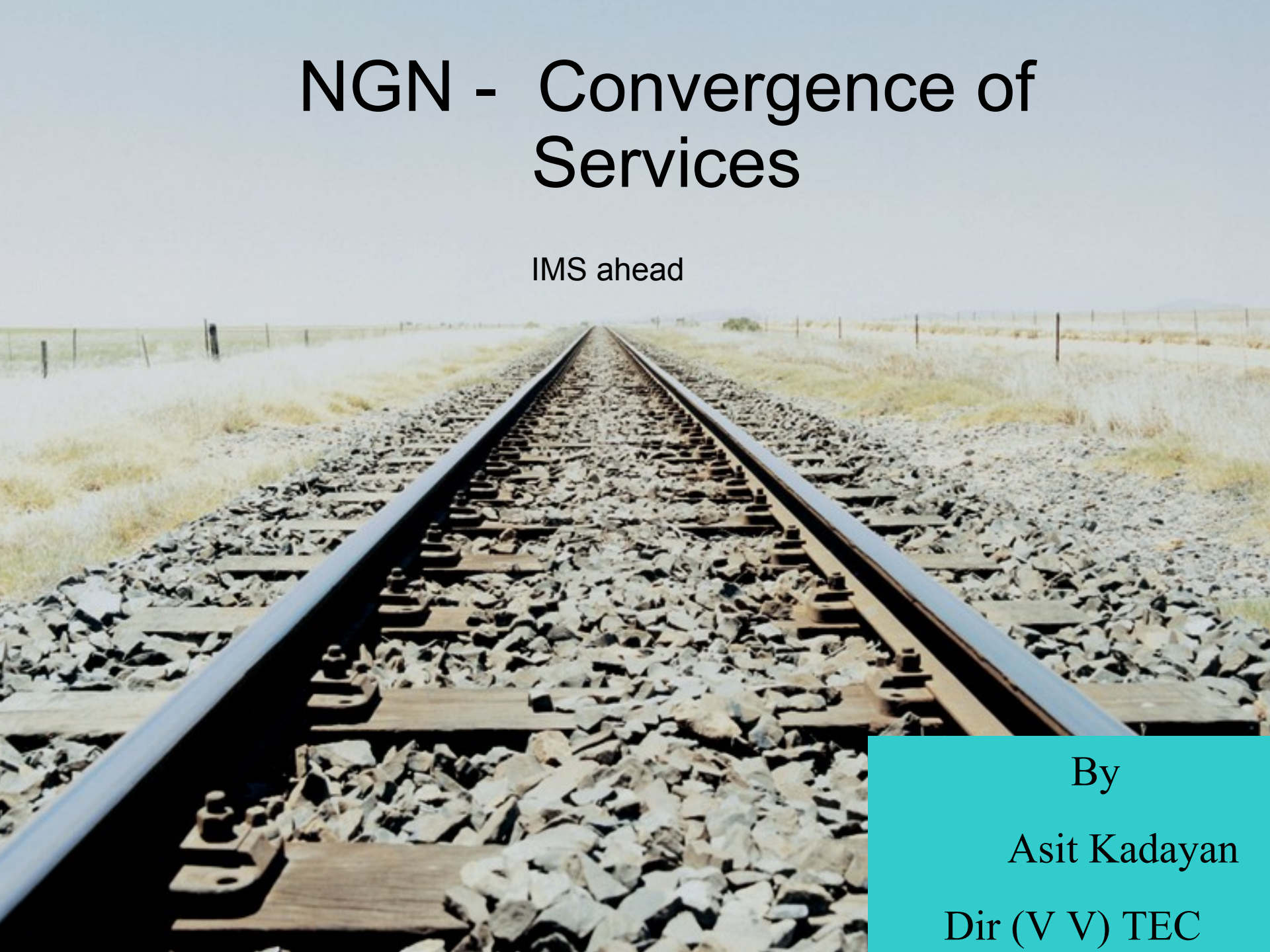
NGN - Convergence of Services

IMS ahead



By

Asit Kadayan

Dir (V V) TEC

Standardization landscape

Application Enablers
Interoperability testing

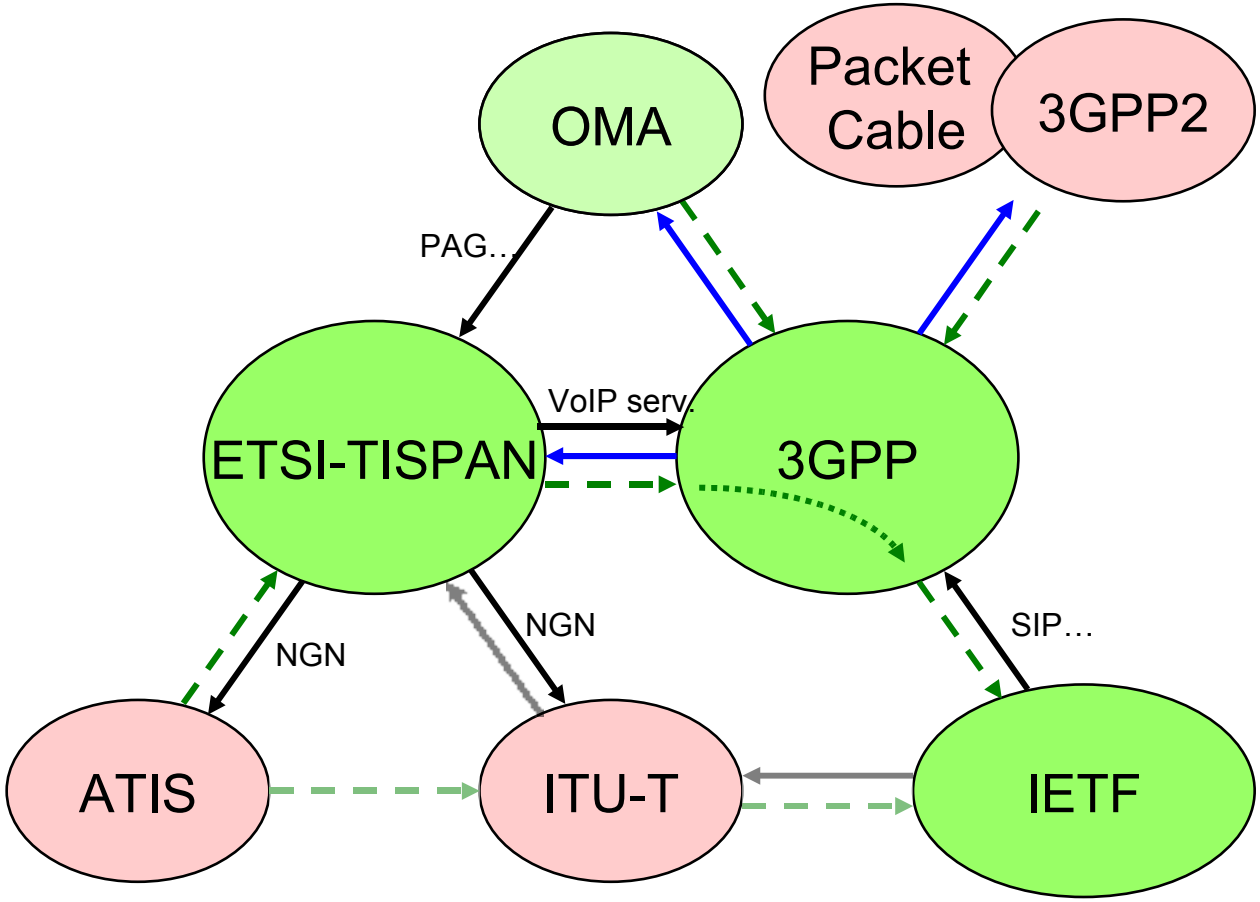
Next Generation
Network for wireline
services

Define IMS architecture
Select protocols to use
Define Radio interface

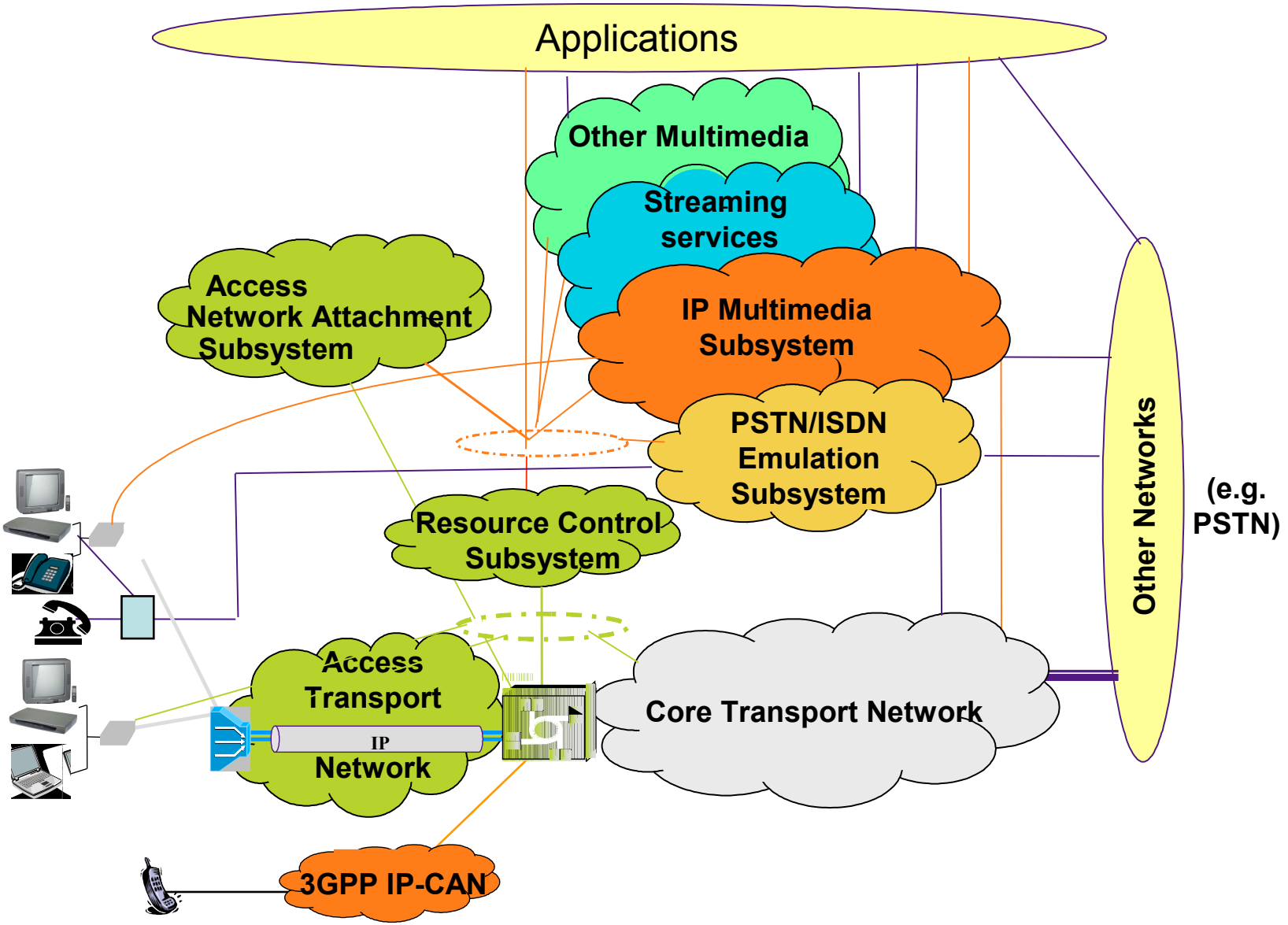
Specify protocols,
e.g. IPv6, SIP, XDMS,
DIAMETER, …

Referencing the
outcome from
3GPPs and ETSI

IMS standardization interactions



NGN Architectural Concept



Fundamentals

- Advanced Multimedia Services
  - converged fixed/mobile services
  - based on 3GPP IMS
- Fixed Line Access

- Support for PSTN/ISDN Replacement
  - existing customers unaffected
- Extensible
  - for future services

Services

- ALL 3GPP IMS Services
- Plus
  - Emergency calling (112 etc.)
    - for all terminals/users
  - Existing PSTN/ISDN services
    - for legacy only
  - Interoperability with 3GPP IMS
  - Interworking to PSTN/ISDN
    - both TDM and replacement scenario
  - Future Services e.g. streaming (RTSP)
    - e.g. Video on Demand, broadcast services

Requirements Overview

- All 3GPP IMS services;
  - extended/adapted for fixed-line terminals;
- Conversational and non conversational services;
- Support for existing PSTN/ISDN terminals;
  - partial or wholesale replacement of existing core infrastructure;
- Regulatory Requirements
  - e.g. Emergency calling from any access;
- Interworking at the NNI;
- Mobility: nomadicity of users and devices;

Requirements Overview

- Secure and trustworthy environment;
- Support for a wide range of QoS-enabled services;
- Managed network
  - high availability;
- Flexible framework
  - service innovation & standardisation minimal;
- Third party service provider support;
- Flexibility
  - to support an ever-increasing variety of terminals with diverse capabilities.

Mobility

- User Mobility
  - **Moving to different physical locations and using a terminal**
  - **Requires unique identity**
- Terminal Mobility
  - **the ability to move to different physical locations and provide the user with their services**
- Authentication
  - **User Authentication (by core) for services**
    - **Identification of user**
  - **Terminal Authentication (by access network) for connectivity**
    - **Device capabilities**

PSTN/ISDN Service Re-use

(PSTN/ISDN Simulation)

- NGN Customers
  - Existing (similar) services
    - divert, voice mailbox, “CLI” etc.
  - Not Identical to PSTN
  - Different invocation/ergonomics
    - To take advantage of new network and terminal capabilities
- True PSTN/ISDN Services
  - Not available, but interworked.

Services & Requirements

- Service Sets
  - IP Multimedia Services (from 3GPP IMS)
  - PSTN/ISDN Emulation
  - Streaming Services
  - Other Multimedia Services
- Requirements
  - Network Attachment & Authentication
  - Resource Control
  - Transport
  - Interconnect

JRG on NGN

- ITU-T SG 13 launched JRG-NGN at 1st August 2003 : 3 Meetings
- Joint Special Rapporteur Group Activity within SG 13
- Focus on "Foundational Documentation of NGN" until June. 2004

Draft Recommendations in AAP

Y.NGN-Overview (Y.2001)	Overview of the NGN
Y.NGN-GRM (Y.2011)	General principles and general reference model for NGN

Deliverables for further study

Deliverables	Title
Y.NGN-GRQ	General requirements for NGN
Y.NGN- FRM	Functional requirements and architecture of the NGN
Y.NGN-CONV	Next Generation Networks – Convergence scenarios
Y.NGN-MOB	Mobility management requirements and architecture for NGN
Y.NGN-CMIP	Customer manageable IP network
Y.NGN-MIG	Migration of networks to NGN
Y.PSTN-NGN	PSTN migration to NGN

JRG on NGN

Deliverables on QoS for further study

Deliverables	Title
Y.NGN-QoS	General aspects of QoS and network performance in the NGN
Y.e2eqos.1	Requirements and framework for end-to-end QoS architecture for NGN
Y.e2eqos.2	An end-to-end QoS architecture based on centralized resource control for IP networks supporting NGN services
Y.123.qos	A QOS ARCHITECTURE FOR ETHERNET-BASED IP ACCESS NETWORK
Y.ipaqos	A QoS Framework for IP based access networks
Y.NGN-NHNperf	Network performance of hybrid networks in NGN

NGN Focus Group

- ITU-T Director launched NGN Focus Group at June 2004
- Almost every two month meeting : 6, 7, 9, 11/2004 and 2, 4, 6/2005

- Functional & Nomadicity Architecture (base on IMS & non-IMS)
- QoS (include the xDSL Access)
- Security Capability (inc. Authentication)
- NGN Control and Signaling Capability
- Evolution from CGN to NGN

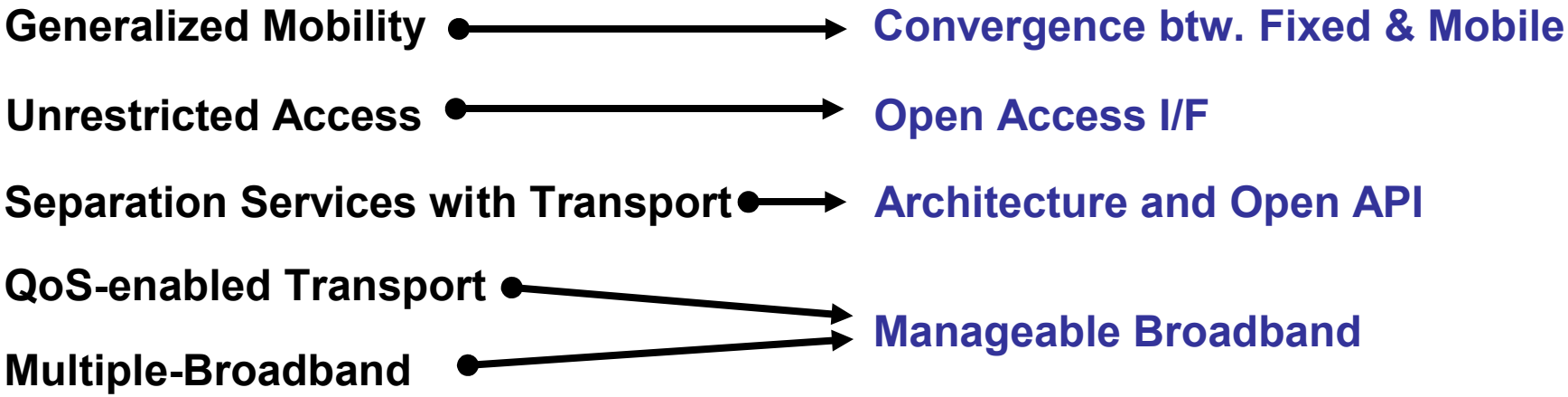
WG	Area	Deliverables
WG 1	SR (Service Requirements)	NGN Scope, Releases 1 / General Requirements, Servie and Capability, Mobility Services and Capabilities
WG 2	FAM (Functional Architecture, and Mobility)	Req. and Architecture, Functional Req. for NGN Mobility, Functional Req. for Soft Router
WG 3	QoS (Quality of Services)	TR-123.qos, TR-msnniqos, TR-NGN.qos, TR-NGN.NHNperf, TR-e2eqos.1, TR-enet, TR-atmipa, TR-racs, TR-ipaqos
WG 4	CSC (Control & Signalling)	TRQ.IP QoS.SIG.CS1
WG 5	SeC (Security Capability)	NGN Security Framework
WG 6	Evol (Evolution)	Evolution of Networks to NGN, PSTN evolution to NGN
WG7	FPBN (Future Packet-based Network)	Future Packet Network requirements

Definition & Features of NGN

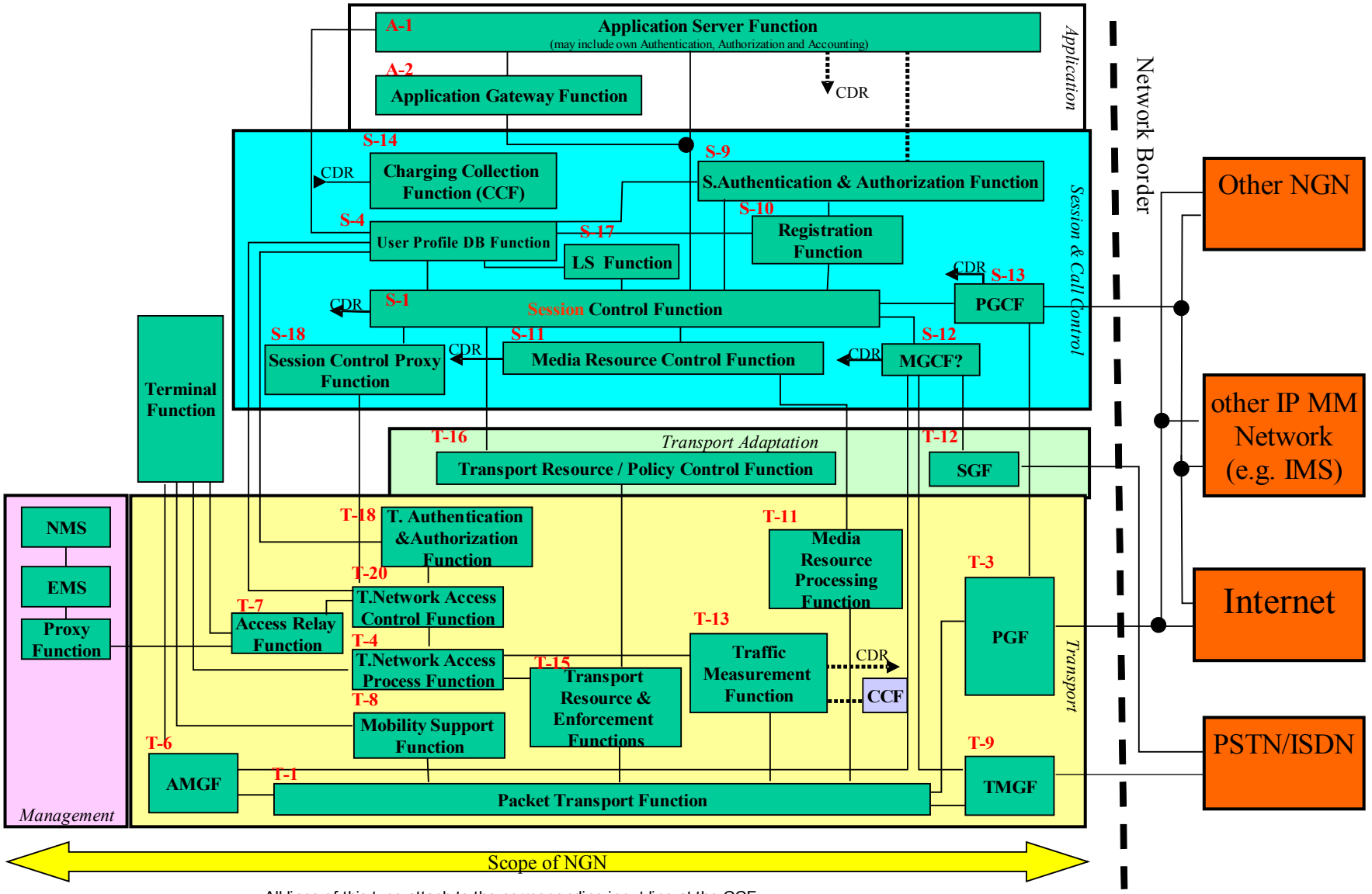
Definition of NGN (Draft Rec. Y.2001)

A NGN is a packet-based network able to provide telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It offers unrestricted access by users to different service providers. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.

