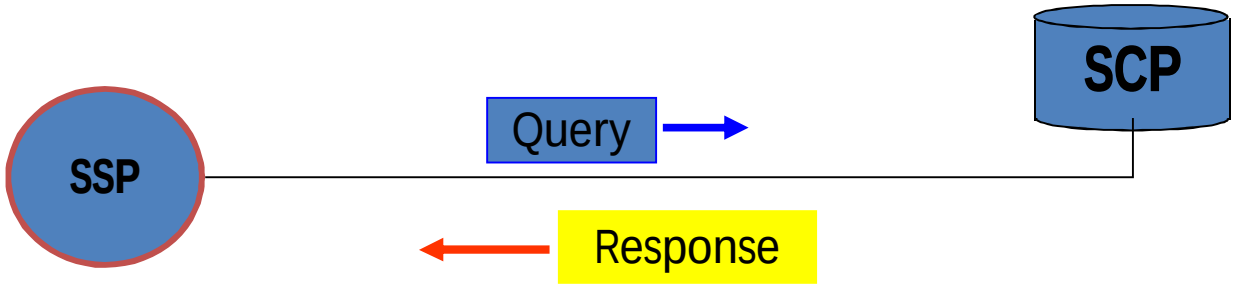
Wireless Mobile Communication

Lecture 31

- Advanced Intelligent Network

Intelligent Networks



- a SSP communicating with an SCP to retrieve information about processing a phone call.
- triggered in different ways, but most often occurs in response to dialing phone numbers that have special significance; such as:1-800, 19000,...
- The communication between the SSP and the SCP takes place over the SS7 network using the TCAP layer of SS7.
- does not happen for every call but only for those that require IN services.

Intelligent Networks

- The early implementations of IN were based on a database performing number translation
- IN implementations cover a more extensive set of services from time of day routing plans, follow-me services, pre-paid mobile services (wireless intelligent
- networks), calling card services, to advanced network-based call centre.
- The basic aim of IN is to decouple the service logic from the control of the switch fabric. Defined in **Q.1201** as ‘‘integrated service creation and implementation by means of the modularized reusable network functions’’.
- The business aim of IN is the removal of a dependency on switch manufacturers for the provision of new services.

