Cairo University
Faculty of Engineering
Electronics and Electrical Communications Department

Professional Masters Program – Major Telecommunications

ECP 610: Multimedia Communications

Part 4:IP Multimedia Subsystem (IMS)

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IP Multimedia Subsystem (IMS)

IP Multimedia Subsystem (IMS) Main Factors

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   - 1.2 3GPP Development
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IP Multimedia Subsystem (IMS) Main Factors

1. **IMS Background Knowledge and Basic Concepts**
2. **IMS Network Structure**
3. **IMS Registry Process**
4. **IMS Session Process**

IMS Background Knowledge and Basic Concepts

IMS Background Knowledge and Basic Concepts

- **IMS Basic Concepts**
- **3GPP Development**
- **SIP Concepts**

IMS Basic Concepts

IMS is defined in the 3GPP R5 as follows:

IMS: IP Multimedia subsystem (3GPP TS 23.002)

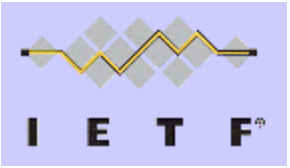
- The IM subsystem comprises all CN elements for provision of IP multimedia services comprising audio, video, text, chat, etc. and a combination of them delivered over the PS domain.

- The entities related to IMS are CSCF, MGCF, MRF, etc. as defined in the stage 2 of the IM subsystem TS 23.228. See TS 22.228 for some service examples of IMS.

Where does IMS come from?

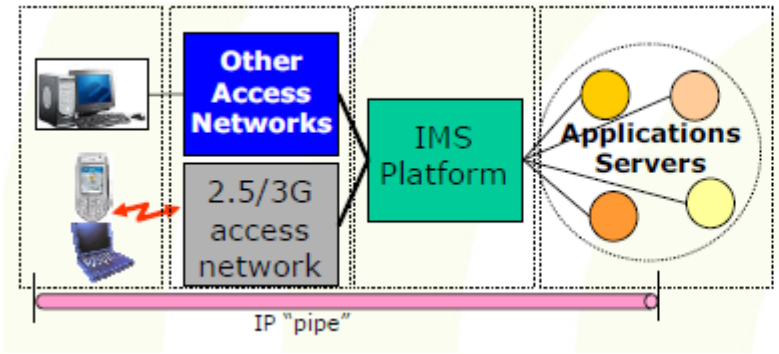
(Europe)

(USA)



BODY	NETWORK TYPE	NAME	STATUS
IETF	Any IP network	Session Initiation Protocol (SIP) Diameter Common Open Policy Service (COPS)	SIP approved in early 1999, now present in commercial products and services; refinement ongoing. Has worked closely with 3GPP on IMS.
3GPP	UMTS (W-CDMA) mobile networks; being extended to other access networks in Release 6	IP Multimedia Subsystem (IMS)	Initially defined in 3GPP Release 5; refined in Release 6; Release 7 definition with further features now in preparation.
3GPP2	CDMA2000 mobile networks; being extended to other access networks	Multimedia Domain (MMD)	Mirroring developments in 3GPP; interoperable with 3GPP IMS.
CableLabs	Cable IP networks	PacketCable 2.0	IMS expected to form the core of SIP-based control layer for cable services; SIP already integrated in PacketCable Multimedia (PCMM).
ETSI	Next-gen wireline networks	Tispan	Release 1 will be issued in September 2005 and is heavily based on IMS.
ATIS	North American wireline networks	NGN	Basing its work heavily on work and concepts already completed by Tispan.
ITU	Next-gen wireline networks	ITU SG13 NGN	Largely based on Tispan work.
OMA	All mobile networks	OMA POC	Focused on standard definition of services. Initial focus is push-to-talk over cellular (POC); Release 1 due end of 2005.
GSM Association	GSM, UMTS	N/A	IMS interoperability testing via Global Roaming Exchange (GRX); two sets of tests now successfully completed.

IMS Basic Concepts



ACCESS–AGNOSTIC, STANDARDS–BASED ARCHITECTURE which **Accommodates** and **Unifies Access** (single GUI) to **ANY IP–Based Application:**

- Voice/Video
- Messaging (Text, Image, File, email)
- Other (PoC, multiplayer gaming)

Interoperability with ASs:

A Standard's-based IMS Platform can assure (future) interoperability with Application Servers from a variety of vendors [widest possible set of IP-based Applications] & Terminals/Clients

Candidate Applications:

- Short-Term:

1. Available Today: PoC, Video Sharing, multiplayer gaming, Media Push
2. Available Soon: Instant (Multimedia) Messaging

- Medium-Term: Small-scale VoIP Offerings within Mobile Domain
- Longer-Term: VoIP offerings across all domains (Fixed-Mobile Convergence)

IMS Benefits

Benefits to End-Users

- Integrated Rich Media
  Voice, messaging, gaming, multimedia/file exchanging
- Single Public Identity
- Personalized Communications
- Roaming
- IP services @ mobile handset
- Mobile-Fixed Interworking

Benefits to Operators

Open and Standardized Interfaces -> Best of breed in multi-vendor infrastructure -> Cooperation with 3rd party application developers

- Secure service interoperability
- **Short Time-to-Market**
- Common platform with reusable components
- Common foundation for services; fixed, mobile and enterprise
- Combination of functionalities/services
- Integrated and Interoperable Services
- **Lower Costs**
- Sharing of components and integration costs -> Lower CAPEX
- Common platform -> Lower complexity -> Lower OPEX
- **New revenues from new interactive multimedia applications**
- **Keeps charging relation with user in novel IP service**

IMS Features

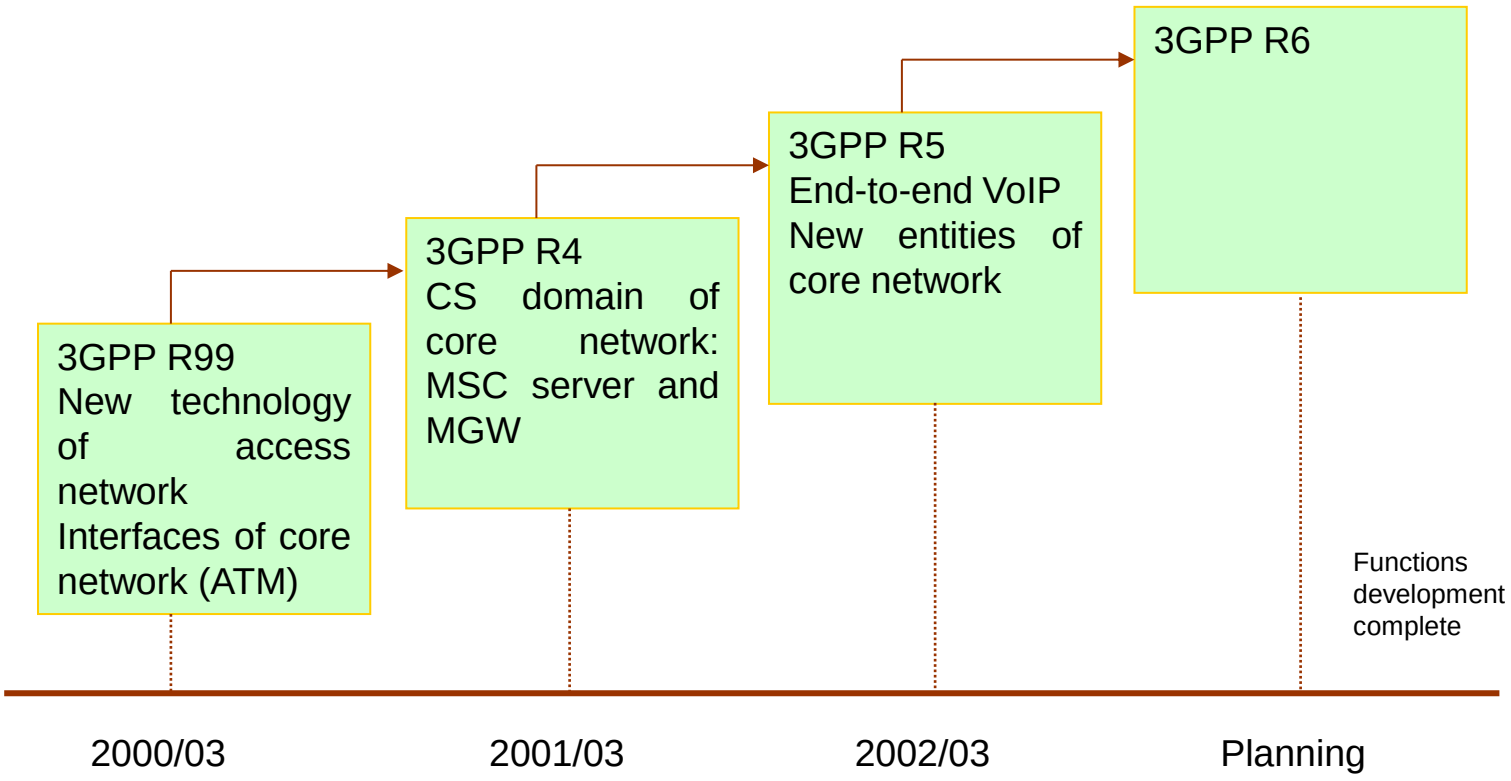
As the basis of the unified core network in the future, the IMS has the following features:

- The IMS uses SIP to control sessions. Because the SIP is simple, flexible, easy to expand, and convenient for media negotiation, the IMS will be more adaptable in the future.
- Service logic is separated from network transmission. Services are distributed in different servers, and the network is used only for transmission. Therefore, two ends can complete the services to the greatest extent.
- Service trigger conditions are matched with standard SIP as the trigger interface and subscription data as the match principle. Therefore, a service can be triggered and matched flexibly to the greatest extent.
- Subscription data is stored in the HSS for being downloaded by the session control NE or service processing NE. Therefore, a piece of UE or service can be moved to any place.
- Services are provided to a user in the home domain. Therefore, the user can enjoy the services in different places at different time.
- Sessions and services are distributed. Therefore, the IMS can be as reliable, stable and available just as the IP network is.

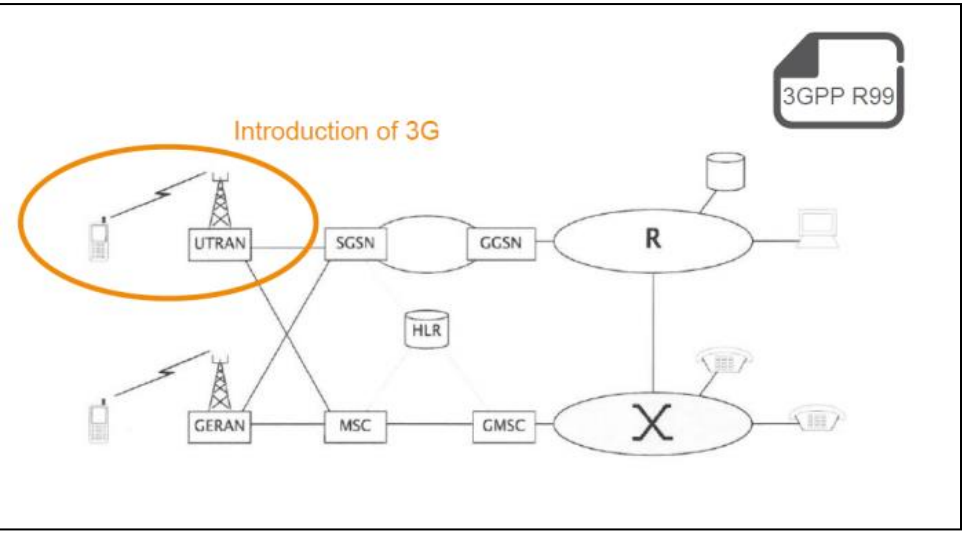
IMS Background Knowledge and Basic Concepts

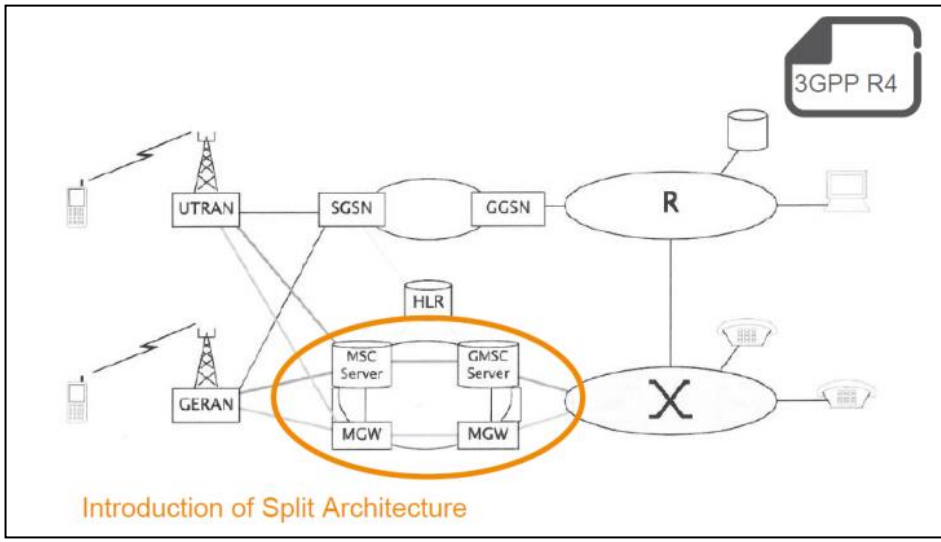
- IMS Basic Concepts
- 3GPP Development
- SIP Concepts