Target Standards Area

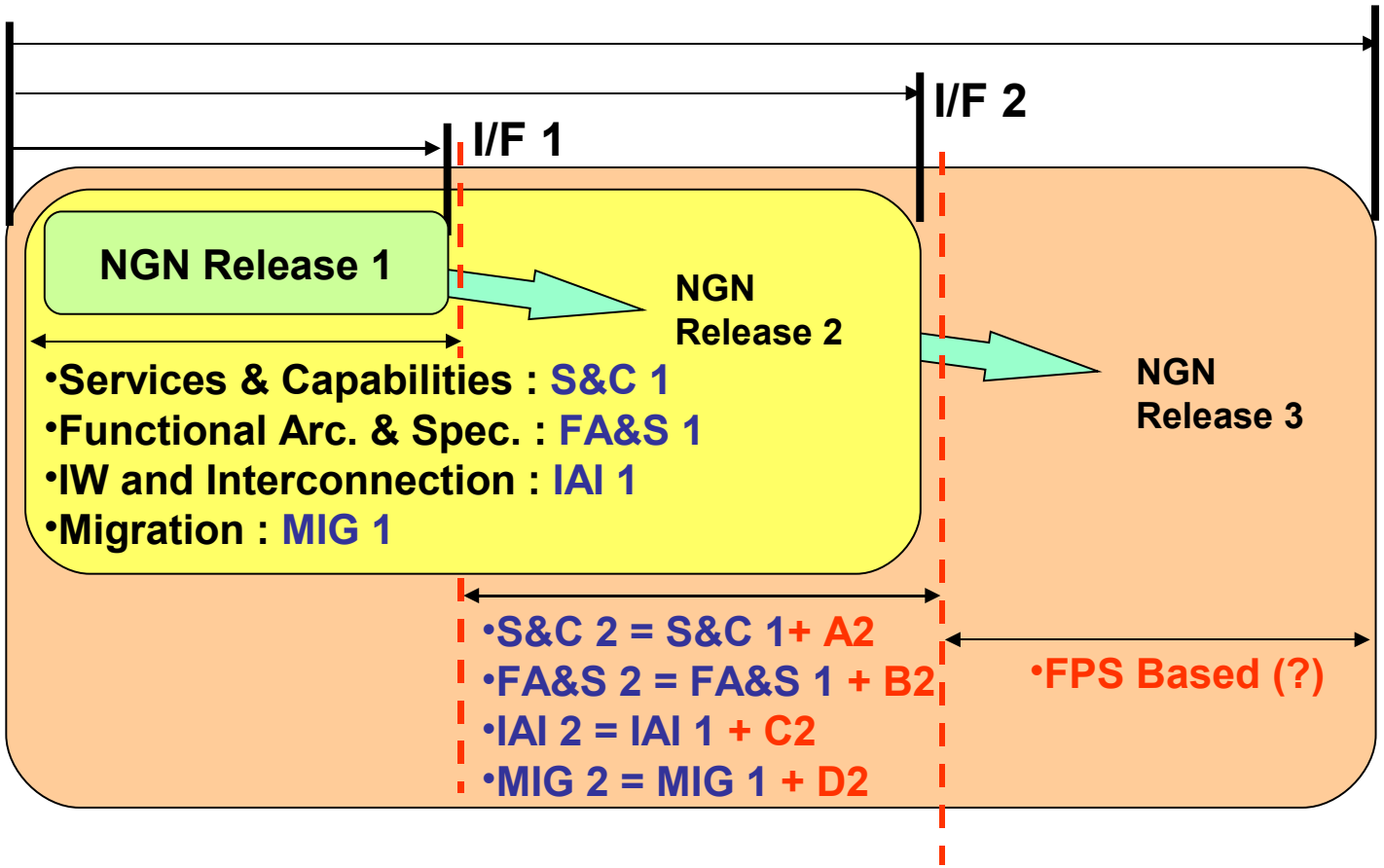


Functional Architecture Model



Development of NGN Releases

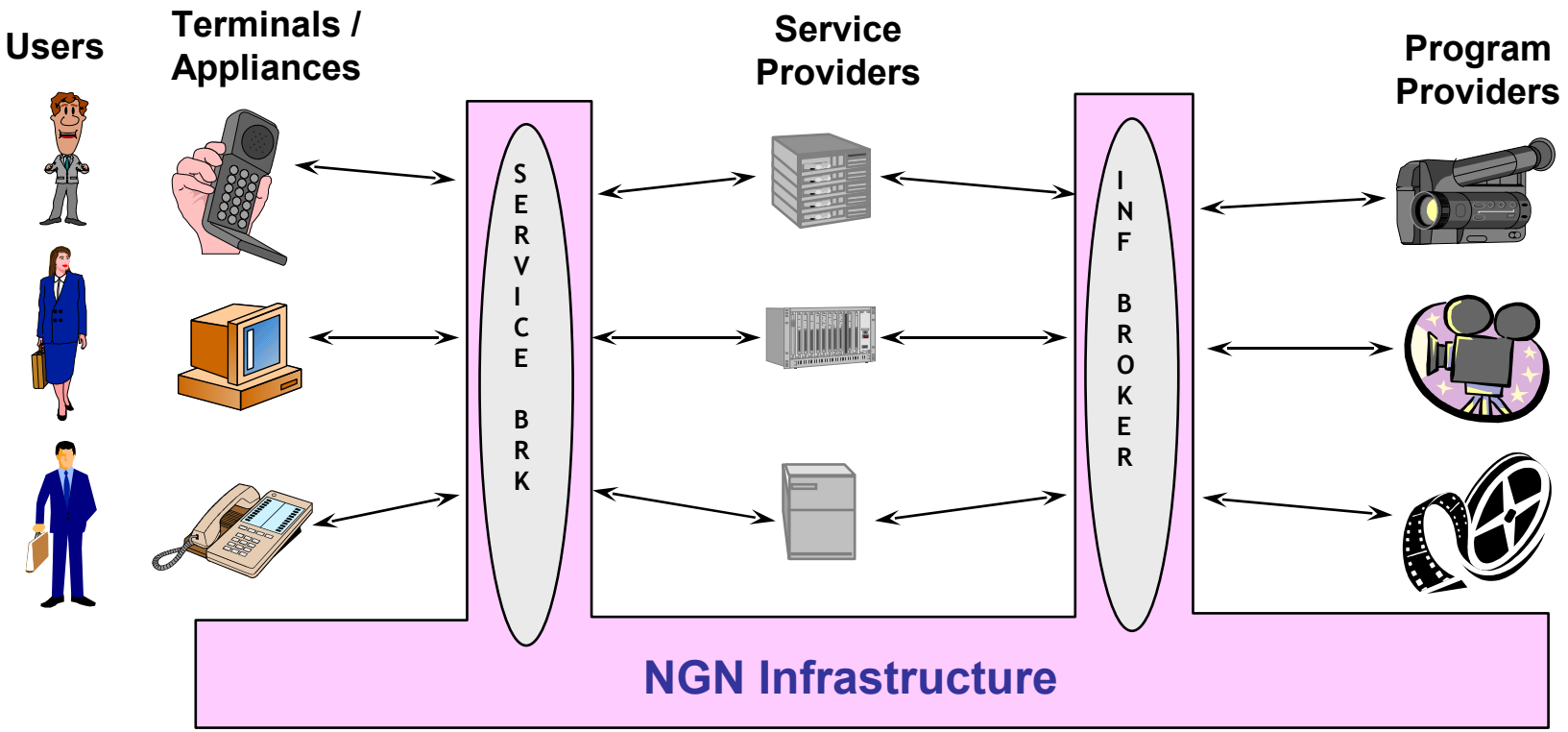
- Services and Capabilities (include Network and Control Capability)
- Architecture and their components
- Specifications for Interfaces, etc.



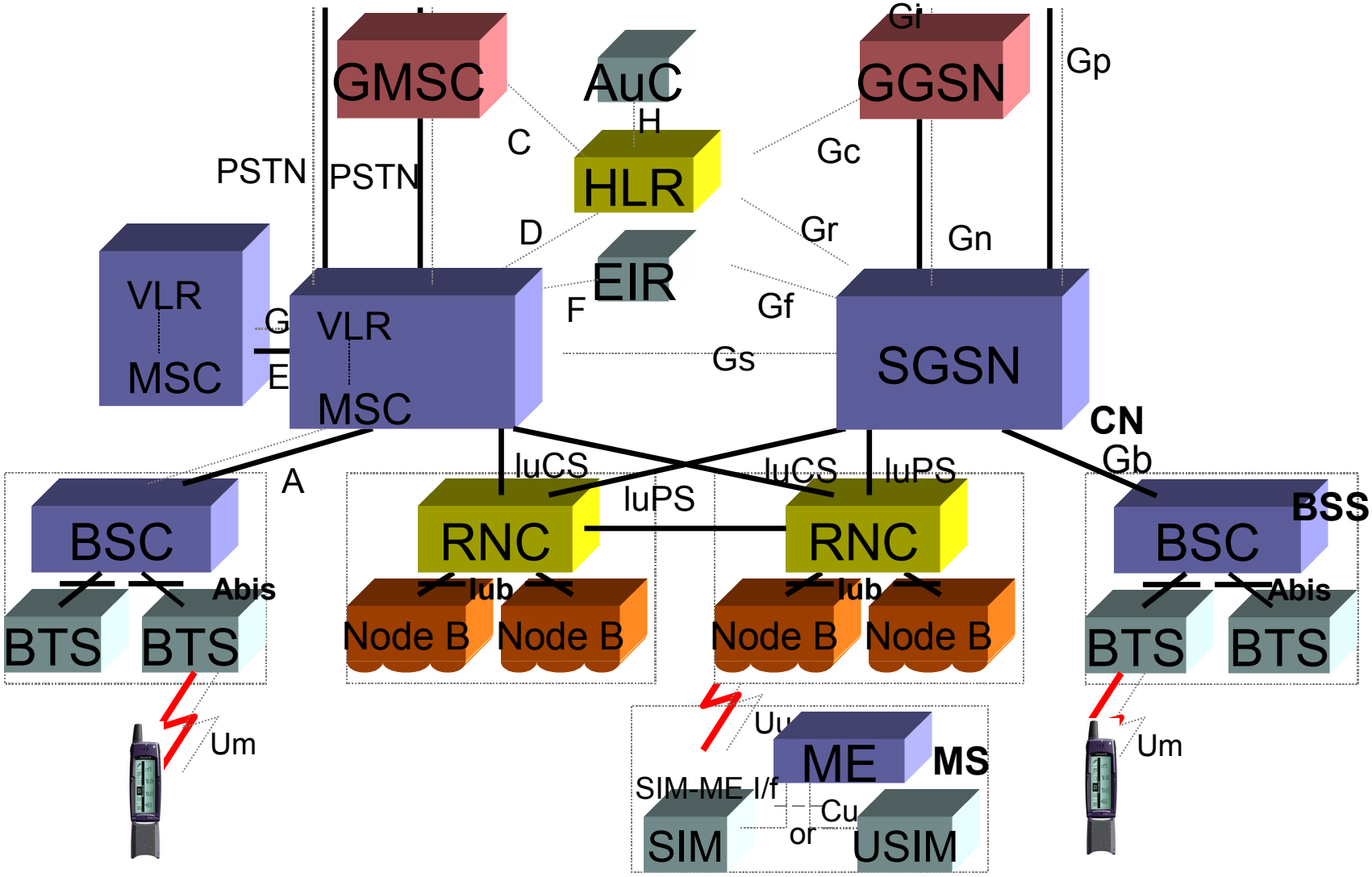
Simplified Realization Model of NGN

- Content-based Delivery Network Infrastructure
- Service Broker Infrastructure
- Information Broker Infrastructure

Convergence
Integration
Mobility (Uniq. ID)

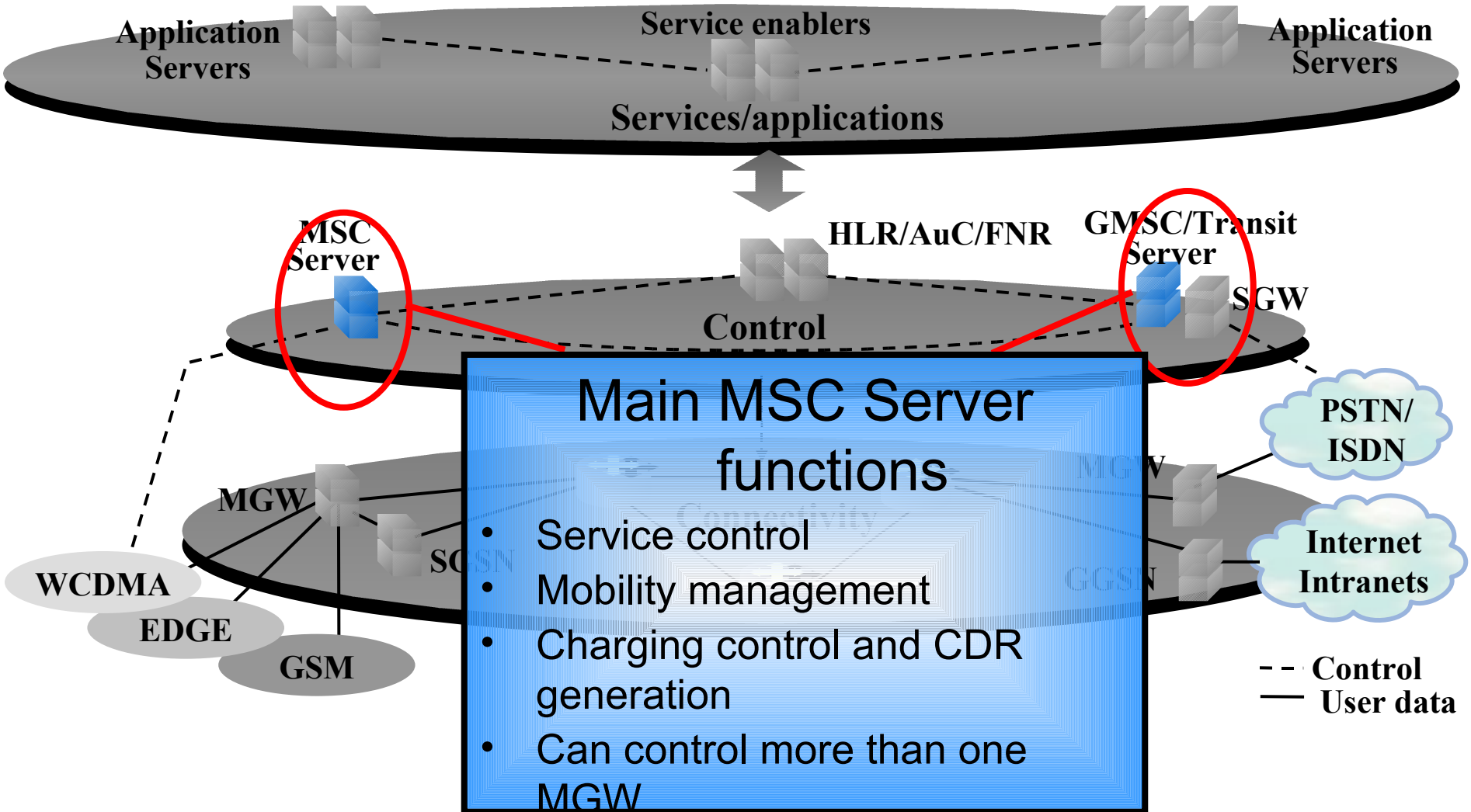


UMTS Architecture - R99



MSC/GMSC Server.

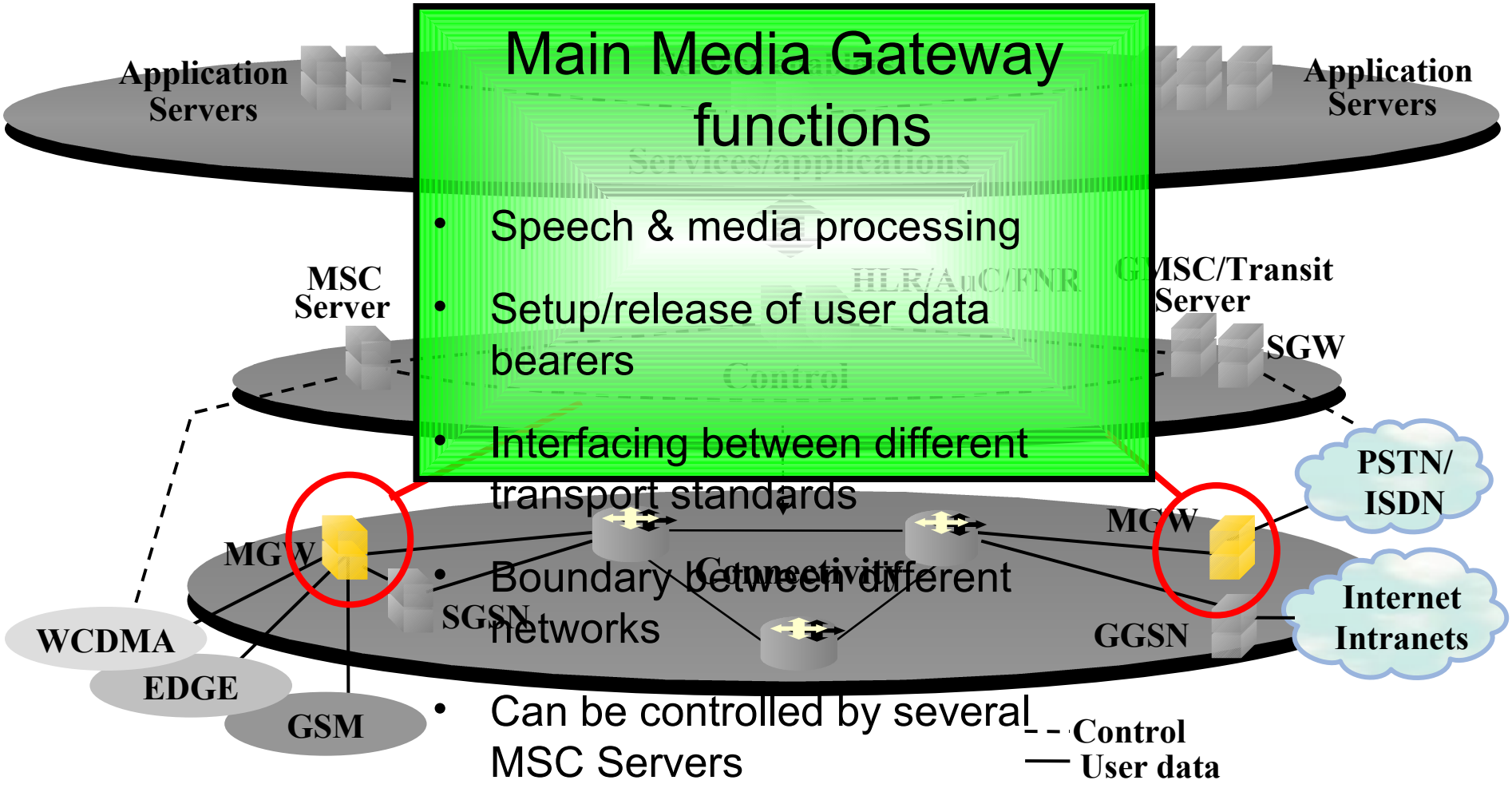
WCDMA Core



Main MSC Server functions

- Service control
- Mobility management
- Charging control and CDR generation
- Can control more than one MGW

Media Gateway:



Main Media Gateway functions

- Speech & media processing
- Setup/release of user data bearers
- Interfacing between different transport standards
- Boundary between different networks
- Can be controlled by several MSC Servers

Introduction of IMS

- IMS introduced in 3GPP Rel5, and further enhanced in Rel6:
- IP Multimedia domain for call control based on SIP
- 3GPP specifies features to fulfil operator requirements, e.g.:
- QoScontrol
- Charging
- Security
- Subscription profiles
- Interworkingwith other networks (CS/PSTN)
- IMS provides building blocks allowing faster integration and deployment of IP multimedia services

Introduction of IMS

- IMS provides an open, standard, and efficient multi-media service delivery mechanism, which is controllable and chargeable and manageable.
- IMS provides an open, access-independent, standard session control architecture to support multi-media services.

