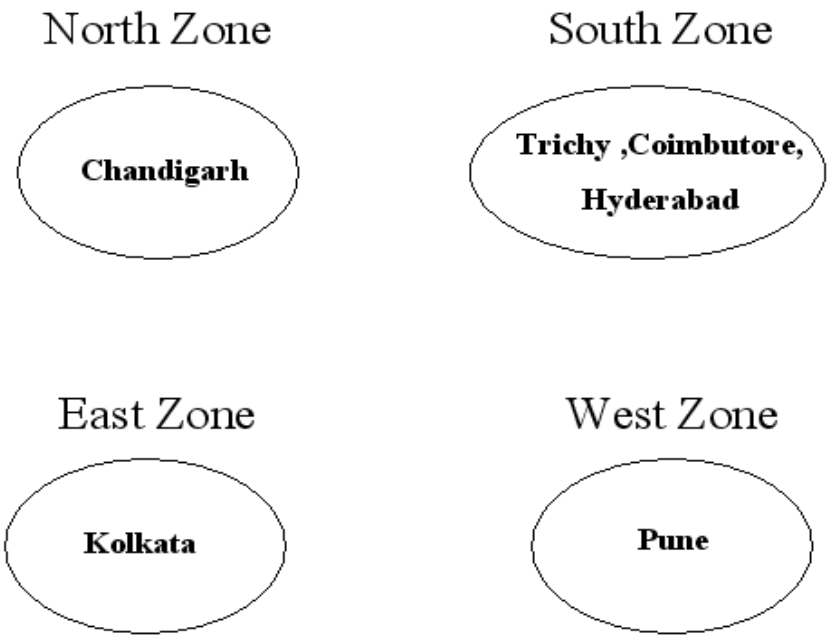
North Zone MIN Network handles H.P, **J&K, Haryana , Punjab, U.P(W) , U.P(E) ,UA, Rajasthan

East Zone MIN Network handles West Bengal , Orissa, Bihar, N.E, Jharkhand ,A&N

South Zone MIN Network handles Andhra .Pradesh , Kerala , Tamilnadu, Karnataka

West Zone MIN Network handles Maharashtra , M.P , Gujarat , Chattisgarh.

BSNL MIN Network



For MIN connectivity every MSC has signaling connectivity (SCCP) with the SCP of its respective zonal MIN. Accordingly we have to define MIN routing in every MSC in order to excess MIN network.

With the implementation of zonal MIN networks ,it is possible to get prepaid services throughout India. In case of roaming the recharge coupon of parent circle is required but we can use this recharge coupon from anywhere in India. This feature was not present in earlier phases of BSNL network.

MIN Software version

At present CAMEL Phase III (CAP III)is implemented throughout the BSNL Network. In case of CAP II (CAMEL Application Part-II) inter technology prepaid roaming was available for voice calls only, but with the introduction of CAP III inter technology prepaid roaming for voice as well as data call is possible .Inter technology roaming feature gives the advantage of using MSC/VLR of one vendor and MIN network of another vendor.

At present BSNL is providing International Roaming to only post paid subscribers

Services Offered by MIN

- Toll free service
- Universal access Number
- Voice Virtual Private Network
- Televoting
- Virtual calling Cards

Chapter 7:Mobile Intelligent Network

Sample Self Study Objective Type questions

1. The two forms of mobile intelligent technology in GSM networks among the following
(i) INAP, (ii) EDGE, (iii) CAMEL, (iv) SIP, (v) SS7, (vi) Sigtrans

a. (i) and (vi) only
b. (iii) and (iv) only
c. (i) and (iii) only
d. (ii) and (v) only

2. Intelligent network conceptual model (INCP) consists of layers (i) service plane, (ii) Global Functional plane, (iii) distributed functional plane, and (iv) physical plane.

a. Service independent building block is related to service plane
b. Service independent building block is related to Global functional plane
c. Service independent building block is related to distributed functional plane
d. Service independent building block is related to physical plane.

3. A call in progress is cut off when its account balance reaches zero. In which phase of CAMEL this feature is a drawback?

a. camel phase-I
b. camel phase-II
c. both a and b together
d. none of the above.

4. The Value added applications capabilities deployment for mobile intelligent network depends on which two factors below,

a. Mobile to PSTN connectivity
b. Mobile call processing technology and mobile registry server
c. Mobile deployment technology and mobile switching network
d. Mobile networking technology and mobile intelligent network.

5. Specialized Resource Function SRF is a functional capability found in

a. ADSL modem
b. PSTN phone instrument
c. Voice Response Unit (VRU)
d. data card

6. CAMEL stands for

a. Customized Applications for Mobile Network Enhanced Logic.
b. Customized Analysis for Mobile Network Edge licensing.
c. Controlled Applications for MSC Enabled Logic.
d. Centralised Agreement for Mobile Network Employment Licences.

7. CAMEL is used to

a. provide a standard for mobile intelligence across varying vendor equipment for GSM network.
b. provide advanced services to roaming mobile users of different vendors.
c. both a and b are applicable
d. none of the above.

8. CAMEL Phase one and Phase two were deployed in the year

a. 2000 and 2001 respectively
b. 1996 and 1999 respectively
c. 1997 and 1998 respectively.
d. 1998 and 1999 respectively.

9. The speciality of CAMEL phase –II is that

a. VRU plays prompt about account recharge, low amount balance.
b. VRU does not play any announcement during low amount balance
c. VRU plays noise on account balance reaching zero.
d. VRU plays prompt about account recharge, highest amount balance.

10. The reasons for deploying mobile IN technologies are to

a. provide value added capabilities for cost reduction, improved service delivery
b. rapid service creation and deployment.
c. both a and b above
d. none of the above.,