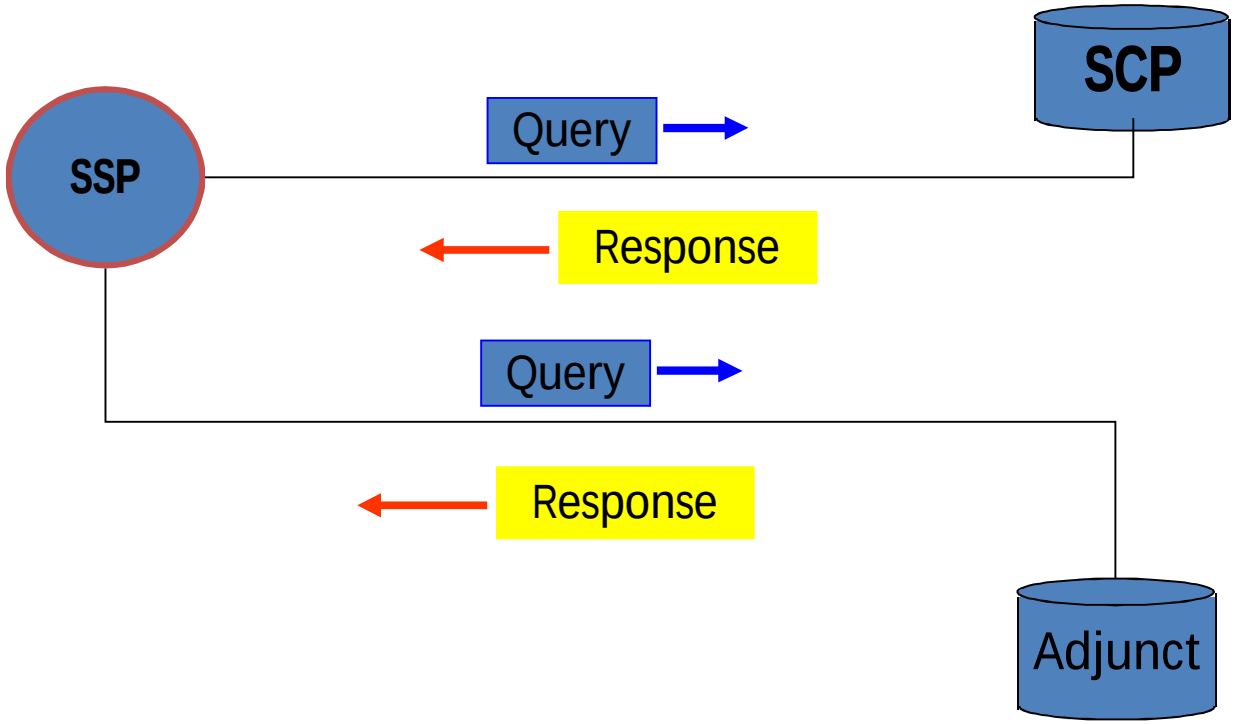
Service Data and Logic

- **Service data** is the information needed to process a call or a requested feature. Information such as Called Party Number, Routing Number, and Carrier are examples of service data.
- **Service logic** is the decision-making algorithms implemented in software that determine how a service is processed. The service logic acts on service data in making these decisions and directing call processing to create the proper connections, perform billing, provide interaction to the subscriber, and so forth.

Service Data and Logic

- Until IN capabilities were introduced in the 1980s, the service data for the PSTN resided within the telephone switches throughout the network.
- The expansion of telecom services created several issues with this architecture, including the following:
  - Increased storage demands
  - Maintaining synchronization of replicated data
  - Administrative overhead
- One of the benefits of the IN is centralizing service data in a small number of nodes.
- This alleviates the overhead of administering data at each switching node and reduces the problem of data synchronization to a much smaller number of nodes.

Service Distribution and Centralization

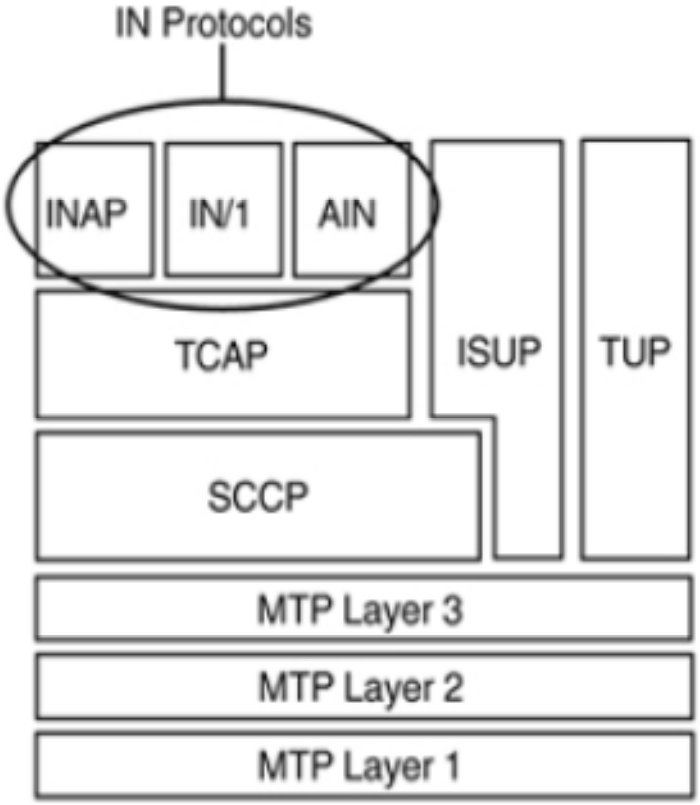


Service Distribution and Centralization

- IN redistributes the service data and logic to other platforms outside of the switch, leaving the switch to perform basic call processing. The SCP and Adjunct are two new nodes that IN has introduced for hosting service data and logic.
- The **SCP** usually serves a large number of SSPs and maintains a large amount of data. It is typically implemented on larger-scale hardware to meet these needs.
- The **Adjunct** is a much smaller platform that normally serves one or possibly a few local offices and is often co-located with the switch.
- Adjuncts characteristically use generic hardware platforms, such as a network server or even personal computers equipped with an Ethernet interface card or SS7 interface cards.