The Objectives IMS

- Providing a standardized multimedia solution on top of the IP bearer
- 3G networks
- Wireline broadband access
- WLAN
- Be regarded as the generic service enabler for future IP multimedia applications
- Presence
- Messaging
- Location management
- Group management
- …

IMS Releases

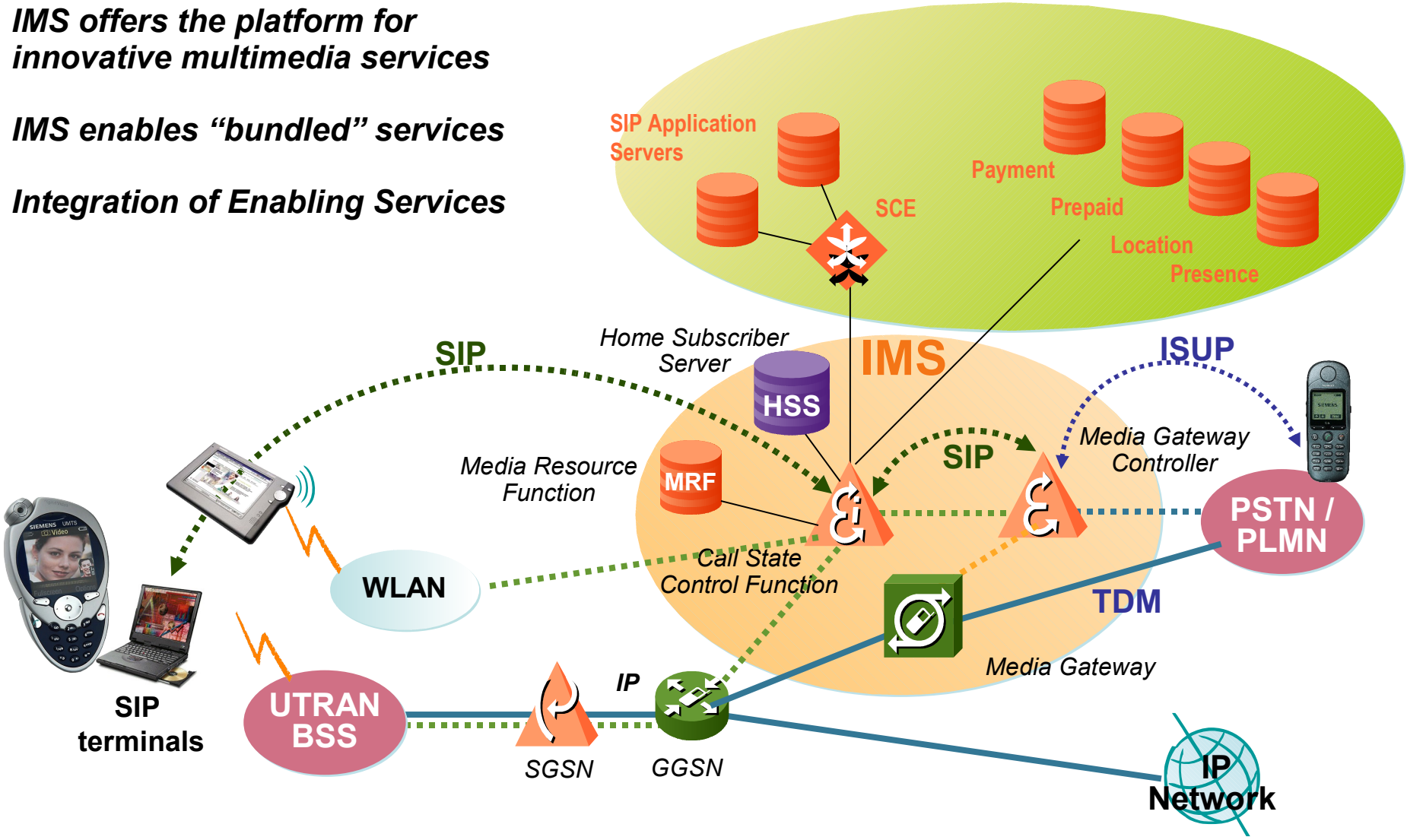
- IMS Releases
- Release 5 specifies the bases of IMS
- Release 6 is a more complete solution:
- more service enablers available
- Inter-working with CS, IP networks…
- IP-CAN
- Resource reservation
- Group management
- Inter-working between IPv4 and IPv6
- Emergency session
- GUP
- …
- Release 7 is under definition (All IP,…)

IMS Infrastructure Architecture

IMS offers the platform for innovative multimedia services

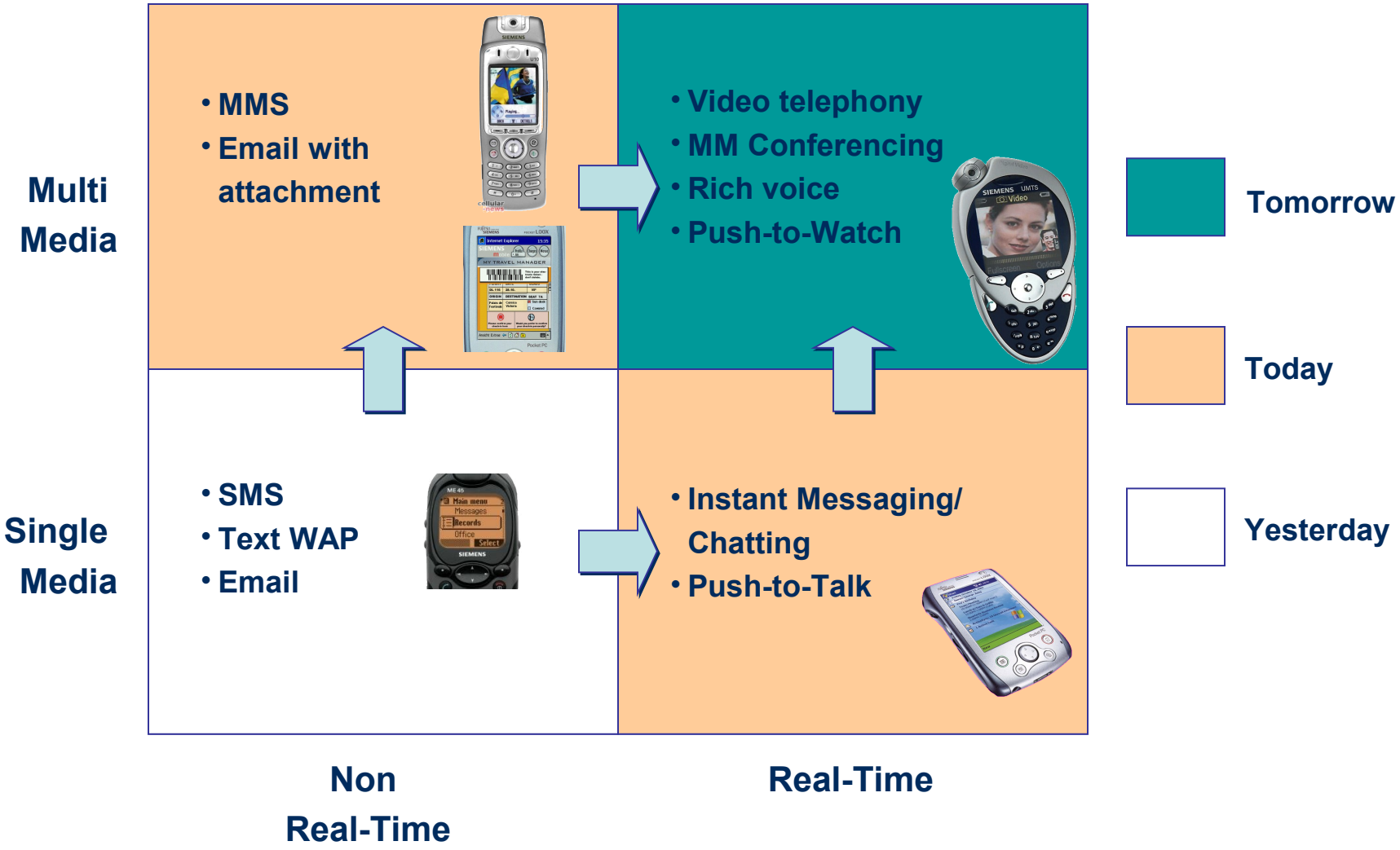
IMS enables "bundled" services

Integration of Enabling Services



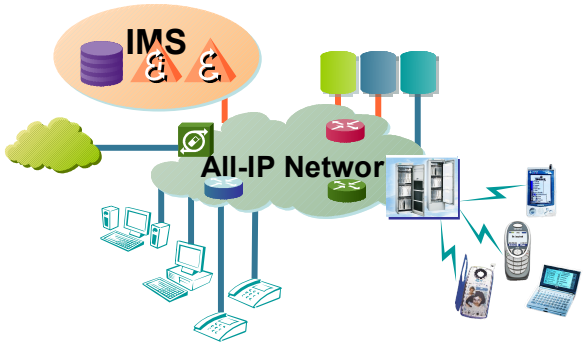
IMS Challenge 1

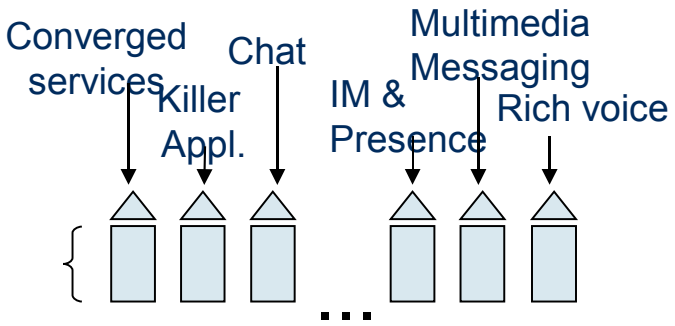
Easy provision of integrated multimedia services

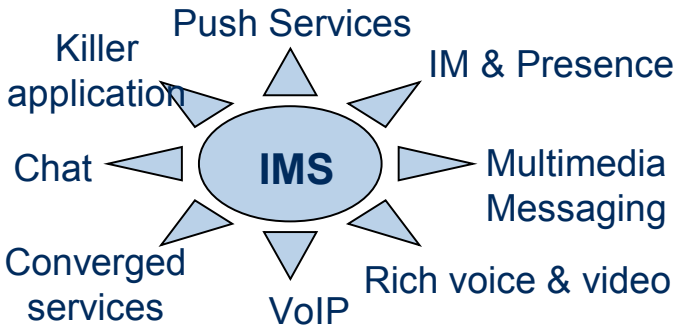


IMS Challenge 2

Optimize synergies and interworking of all types of services





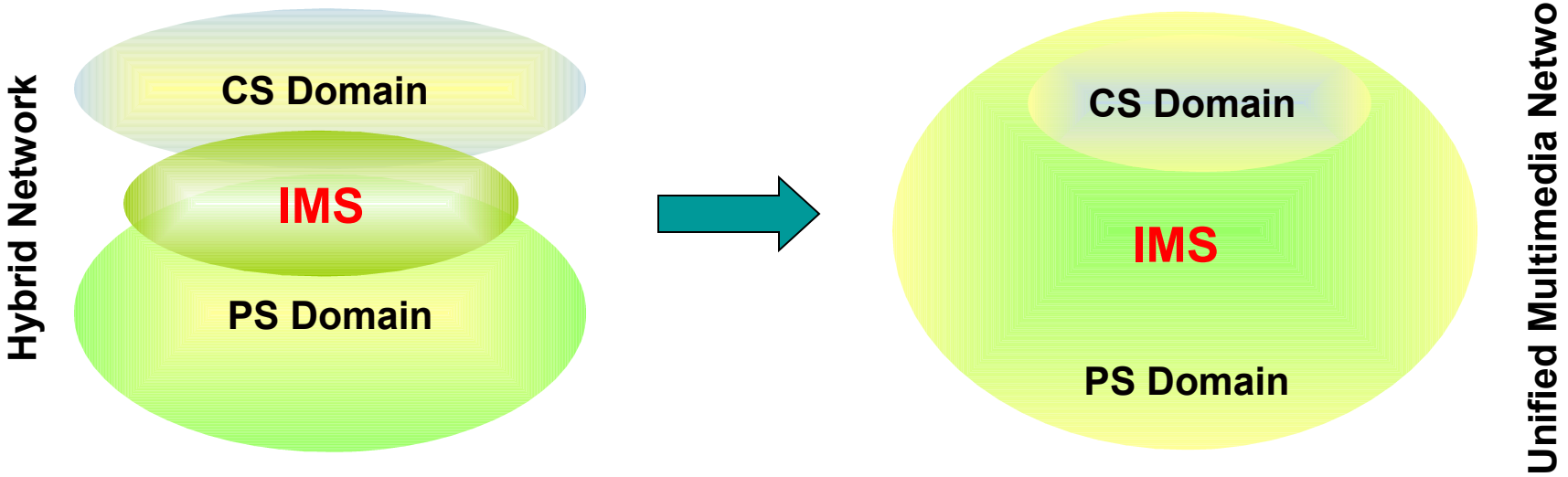


- Provide standardized control layer for real-time&non-real-time multimedia sessions
- Avoid repeated integration of new services without any synergy
- Improve efficiency of service deployment **In the IMS service applications are effectively separated from the underlying network technology (separation of control and user planes), making service development and deployment easy, fast and cost effective**
- Stay access independent **(support of RAN, WLAN, xDSL, ...)**

IMS Challenge 3

Pave ground for evolution towards an All-IP Network

- Todays hybrid networks will converge to unified multimedia networks
- IMS is the first step and will be central part of an All-IP network



IP Multimedia Subsystem (IMS)

- The ability to deliver person-to-person real-time IP-based multimedia communications (e.g. voice, video, etc.)
- The ability to fully integrate real-time with non-real-time and person-to-machine communications
- The ability for different services and applications to interact
- The ability for the user to very easily set up multiple services in single session or multiple simultaneous synchronised sessions
- The ability to support individual users as well as entire communities

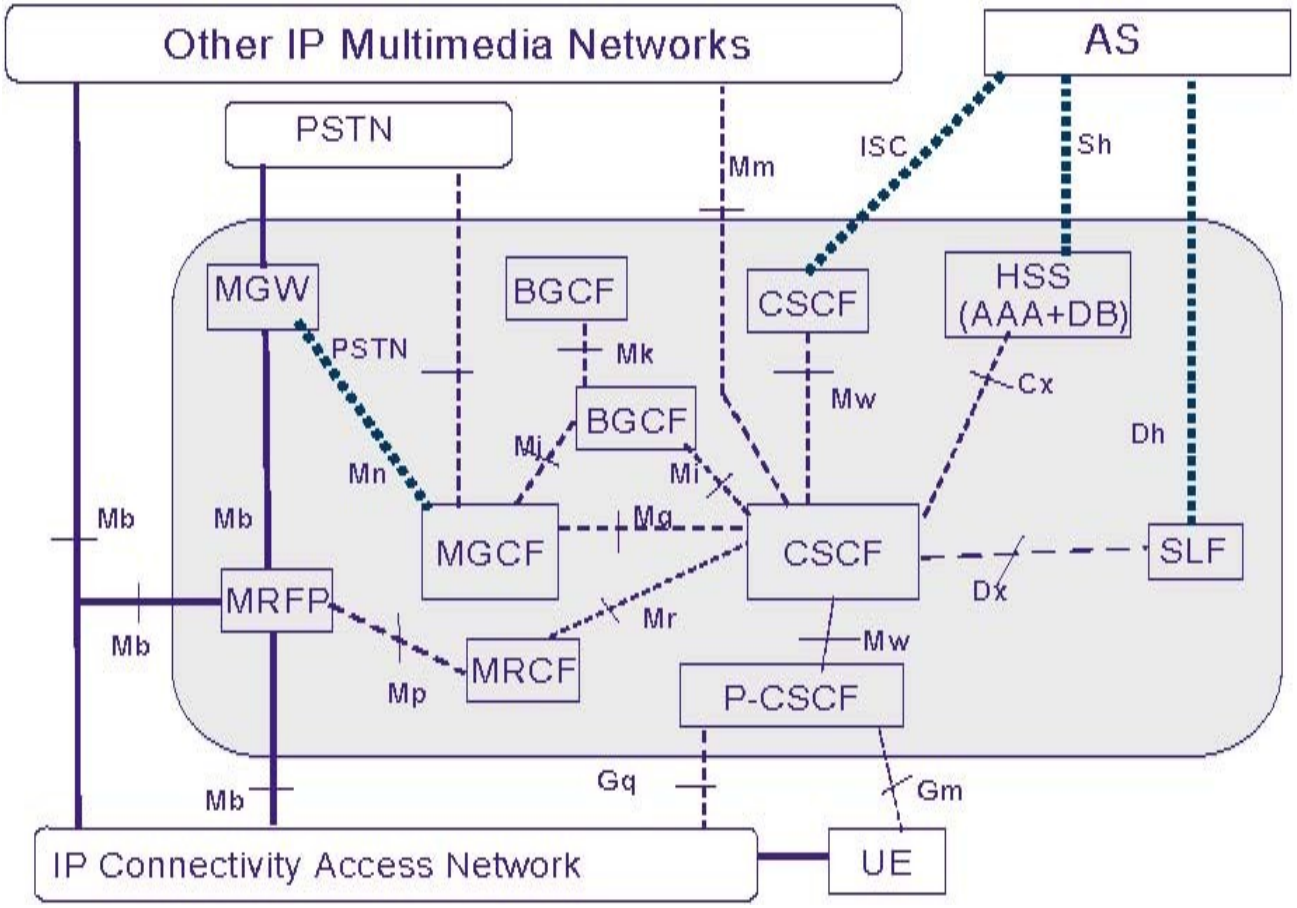
Highlights of IMS

- Built on IETF Protocols
- SIP: SIP as the singleCall ControlProtocol for IP Multimedia Services
- Diameter: AAA protocol
- XML: User Profile protocol
- COPS, …
- the home network controls the services for a roaming user
- S-CSCF is the only service triggering point
- Visit network can also provide local service to a roaming user
- Access Independence
- the IMS is designed independent of the underlying IP connectivity network
- specifications re-used by 3GPP2 for CDMA2000 systems
- access via WLAN will be defined

