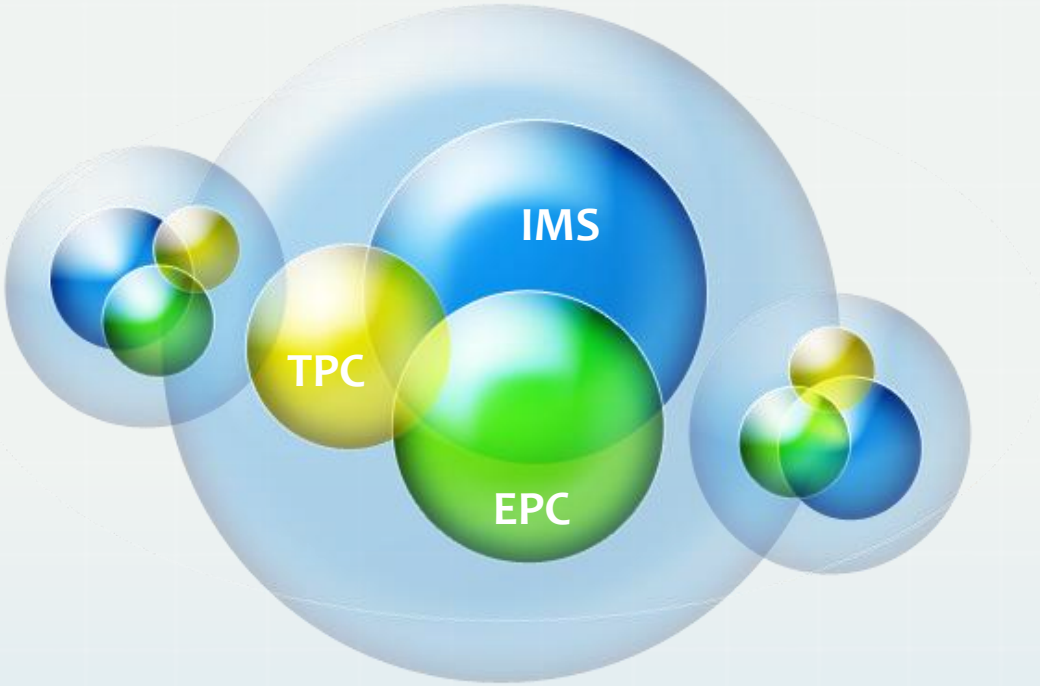


IP Multimedia System:

general aspects and migration perspectives

Dr. Leo Lehmann
Federal Office of Communication, Switzerland

ITU Workshop on “Developments regarding telecommunication network architectures and services”, Kampala 2 April 2012

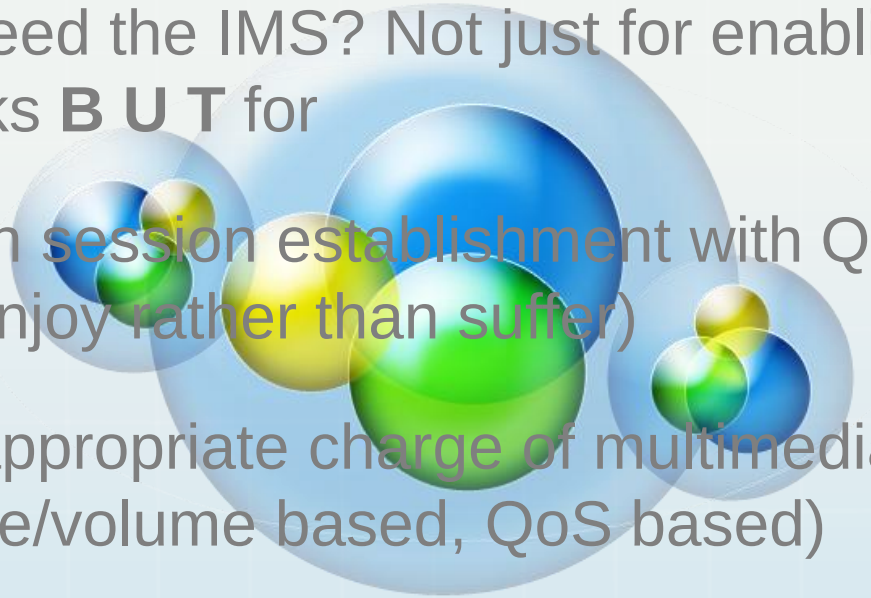
Content

- IMS definition & features
- IMS history
- IMS basic architecture
- IMS & UMTS/ LTE networks
- IMS registration and session setup
- IMS Billing
- IMS centralized services
- IMS & NGN
- IMS migration scenarios
- Further information

IMS definition & features

The IP Multimedia Subsystem is an architectural framework for delivering Internet Protocol (IP) multimedia services

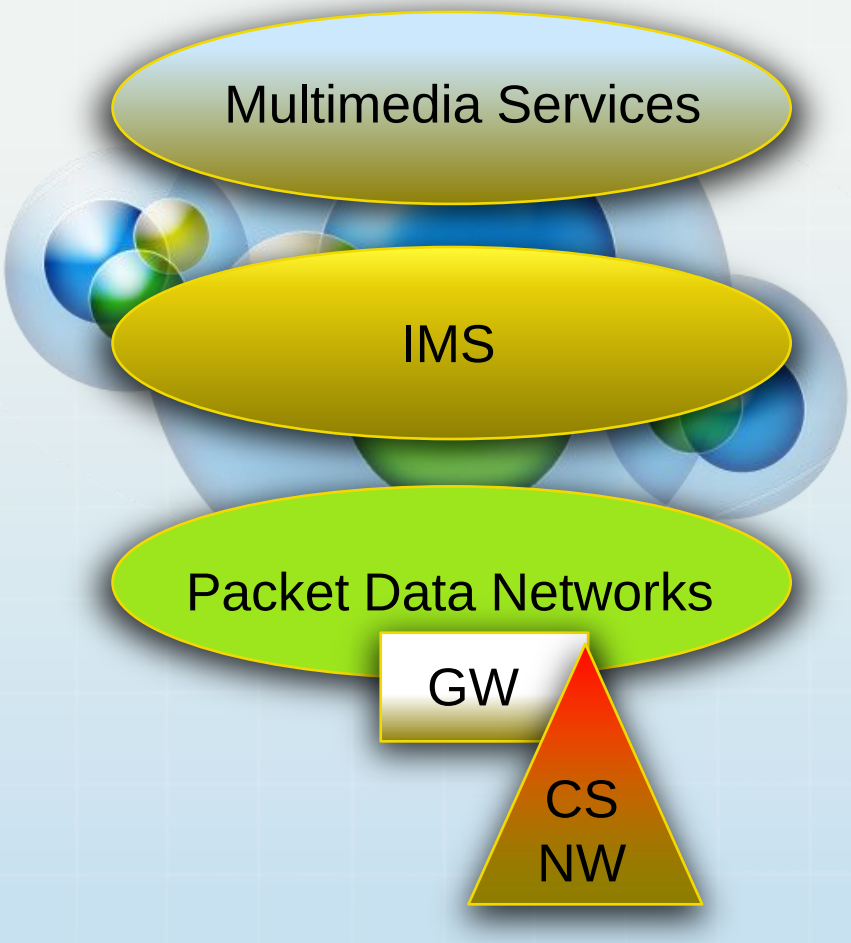
Do we really need the IMS? Not just for enabling IP services in mobile networks **B U T** for



- Combination session establishment with QoS/ security provision (enjoy rather than suffer)
- Means for appropriate charge of multimedia sessions (e.g. flat rate, time/volume based, QoS based)
- combination & integration of different type of (multimedia) services (own, 3rd party) by standard interfaces
- Inhering services like VoIP, Video, IM

IMS definition & features cont.