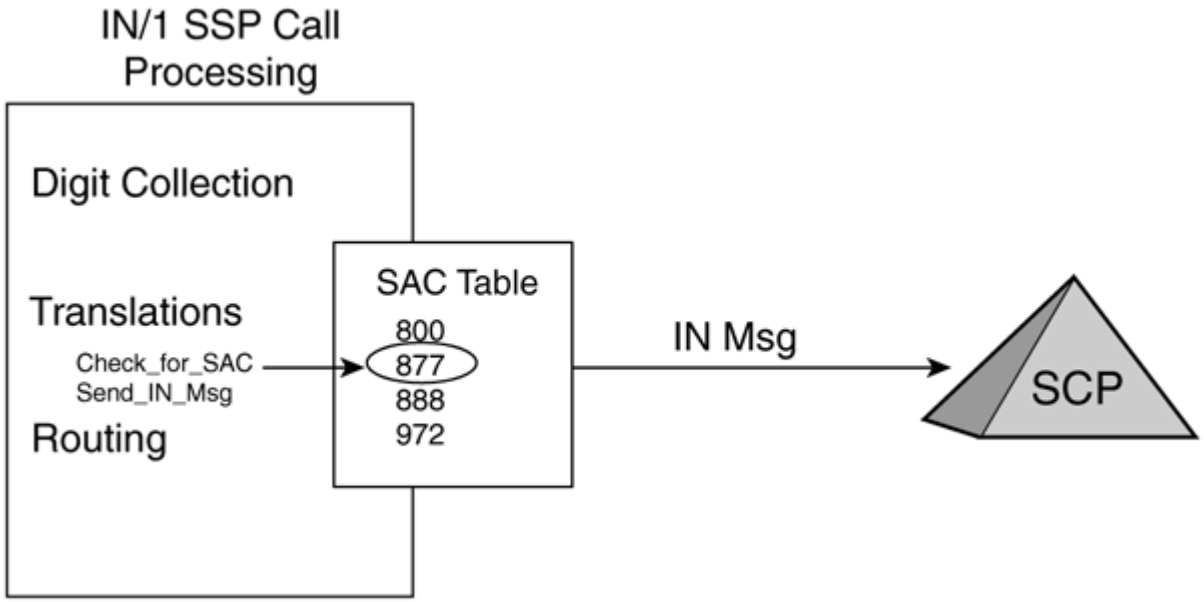
IN Services

- There have been two primary drivers for IN services: regulatory mandates and revenue-generating features.
- LNP is an example of regulatory mandates that have greatly expanded the use of IN.
- Time Of Day (TOD) Routing, and Private Virtual (PVN) Networking provide solutions for everyday business needs are revenue generating services providers.
- In Europe, Intelligent Network Application Part (INAP), developed by the ETSI standards body, interfaces with ITU TCAP for delivering IN information between nodes.
- In North America, IN/1 and AIN, developed by Telcordia, interface with ANSI TCAP to deliver the equivalent information.



IN/1

- IN/1 was only used for a small number of services such as:
  - Enhanced 800 (E800)
  - Automatic Calling Card Service (ACCS)
  - Private Virtual Network (PVN)
  - Placing hooks in the call processing software to trigger queries to the SCP modified the SSP control logic.



AIN

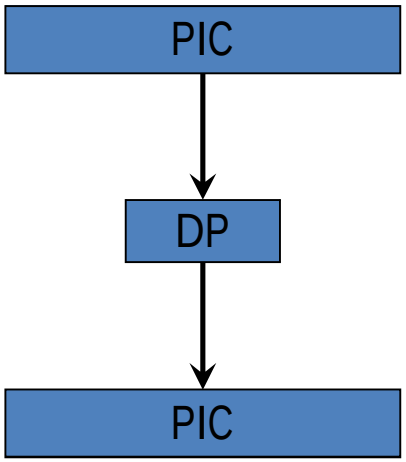
- A part of the evolution of the original IN concept. AIN is a term that is primarily used in North America to describe the evolution of the IN beyond the IN/1 phase.
- AIN defines a Basic Call State Model (**BCSM**), which identifies the various states of call processing and the points at which IN processing can occur, Points In Call (PIC) and Detection Points (DP), respectively.