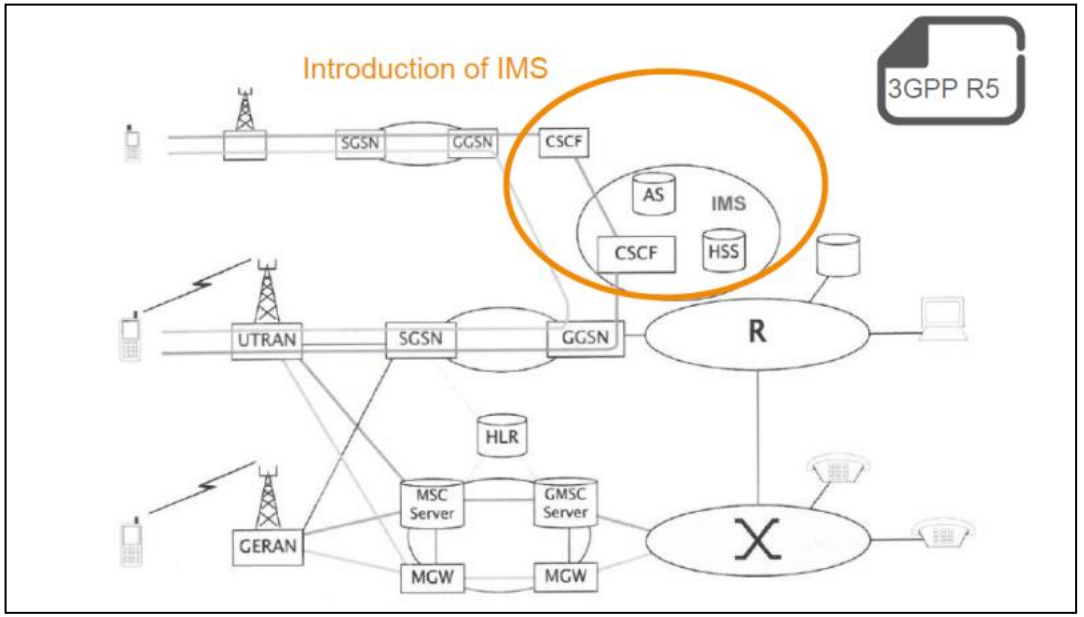
3GPP Development



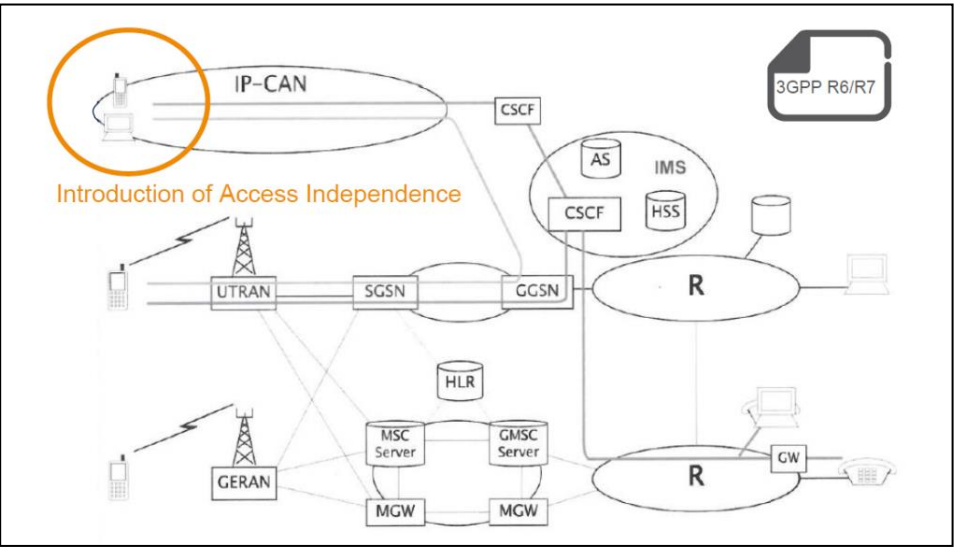
Mobile Networks Evolution – 3GPP R99 , R4 and R5

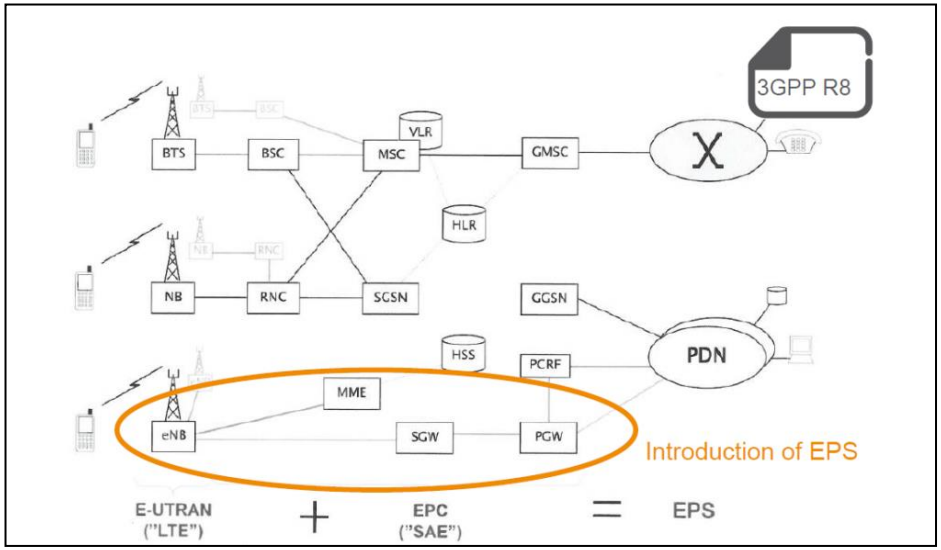




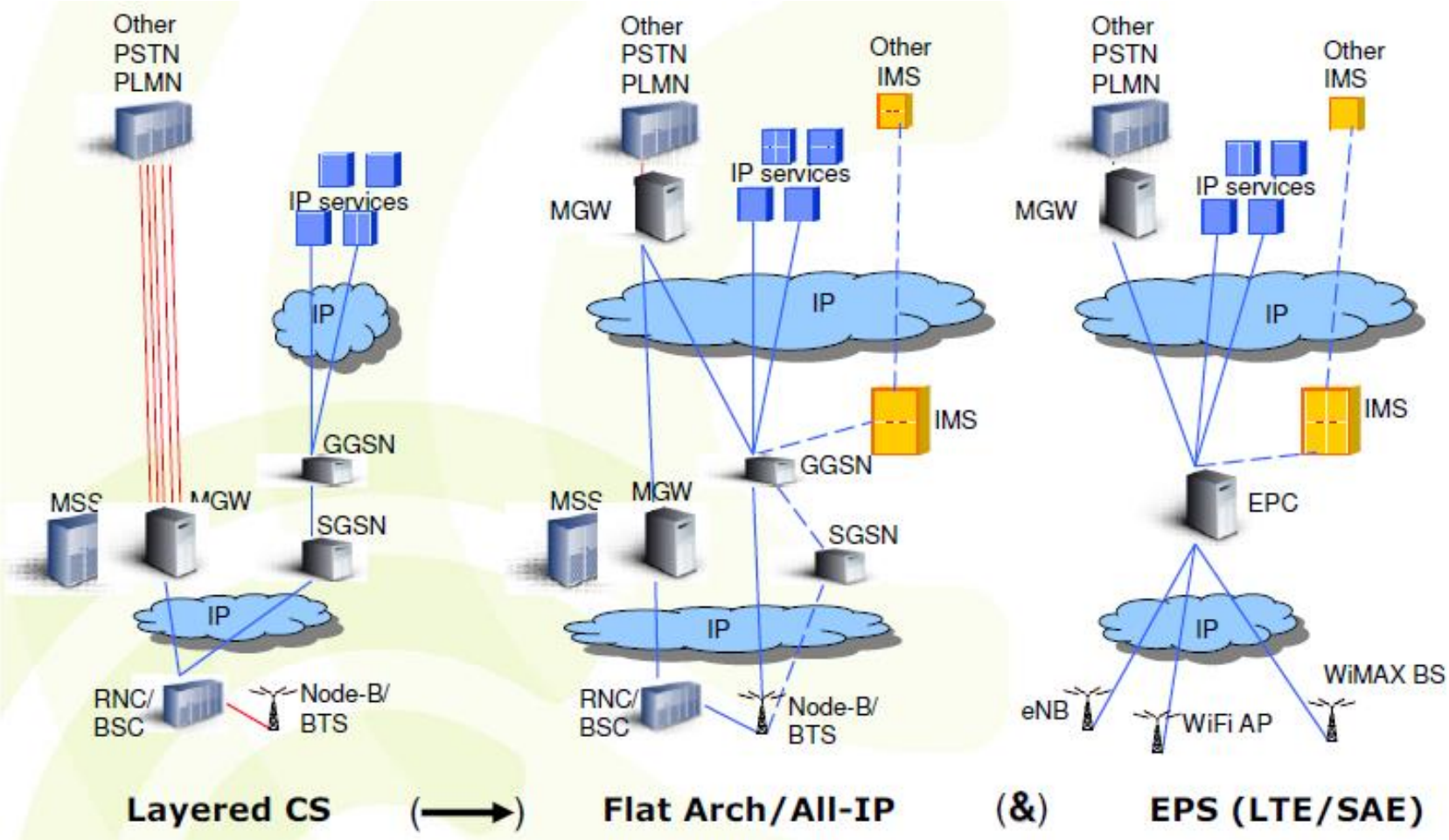


Mobile Networks Evolution – 3GPP R7 and R8

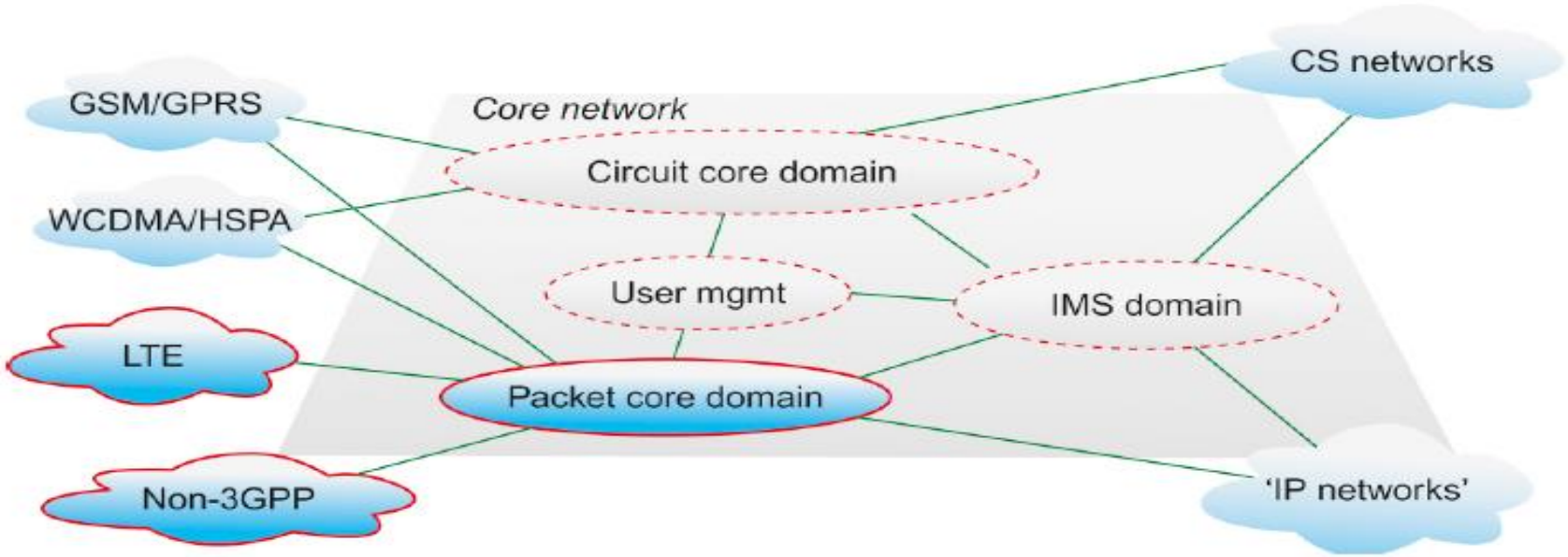




Mobile Architecture Networks Evolution



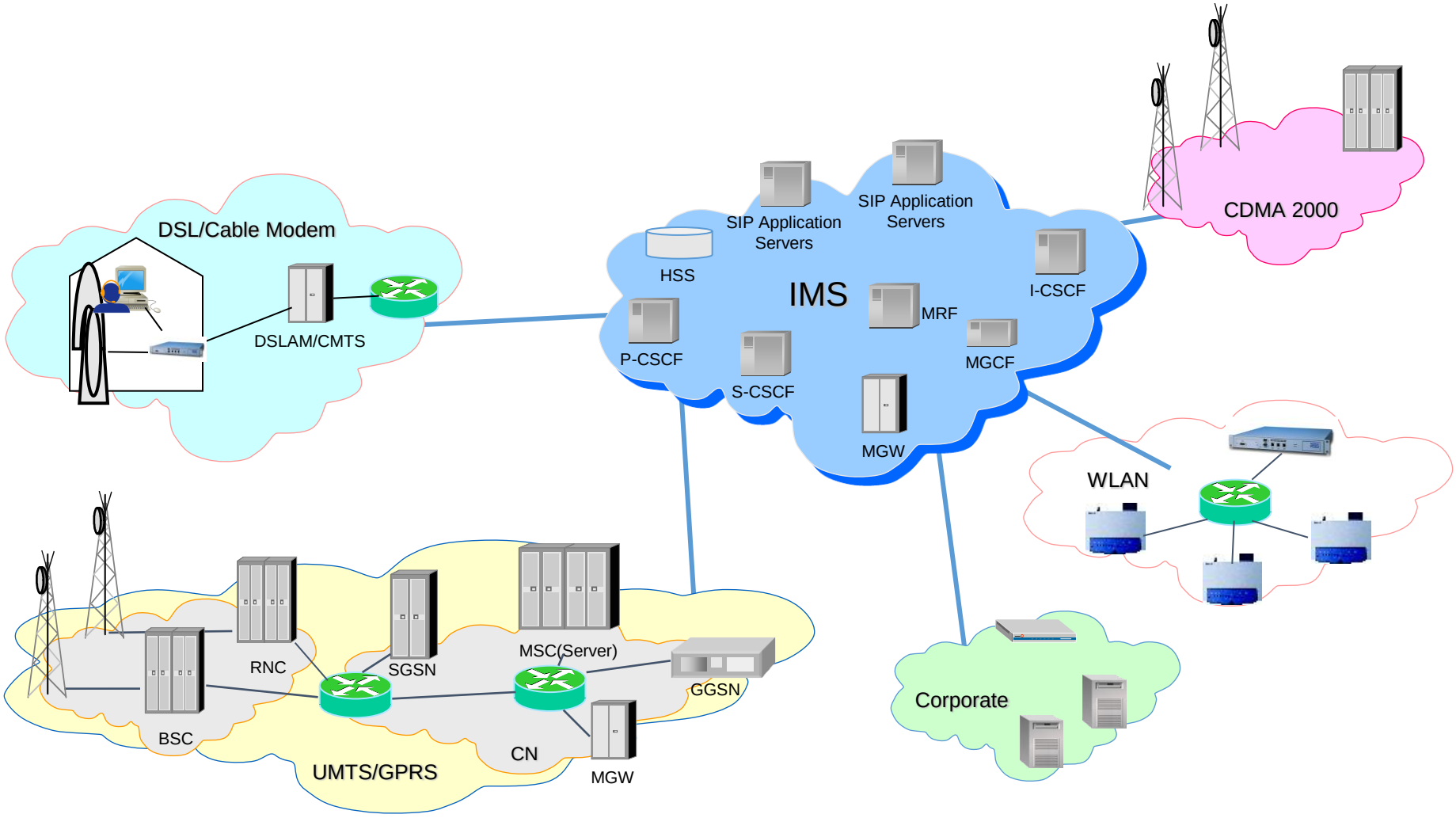
EPS – 3GPP Architecture Domains



- From an operator's perspective, in order to provide a data-only mobile broadband service, the infrastructure must be upgraded to EPS.
- EPS provides components that allow existing 2G/ G access networks to utilize EPC components.
- For those incumbent 2G/ G operators the existing CS network can provide access to voice calls in the short term, but the deployment of IMS in conjunction with EPS would provide an All-IP network with access to speech services.
- Our focus here is how EPS is supporting voice services.
- There are two fundamentally different ways that voice services can be realized for LTE users; **using circuit-switched** or **IP Multimedia Subsystem (IMS) technologies**.