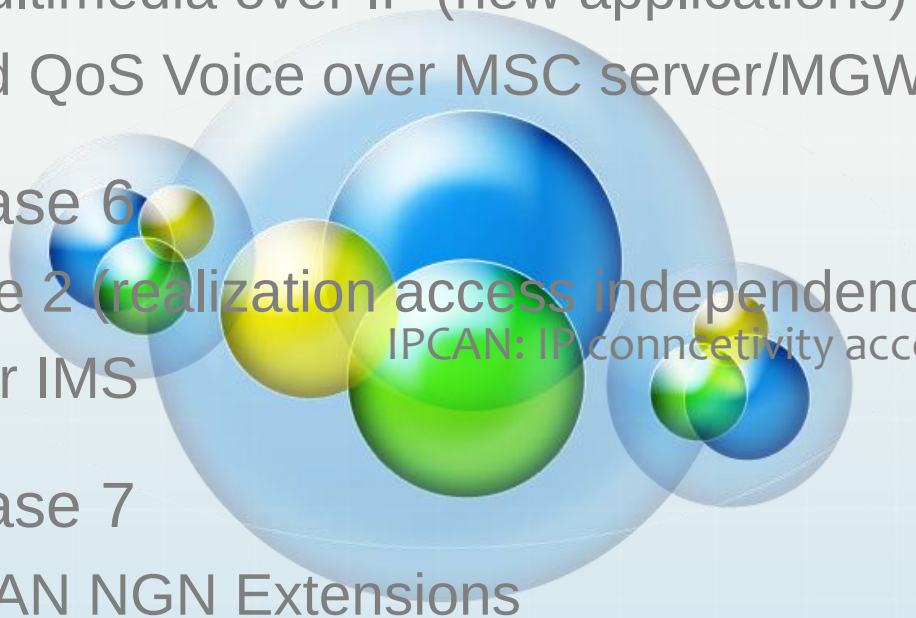
Overlay for fixed and mobile IP based networks; merging the cellular world with the internet



- Abstraction from underlying network
- Fix/ mobile convergence
- Interoperability with CS mobile networks (MAP)
- Roaming/ location awareness (IP domain)
- Common control platform
- SIP service enabler
- Based on SIP (IETF), Diameter (IETF), H.248 (ITU-T)

IMS history (some highlights)

- 3GPP Release 5:
  - Introduction of SIP based IMS
  - Mobile Multimedia over IP (new applications)
  - End 2 end QoS Voice over MSC server/MGW
- 3GPP Release 6
  - IMS phase 2 (realization access independence IPCAN)
  - Voice over IMS
- 3GPP Release 7
  - IMS TISPAN NGN Extensions
  - eCall via IMS
  - ICS
  - Charging and QoS Optimizations

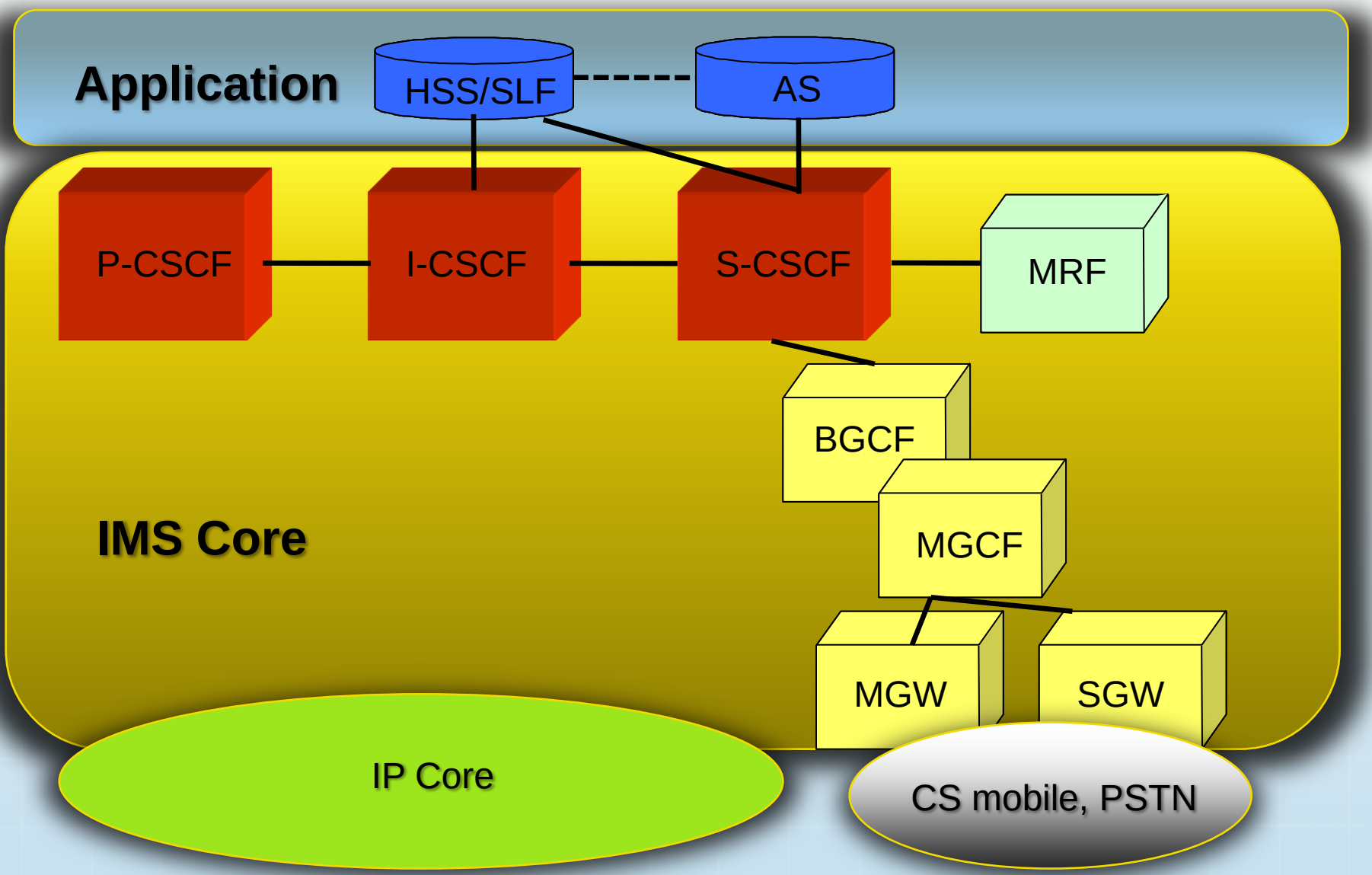


IPCAN: IP conncetivity access network

IMS history (cont)

- 3GPP Release 7
  - IMS centralized services
  - Charging and QoS Optimizations
- 3GPP Release 8
  - Common IMS
  - IMS Extensions for packetized switched streaming
  - MM broadcast/multicast services
  - Session mobility support
- 3GPP Release 9/10
  - home node B
  - M2M