Detection Point (DP)

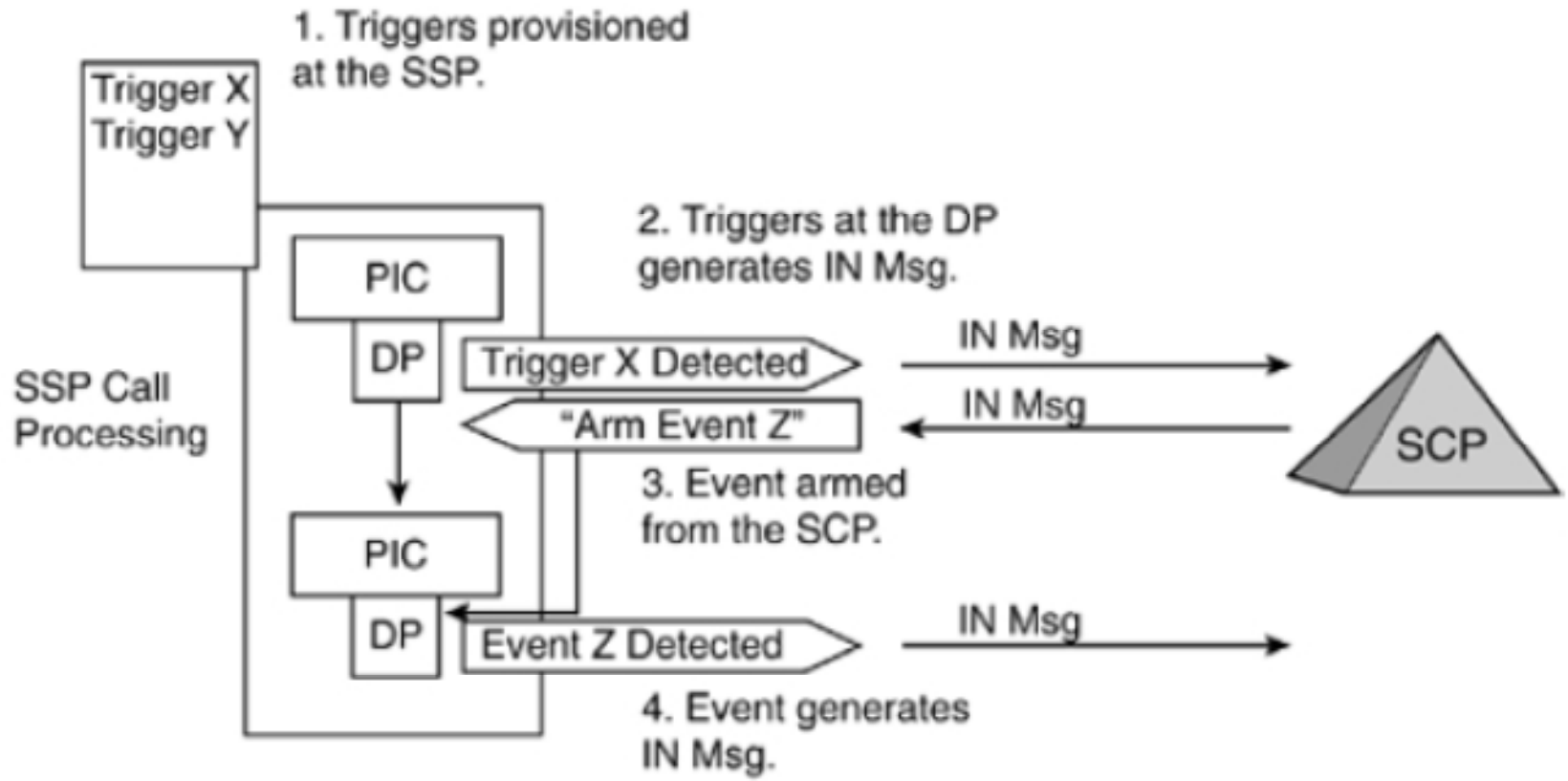
- DPs between the various PICs represent points at which IN processing can occur. The DP detects that the call has reached a particular state,
- DP is a generic term that identifies the insertion point for IN processing. More specifically, each DP is either a Trigger Detection Point (**TDP**) or an Event Detection Point (**EDP**).
- **Trigger Detection Point (TDP):** TDP is a point at which the SSP can set triggers that execute when the TDP is encountered. The trigger represents an invocation point for an IN service. When a trigger has been subscribed for a particular TDP and the TDP is encountered, the SSP software launches a query to the SCP.
- **Event Detection Point (EDP):** An EDP is a point at which the SCP "arms" an event at the SSP. The event is armed to request that the SCP be notified when the particular EDP is reached during call processing. The SCP can then determine how the call should be further directed. For example, the SCP might want to be notified before a user is connected to a "busy" treatment so that a call attempt can be made to another number without the phone user being aware that a busy signal has been encountered.