- **Voice services based on circuit-switched technology → Circuit-switched fallback CSFB**
- **Voice services with IMS technology → Single-Radio Voice Call Continuity SRVCC**

IMS Access Network Independence



IMS Background Knowledge and Basic Concepts

- IMS Basic Concepts
- 3GPP Development
- SIP Concepts

SIP Concept

- SIP (RFC 3261), developed by IETF, is one of framework protocols of multimedia communication system. It is a protocol for IMS control plane, used for setting up, changing, or ending multimedia sessions.
- SIP is used for session setup and media negotiate along with RTP/RTCP, SDP, RTSP, and DNS.
- Once a session is set up, medium stream uses the RTP on the bearer plane to transmit the session directly. Also, multiple media can be interacted flexibly in one session.

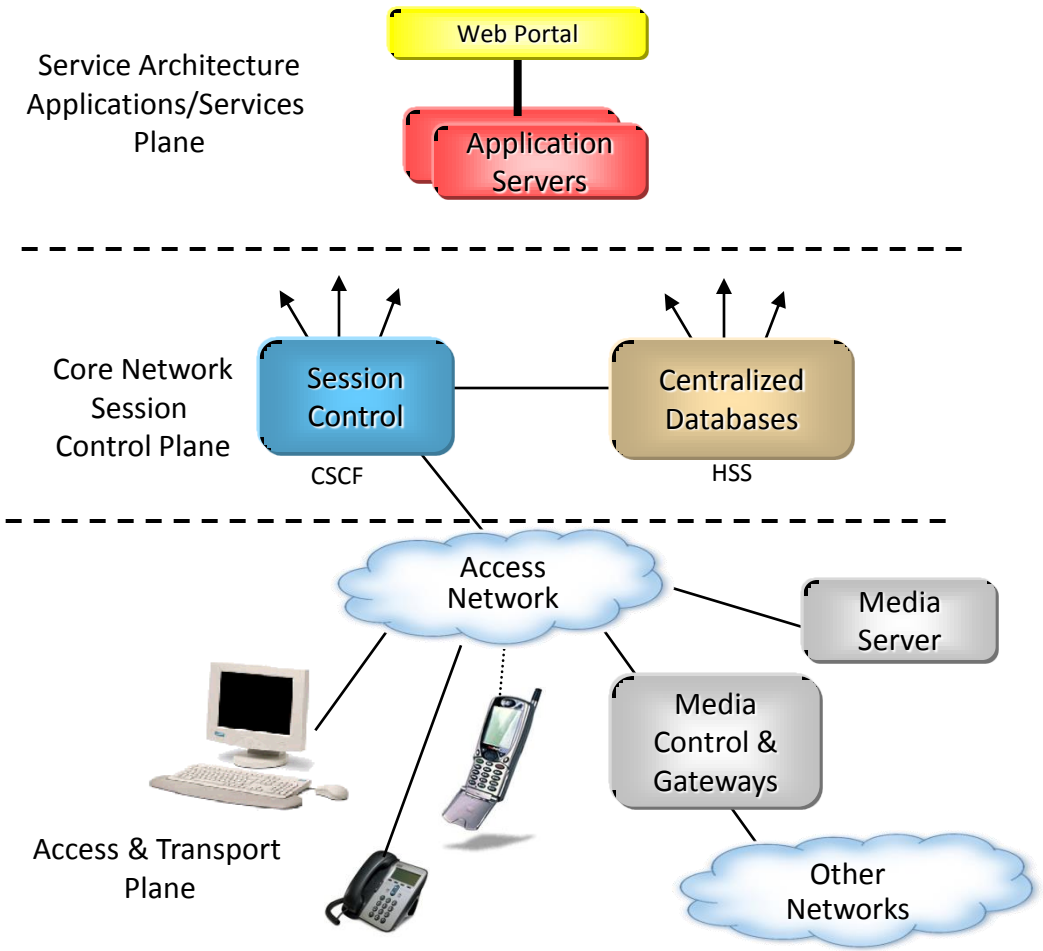
IP Multimedia Subsystem (IMS) Main Factors

1. IMS Background Knowledge and Basic Concepts
2. **IMS Network Structure**
3. IMS Registry Process
4. IMS Session Process

IMS Network Structure

IP Multimedia Subsystem (IMS) Network Structure

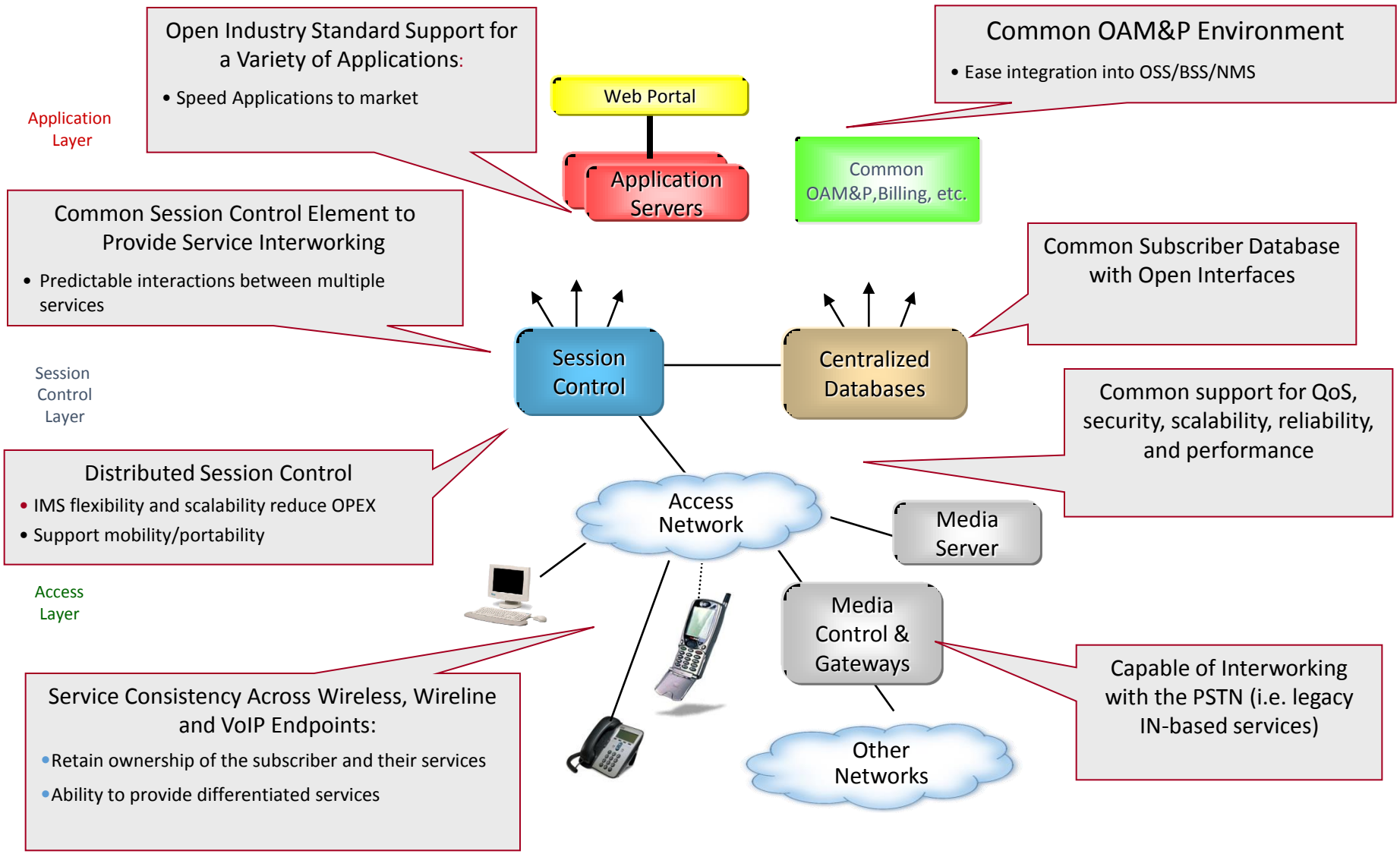
IMS Structure



CSCF – Call Session Control Function
HSS – Home Subscriber Server

- An Industry Standard Service Architecture (SA) and Core Network (CN) architecture
- An IP Multimedia Services Architecture
- Defined with Open Standards from 3GPP and ETSI
- Based on IETF Protocols (SIP, RTP, RTSP, COPS, DIAMETER, etc.)
- Designed for both Wireless and Wireline Networks and for Fixed and Mobile Convergence (FMC)
- A Solution for Service Transparency
- Capable of Interworking with PSTN (i.e. legacy IN-based services)

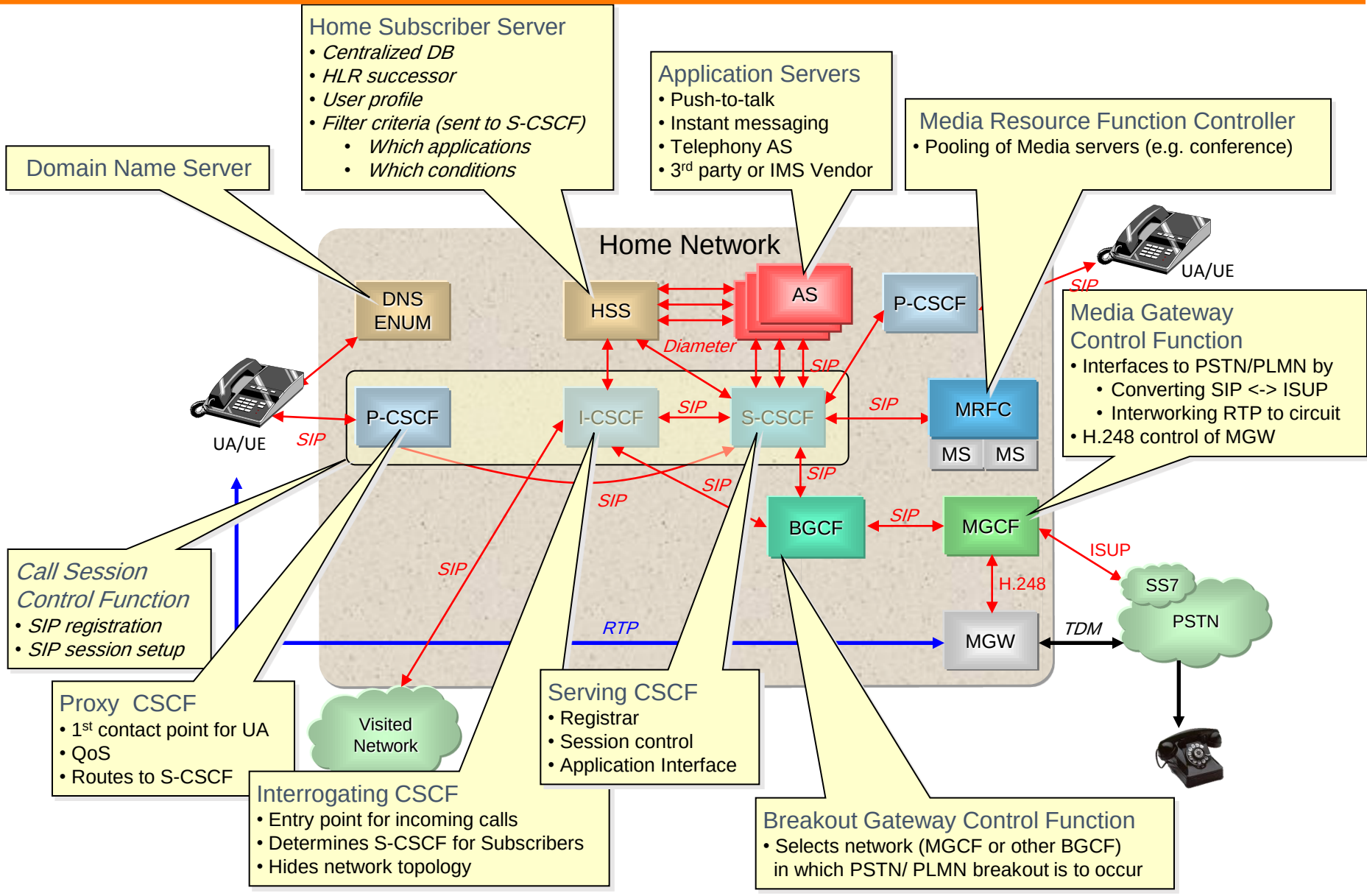
IP Multimedia Subsystem (IMS) - Key Attributes