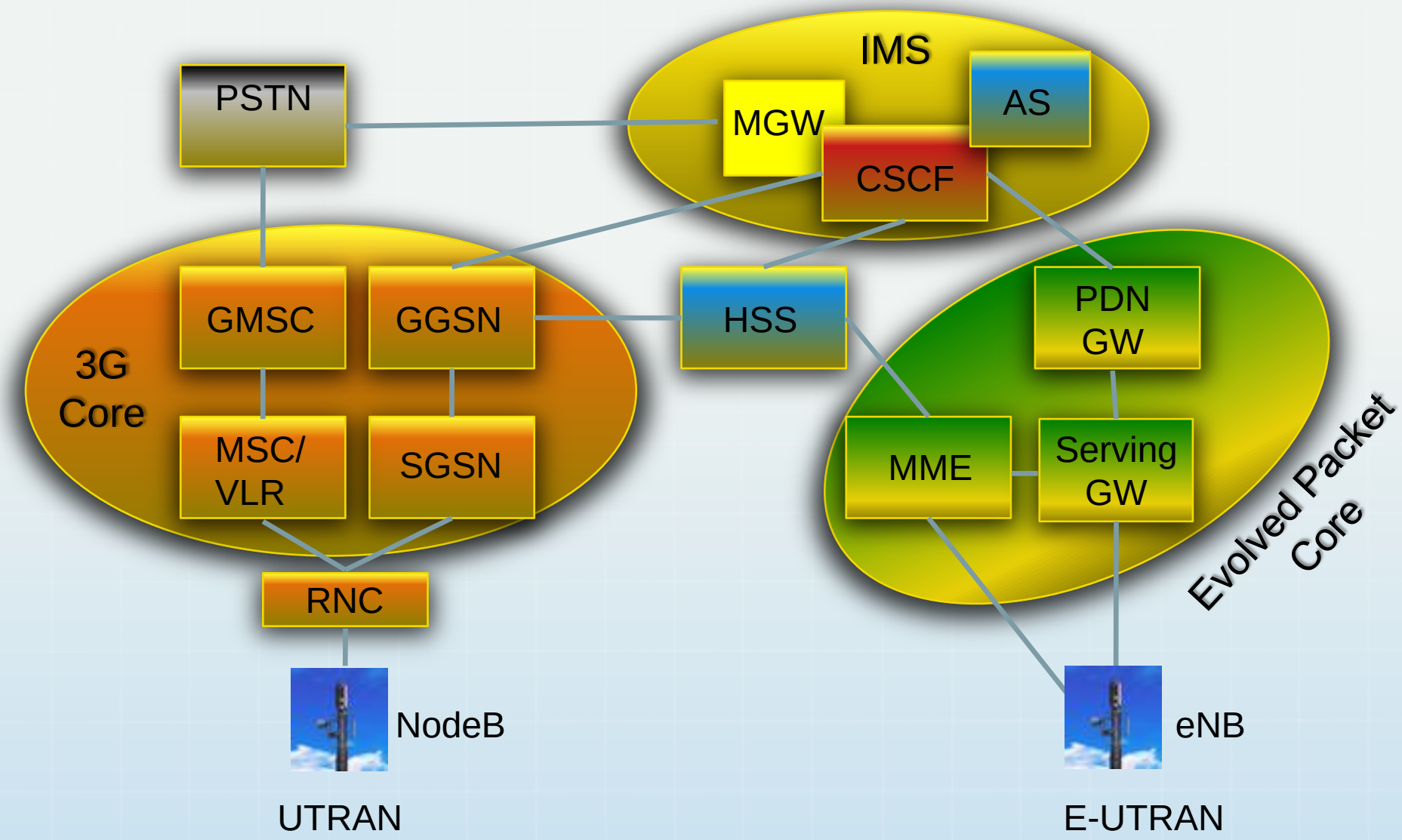
IMS basic architecture (3GPP 23.002)



IMS basic architecture (cont)

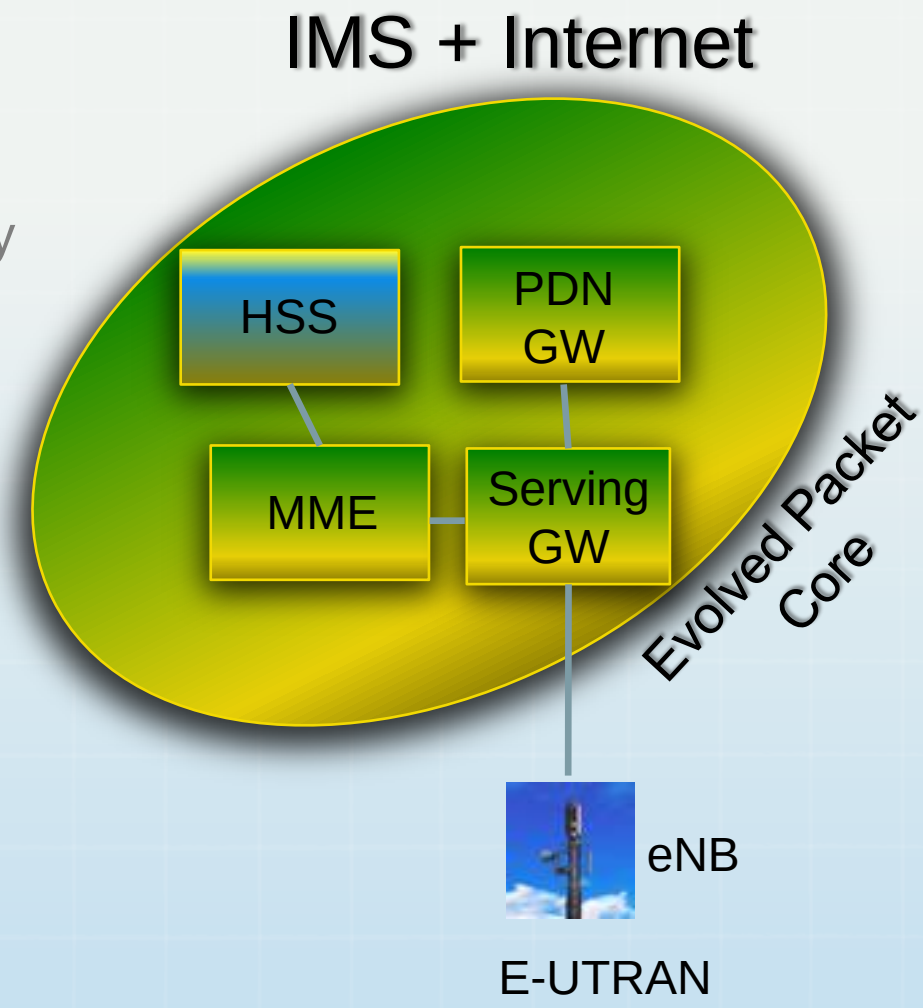
S-CSCF Serving Call Session Control Function: central session control, activation/ cancellation of bearer services, AAA control Support, resides in home network
I-CSCF Interrogating Call Session Control Function: topology hiding interworking gateway, resides in home network
P-CSCF Proxy Call Session Control Function: first contact to UE, resides in visited network
BGCF Border Gateway: selection of CS GW
MGCF Media Gateway Control Function: MGW Control
MGW Media Gateway: Transformation CS/ IP data
SGW Signaling Gateway: Conversion ISUP/ SIP
MRF Media Resource Function: media server providing conferencing etc.
HSS Home Subscriber Server: user profiles, S-CSCF assignment
AS Application Server: SIP, OSA, CAMEL