Detection Point (DP)

- PIC is defined as call processing state.
- A set of entry events define the transitional actions that constitute entering into a PIC.
- Exit events mark the completion of processing by the current PIC.
- Within each PIC, the switch software performs call processing for that stage of the call in the same processing procedure that existed before the introduction of IN.



Detection Point (DP)



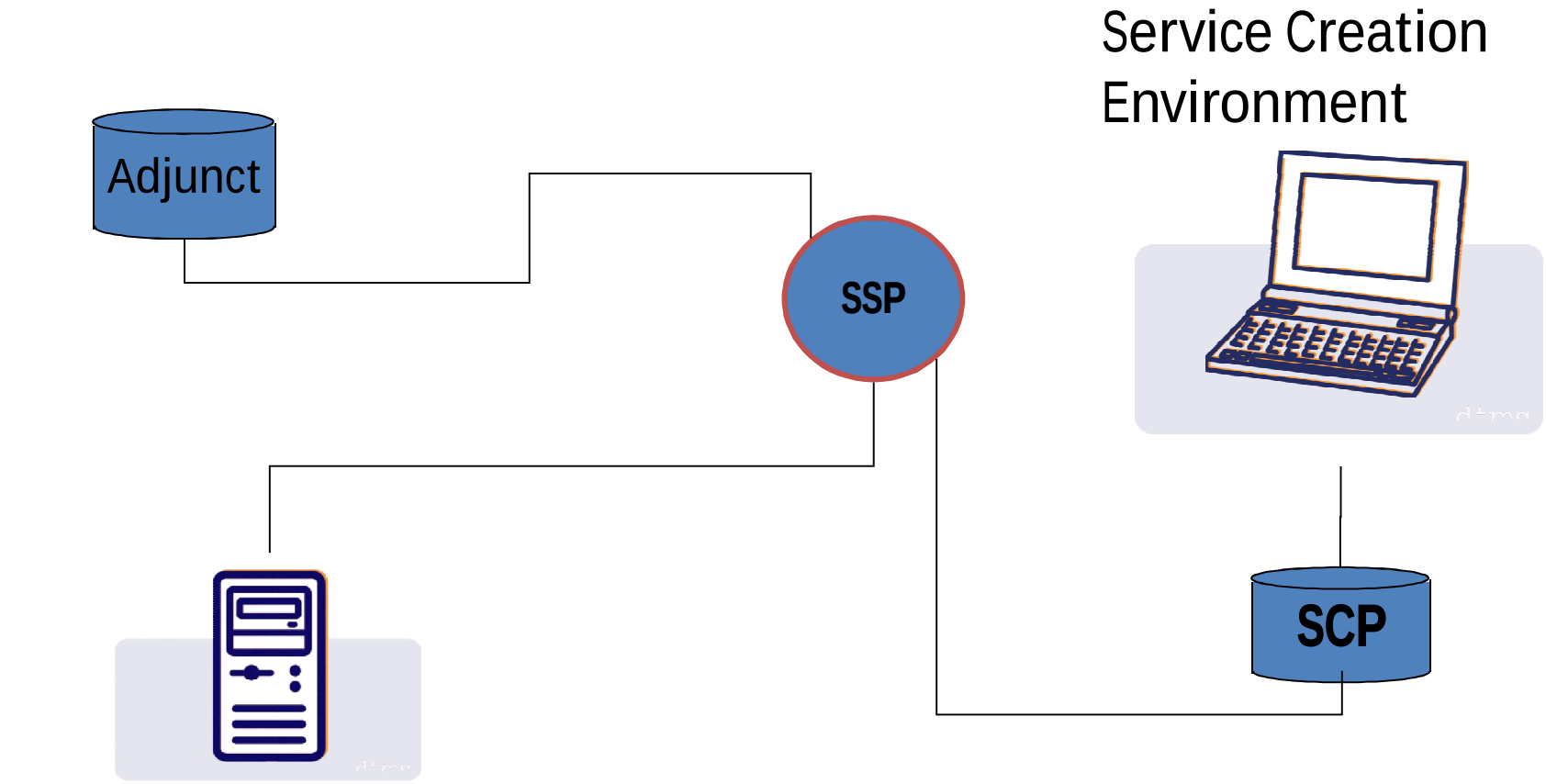
Detection Point (DP)