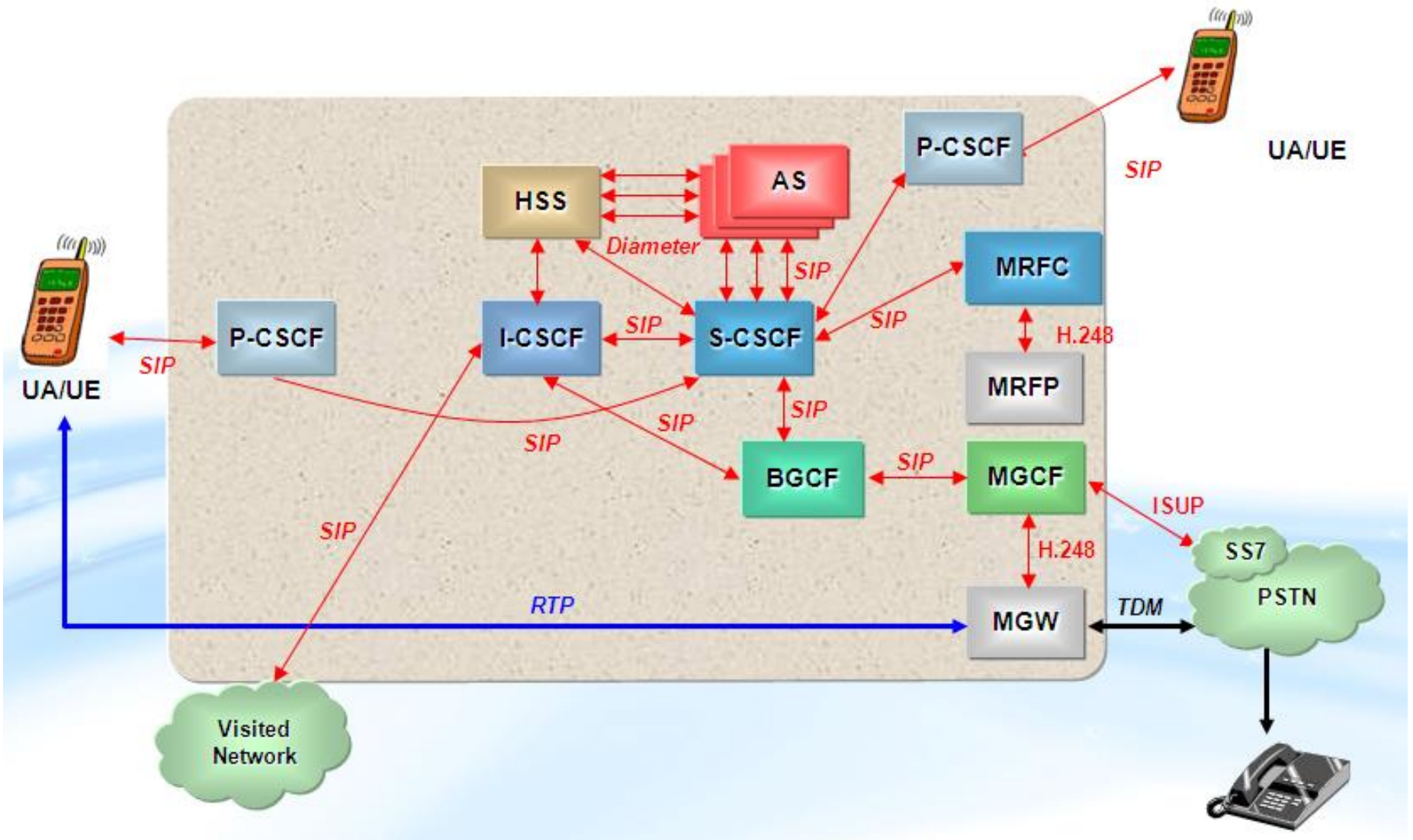
IMS Network Structure

IP Multimedia Subsystem (IMS) Network Elements

IMS Network Elements



IMS Network Elements



IMS Network Elements

- **P-CSCF (Proxy-CSCF):** The P-CSCF is the first point of contact between the IMS terminal and the IMS network. All the requests initiated by the IMS terminal or destined to the IMS terminal traverse the P-CSCF.

- **I-CSCF (Interrogating-CSCF):** The I-CSCF has an interface to the SLF (Subscriber Location Function) and HSS (Home Subscriber Server). This interface is based on the Diameter protocol. The I-CSCF retrieves user location information and routes the SIP request to the appropriate destination, typically an S-CSCF.

- **S-CSCF (Serving Call Session Control Function):** It maintains a binding between the user location and the user's SIP address of record (also known as Public User Identity). Like the I-CSCF, the S-CSCF also implements a Diameter interface to the HSS.

- **SIP AS (Application Server):** The AS is a SIP entity that hosts and executes IP Multimedia Services based onSIP.

- **PDF (Policy Decision Function):** PDF manages the QoS over the media plane and can be integrated in the P-CSCF5 or implemented as a separated .

- **SGW (Signaling Gateway):** SGW performs lower layer protocol conversion.

- **The Home Subscriber Server (HSS):** contains all the user related subscription data required to handle multimedia sessions

IMS Network Elements

- **Subscription Locator Function (SLF)**

  If a carrier uses multiple HSSs, I-CSCF can obtain the HSS domain names of subscription information through the SLF during the registry and transaction setup process. It can be integrated with HSS.

- **Media Gateway Control Function (MGCF)**

  MGCF supports the interaction between IMS control plane and PSTN or PLMN CS, supports the interaction between ISUP/BICC and SIP, and performs the RTP between PSTN or CS TDM and IMS user plane through the IM-MGW based on the H.248.

- **IMS-Media Gateway Function (IM-MGW)**

  IM-MGW performs wideband or narrowband bearer interoperation between IMS and PSTN or CS user plane, and performs Codec coding and decoding function as well.

- **Breakout Gateway Control Function (BGCF)**

  BGCF is configured according to interoperation rules for called number analysis. It chooses MGCF for the calls from IMS to PSTN/CS so as to access the MGCF routes automatically.

IMS Network Elements

- **Multimedia Resource Function Controller (MRFC)**

  MRFC can control the media resources of MRFP through the H.248, translate the AS SIP resource control commands, convert these commands so that MRFP can recognize them, and generating charging information.

- **Multimedia Resource Function Processor (MRFP)**

  MRFP serves as a common network resource. It provides resource services under the control of MRFC, such as media stream mix (multiparty session), multimedia play (playing tone and streaming player), and media content translation (code conversion and speech recognition).

- **Domain Name System (DNS) and E.164 Number URI Mapping (ENUM) Server**

  DNS is used to translate URL addresses into IP addresses. DNS servers can be borrowed from the Internet or created in the network. ENUM server is used to converting telephone numbers into URLs. Generally, ENUM servers must be created by IMS carriers.

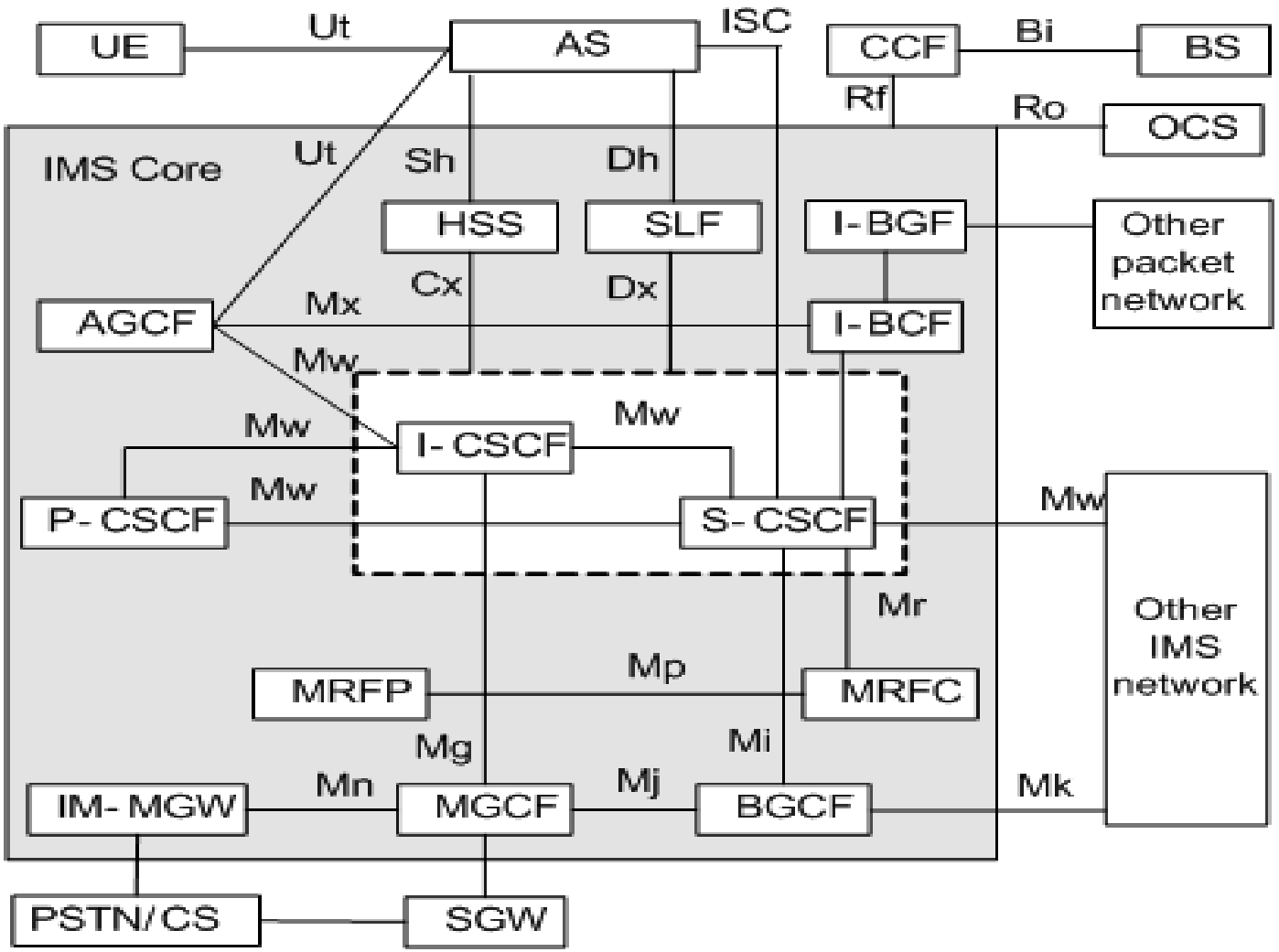
- **Dynamic Host Configuration Protocol (DHCP) server**

  Based on the dynamic host configuration protocol, a DHCP server can designate the URL address of P-CSCF to IMS terminal during the dynamic IP address allocation process.

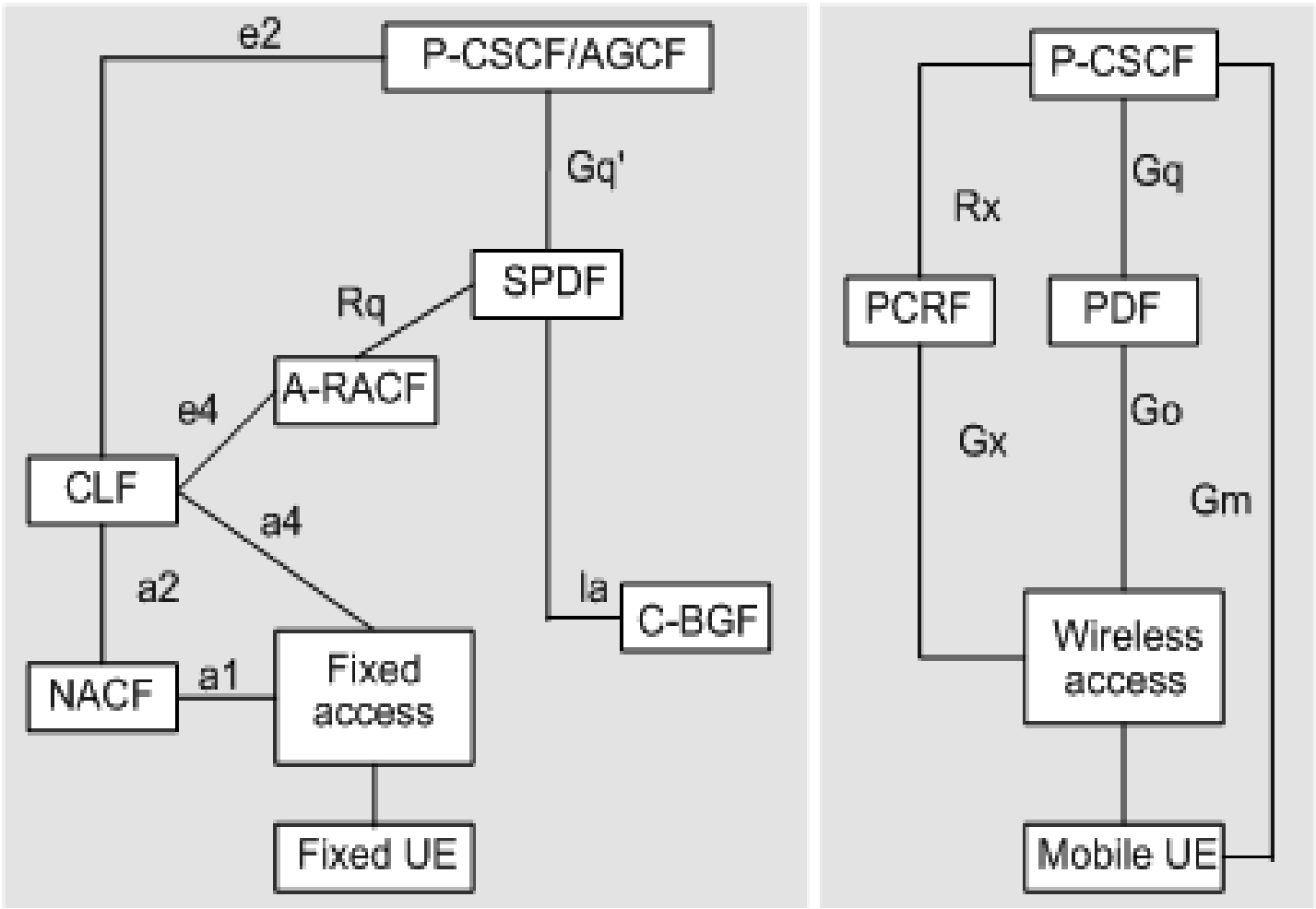
IMS Network Structure

IP Multimedia Subsystem (IMS) Interfaces

Main Interfaces for interworking in the IMS



Main Interfaces for interworking in the IMS



Main Interfaces for interworking in the IMS

Interface	Location and Function	Protocol
Gm	It is between IMS user terminals and the P-CSCF. It is used for the registration and session control of the IMS user.	SIP
Mw	It is used for the message communication and proxy forwarding between the CSCFs in the IMS registration and session flows.	SIP
Gq	It is between the P-CSCF and the PDF. The P-CSCF informs the PDF of the current session and bearer related information through the Gq interface. Therefore, the PDF can execute SBLP, interwork with PDFs in other backbone networks, and find out the QoS guarantee path to the peer access network or interworking node.	Diameter
Gq'	It is between the P-CSCF and the SPDF, and performs similar functions as the Gq interface.	Diameter
Go	It is used between the PDF and the GGSN to send QoS policies to the convergence node in the IP access network to execute policies.	COPS
Gx	It is between the PCRF and PCEF. The PCRF sends instructions indicating the installation or removal of related charging policies. The PCEF reports related bearer events to the PCRF.	Diameter
Cx	It is used to interact the following information between the CSCF and the HSS: ●All the information required when the I-CSCF selects the S-CSCF ●Information of the route from the CSCF to the HSS ●Information related to roaming authorization that the CSCF obtains from the HSS ●Security parameters that the CSCF downloads from the HSS and are required for the access authentication of IMS subscribers ●Subscription data of the IMS session filter that the HSS sends to the CSCF	Diameter
Dx	It is between the CSCF and the SLF. When the IMS operator has multiple HSS subscription databases, the Dx interface is used for the CSCF to get from the SLF the address of the HSS that has the subscription data of the subscriber being processed. When the operator has only one HSS (server array), this interface is not required.	Diameter
Mg	It is between the CSCF and the MGCF. Through the interface, the CSCF indirectly controls other non-IMS networks, such as the CS network, mobile 3G R4 network based on IP, and fixed NGN.	SIP