IMS & UMTS/ LTE – EPC networks

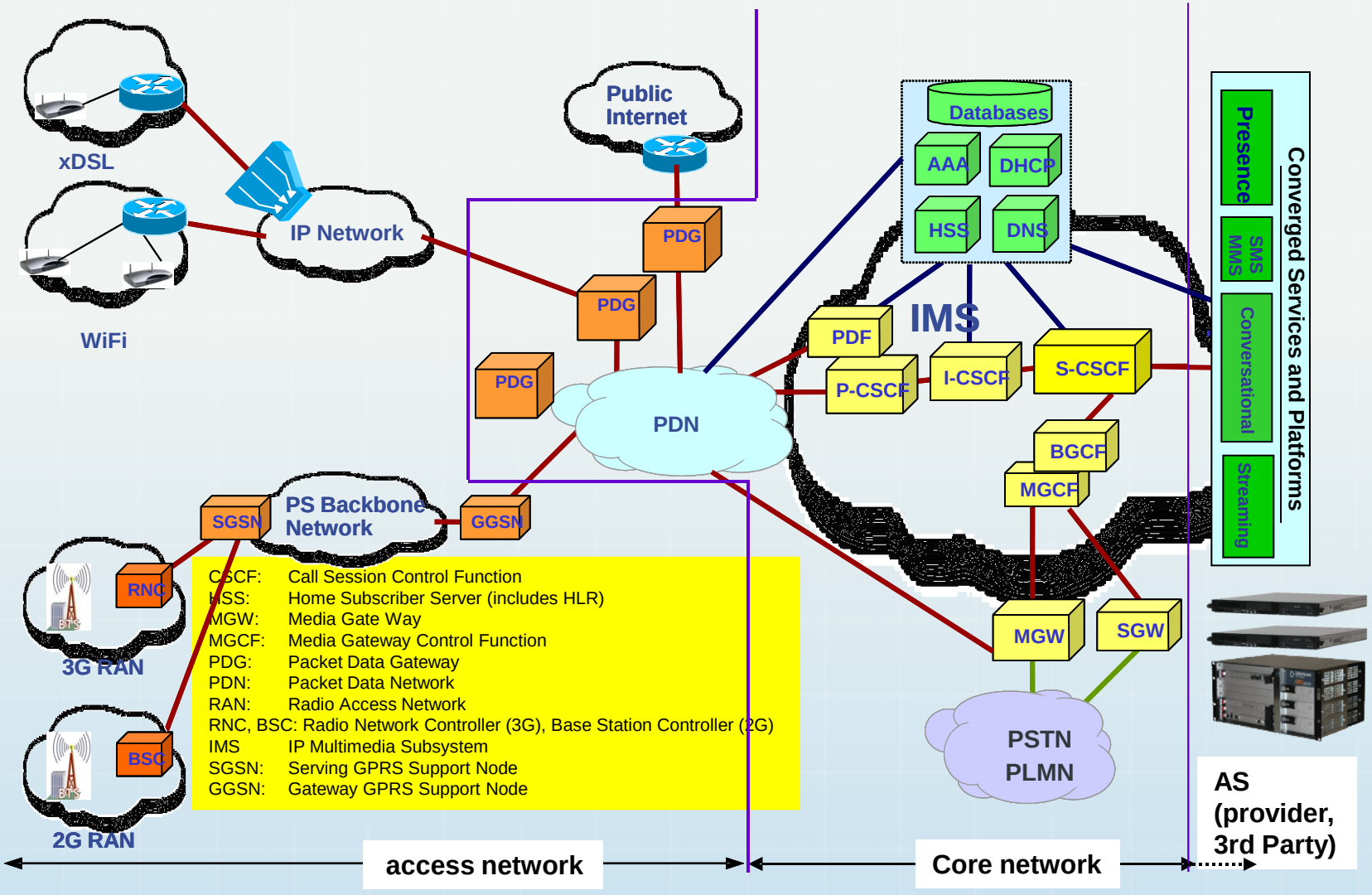


IMS & UMTS/ LTE – EPC networks (cont)

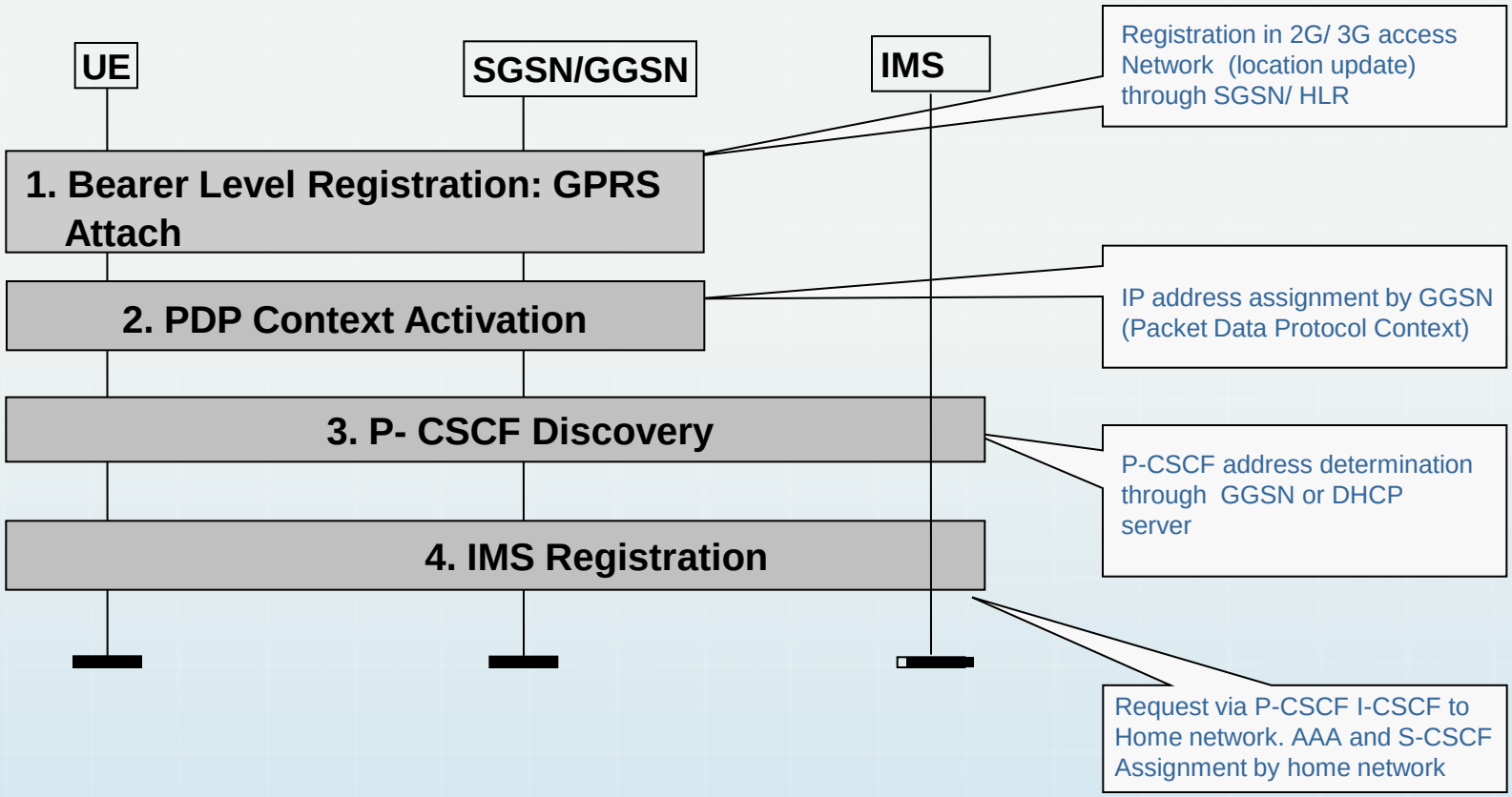
- EPC Components
  - Mobility Management Entity
  - Serving Gateway
  - Home Subscriber Server
  - Packet Data Network Gateway
- Functions
  - AAA
  - Mobility Management
  - IP over LTE
  - QoS, Charging