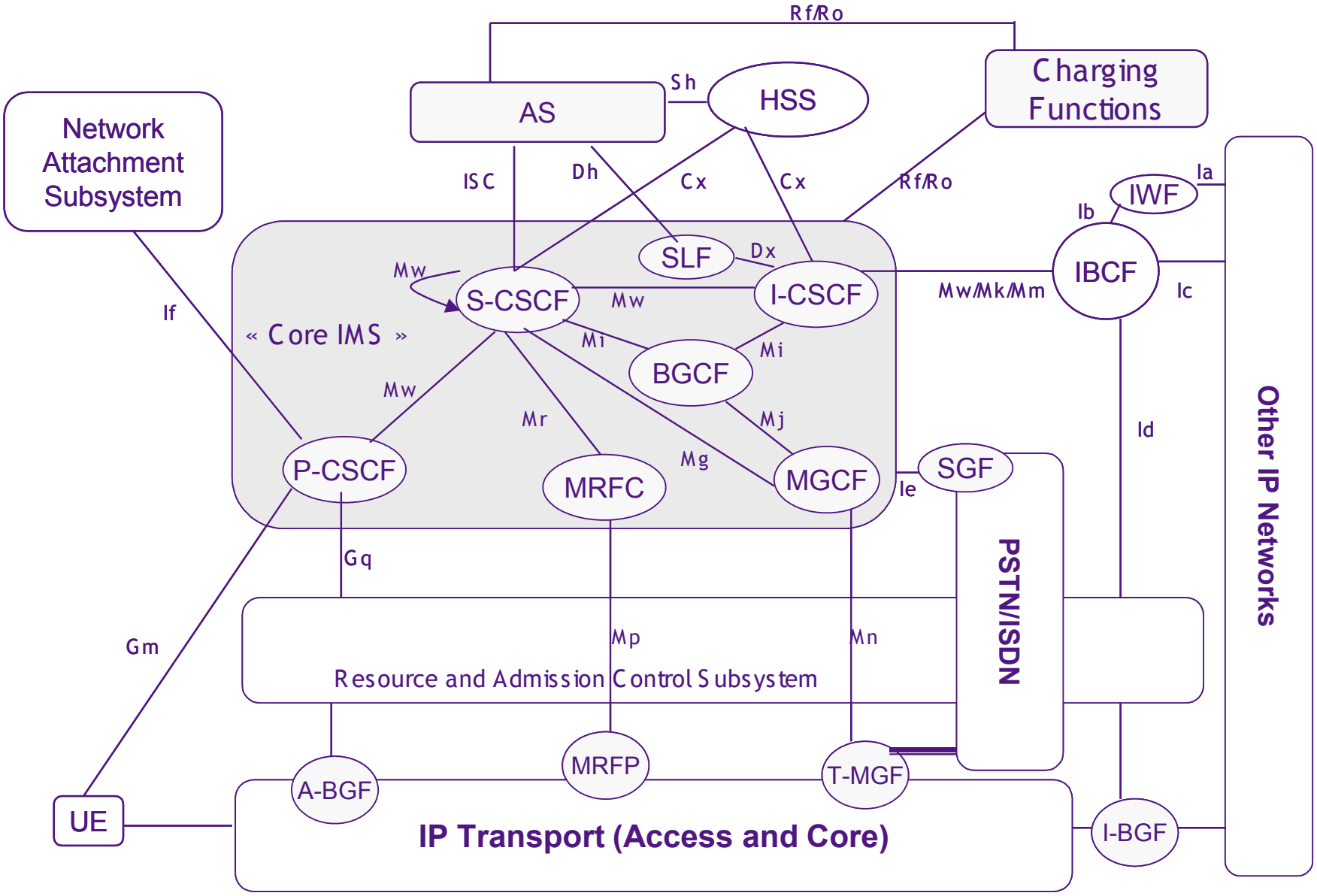
Highlights of IMS

- Open and standard Interface
- Increase the service capabilities
- Simplified network architecture
- Unified User data management
- S-CSCF dynamic allocation
- Increase network reliability and flexibility
- Enhanced Charging functions
- Online charging and Offline charging
- Enhanced Security
- Integrated security framework, based on IPSec and AKA
- QoS
- Resource reservation

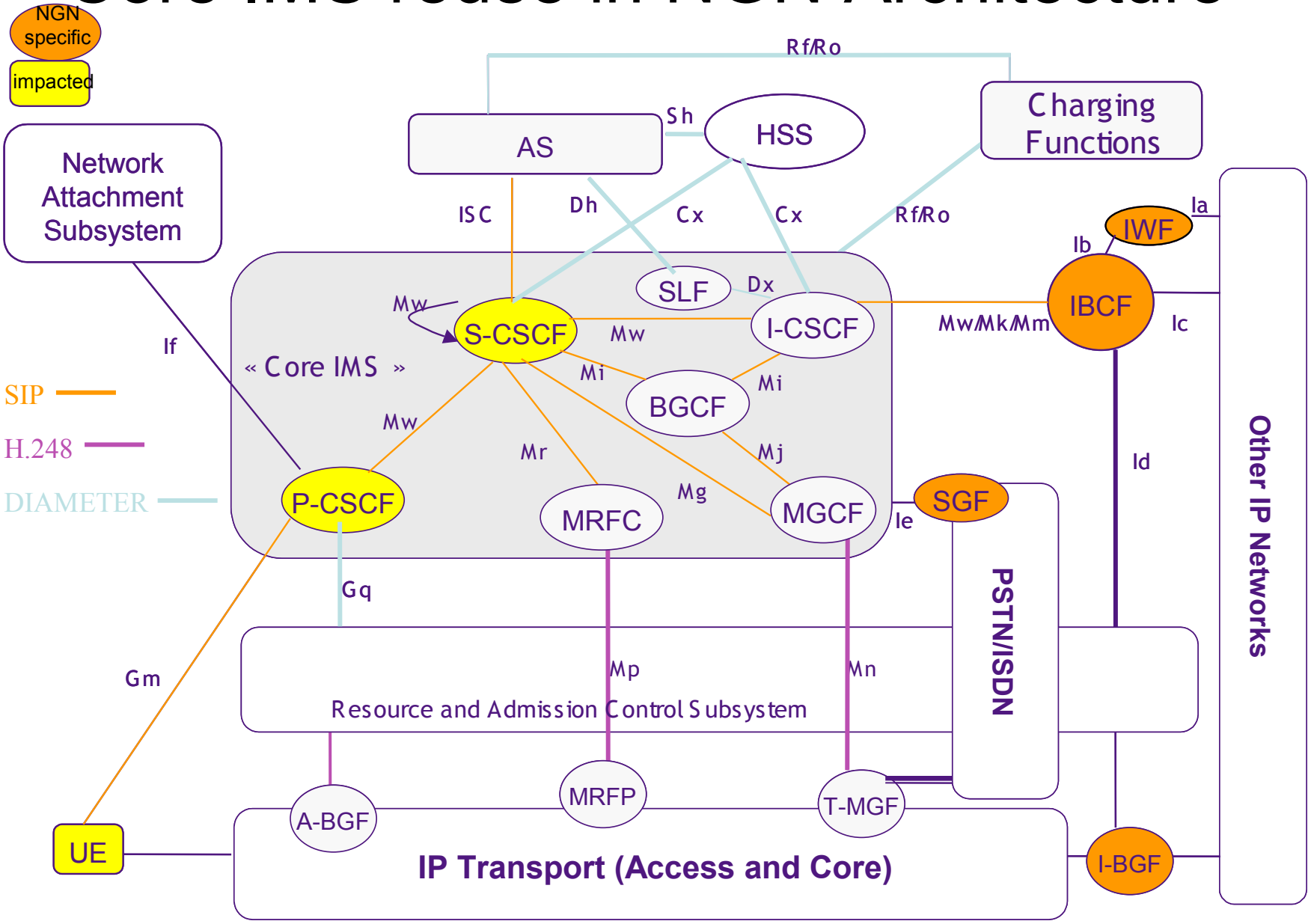
IMS Architecture



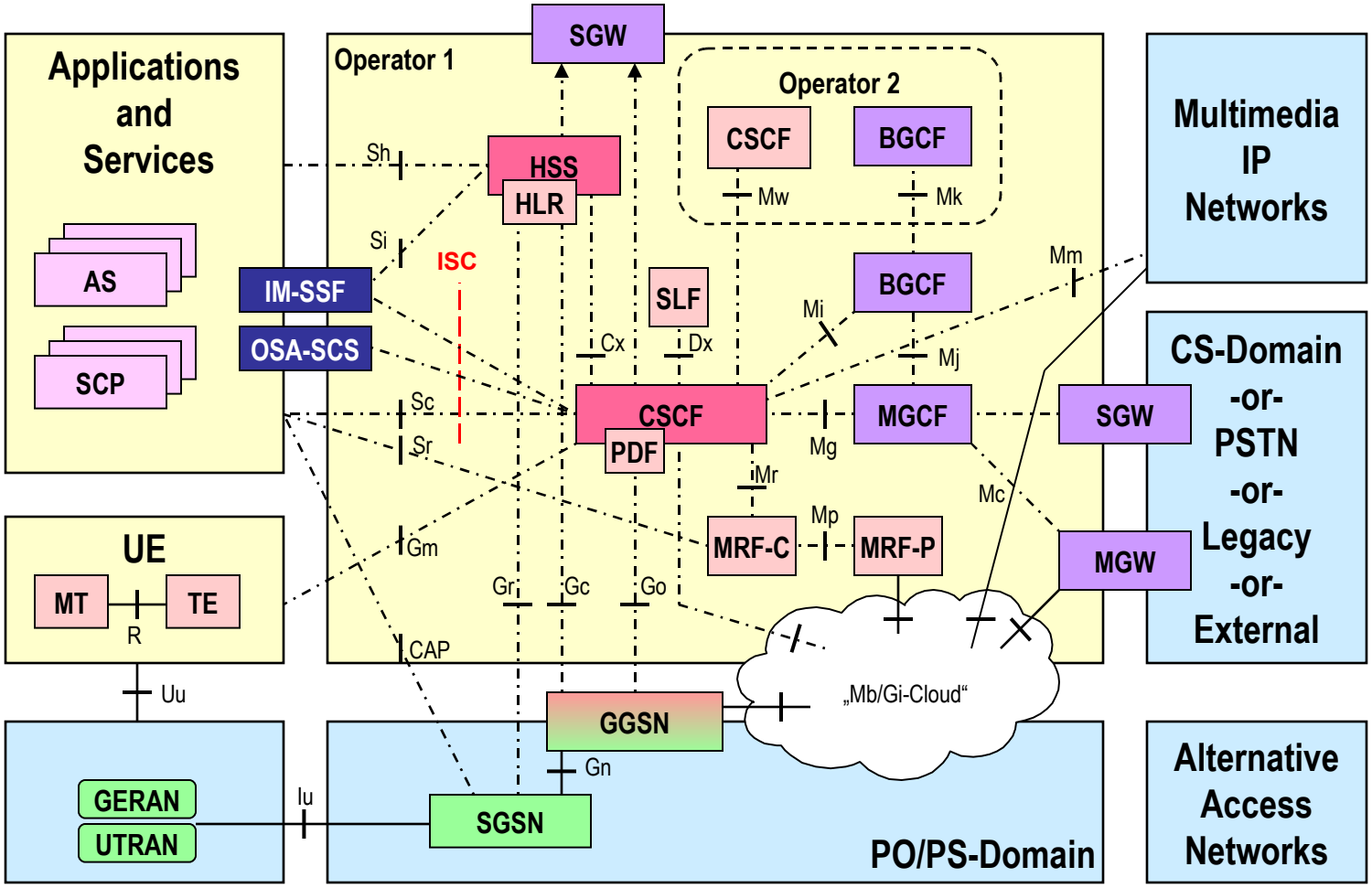
TISPAN Release 1: Core IMS



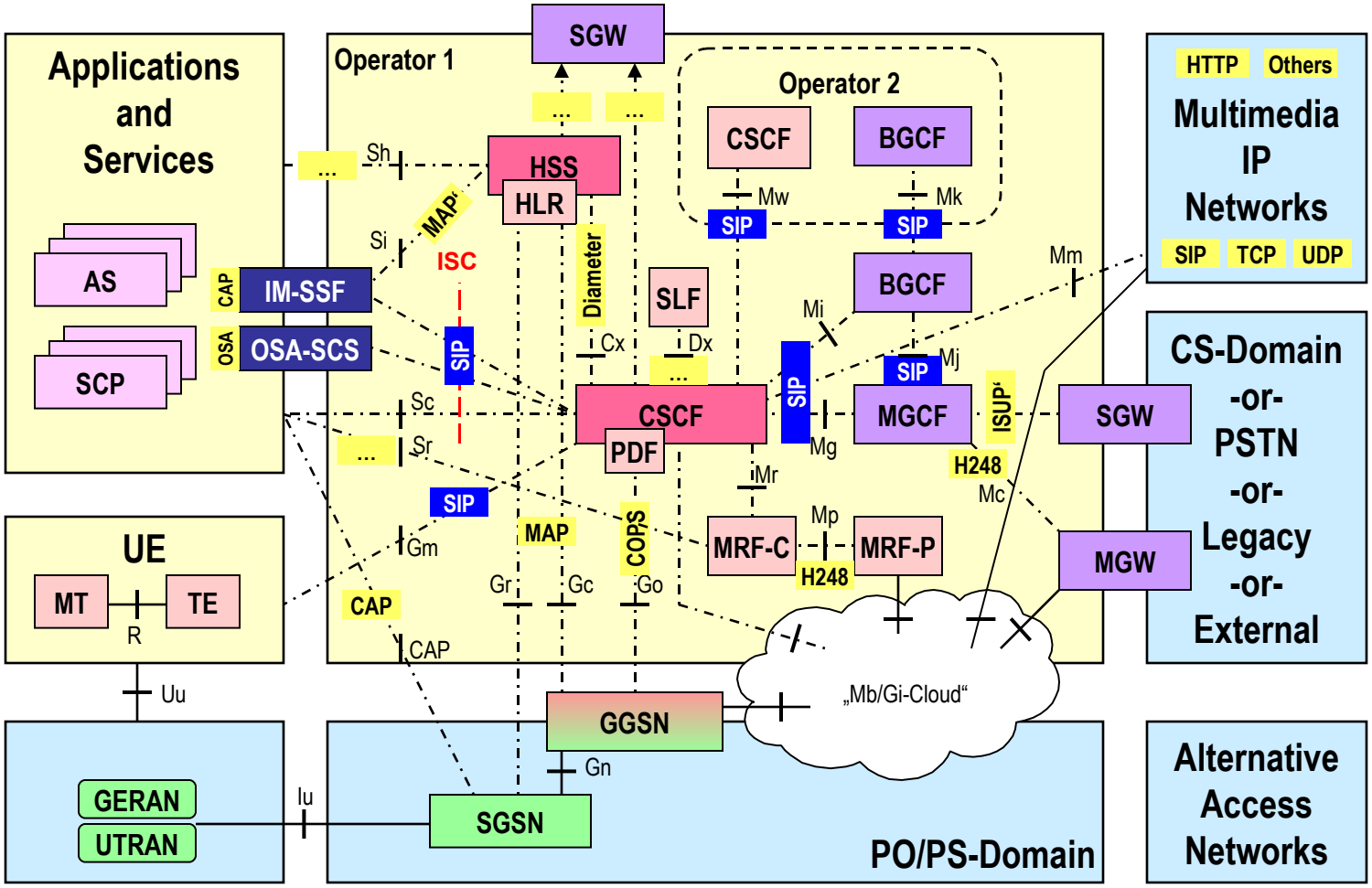
Core IMS reuse in NGN Architecture



Network Entities and Reference Points



Network Entities and Protocols



IMS Function Groups

- IMS Core
- P/I/S-CSCF, SLF/HSS, BGCF, MRFP/MRFC
- Service Network
- SIP AS, Parley Gateway, SCP
- Inter-working Entities
- MGCF/MGW
- IP-CAN: Provides the IP bearer to access to the IMS
- GPRS, UMTS, WLAN, xDSL
- Charging Entities
- Offline charging
- Online charging
- IP Accessorial Entities
- DNS、 Firewall、 NAT、 DHCP

Network Entities

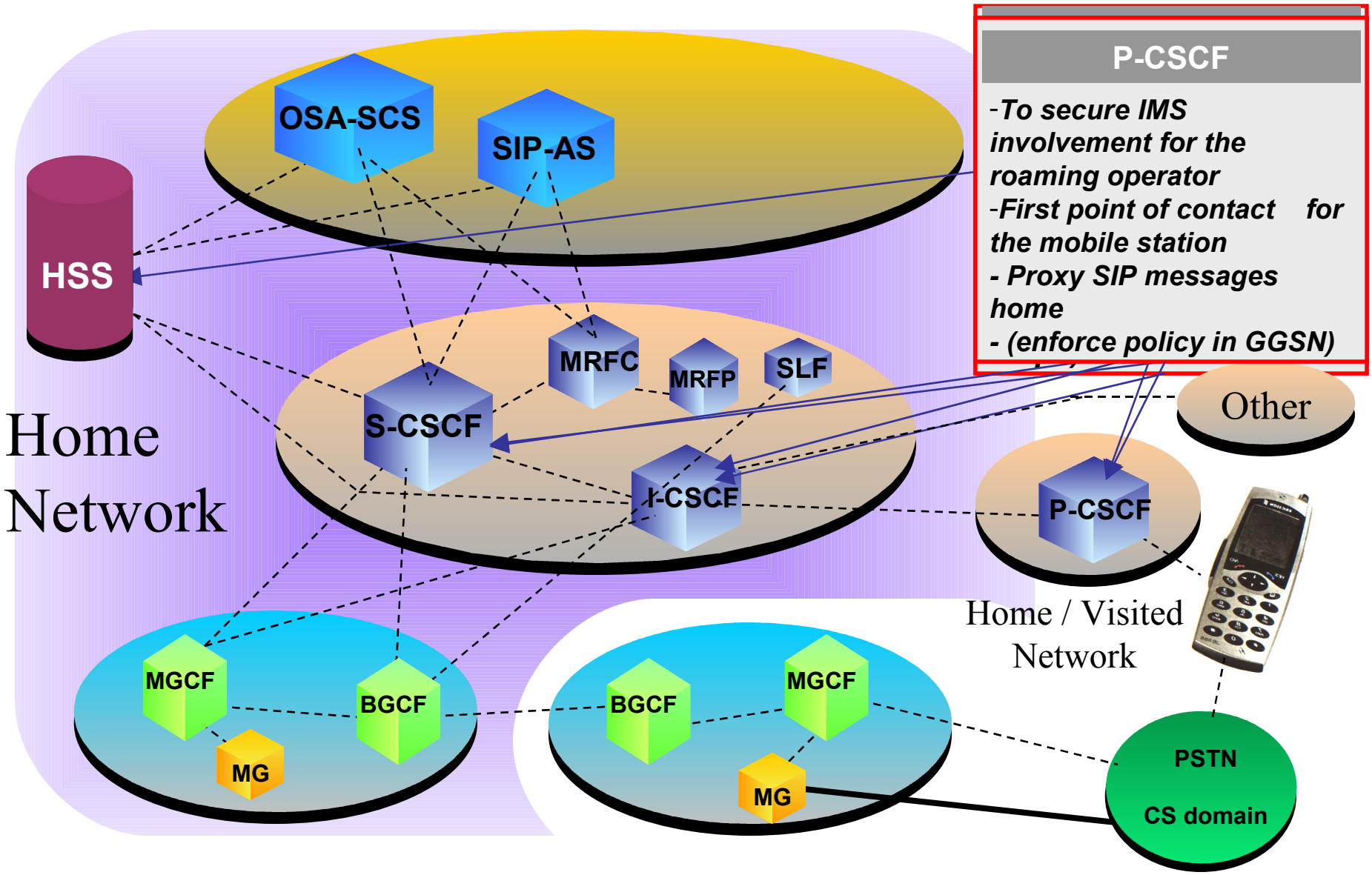
- CSCF (Call Session Control Function)
- PDF (Policy Decision Function)
- HSS (Home Subscriber Service)
- HLR (Home Location Register)
- SLF (Subscription Locator Function)
- MRF-C (Multimedia Resource Function - Controller)
- MRF-P (Multimedia Resource Function - Processor)
- BGCF (Breakout Gateway Control Function)
- MGCF (Median Gateway Control Function)
- MGW (Media Gateway)
- SGW (Signaling Gateway)
- AS (Application Server)
- SCP (Service Content Provider)
- IM-SSF (Service Switching Function)
- OSA-SCS (Service Capability Server)