Main Interfaces for interworking in the IMS

Interface	Location and Function	Protocol
Mj	It is between the S-CSCF and the BGCF. Through the interface, the S-CSCF forwards session control signaling to the BGCF. Then the BGCF selects the MGCF required for interworking with the PSTN and 3G/2G CS network.	SIP
Mj	It is between the BGCF and the MGCF. Through the interface, the BGCF transmits session control signaling to the MGCF when the IMS network interworks with the PSTN or PLMN.	SIP
Mk	It is between the BGCFs. Through the interface, the BGCF in the same network with the calling S-CSCF forwards session control signaling to the BGCF in the same network with the interworking node MGCF.	SIP
Mm	It is between the CSCF and other external non-IMS IP networks. Through the interface, the CSCF interworks with other IMS networks or non-SIP IMS networks.	SIP
Mr	It is between the CSCF and the MRFC. Through the interface, the S-CSCF obtains related network resource services, such as announcements playing, digit collection, conference bridge, and video stream media.	SIP
Mx	It is between the I-BCF and other entities such as the CSCF, AGCF and BGCF. It implements the interworking between the IMS and other packet networks.	SIP
ISC	It is between the S-CSCF and the AS. According to the rules of triggering IMS subscription obtained from the HSS and the SIP service request sent from the IMS terminal, the S-CSCF decides whether to trigger the service, and then directs the session to a specific AS for final processing of the value-added service.	SIP
Rf	It is between the CCF and other entities such as the CSCF, MRFC, BGCF and AS, to implement the session related offline charging.	Diameter
Ro	It is between the OCS and other entities such as the AS, MRFC, and OCG to implement session-related online charging.	Diameter
Rx	It is between the PCRF and the AF to exchange session information in the application layer. The information is required when the PCRF determines policies and charging control rules. The PCRF exchanges the determined policies and charging control rules with the PCEF.	Diameter
Sh	It is between the HSS and the SIP AS or OSA-SCS. Through the interface, the AS queries the HSS to get the data relevant to value-added service logic and synchronizes relevant data to the HSS.	Diameter
Dh	It is between the SLF and the AS or OSA-SCS. According to the given subscriber identity and home domain information, the AS confirms the address of the HSS where the user data is located.	Diameter

Main Interfaces for interworking in the IMS

Interface	Location and Function	Protocol
BOSS	It is between the HSS/AS and the business hall server and is used to transfer corresponding communication information.	SOAP（Simple Object Access Protocol）
Mn	It is between the MGCF and the IM-MGW. Through the interface, the MGCF controls the interworking of the media streams on the IM-MGW, and the invoking of special resources.	H.248
Mp	It is between the MRFC and the MRFP. Through the interface, the MRFC controls the announcement playing, conference, and DTMF receiving and sending of the MRFP.	H.248 or SIP
Mb	It is between the IMS access network and the IPv6 network. Through the interface, the data on the control plane and user plane in the IMS network can be transmitted over the IPv6 network.	IPv6
Ut	It is between UE and the AS. Terminal users can manage and customize service options on the AS through the interface.	HTTPS（Hyper Text Transfer Protocol Secure）
e2	It is between the P-CSCF and the CLF. The P-CSCF obtains location information of fixed users through the interface.	Diameter/SOAP
e4	It is between the A-RACF and the CLF. The A-RACF obtains user configuration information through the interface.	Diameter
Rq	It is between the SPDF and the A-RACF. The SPDF interacts with the A-RACF through the interface to control QoS resources in the access network.	Diameter
Ia	It is used between the SPDF and the C-BGF to send QoS policies to the C-BGF so as to implement policies.	H.248
a1	It is between the NACF and the access network. The access network obtains such information as the IP address of UE through the interface.	DHCP
a2	It is between the NACF and the CLF. The NACF registers the association between the allocated IP address and user identity to the CLF.	Diameter

IMS Network Structure

IP Multimedia Subsystem (IMS) Signaling Protocols

IMS Signaling and Media Protocols

- **Session Initiation Protocol (SIP)**

SIP's main purpose is to manage sessions, specifically to establish, modify, and terminate multimedia sessions.

- **Session Description Protocol (SDP)**

A session description could include information such as the purpose of the session, the media and the codec's used in the session.

- **Diameter**

The 3GPP standards body has adopted Diameter as the primary signaling protocol for authentication, authorization, and accounting (AAA) in IMS. Diameter was developed and standardized by IETF as described in RFC 3588. Diameter is used by IMS's SIP servers (CSCFs) to perform authentication using information provided by the HSS and to determine if a client is authorized to access the services provided by the server.

- **Real-time Transport Protocol (RTP)**

RTP provides end-to-end delivery services for data with real-time characteristics, such as audio and video. RTP typically runs on top of UDP, no specific ports are defined for this purpose, but rather an even port and the next higher odd port are used (the later is used by the Real-time Transport Control Protocol (RTCP) to provide feedback on the RTP transported data).

IMS Signaling and Media Protocols

Protocol	Location and Function
SIP	It is used to control calls between the CSCF and other entities such as the UE, AS, and MGCF.
COPS	It is used for NAT control between the CSCF and NAT network devices. It is also used for the policies between the PDF and the GGSN to interact with each other.
Diameter	It is used to exchange information between the CSCF and the HSS or PDF. It is also used to interact charging information between the CCF/OCS and the CSCF, MRFC, BGCF, MGCF or AS.
ENUM	It is used to change an E.164 number to a SIP domain name between the CSCF and the ENUM server.
DNS	It is used to change a domain name to an IP address between the CSCF/AS and the DNS server.
H.248	It is used to control messages between the MGCF and the MGW, and between the MRFC and the MRFP.
SNMP	It is used for the NMS in the IMS to interwork with managed elements.
IPv6	It defines the IP address scheme of the next generation.
IPsec	It is used to protect network security between the UE and the CSCF and between security gateways.
SOAP	It is used to exchange information between the P-CSCF and the CLF, the NACF and the CLF, and between the AS and service Portal. The exchange is over the extensible mark-up language or the Hypertext Transfer Protocol.
NTP	It is used to support the time synchronization between the OMS2600 and the NTP server. So that all IMS equipment can synchronize with each other.

IP Multimedia Subsystem (IMS) Main Factors

1. IMS Background Knowledge and Basic Concepts
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3. **IMS Registry Process**
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IMS Registry Process

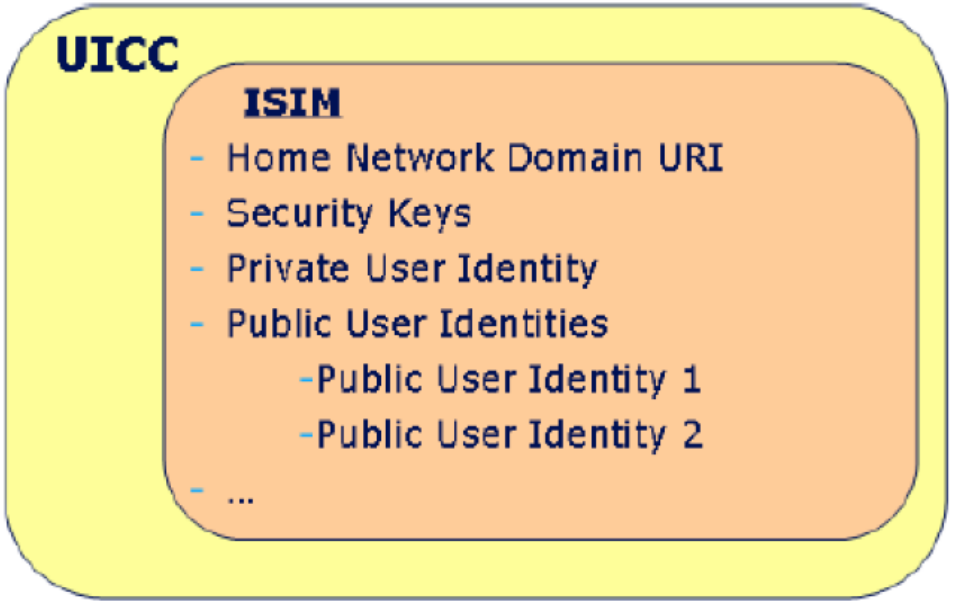
Contents

Contents

Identification Modules

There are two identification modules in Universal Integration Circuit Card (UICC):

- IMS Subscriber Identity Module (ISIM) and Universal Subscriber Identification Module (USIM).
- Subscriber Identity Module (SIM)
- Universal Identity Module (USIM)
- IMS Subscriber Identity Module (ISIM)



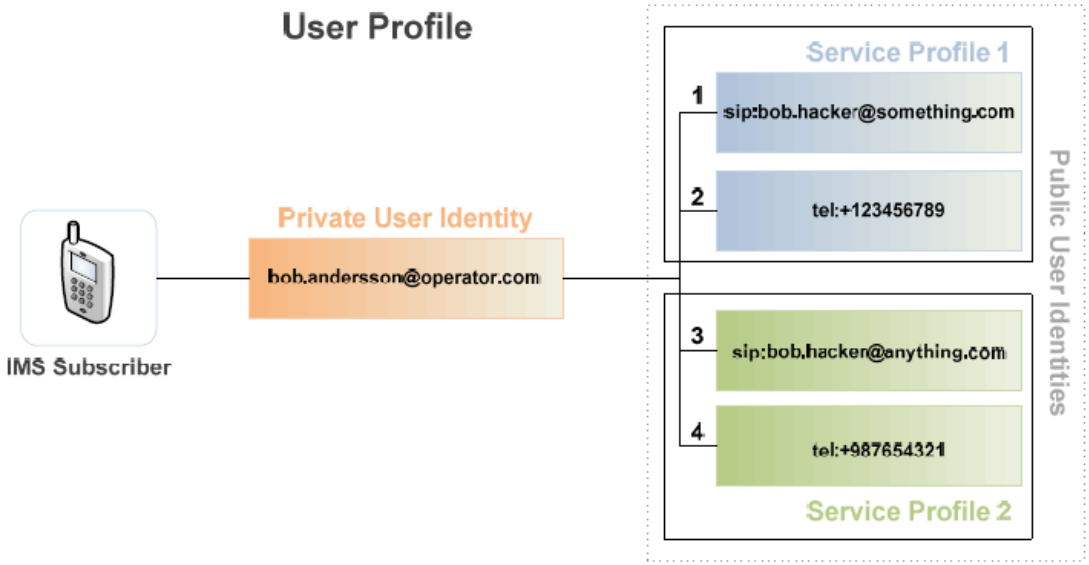
Identification Modules

There are two identification modules in Universal Integration Circuit Card (UICC):

- IMS Subscriber Identity Module (ISIM) and Universal Subscriber Identification Module (USIM).
- ISIM is used to store IMS subscriber data, such as IMPI, IMPU, home network domain name, and security key.
- USIM is used for PS domain. It can store security parameters, IMSI, APN, and so on. If there is no ISIM, USIM can be used to create a temporary IMPU.

User and Service Identities in IMS

- **IMS Public User Identity (IMPU)** Similar to a phone number or email address, the IMS public user identity is a unique address that can be used by a caller to contact the subscriber. Each IMS subscriber will have one or more public identities. These identities can take the form of a SIP or SIP SURI or a TelURI. The public identities are used by the IMS components for routing SIP requests from a caller to a callee as well as for identifying certain services used by the callee. Hence, in some sense the public identity resembles the MSISDN (Mobile Subscriber ISDN Number) in GSM .
- **IMS Private User Identity (IMPI)** The private user identity is used by the network operator for various internal operations mainly concerning user authentication, authorization, and accounting and administration purposes. Each subscriber will have at least one unique identity and possible more. In some sense it resembles the usage of the IMSI (International Mobile Subscriber Identity) in GSM .
- **Public Service Identities (PSI)** Public service identities are defined by 3GPP so as to enable users to directly access public services such as a conferencing bridge or voice box. These identities can be a SIPURI or a TelURI and indicate a certain service at an application server. Unlike public user identities, a PSI is not related to a certain user.