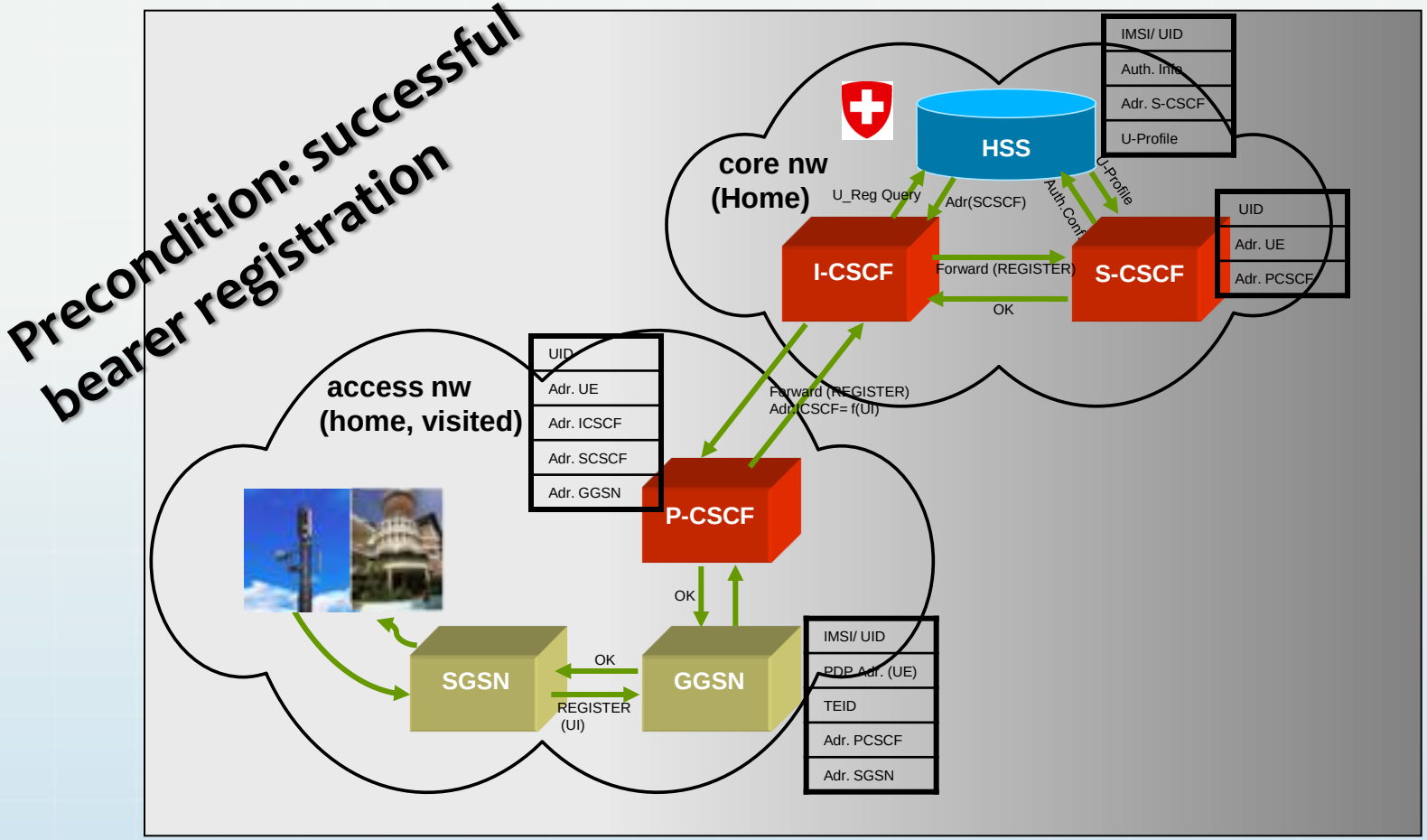
IMS registration & session setup



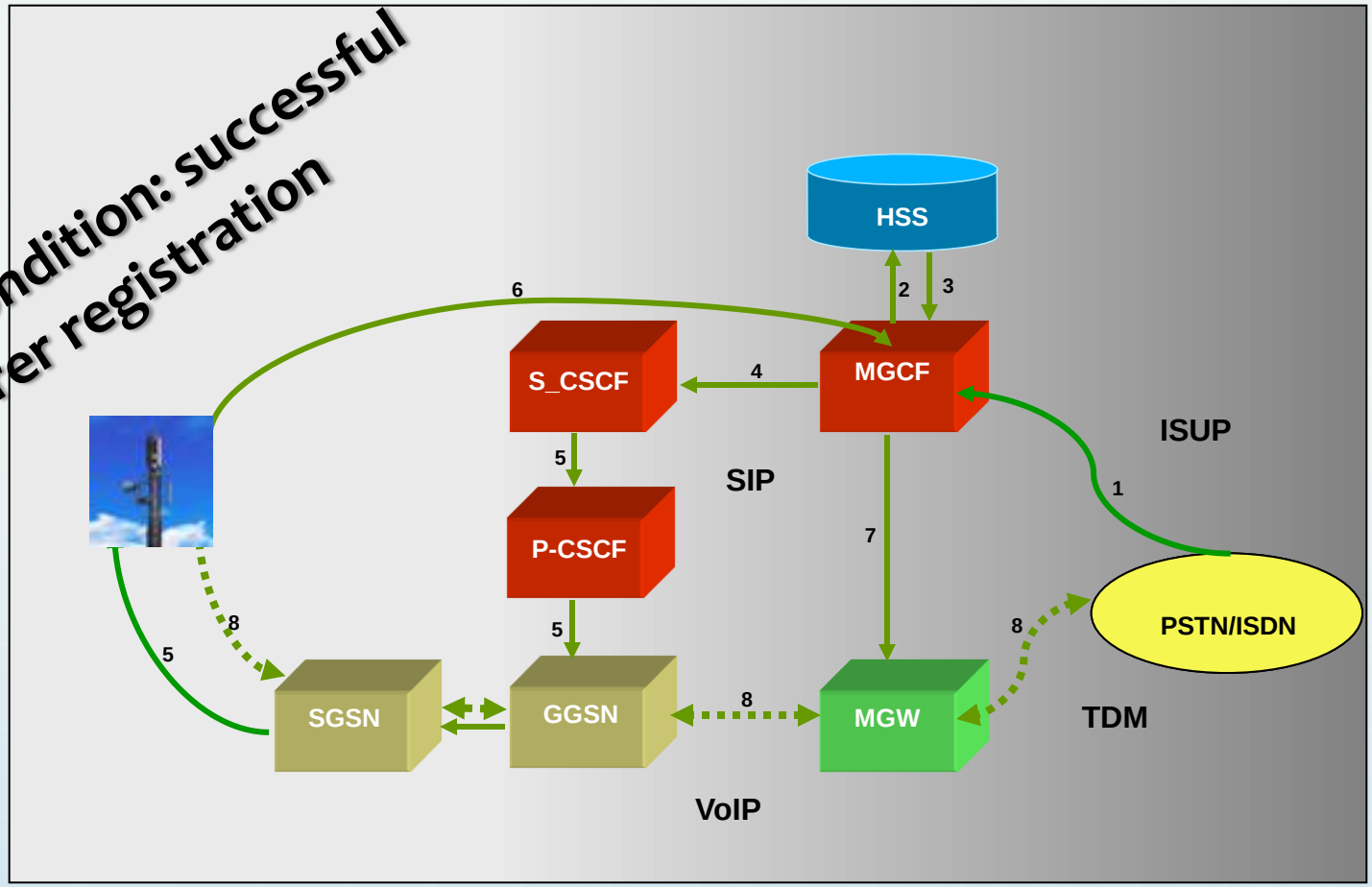
IMS registration



IMS registration (cont)