Additionally:
- QoS Entities
- Charging Entities
- Security Entities
- Lawful Interception Entities
- Presence Service Entities
- Location Service Entities
- Push Service Entities
- OAM and NM Entities
- Firewalls, NAT, IPv4/v6, …
- DNS, DHCP, TRIP, …

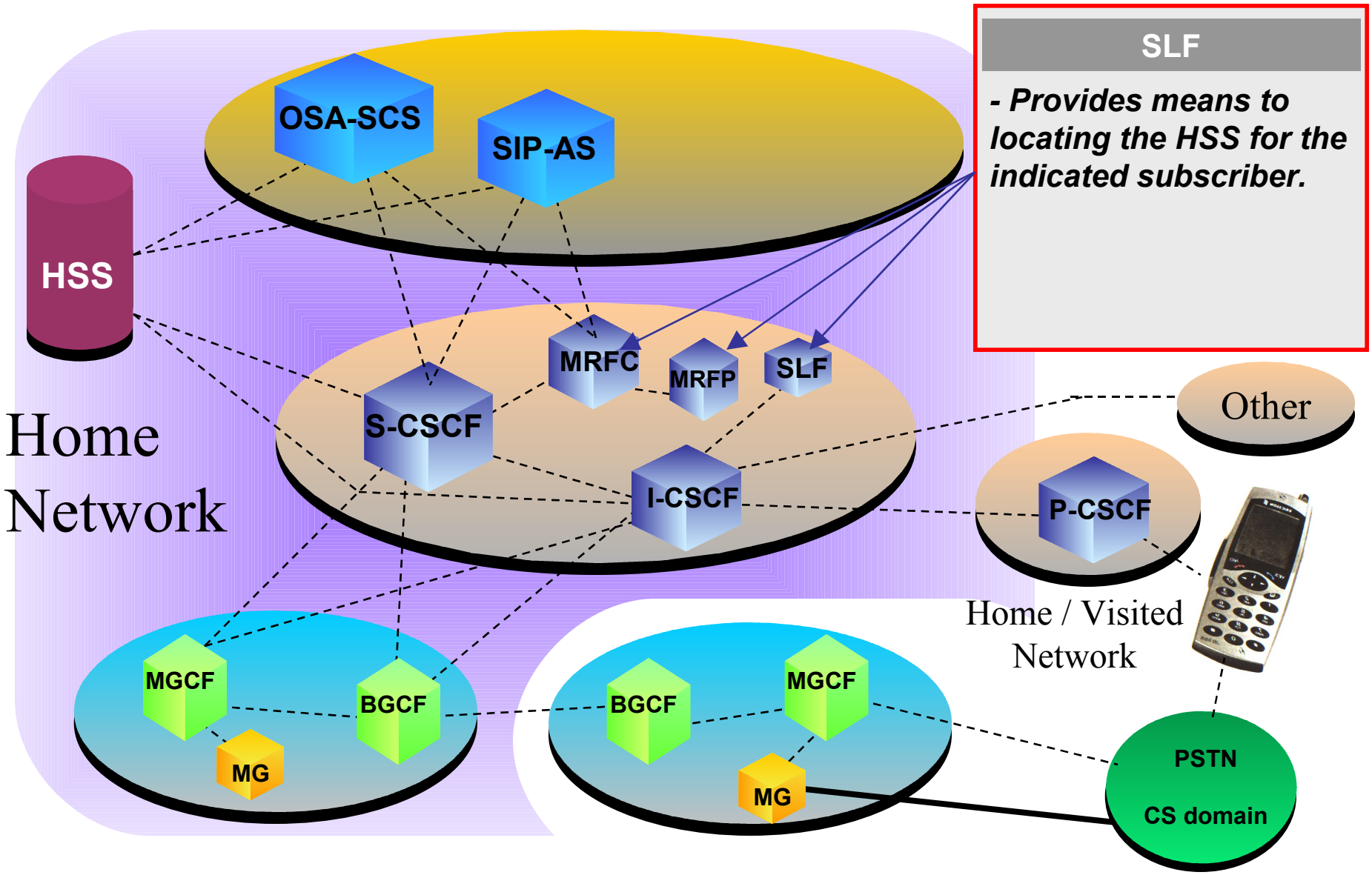
Single Session Control

- SIP is the single session control protocol used between the UE and the CSCF
- Gm: between UE and P-CSCF
- Mg: between MGCF and CSCF
- Mw: between CSCFs
- Mm: between CSCF and external IP networks
- Mi: between CSCF and BGCF
- Mj: between BGCF and MGCF
- Mk: between BGCF and BGCF

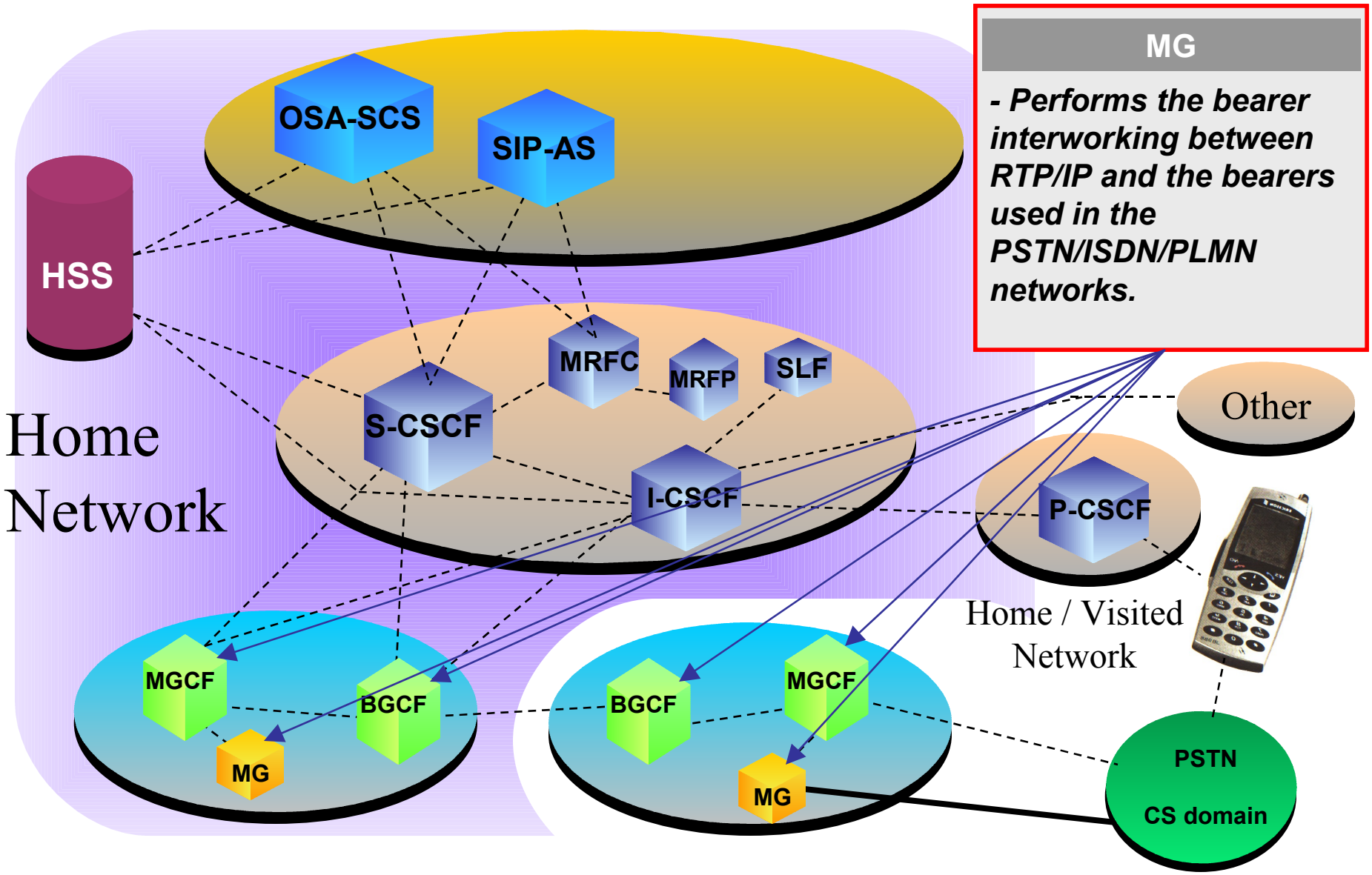
Simplified 3GPP IMS Architecture



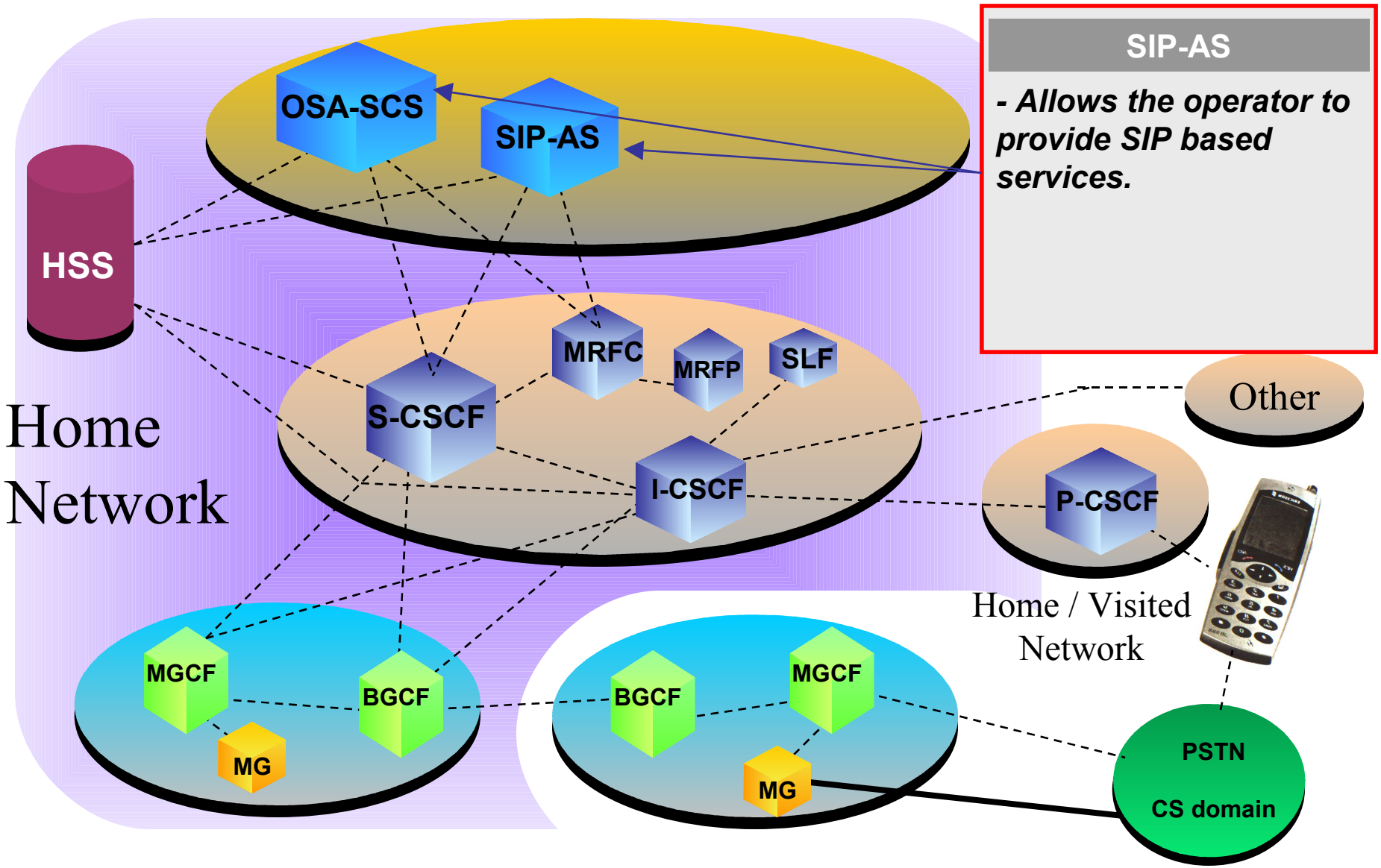
Simplified 3GPP IMS Architecture



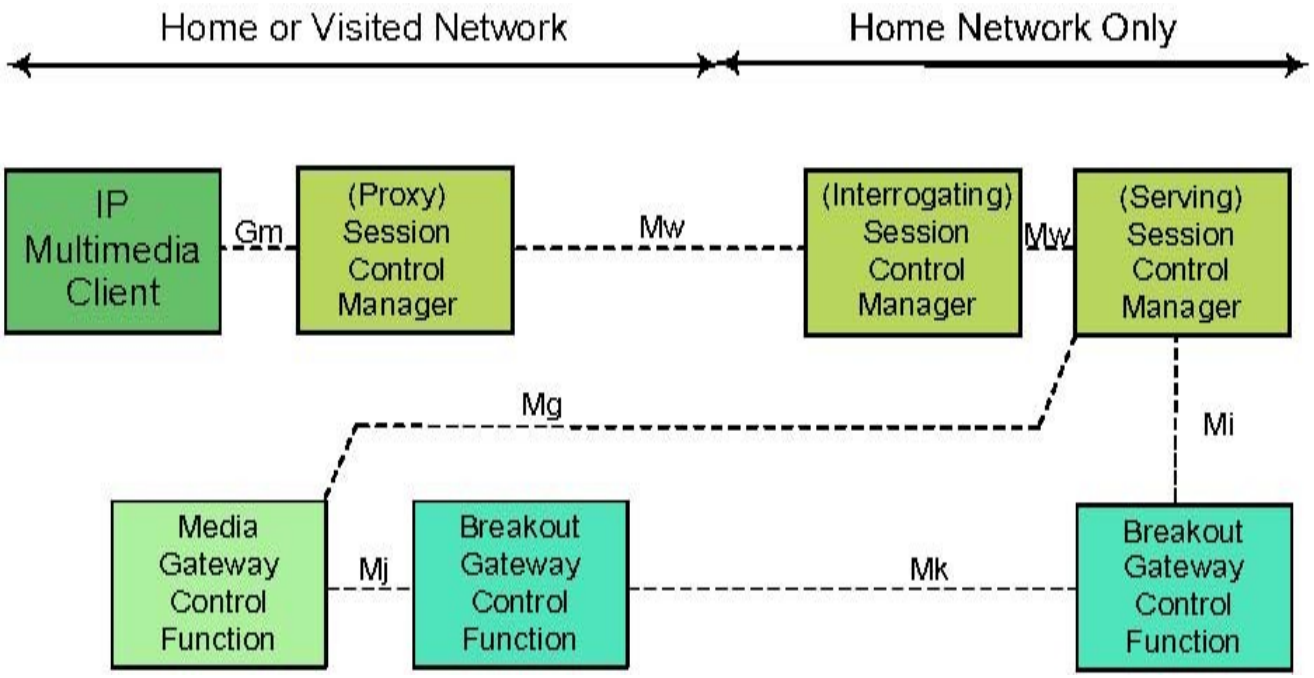
Simplified 3GPP IMS Architecture



Simplified 3GPP IMS Architecture

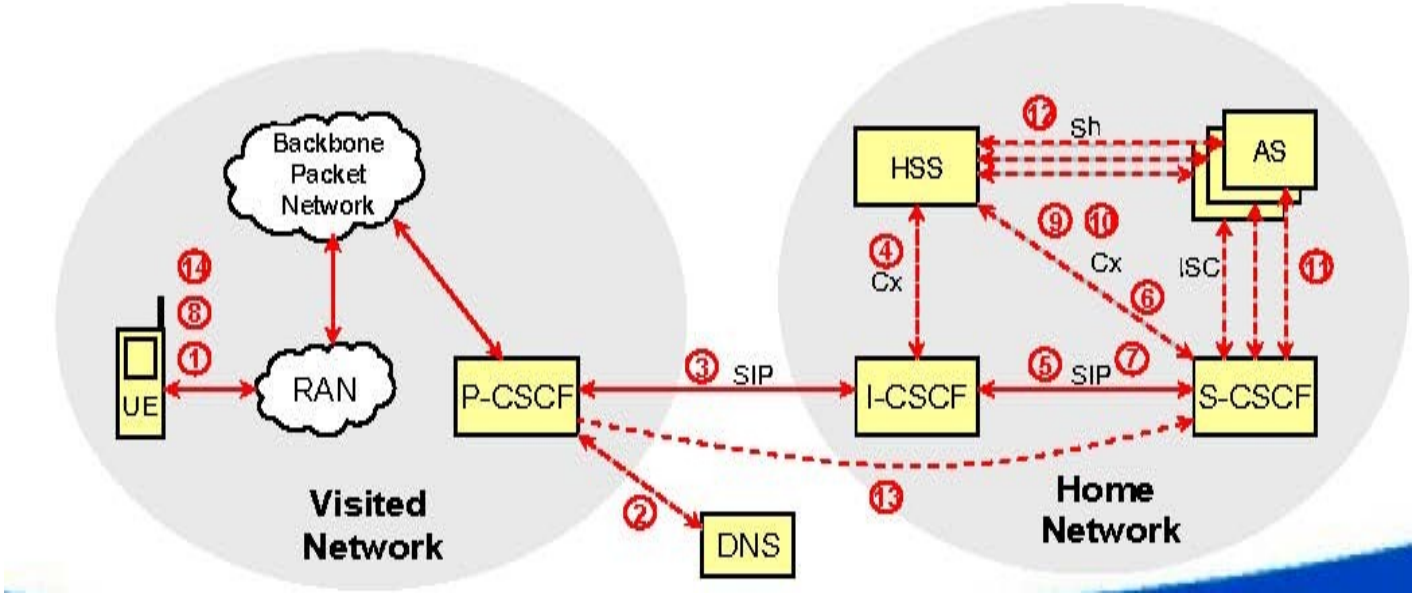


Location of Session control entities

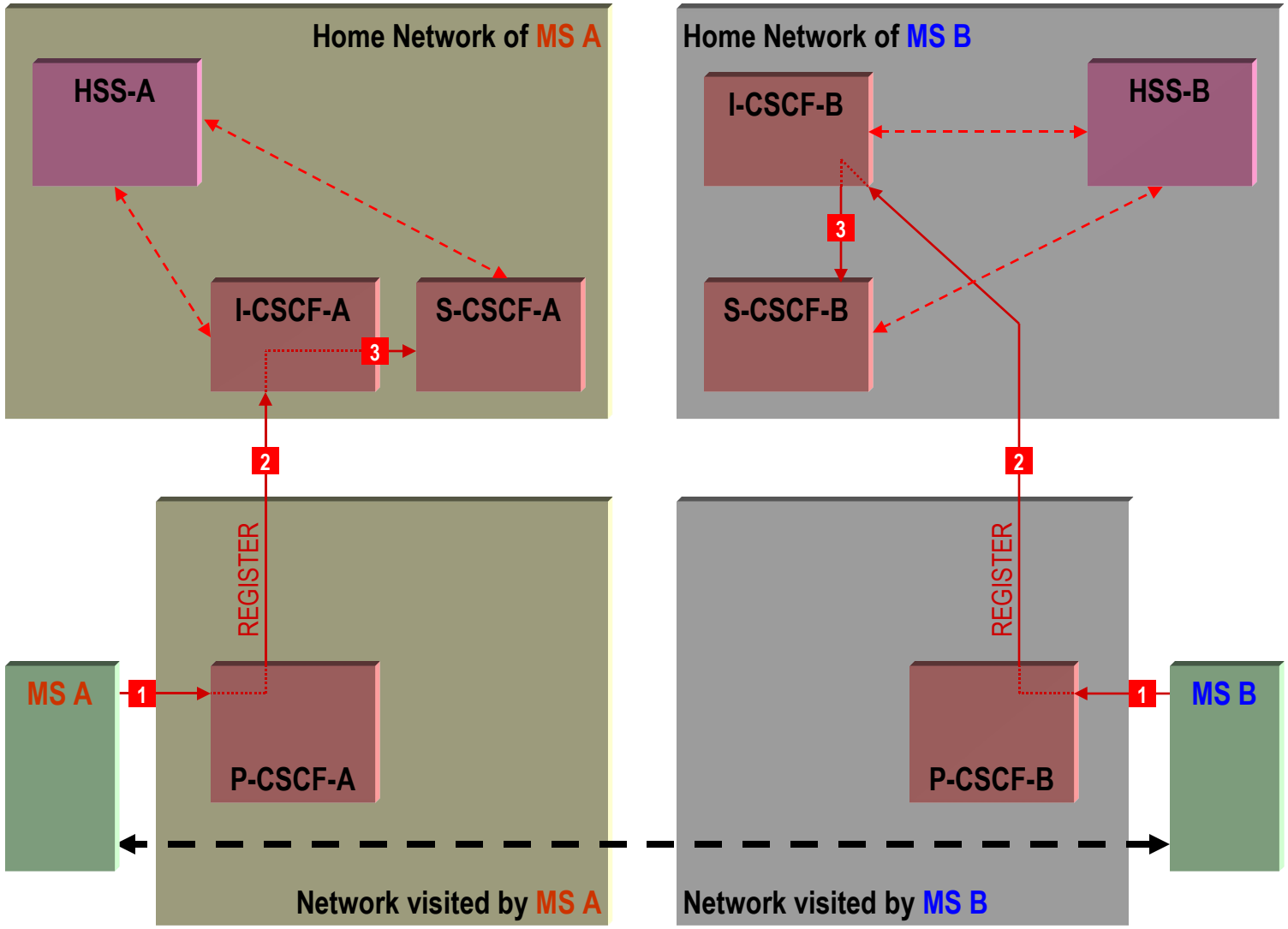


Registration and Re-Registration

1. UE sends the Register information flow to the proxy
2. Query DNS to obtain routing information
3. Forward SIP REGISTER to Home Network
4. Retrieve information needed for S-CSCF Selection
5. Forward SIP REGISTER to S-CSCF
6. Retrieve and select Authentication Vector
7. Reject with Authentication Data
8. Re-initiate SIP Registration (steps 1 – 5)
9. Store S-CSCF Name
10. Retrieve Subscriber Profile and Filter Criteria
11. Register with AS(s) based on Filter Criteria
12. AS(s) retrieve Subscriber profile (if needed)
13. P-CSCF SUBSCRIBE, for de-registration
14. UE SUBSCRIBE, for de-registration