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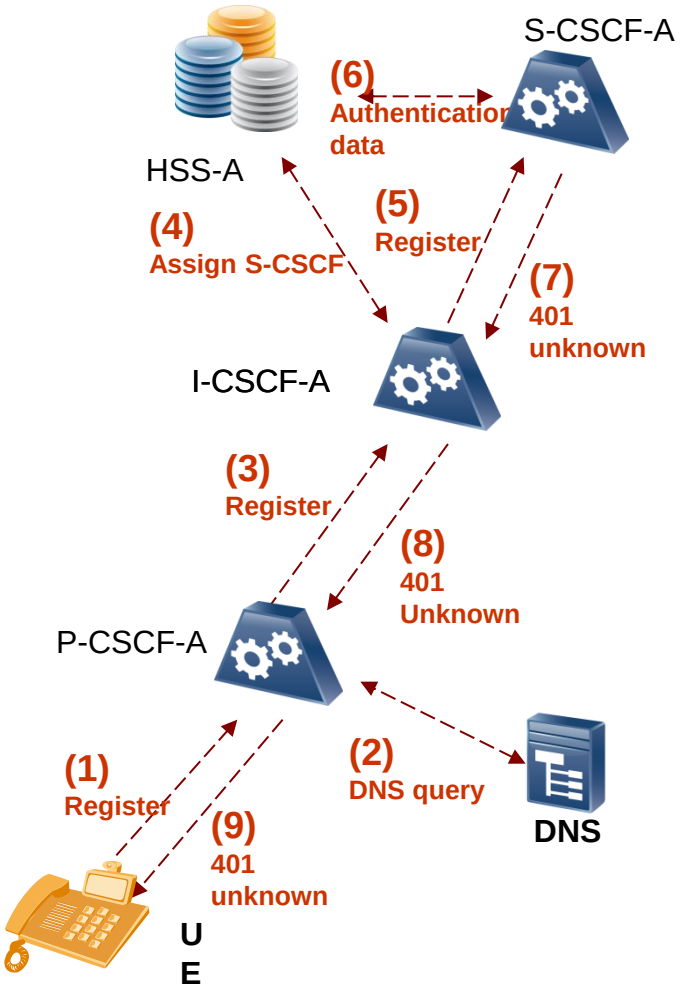
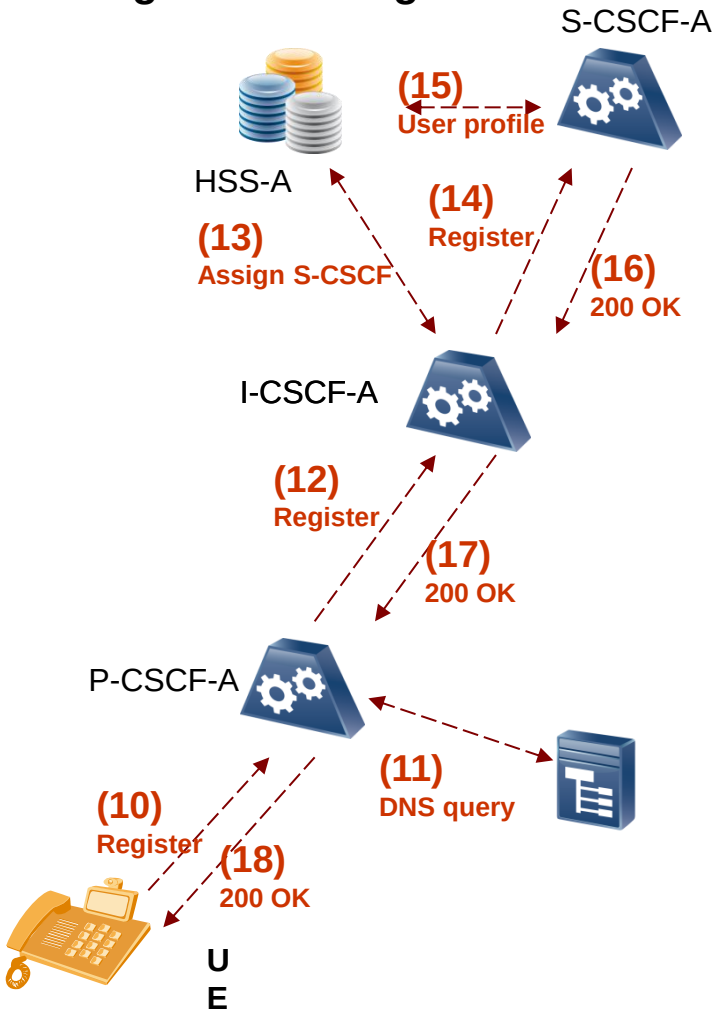
Registration Procedure

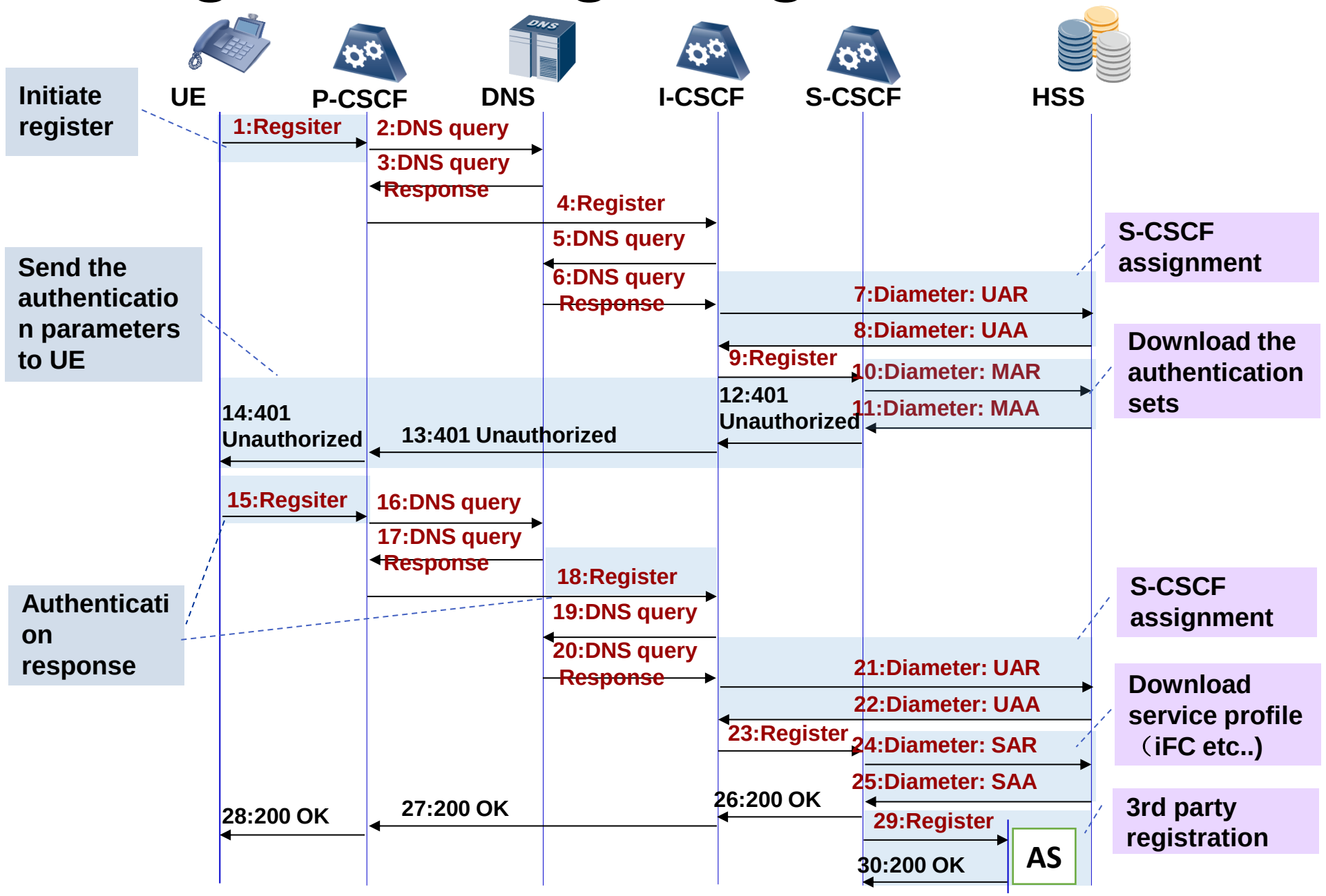
1— Initial register message



2—2nd register message



Registration Signaling Flow



Diameter Message

Message	Explanation
UAR	User Authorization Request
UAA	User Authorization Answer
MAR	Multimedia Authentication Request
MAA	Multimedia Authentication Answer
SAR	Server Assignment Request
SAA	Server Assignment Answer

Functions of NEs During Registration

- The following table describes the functions of the main NEs during the registration:

NE	Function
P-CSCF	-> Checking the IMPI, IMPU, and home domain -> Querying the DNS to obtain the I-CSCF IP address based on the home domain and forwarding the initial registration request
I-CSCF	-> Querying the HSS to select an S-CSCF and specifying the S-CSCF -> Forwarding the registration request to the S-CSCF
S-CSCF	-> Downloading authentication data from the HSS to authenticate the terminal -> Downloading the service subscription data (service profile) of the user from the HSS -> Performing third-party authentication based on the iFC
HSS	-> Interacting with the I-CSCF (delivering the S-CSCF list and the functions supported by each S-CSCF) to determine the S-CSCF -> Delivering authentication data and user service subscription data and recording the user registration status

Stored Information

Node	Before Registration	During Registration	After Registration
UE	IMPI, IMPU, Credentials Home Domain Proxy Name/Address	Same as before registration	IMPI,IMPU, Credentials Home Domain **Proxy Name/Address**
P－CSCF (in Home or Visited network)	**DNS address**	I-CSCF address/name UE Address，IMPI，IMPU	Final Network Entry point UE Address, IMPI，IMPU **S-CSCF address**
I-CSCF (in Home network)	**HSS address**	S-CSCF address/name (Delete after sent the message)	No State Information
S-CSCF (in Home network)	**HSS & DNS address**	HSS Address/name User profile P-CSCF address/name P-CSCF Network ID UE IP Address, IMPI，IMPU	May have session state Information Same as during registration Service profile **P-CSCF address**
HSS	**User Service Profile**	P CSCF Network ID	**S-CSCF address/name**

Stored Information

- **After the P-CSCF registration is completed successfully, the following information is stored:**

1. S-CSCF IP address. After being registered successfully, the user initiates a call to the P-CSCF and the P-CSCF knows to which S-CSCF to route the call (instead of selecting any S-CSCF as during registration). The S-CSCF sends its IP address in the Service-Route header field in a registration 200 message to the P-CSCF.
2. UE information, including the IMPI and IMPU of the UE, access network information, and UE IP address. When the user serves as the called party, the P-CSCF knows how to route the call to the UE.

- **After the S-CSCF registration is completed successfully, the following information is stored:**

1. P-CSCF IP address. When the user is the called party, the S-CSCF knows the P-CSCF that serves the called party. The P-CSCF sends its IP address in the Path header field in a calling message to the S-CSCF.
2. UE information, including authentication information (authentication information does not need to be downloaded during user re-registration) and service triggering data (service triggering during a call)

- **After the HSS registration is completed successfully, the following information is stored:**

1. S-CSCF IP address. During user re-registration, the HSS directly returns a UAA message carrying the S-CSCF IP address and the I-CSCF does not need to select any S-CSCF.

De-registration Procedures

- UE initiated de-registration
- Network initiated de-registration
  - HSS initiated the de-registration procedures before the register timer expires
  - AS initiated the de-registration procedures before the register timer expires
  - The register timer expires, network initiated the de-registration procedures

De-registration Procedures

- When de-registration is performed:

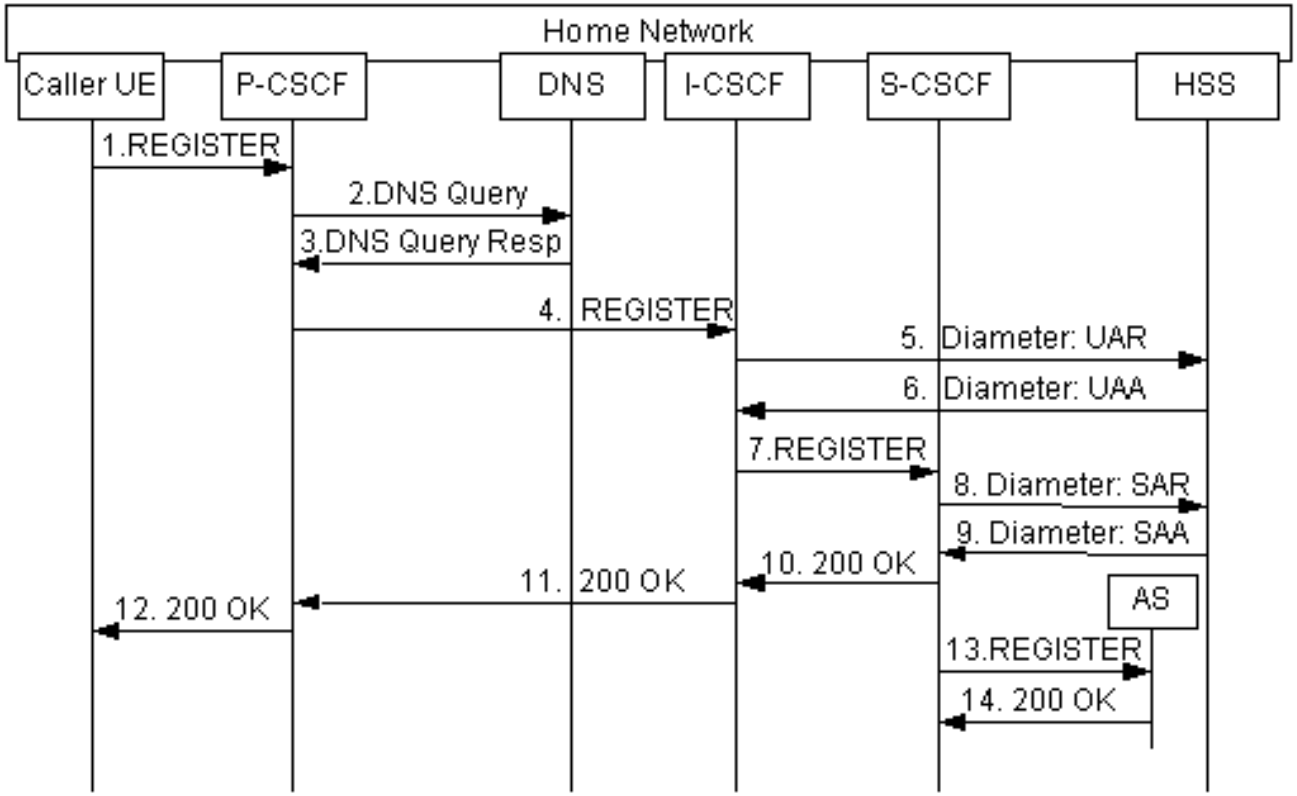
(1)A user is not de-registered unless the UE is powered off.

(2)The HSS generally de-registers a user due to an administration or security reason.

For example, the user modifies the authentication information. In this case, the user is de-registered so that the user is re-registered to use new authentication information for authentication.

(1)The mechanism of de-registering an AS is the same as the mechanism of de-registering the S-CSCF. The user registration request carries a register timer, which is saved by both the AS and S-CSCF. When the register timer expires, the user is de-registered.