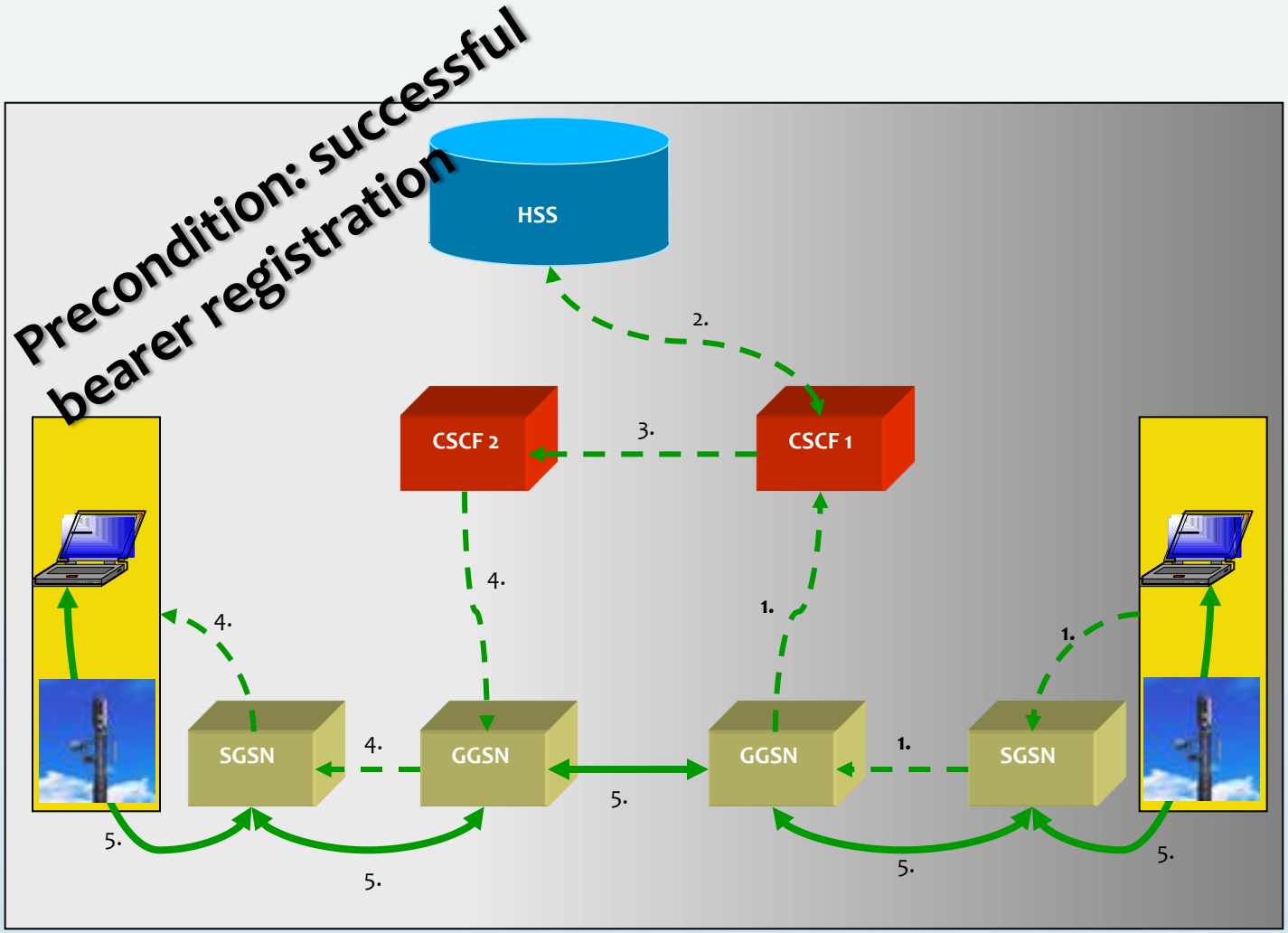


PSTN voice call



1. Incomming PSTN call
2. Protocol transformation & localisation
3. S-CSCF addree, UID
4. INVITE Session
5. Forward (INVITE)
6. Ressource reservation confirmation
7. MGW activation
8. IP PDU transformation & transport

IP media session establishment



1. Session initiation (URI callee)

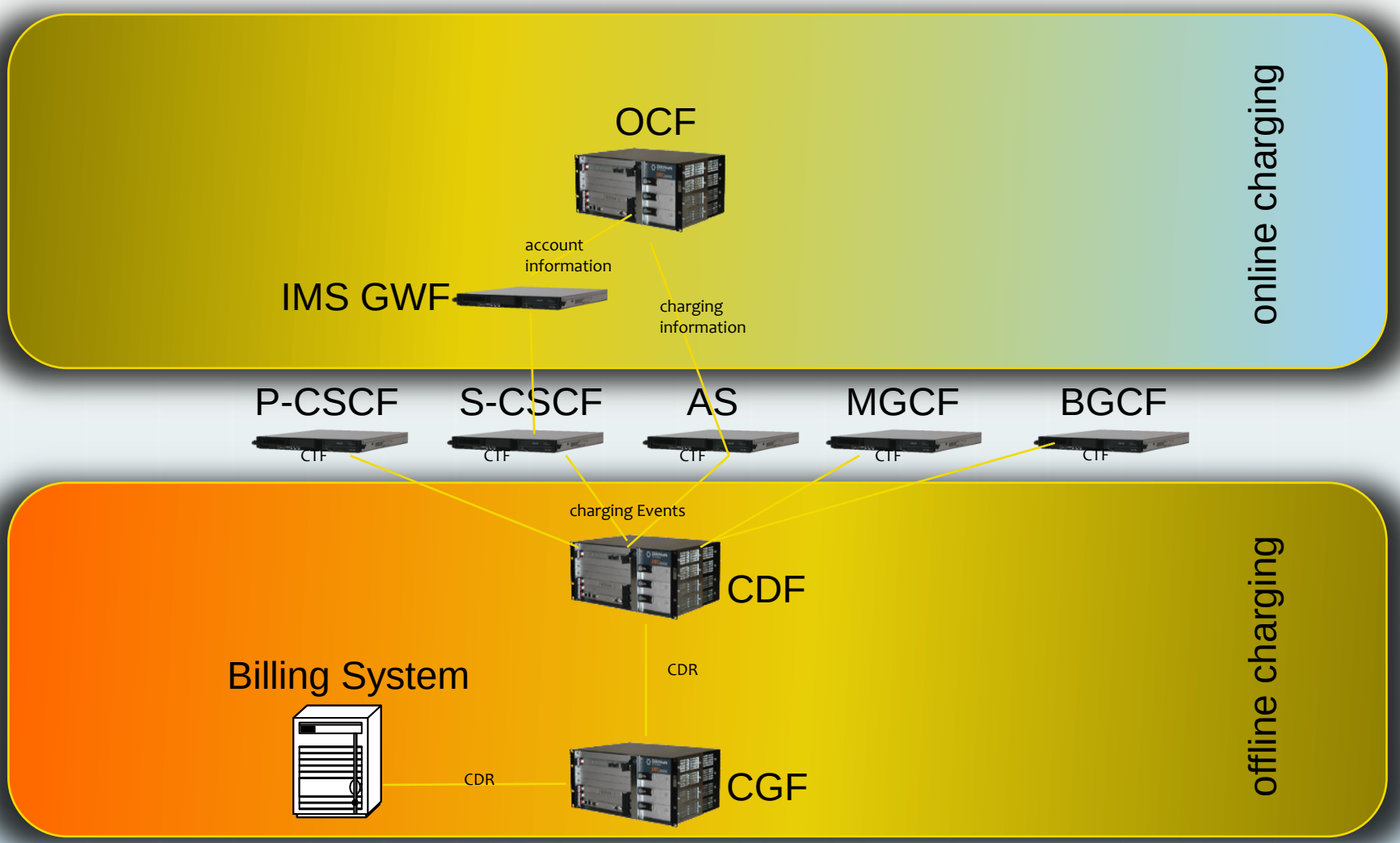
2. HSS request for callee localization (IP domain)