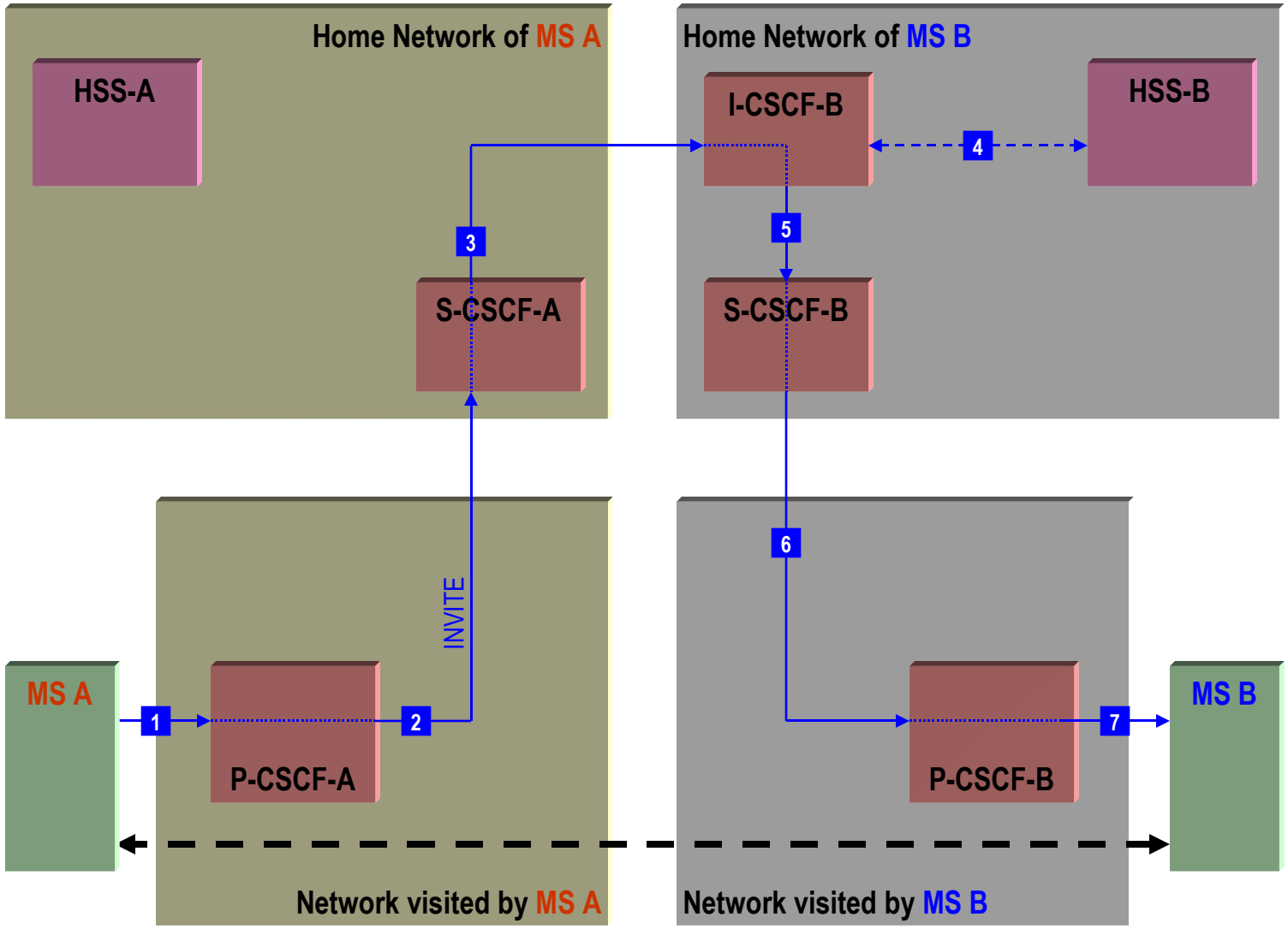


Basic Message Flow
Routing of Mobile-To-Mobile Calls - Registration

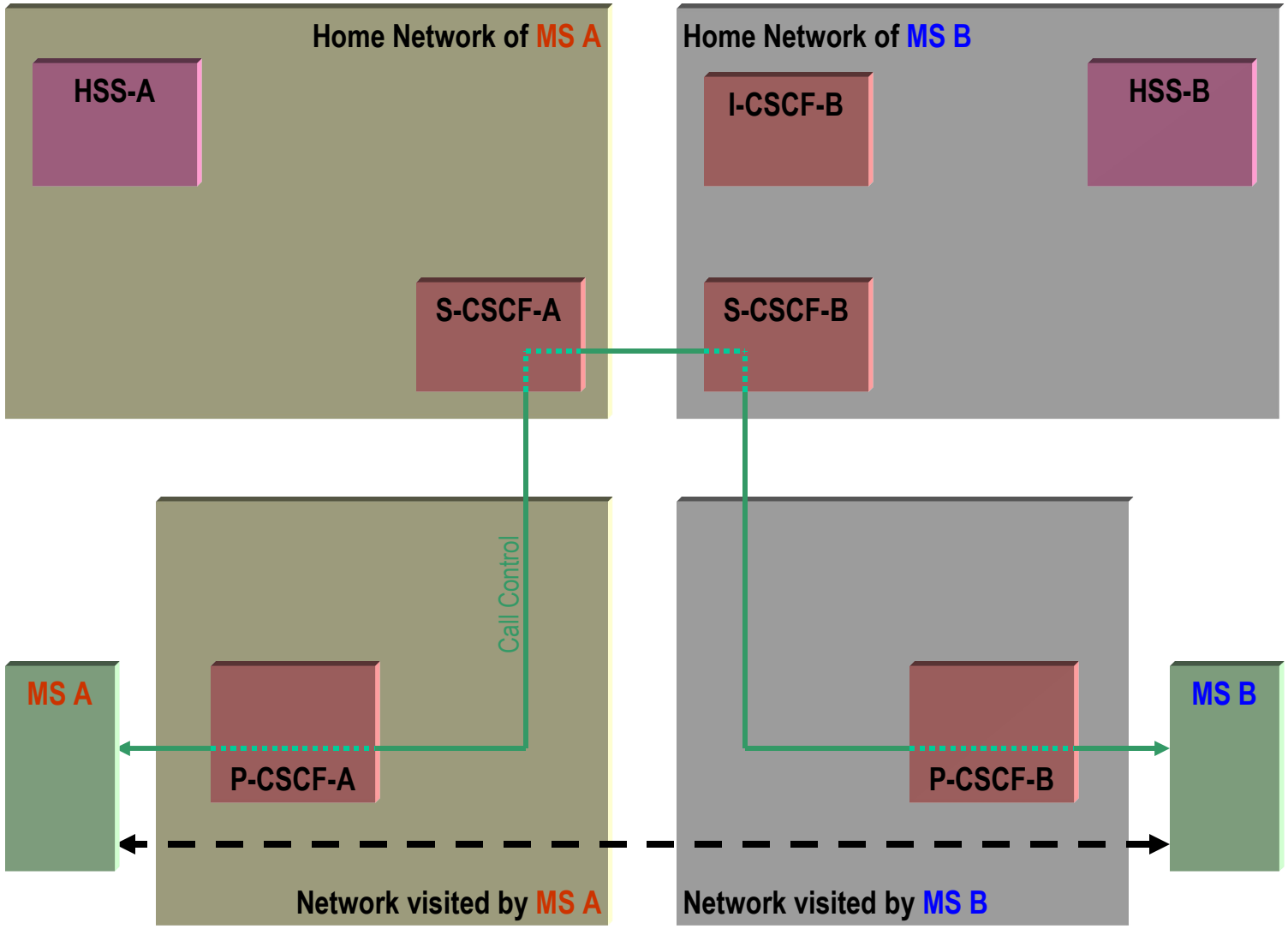


Basic Message Flow

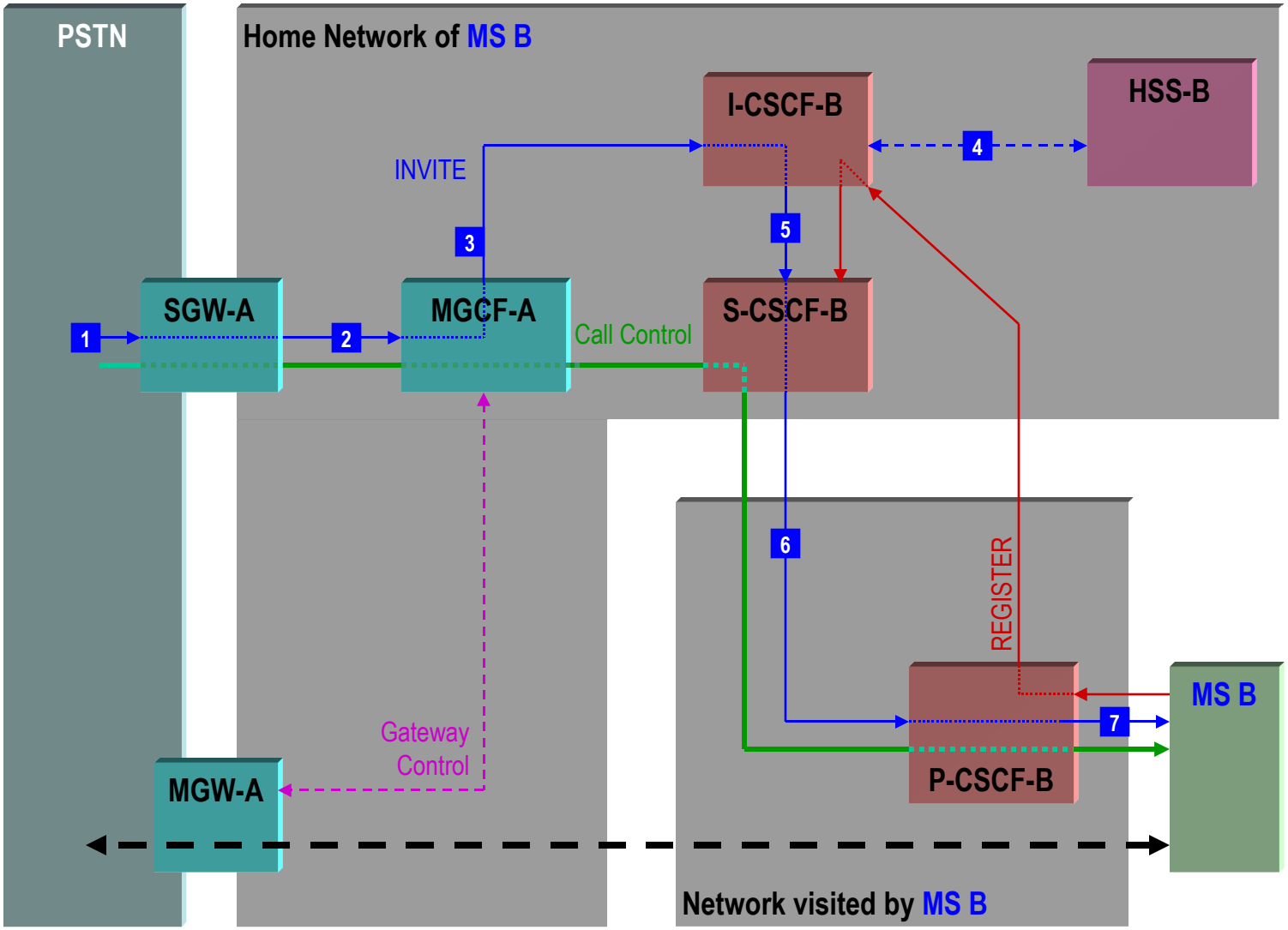
Routing of Mobile-To-Mobile Calls - Session Initiation



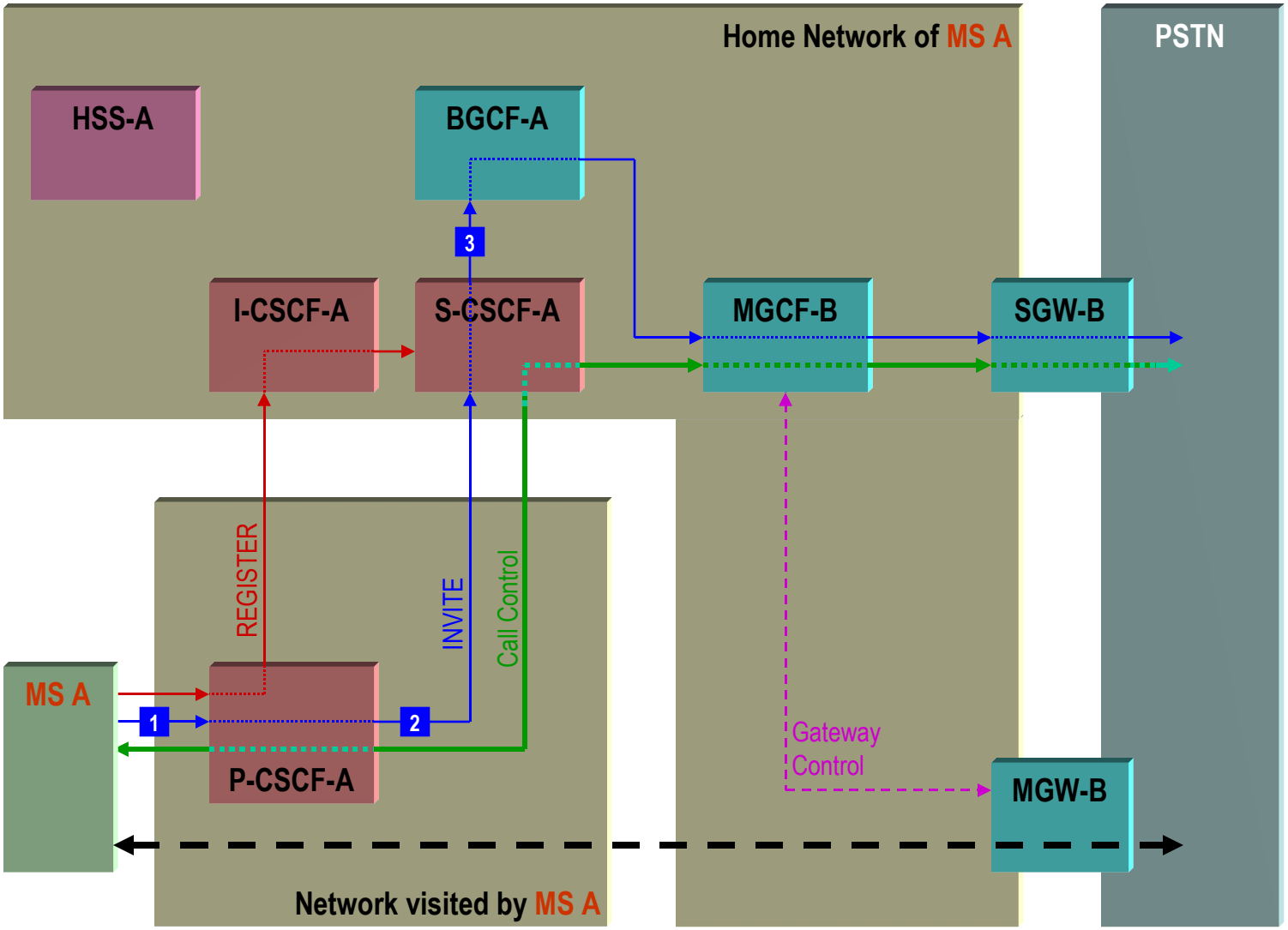
Basic Message Flow
Routing of Mobile-To-Mobile Calls - Call Control



Basic Message Flow
Routing Calls from CS or PSTN



Basic Message Flow
Routing Calls to CS or PSTN



Why 3GPP selected SIP for IMS

SIP vs H.323

In June 2001, 3GPP decided to use SIP (instead of H.323).

Main arguments:
SIP is simple.

- Provides a small number of commands, which are text based and easy to understand
- It only initiates and manages a session. It does not determine the nature or content of the call.

- SIP follows a modular approach, which makes it flexible, scalable and extensible
- H.323 in contrast is a comprehensive IP communication

protocol, which defines everything - the relationship

between hardware and software, the coders to use, etc.

→ very complex and large; difficult to support and evolve

IETF and 3GPP

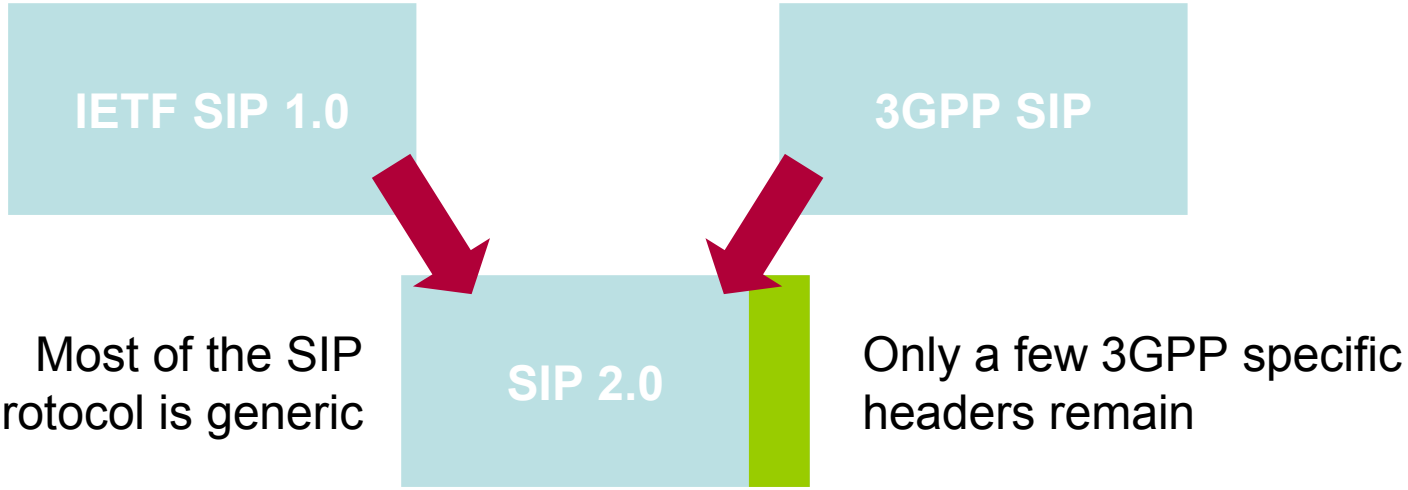
Evolution of the SIP Protocol

IETF

- IETF defines lots of protocols
- Internet paradigm
- Endpoint centric
- Security becomes more important
- Charging is of minor importance (flat rate)

3GPP

- Defines an architecture which uses protocols
- Operator paradigm
- Core network centric
- Security is one of the most important topics
- Charging is one of the most important topics



Characteristics of SIP Messages

- **Basic SIP protocol defines only 6 methods** (Register, Invite, Ack, Bye, Cancel, Options)
- **Communication principal: Request – Response**
- **Syntax is similiar to known Internet protocols (htmp, smtp, addressing, etc)**
- **Example: INVITE message can include a message body being:**
  - SDP information
  - Plain Text
  - HTML Code
  - Link to Java applet
  - Any possible MIME Type (Image, Sound, Video-Clip,…)

Application Server (AS)

- The Application Server provides service control for IMS.
- May be directly connected to S-CSCF or via OSA Gateway for 3rdparty security.
- Interacts with the HSS to obtain subscriber profile information.
- May support applications such as presence, conference control, online charging, etc.