- Wireline networks have agreed on the IN/AIN triggers for querying databases.
- wireless networks do not necessarily support IN/AIN.
- The industry is looking at IS-41 and GSM protocols for querying the LNP database.
- Both the IS-41 and GSM protocols are being modified to support additional parameters for LNP.
- LNP has required new parameters to the *ISDN User Part* (ISUP).

Network Architecture

- **Service Switching Point (SSP):** The SSP performs basic call processing and provides trigger and event detection points for IN processing.
- **Service Control Point (SCP)/ Adjunct:** The SCP stores service data and executes service logic for incoming messages.
- **Intelligent Peripheral (IP):** The Intelligent Peripheral (IP) provides specialized functions for call processing, including speech recognition, prompting for user information, and playing custom announcements.
- **Service Management System (SMS):** Most of the IN services require the management of a significant amount of data. The SMS generally consists of databases that can communicate with IN nodes to provide initial data loading and updates.
- **Service Creation Environment (SCE):** The SCE allows service providers and third-party vendors to create IN services.

Network Architecture



Intelligent Network Conceptual Model

- The ITU Intelligent Network Conceptual Model (INCM) divides the network into different "planes." Each plane shows a particular view of the components that make up the IN. The model is an abstract representation that provides a common framework for vendors and service providers, thereby giving IN architects and implementers a common terminology base for discussion and allowing the development of modular network components.

Intelligent Network Conceptual Model

- **Service Plane**: Represents a view of the network strictly from the view of the service. The underlying implementation is not visible.
- **Global Functional Plane**: A view of the common building blocks across the network that comprise service functions and how they interact with Basic Call Processing.
- **Distributed Functional Plane**: A view of the Functional Entities (FE) that compose the IN network structure. The DFP is where the collection of SIB implementations represent real actions in the course of processing actual service functions. The formal term used to describe these functions is Functional Entity Actions (FEA). For example, this plane describes BCSM within the CCF.
- **Physical Plane**: Represents the physical view of the equipment and protocols that implement the FE that are described in the DFP.

Intelligent Network Conceptual Model

- **SSP**
  - Call Control Function (CCF): Provides call processing and switch-based feature control. This includes the setup, maintenance, and takedown of calls in the switching matrix and the local features that are associated with those calls.
  - Call Control Agent Function (CCAF): Provides users with access to the network.
  - Service Switching Function (SSF): Provides cross-functional processing between the CCF and SCF, such as the detection of trigger points for IN processing.
- **SCP**
  - Service Control Function (SCF): Directs call processing based on Service Logic Programs.
  - Service Data Function (SDF): Provides service-related customer and network data for access by the SCF during the execution of service logic.

Intelligent Network Conceptual Model

- **SMS**
  - Service Management Function (SMF): Manages the provisioning and deployment of IN services and service-related data.
  - Service Management Access Function (SMAF): Provides the interface for accessing the SMF.
- **SCE**
  - Service Creation Environment Function (SCEF): Provides for the creation and validation of new services. Generates the logic used by the SCF.
- **IP**
  - Specialized Resource Function (SRF): Provides resources for end-user interactions, such as recorded announcements and user input via keypads, voice recognition, and so forth.

Private Virtual Network (PVN)

- The PVN is a service that uses public network facilities to create a private network.
- An organization with geographically separate locations can share an abbreviated dialing plan using IN to translate the dialed numbers into network-routable addresses. From the user's perspective, it appears that they are on a private network.
- To determine the call's routing address, the SSP that serves the originating access queries an SCP using the called number, ANI, and other information. An IN response is returned to the SSP with the new routing address and call processing is resumed.

Private Virtual Network (PVN)