3. Forward session initiation

4. Caller notification, Bearer establishment

5. IP PDU streaming

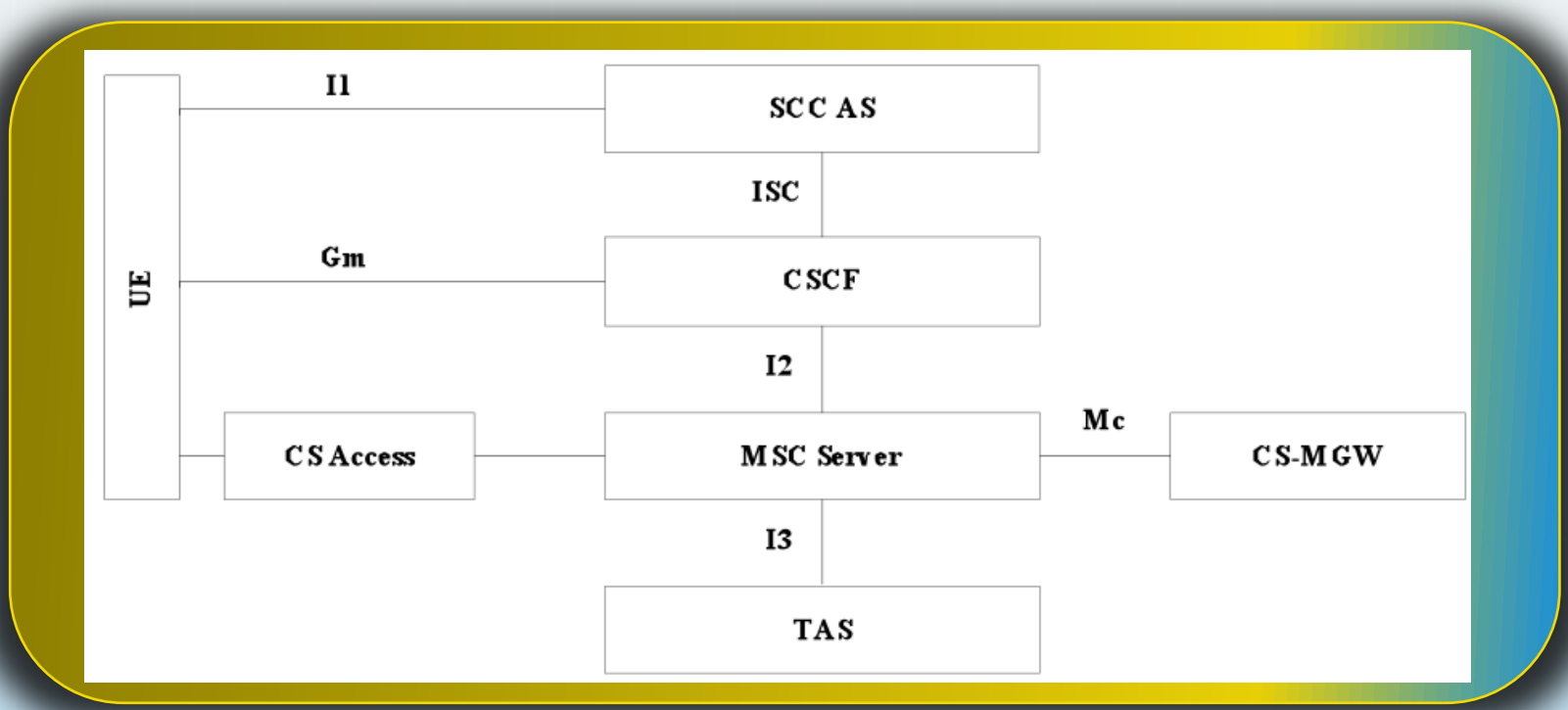
IMS Billing (3GPP 32.240)



CDF Charging Data Function
CGF Charging Gateway Function
OCF Online Charging Function
CTF Charging Trigger Function

IMS centralized services (3GPP 23.292)

- Enables IMS services when using CS devices (CS access)
- Enables CS access to transport IMS voice/video services where PS access is not available for VoIP/ IP-Video (no full duplex speech/video component by PS)



IMS centralized services (cont)

- Service Centralization and Continuity Application Server (SCC AS):
  - SCC AS is a home network based IMS Application that provides functionality required to enable IMS Centralized Services
  - Acts as ICS User Agent (IUA) and provides SIP UA behavior on behalf of the UE for setup and control of for IMS sessions using CS bearers
  - processes as CAA (CS Access Adaptation) the service control signaling received via the CS access for interworking with other IMS functional elements
  - Directs an incoming session to an ICS User
- ICS provision in UE
  - Communicates with the SCC AS for service control signaling.
  - Establishes the Bearer Control Signaling Path to setup the media through the CS domain
- ICS provision in MSC Server:
  - MSC Server processes the user-network signaling received over the CS access for interworking with IMS SIP and vice versa. It controls the MGW functions described to enable the interworking between CS access and RTP bearers.
  - It performs the interworking to support multimedia call in ICS.