What is SIP (Session Initiation Protocol)

- IETF RFC3261: Internet standard
- SIP is an application-layer control (signaling) protocol for creating, modifying, and terminating sessions with one or more participants. These sessions include Internet telephone calls, multimedia distribution, and multimedia conferences.
- Server/Client mode
- Text based protocol
- UTF-8 charset
- Used with other IETF protocols to build a complete multimedia communication architecture
- RTP (Real Time Transport)
- RTSP (Real Time Streaming protocol)
- MEGACO (Media Gateway Control Protocol)
- SDP（ Session Description Protocol ）

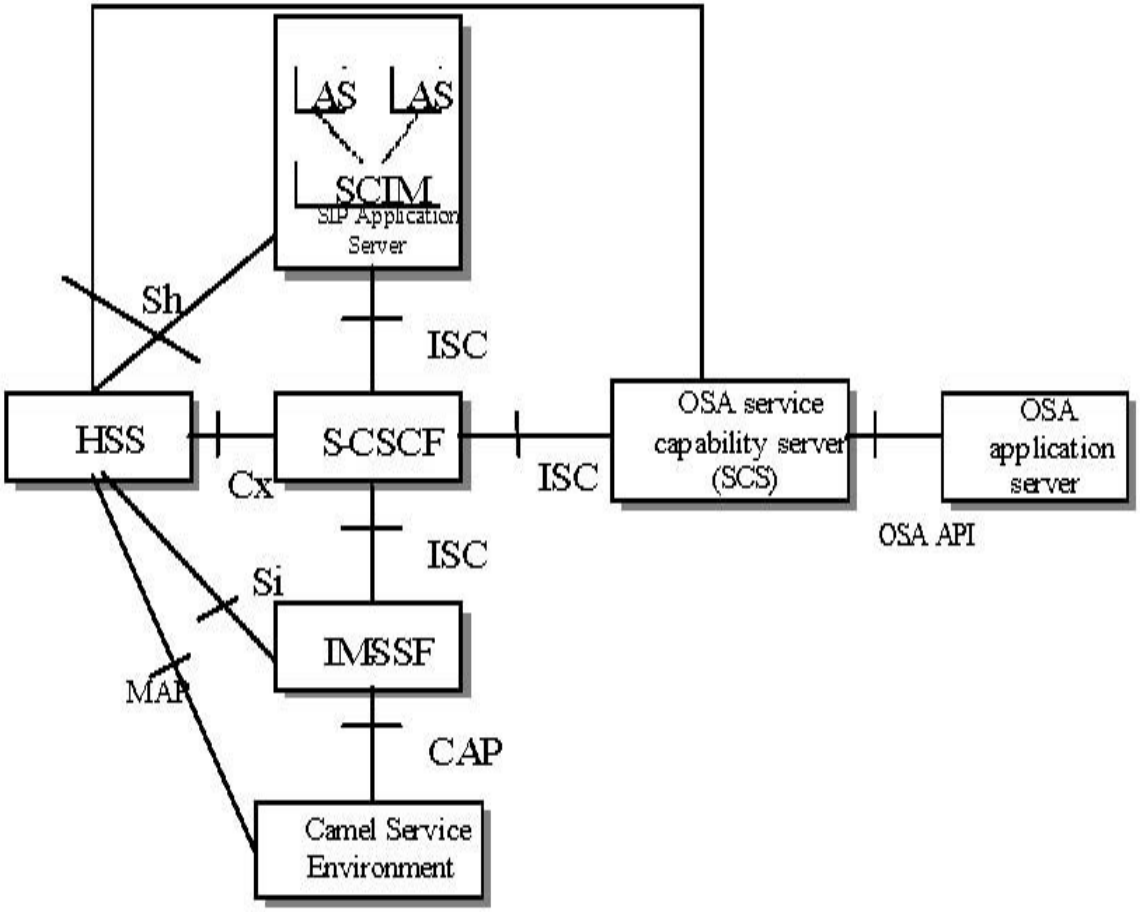
SIP Basic functions

- SIP establishes and terminates multimedia communications based on following aspects:
- User location determination of the end system to be used for communication
- User availability determination of the willingness of the called party to engage in communications
- User capabilities determination of the media and media parameters to be used
- Session setup establishment of session parameters at both called and calling party, "ringing“.
- Session management including transfer and termination of sessions, modifying session parameters, and invoking services.

SIP building blocks

- User Agent
- UAC: User Agent Clients
- UAS: User Agent Server
- Proxy Server
- Redirect Server
- Registrar Server
- Location Server

IMS Service Architecture



ISC interface

- SC (IMS Service Control Interface)
- The ISC interface is between the S-CSCF and AS.
- ISC is used to provide services residing in an AS.
- S-CSCF to an AS in Home Network.
- S-CSCF to an AS in External Network (e.g., Third Party or Visited)
- From the perspective of the S-CSCF, The "SIP Application server", "OSA service capability server" and "IM-SSF" shall exhibit the same interface behaviour.
- The ISC interface shall be able to convey charging information as per 3GPP TS 32.200 and TS 32.225.
- The protocol to be used on ISC interface is SIP

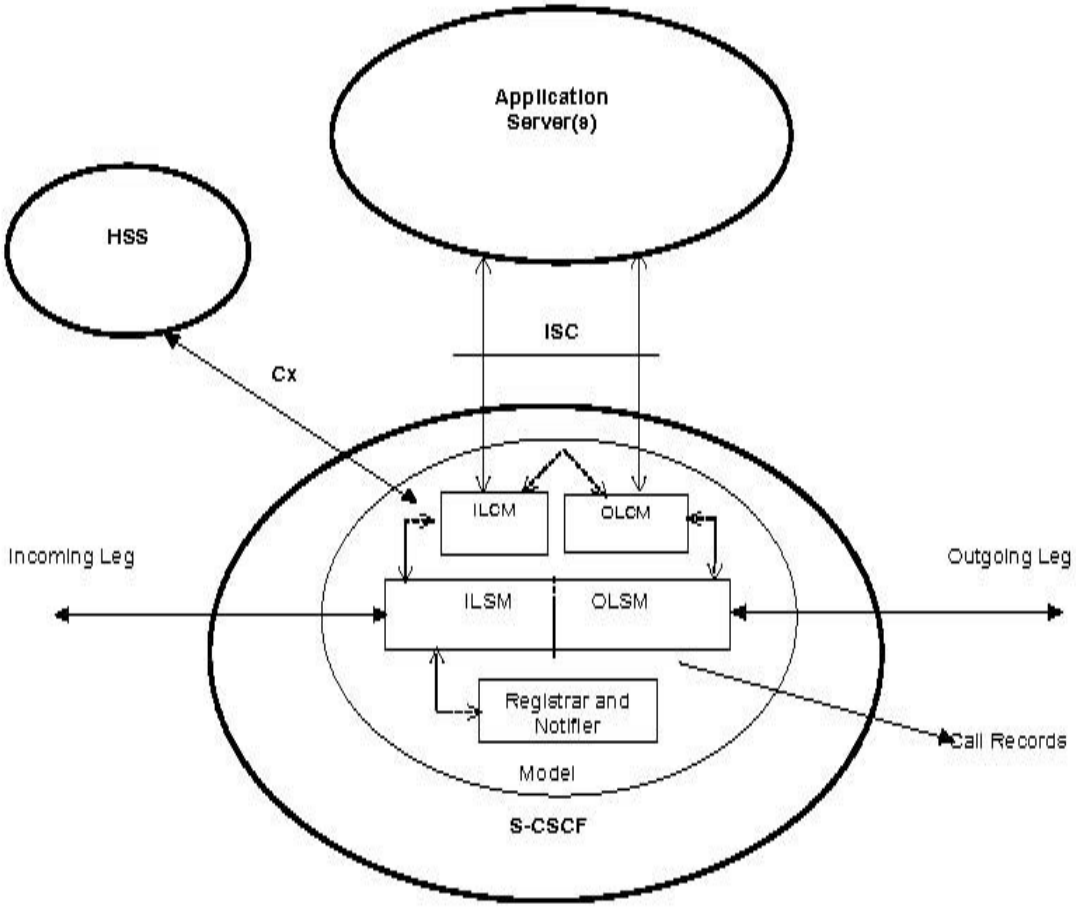
Highlights of ISC interface

- Introducing new services don’t need to think about SIP routing, online and offline charging, register and security
- Services don’t need to be standardized
- Have the capability of interoperating with Internet services
- Services based on IMS can be accessed through all kinds of visiting network, regardless of supporting IMS or not.

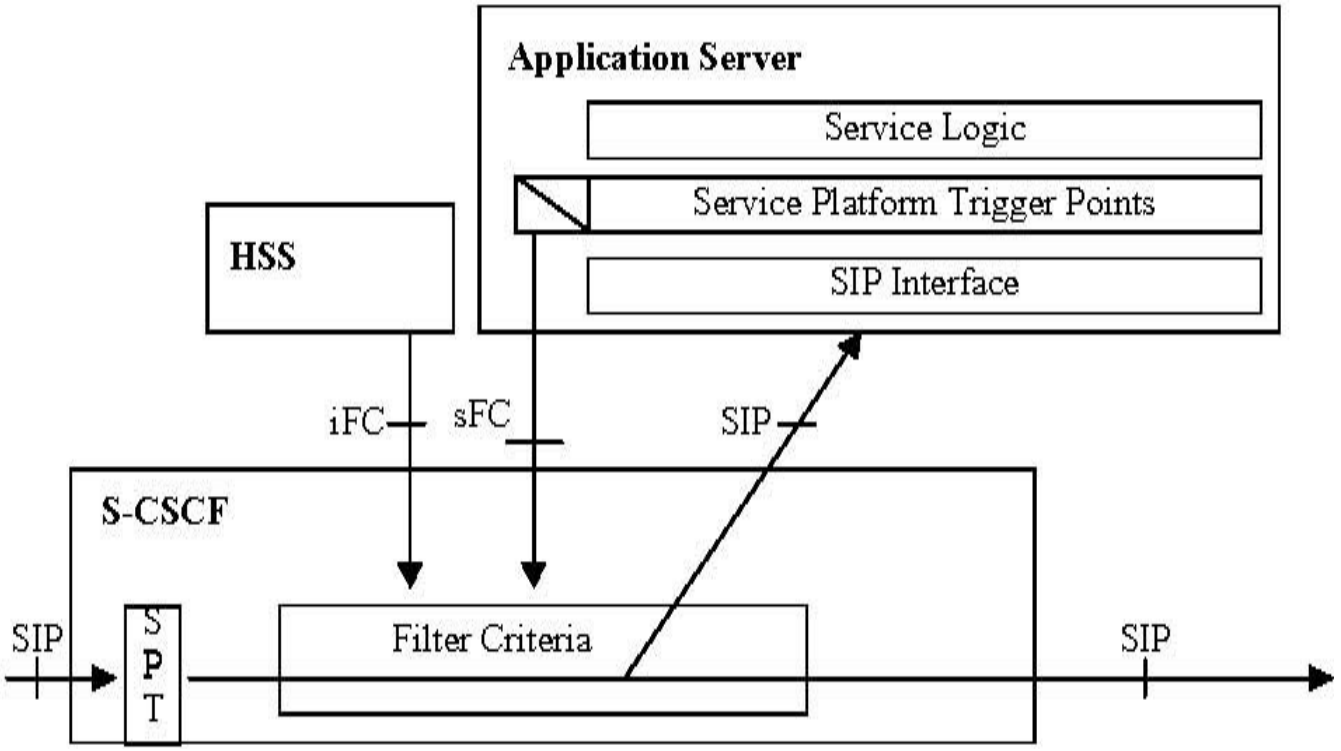
Sh/Si Interface

- HSS to Service Platform Interface: Shand Si
- ShInterface is between the HSS and the "SIP AS" or the "OSA SCS"
- The Shinterface is an intra-operator interface.
- Responsible for transport
- Transparent data, e.g. service related data , user related information
- User related data stored in the HSS (e.g. user service related data, MSISDN, visited network capabilities, user location)
- Standardised data, e.g. for group lists, which can be accessed by different Application Servers
- The Si interface is between the HSS and the IM-SSF.
- It transports CAMEL subscription information including triggers for use by CAMEL based application services