User Initiate the Deregister



cause

- Switch off the UE
- Roaming handover

IMS Session Process

Contents

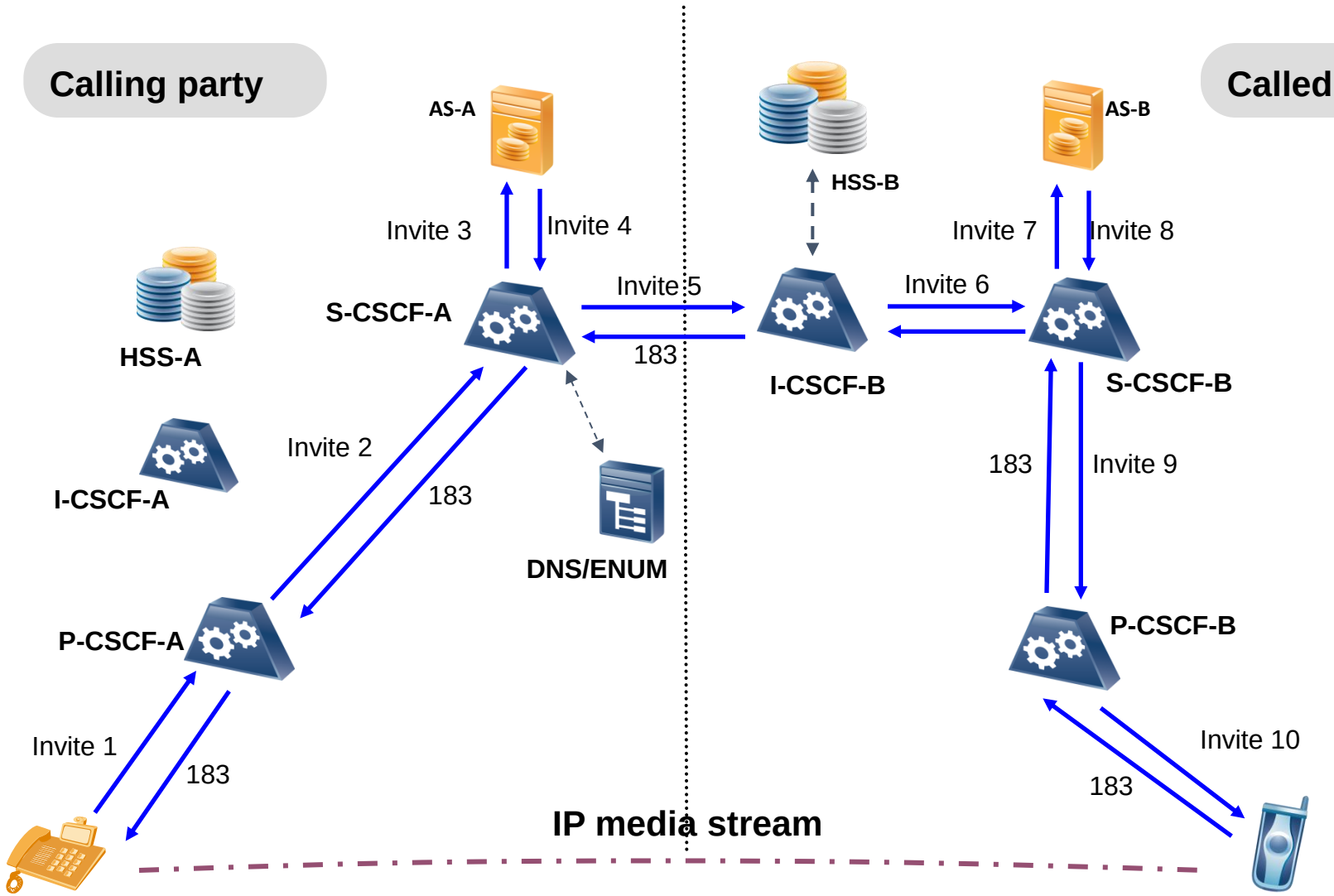
1. IMS Registration and Related Procedures

2. **IMS Session and Related Procedures**

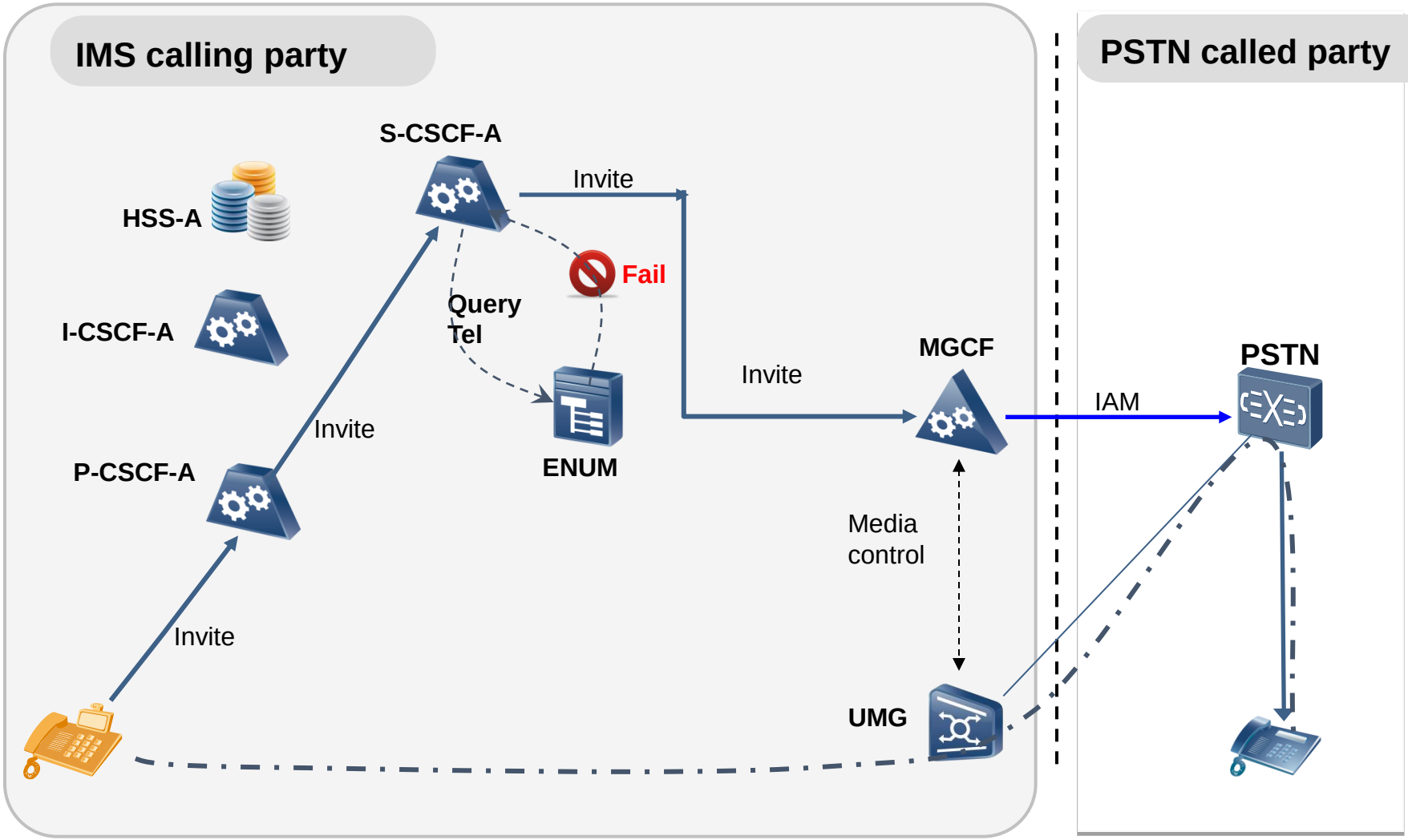
Session Procedure Related Network Nodes

UE	Main Functions
P-CSCF	1: Caller part: the 1st contact point to access to the IMS 2: Callee part: P-CSCF forwards the messages to the callee
S-CSCF	Realize the call control function for both caller part and callee part
I-CSCF	Contact point to access to the callee's home network .
AS	Implement service for both caller and callee side.
DNS/ ENUM	DNS: Reply the ICSCF IP address for S-CSCF query ENUM: Map the TEL format IMPU to SIPURI format
HSS	Only used in the callee part. I-CSCF locate the SCSCF by query the HSS

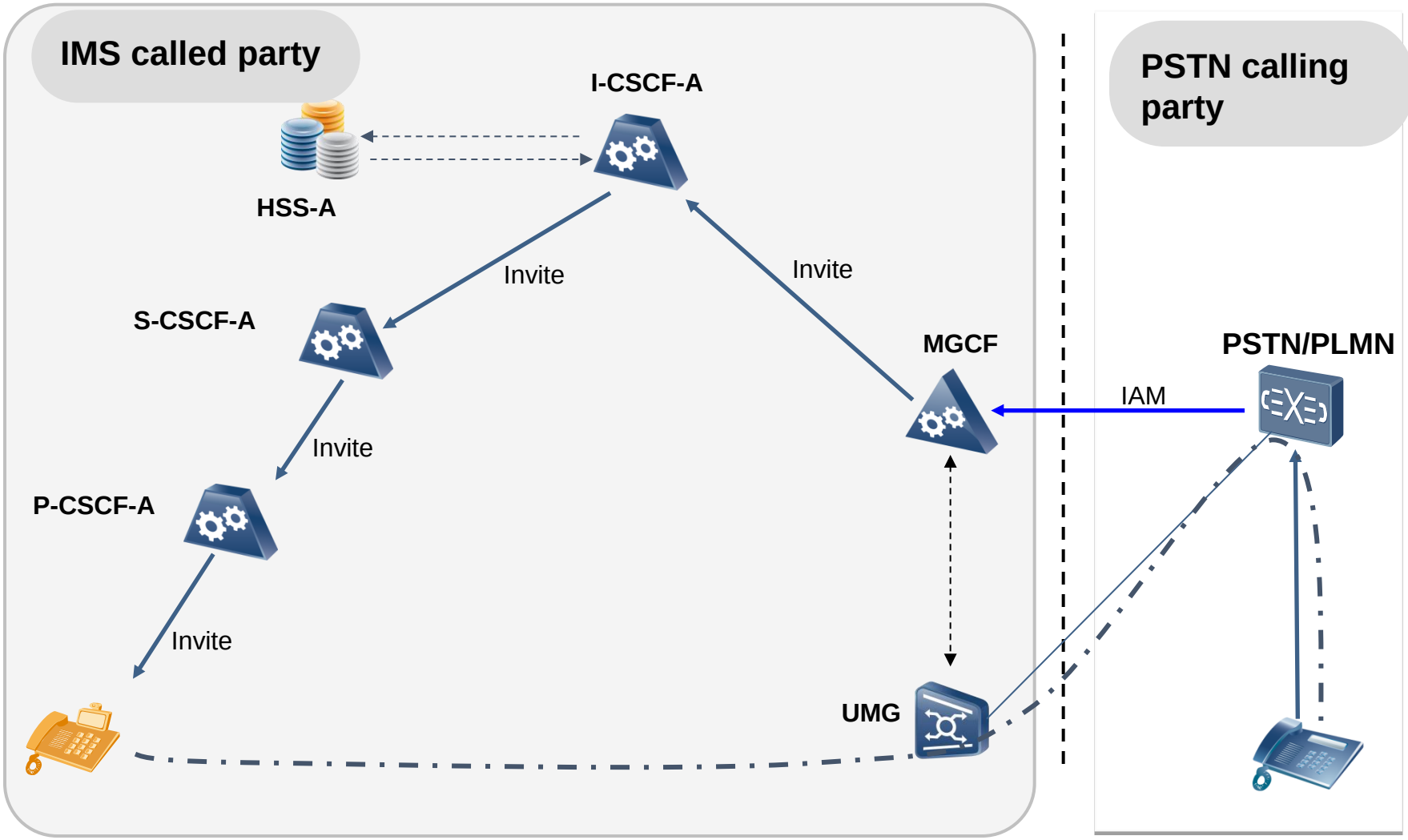
Processing of Service Triggering



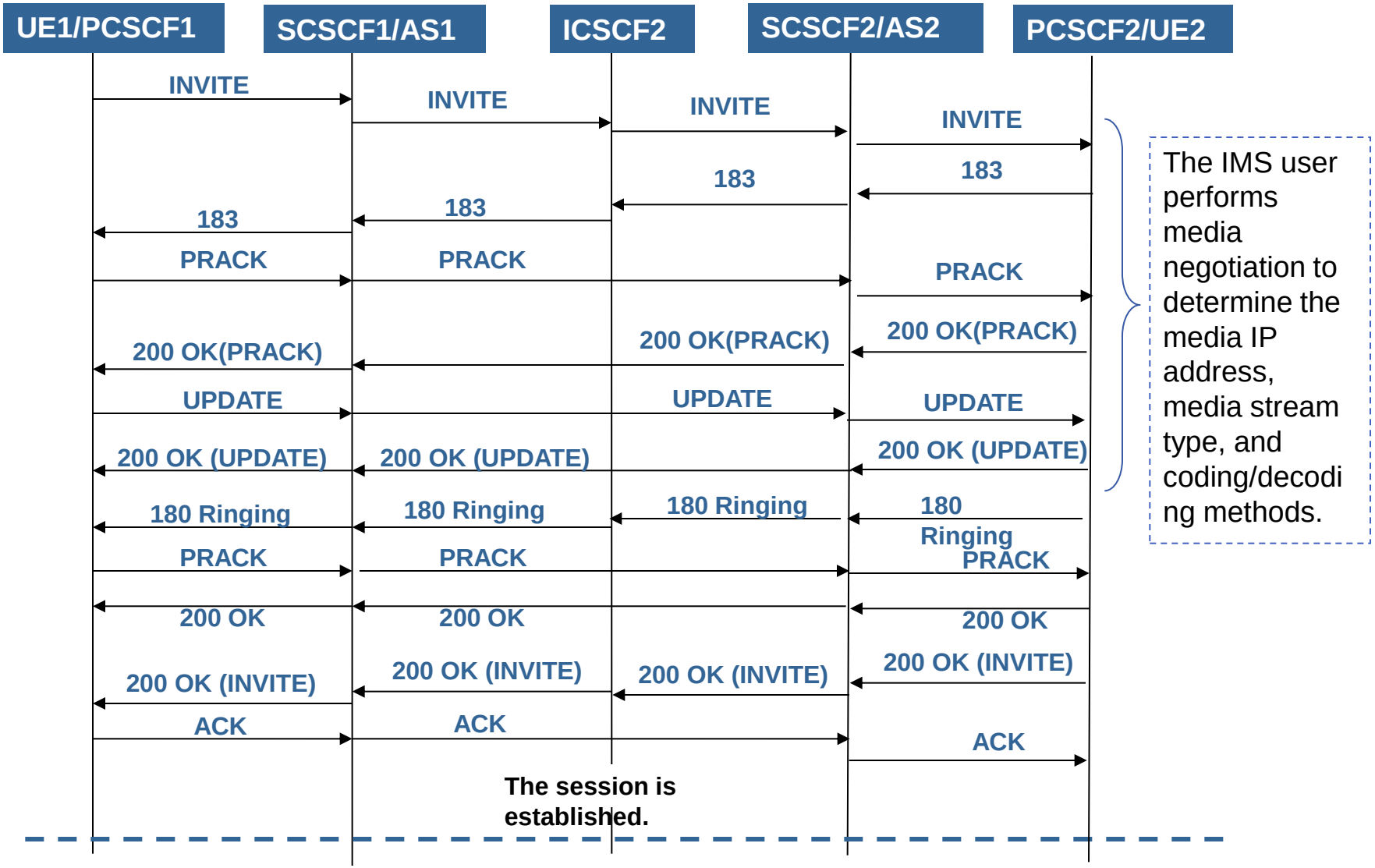
IMS User Call to a PSTN User



PSTN User Call to an IMS User

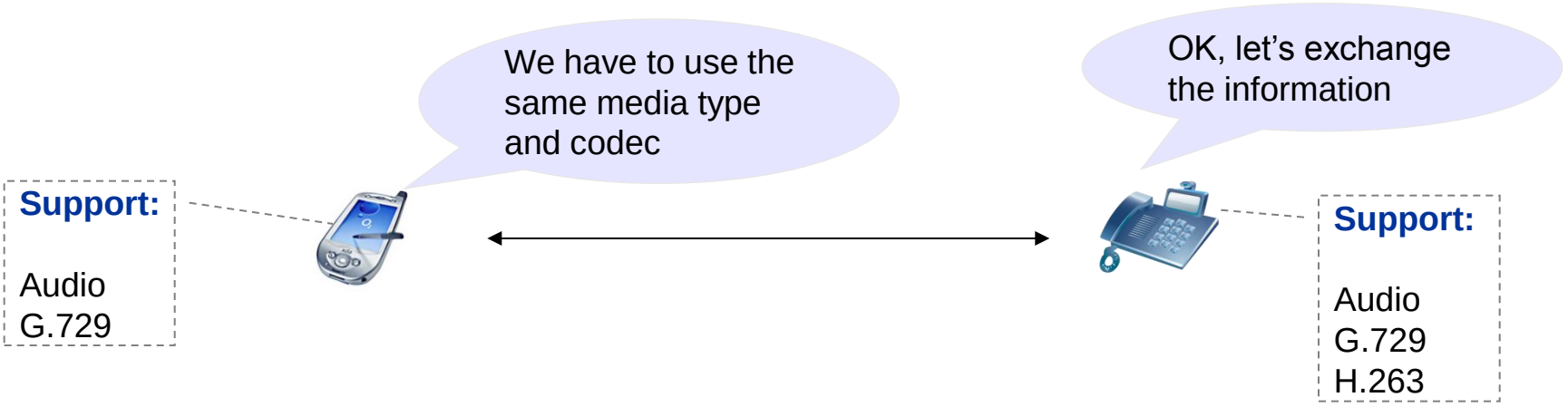


Session Signaling Procedure of IMS Users



Media Characteristics Negotiation

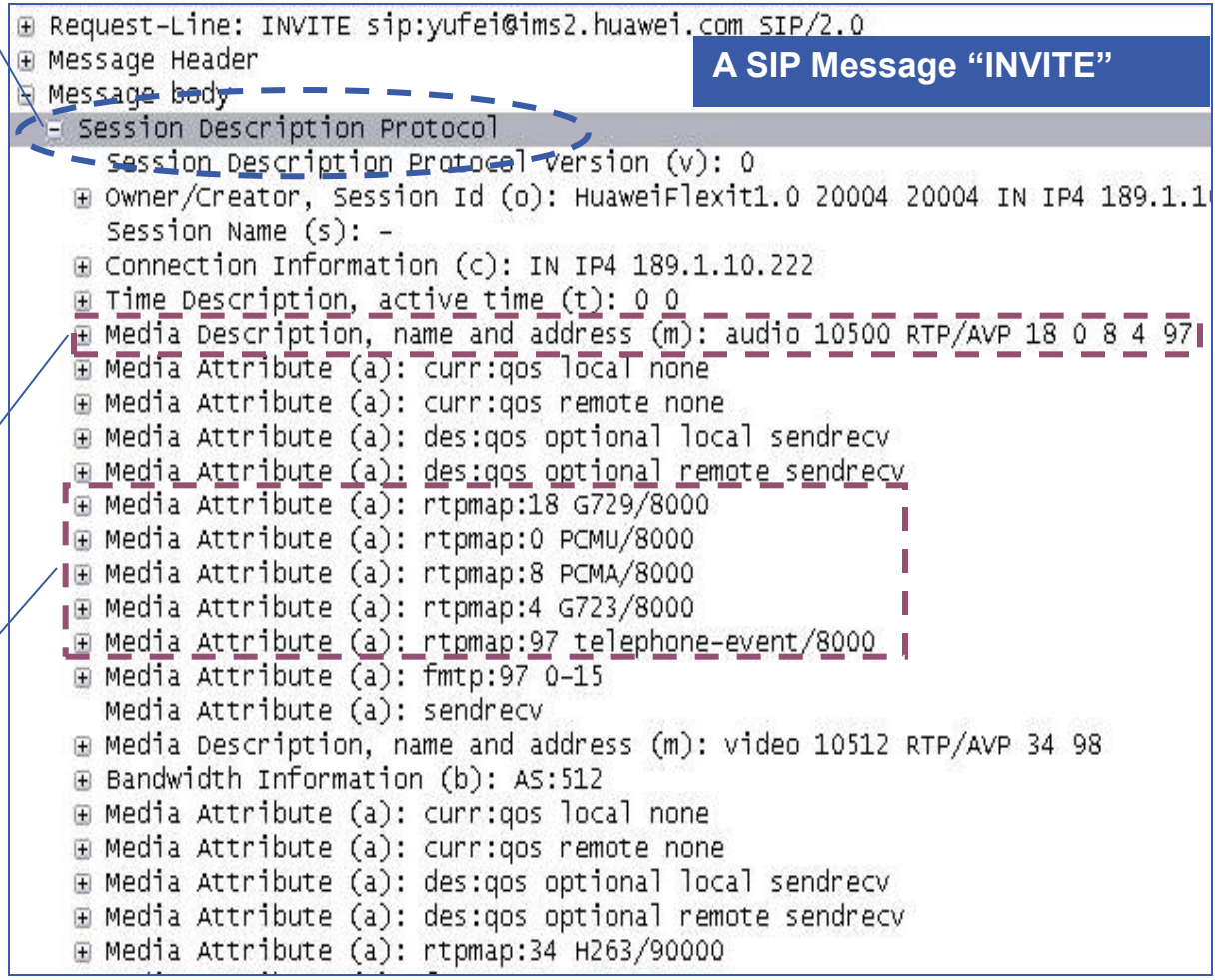
- The Media Negotiation is the procedures for determining the set of negotiated characteristics (media type, codec, etc) between the endpoints of a multi-media session.
- Both sides need to negotiate the media type and the codec which they are going to use.



Media Characteristics Negotiation

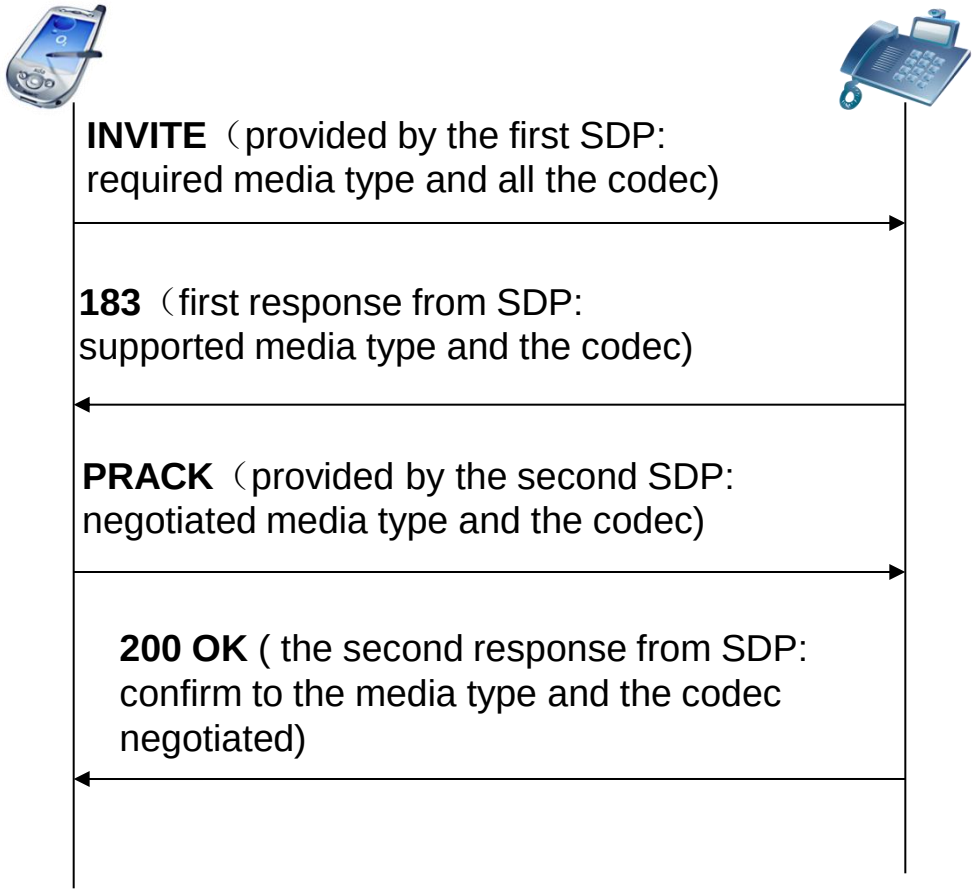
- Media Characteristics are described in the SDP in the SIP message

- Support codec types

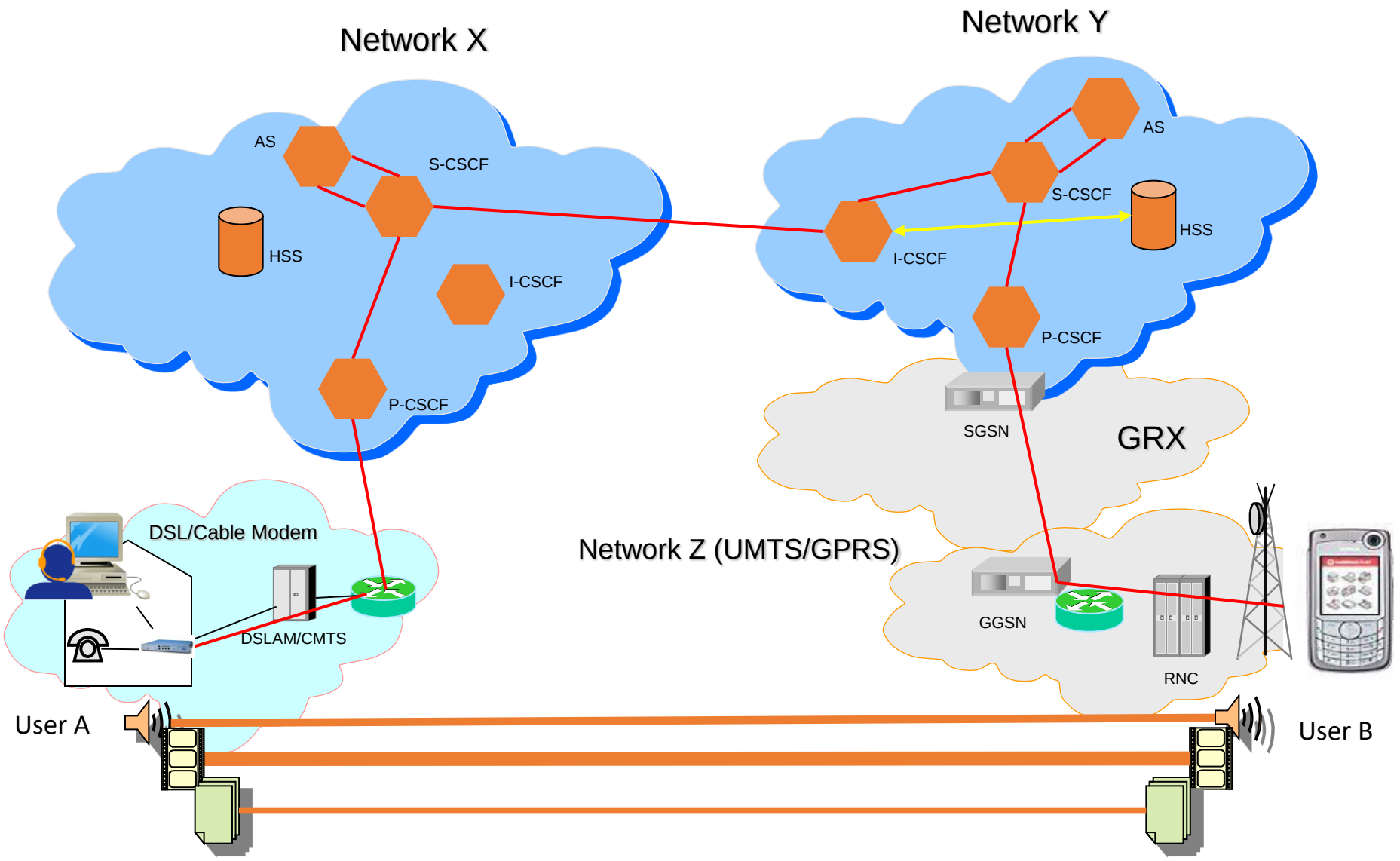


Media Characteristics Negotiations

- SIP messages can contain SDP to initiate media negotiation



A Typical Example of an IMS Call



Thank You