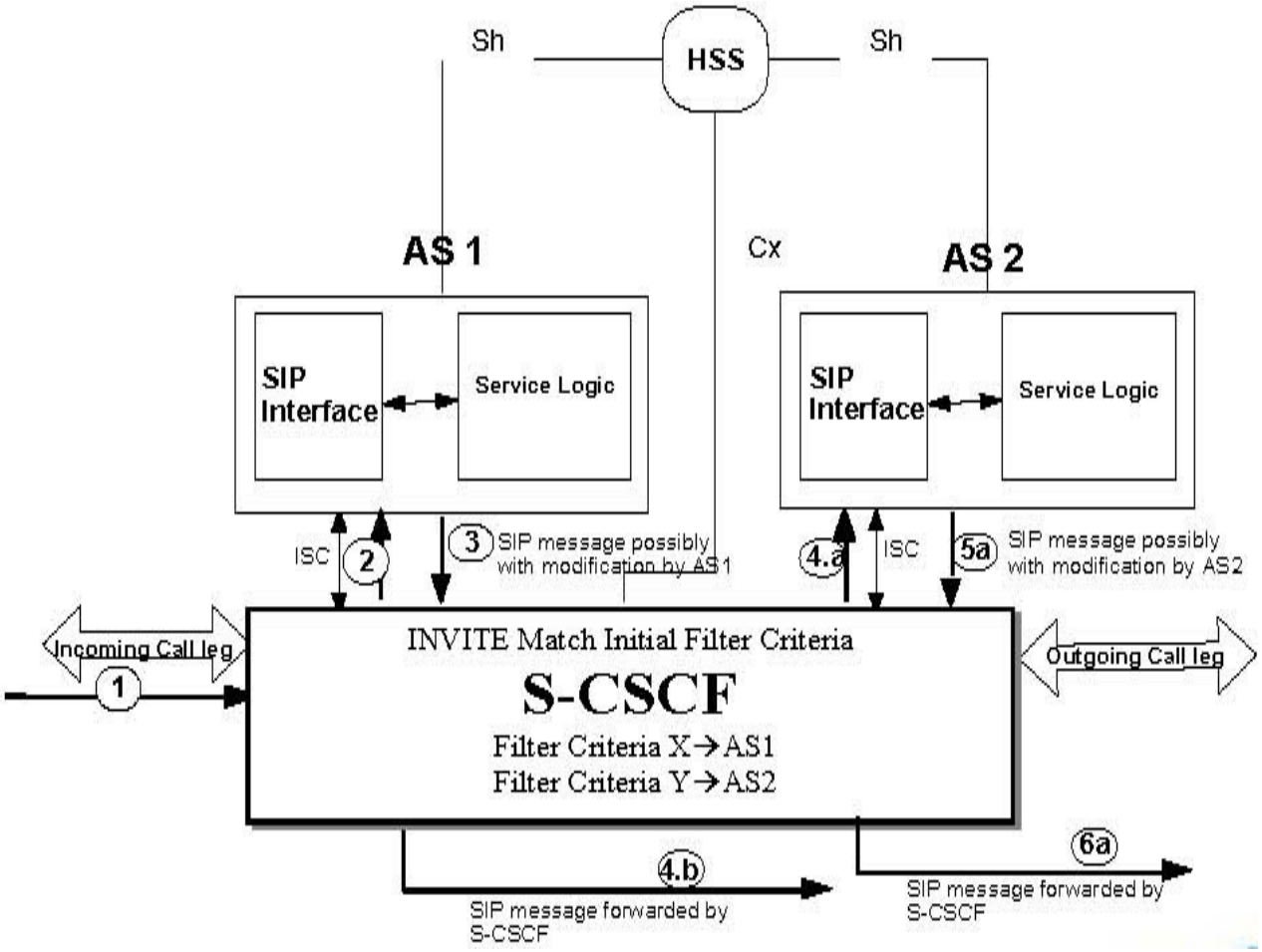
S-CSCF Service Control Model



Service Triggering Mechanism



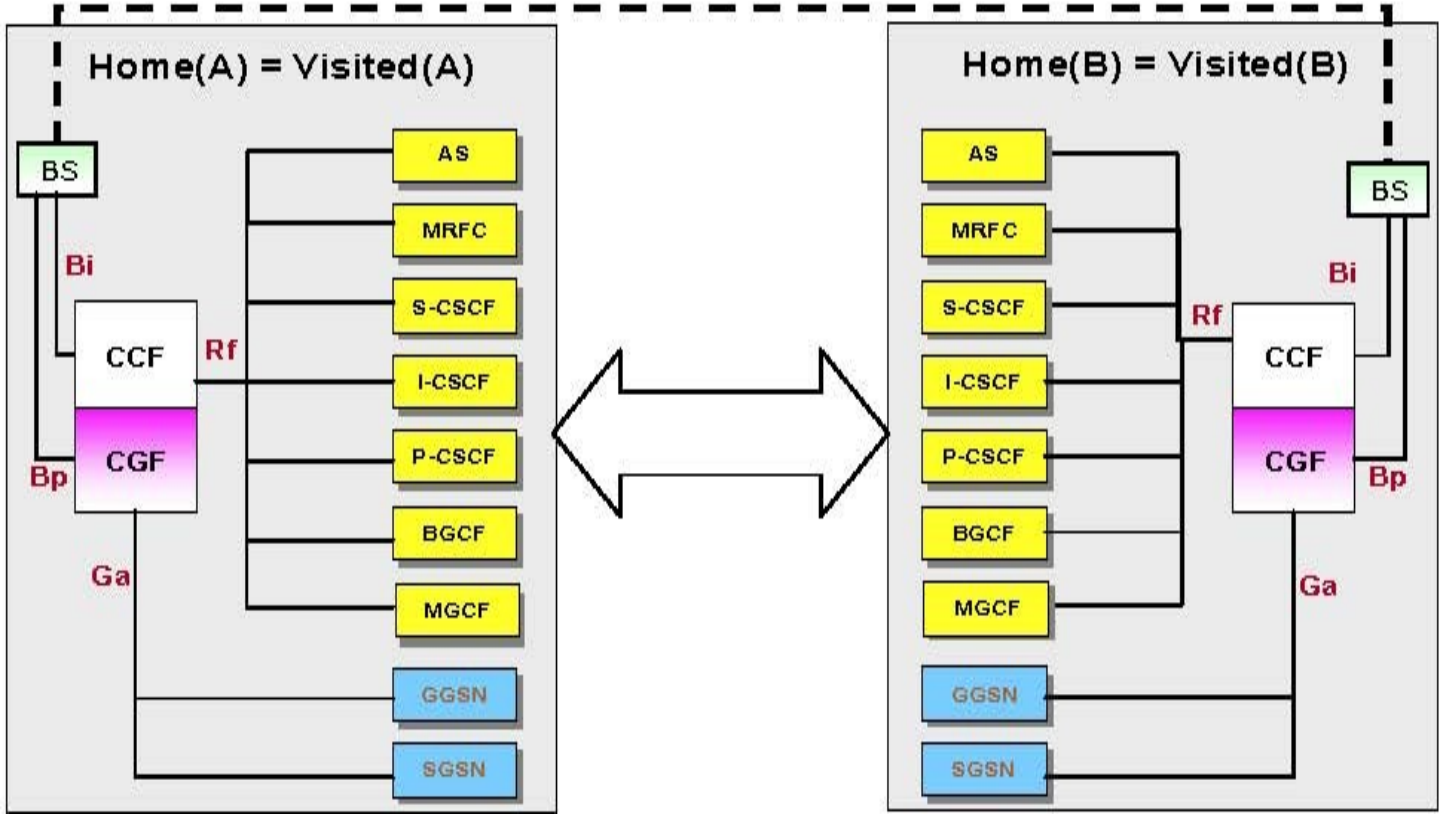
iFC Triggering Procedure



Charging

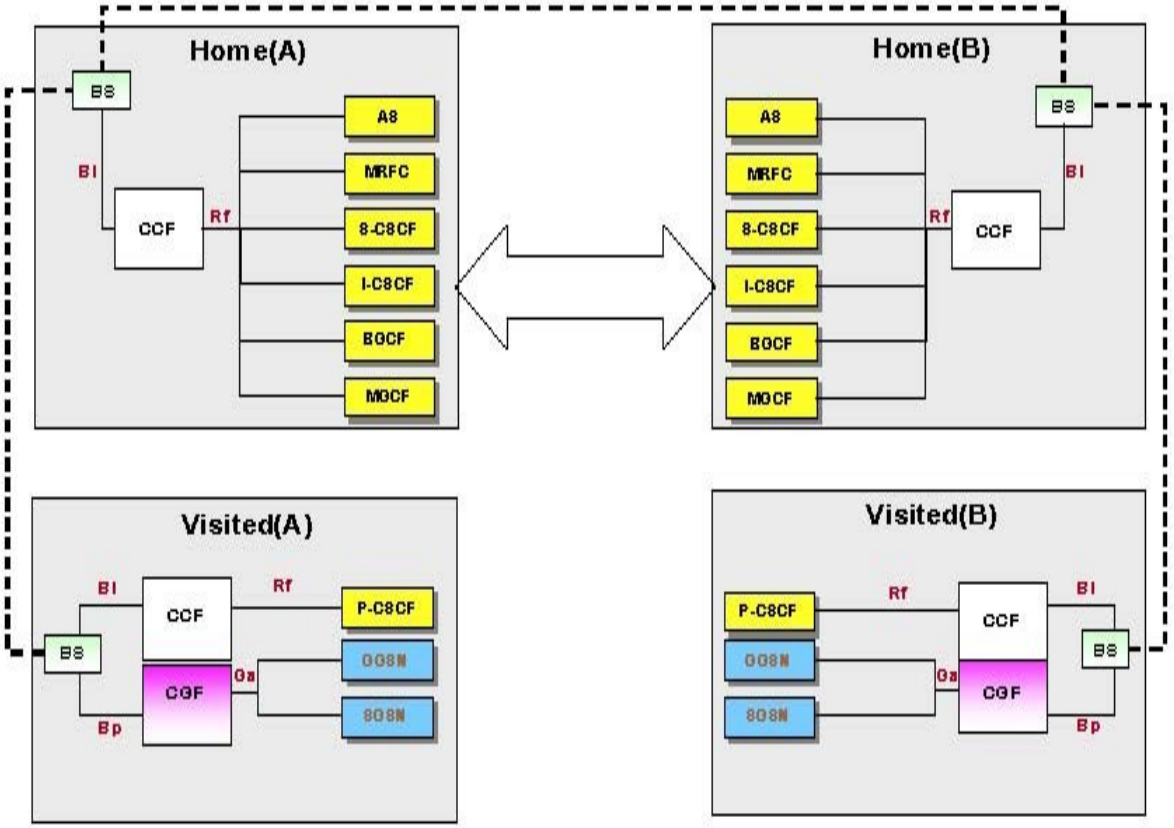
- Off-Line charging
- On-line charging
- Charging layers
- Access/Transport Layer: Charging of usage of bearer resources (e.g. GPRS access services)
- IP Multimedia/Session Layer: e.g. voice or video with a certain QoS, time based charging
- Application/Content Layer -charging of services provided (e.g. games / info)

Offline Charging Architecture



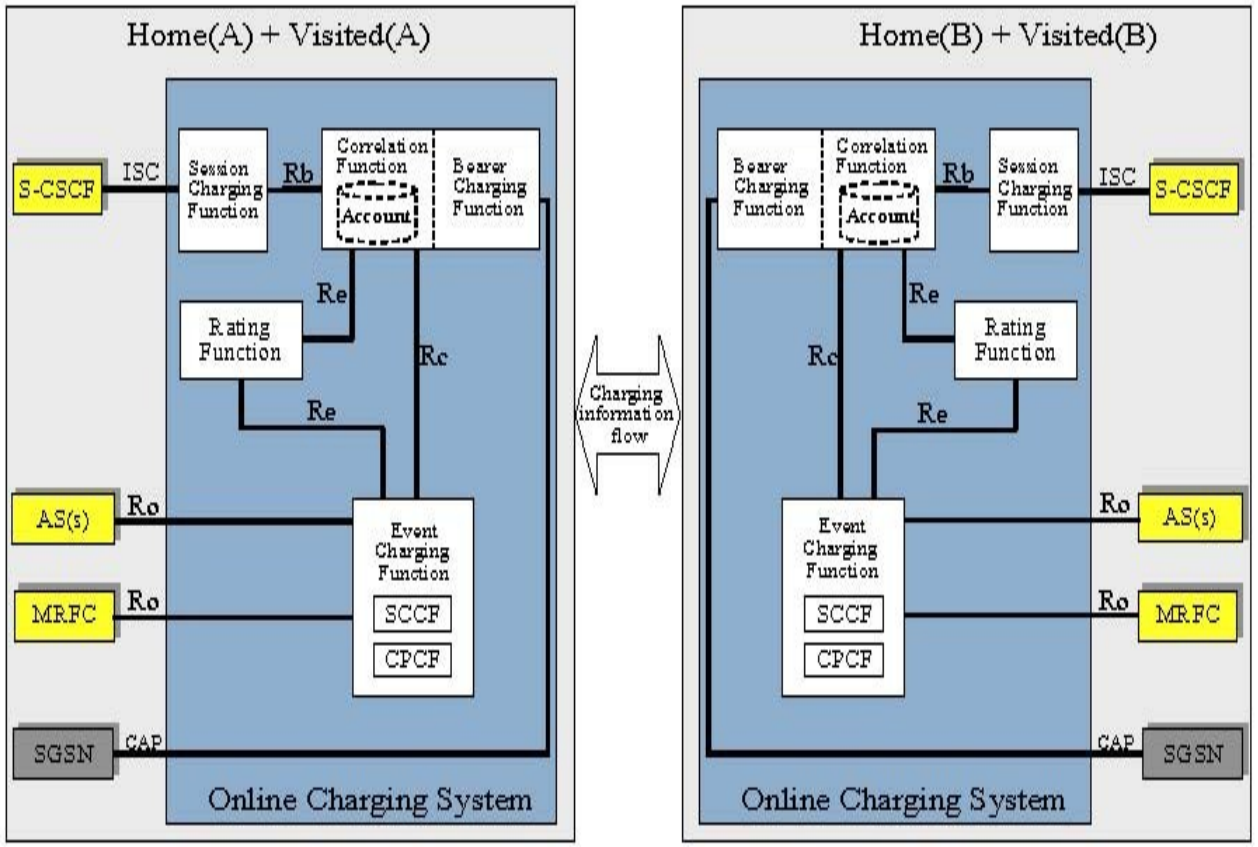
Offline IMS Charging architecture for non-roaming scenario

Offline Charging Architecture



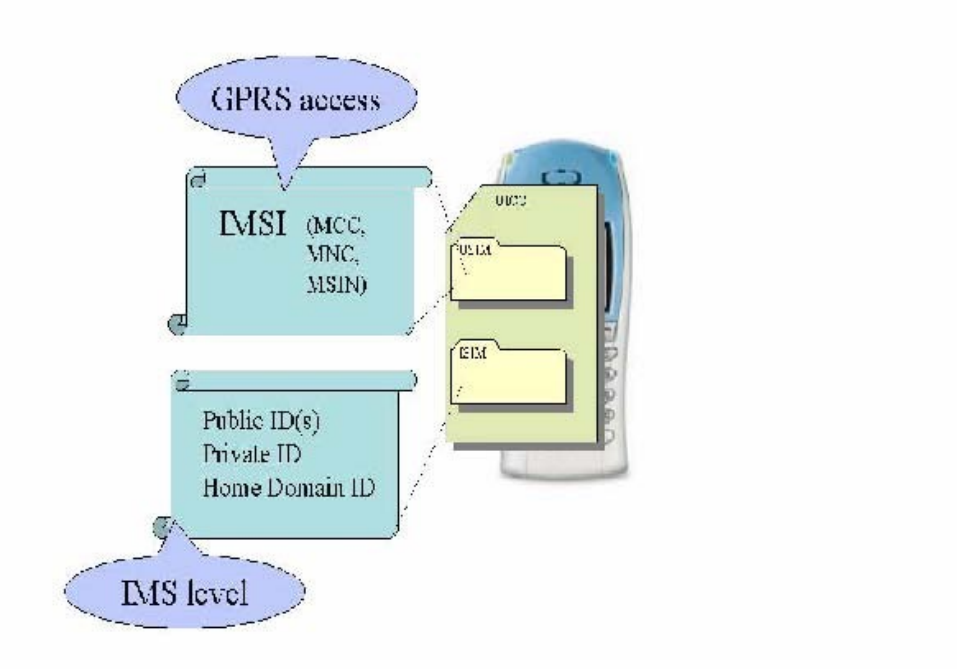
Offline IMS Charging architecture for roaming scenario

Online Charging



Online IMS Charging architecture

Relationship between UICC, USIM, ISIM



Key identifiers of IMS

- he key identifier of the IMS Services Identity Module
- Home Domain ID: Provides the key way that a 3GPP IMS user routes their registration to their Home IMS Network.
- The Private Identity: Be used for authentication by the user's Home IMS Network
- The Public Identity: Be used for contactable by other users for IMS based services.

Home Domain Name

- Be used to identify the home domain of the user
- If there is no ISIM application, Home domain name can be derived from the IMSI:
- Take the first 5 or 6 digits, depending on whether a 2 or 3 digit MNC is used and separate them into MCC and MNC
- Use the MCC and MNC derived in step 1 to create the "mnc<MNC>.mcc<MCC>.3gppnetwork.org" domain name
- Add the label "ims." to the beginning of the domain.

Private User Identities

- Private Identity is not used for routing.
- The Private ID takes the format of a NAI: username@realm
- If there is no ISIM on the UICC, the Private ID is derived from the IMSI.
- use the whole string of digits of IMSI as the username part
- Realm is the home domain name

Public User Identities

- The Public Identity is not used to authenticate the user during registration.
- Both Internet naming and Telecom numbering is supported: SIP URL, or a Tel URL.
- At least one IMPU is stored on the ISIM and can not be modified by the UE
- If the UICC does not contain an ISIM then a IMPU can be derived from the USIM's IMSI
- by pre-fixing 'SIP:' to the Private ID.

NGN : Nothing new, but upgrading, adding Value

Up-grading Current Infrastructure

Adding Value

Current Generation-Beach

Next Generation-Water Park

Back-Up Slides

CSCF (Call Session Control Function)

- CSCF: Manage SIP sessions
- Coordinates with other network elements for session control, feature/service control and resource allocation.
- There are 3 types of CSCFs depending on their role:
- S-CSCF (Serving CSCF): session control point for UE as an originator and terminator (home network).
- I-CSCF (Interrogating CSCF): the contact point into the UE's home network for other networks.
- P-CSCF (Proxy CSCF): the contact point into the IMS for the UE (home or visited network).

Serving CSCF (S-CSCF)

- Functions:
- Registration
- behave as a Registrar as defined in RFC3261
- Session control for the registered endpoint's sessions.
- service logic is performed by an Application Server, not the S-CSCF
- The Serving CSCF retrieves the subscriber profile from the HSS including AS filter criteria.
- Behave as a Proxy Server
- It accepts requests and services them internally or forwards them on, possibly after translation.
- Behave as a User Agent
- Terminate and independently generate SIP transactions.
- Interaction with Services Platforms for the support of services
- Charging and resource utilisation:
- Generation of CDRs

Interaction of S-CSCF and AS

- S-CSCF uses Initial Filter Criteria to involve AS(s) as needed to provide services and features.
- The S-CSCF forwards messages to each AS in the order indicated by the Filter Criteria received from the HSS in the subscriber's service profile. After the last AS is contacted, then the message is sent on towards the intended destination.
- IMS defines Service Point Triggers (SPTs), points in the SIP signaling on which Initial Filter Criteria can be set:
- any initial known or unknown SIP method (e.g. REGISTER, INVITE, SUBSCRIBE, MESSAGE).
- presence or absence of any header or content of any header.
- direction of the request with respect to the served user.
- MO or MT to registered user or MT to unregistered user.
- session description information (i.e. SDP).

S-CSCF Routing Behaviors

- On behalf of an originating endpoint:
- Obtain from DNS the address of the I-CSCF (or other IP endpoint) for the network operator serving the destination subscriber using the destination name of the terminating subscriber (e.g. dialed E.164 phone number or SIP URL). Send the SIP request or responses to the indicated I-CSCF.
- If the destination name of the terminating subscriber is determined by DNS to be a PSTN address, then send the SIP request to the BGCF within the operator's network.
- On behalf of a destination endpoint:
- Send the SIP request to a P-CSCF based on the registered location for registered subscribers.
- Send or redirect the SIP request to an alternate endpoint for unregistered subscribers with call forwarding or similar services.

Proxy CSCF (P-CSCF)

- Functions:
- Serves as the initial point of contact for user terminal to network
- Forward the SIP register request received from the UE to an I-CSCF
- Forward SIP messages received from the UE to the SIP server (e.g. S-CSCF)
- Forward the SIP request or response to the UE.
- Insert public user identity for UE initiated requests
- Maintain a Security Association between itself and each UE
- Perform SIP message compression/decompression.
- Authorisation of bearer resources and QoSmanagement.
- Enforce the bearer resources as negotiated in the SDP

Interrogating CSCF (I-CSCF)

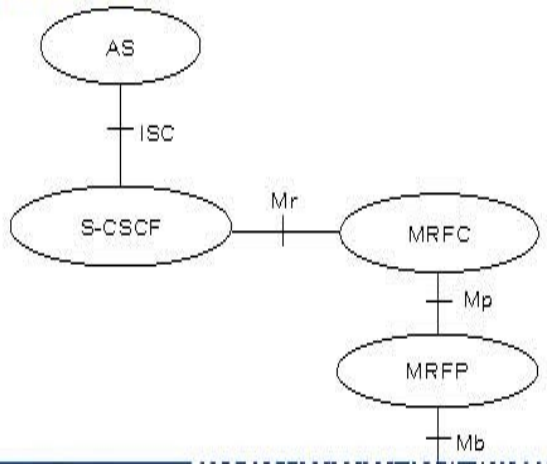
- Functions
- Serves as the initial point of contact from other networks
- Selects a S-CSCF for a user performing SIP registration
- Routes SIP requests received from another network to the S-CSCF.
- Query HSS for the Address of the S-CSCF.
- If no S-CSCF is currently assigned (e.g., unregistered subscriber), then assign S-CSCF to handle the SIP request.
- Performs a stateless SIP proxy function,Send a SIP request or response to:
- S-CSCF in another operator's network.
- MGCF for mobile termination call after processing INVITE.
- I-CSCF in another operator's network (network hiding case).
- THIG (optional): Topology Hiding Inter-network Gateway function
- to hide the configuration, capacity, and topology of the networkfrom the outside

Breakout Gateway Control Function (BGCF)

- Functions
- Selects the network in which the interworkingwith the PSTN/CS Domain is to occur.
- Selects the local MGCF in the network
- Selects peer BGCF
- IMS standards do not specify the criteria for the BGCF to use when selecting the PSTN/PLMN access point. Some possible factors include the following:
- Current location of the calling UE.
- Location of the PSTN/PLMN address.
- Local policies and business agreements between the visited and home network (e.g. Minimize path distance, Least cost path).

MRFC/MRFP

- Functions of MRFC (Media Resource Function Controller)
  - Control the media stream resources in the MRFP.
  - Interprets information coming from an AS and S-CSCF and control MRFP accordingly.
- Functions of MRFP(Media Resource Function Processor)
  - Control of the bearer on the Mb reference point.
  - Provides resources to be controlled bv MRFC.
  - Mixing of incoming media streams
  - Media stream source
  - Media stream processing
  - Floor Control



Home Subscriber Service (HSS)

- HSS:
- The HSS supports IMS level Authentication, and Authorization.
- Holds IMS subscription data, service profile, location information and authentication information...
- Provides HLR function: CS and PS subscription data
- Keeps track of currently assigned S-CSCF
- Supports CSCF and AS access
- Interface: Diameter (IMS), MAP(CS/PS)
- SLF:
- Allocates HSS by SIP URI

Media Gateway Control Function (MGCF)

- MGCF
- Connecting point between IMS control layer and PSTN/ISDN network
- It Controls IM-MGW by H.248 and performs media layer interworking.
- IMS side: communicates with I/S-CSCF and BGCF
- PSTN/ISDN side: performs protocol conversion between SIP and BICC/ISUP.

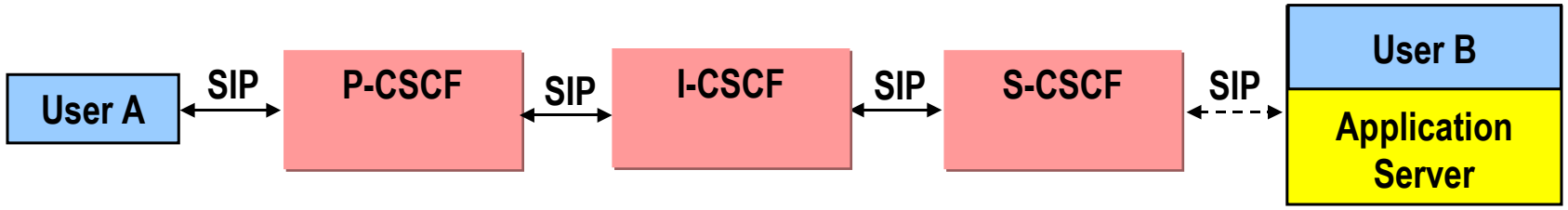
IMS Media Gateway (IM-MGW)

- IM-MGW
- Interacts with the MGCF for resource control
- Terminates bearer channels from circuit switched network and media streams from packet network (e.g. RTP streams in an IP network).
- Supports media conversion, bearer control, and payload processing (e.g. codec, echo canceller, conference bridge).
- Detects events (i.e. bearer loss, DTMF digits, etc.) and notifies the MGCF.
- May perform DiffServCode Point (DSCP) markings on the IP packets sent towards the UE.

IMS Specifications

- 3GPP Specifications (Cont.)
- TS 22.228 – Service requirements for the Internet Protocol (IP) multimedia core network subsystem (IMS); Stage 1
- TS 23.218 – "IP Multimedia (IM) session handling; IM call model; Stage-2"
- TS 23.228 – "IP Multimedia Subsystem (IMS); Stage 2"
- TS 24.228 – Signaling flows for the IP multimedia call control based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3
- TS 24.229 – "IP Multimedia Call Control Protocol based on SIP and SDP; Stage 3"
- TS 23.221 – Architectural requirements

Different Roles of the CSCF



- The Proxy CSCF (P-CSCF) represents the first entry point for a mobile subscriber and determines the appropriate I-CSCF **in the caller's home network, based on the caller's home domain name.**

- **The responsible** Interrogating CSCF (I-CSCF) then selects the appropriate S-CSCF**, depending on the called party's location, the requested service and required service capabilities.**

- **Finally the** Serving CSCF (S-CSCF) establishes the connection to the called party **(via I-, S- and P-CSCF of B party's domain) respectively to the application server, which hosts the requested service.**