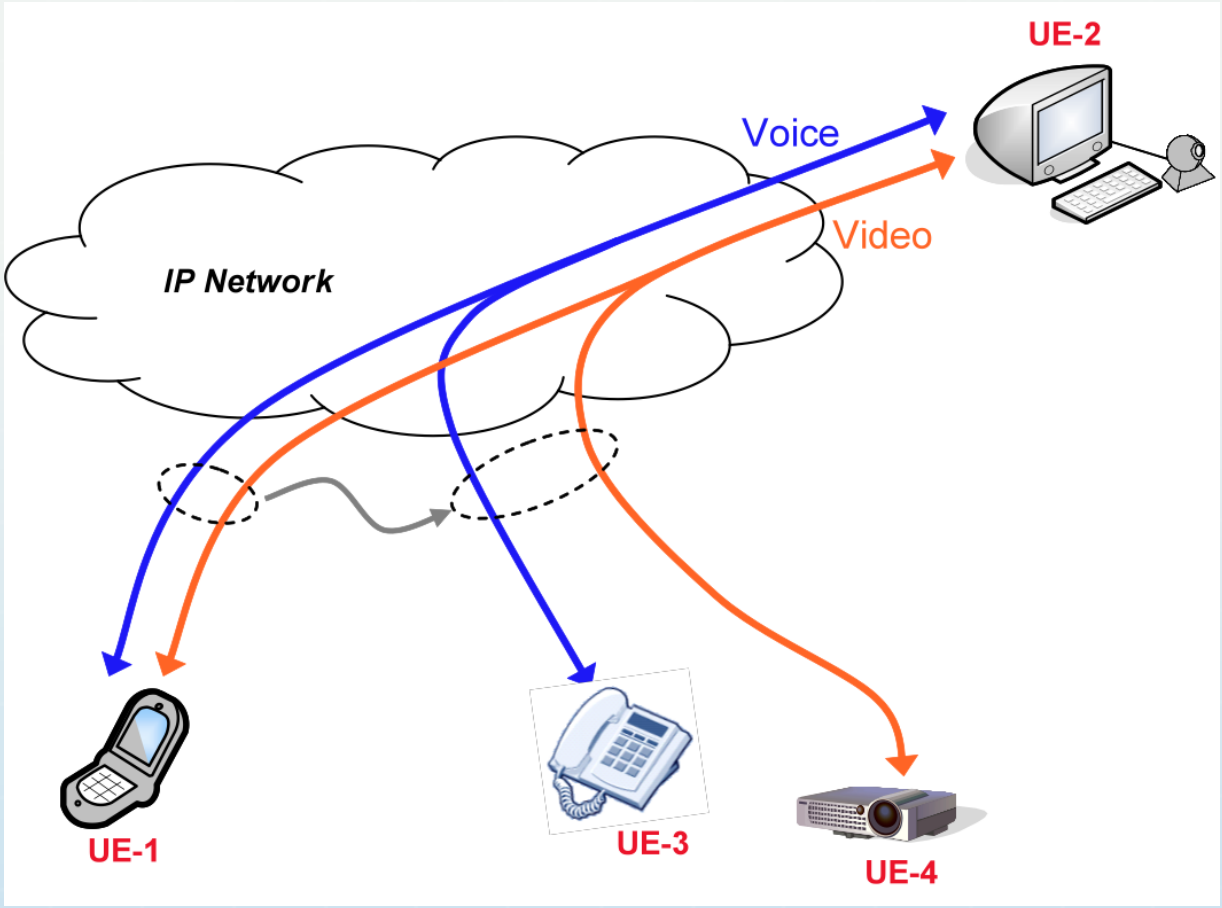
Multimedia session continuity (3GPP TR 23.893)

Media component transfer

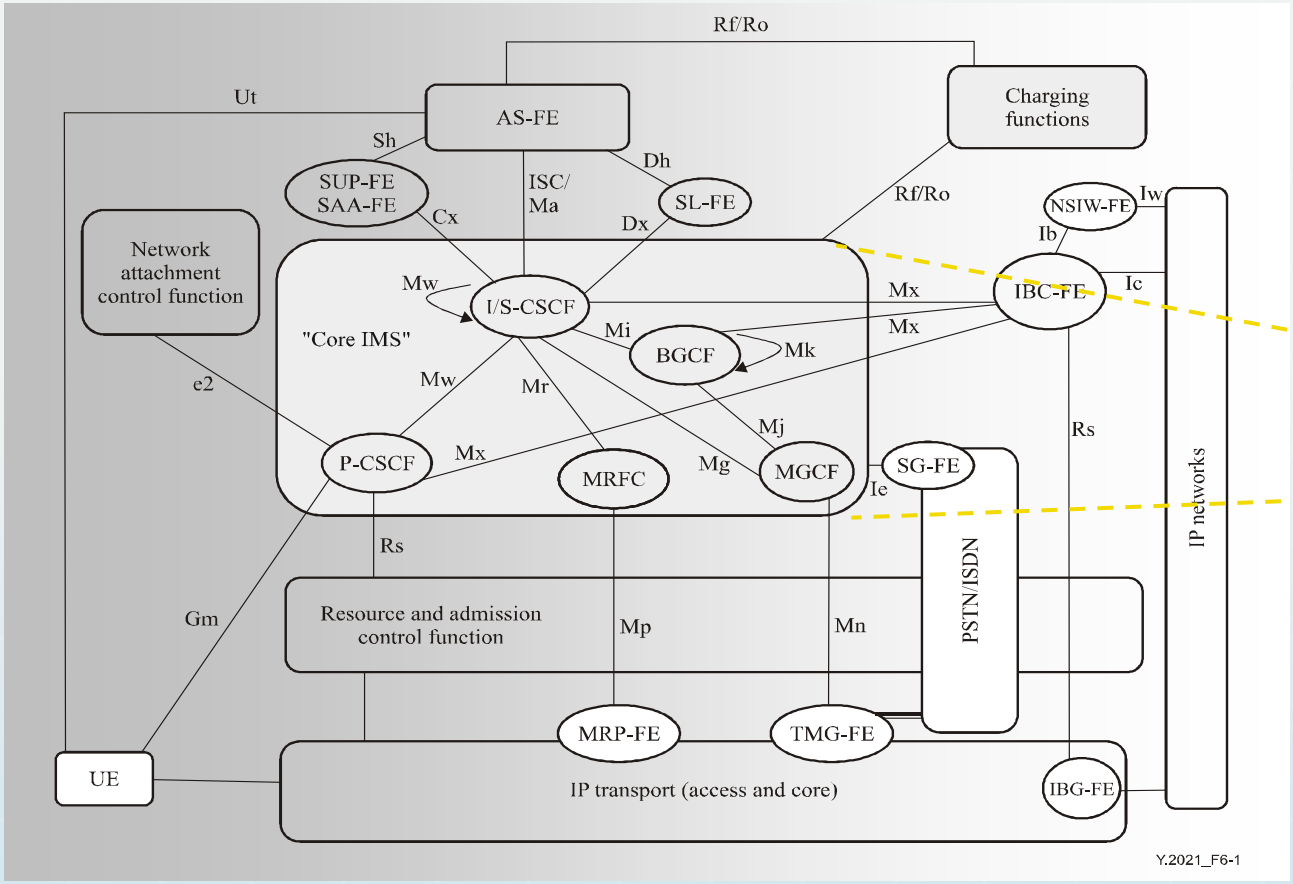
Different network access

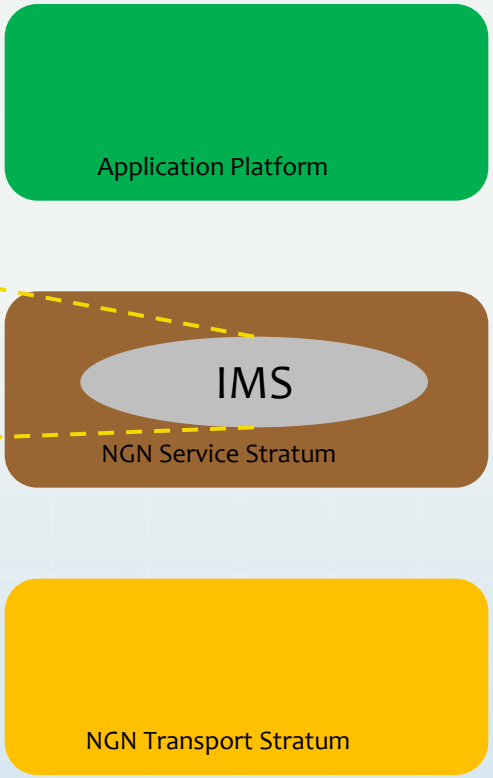
Different UE

Continuation of ongoing media session



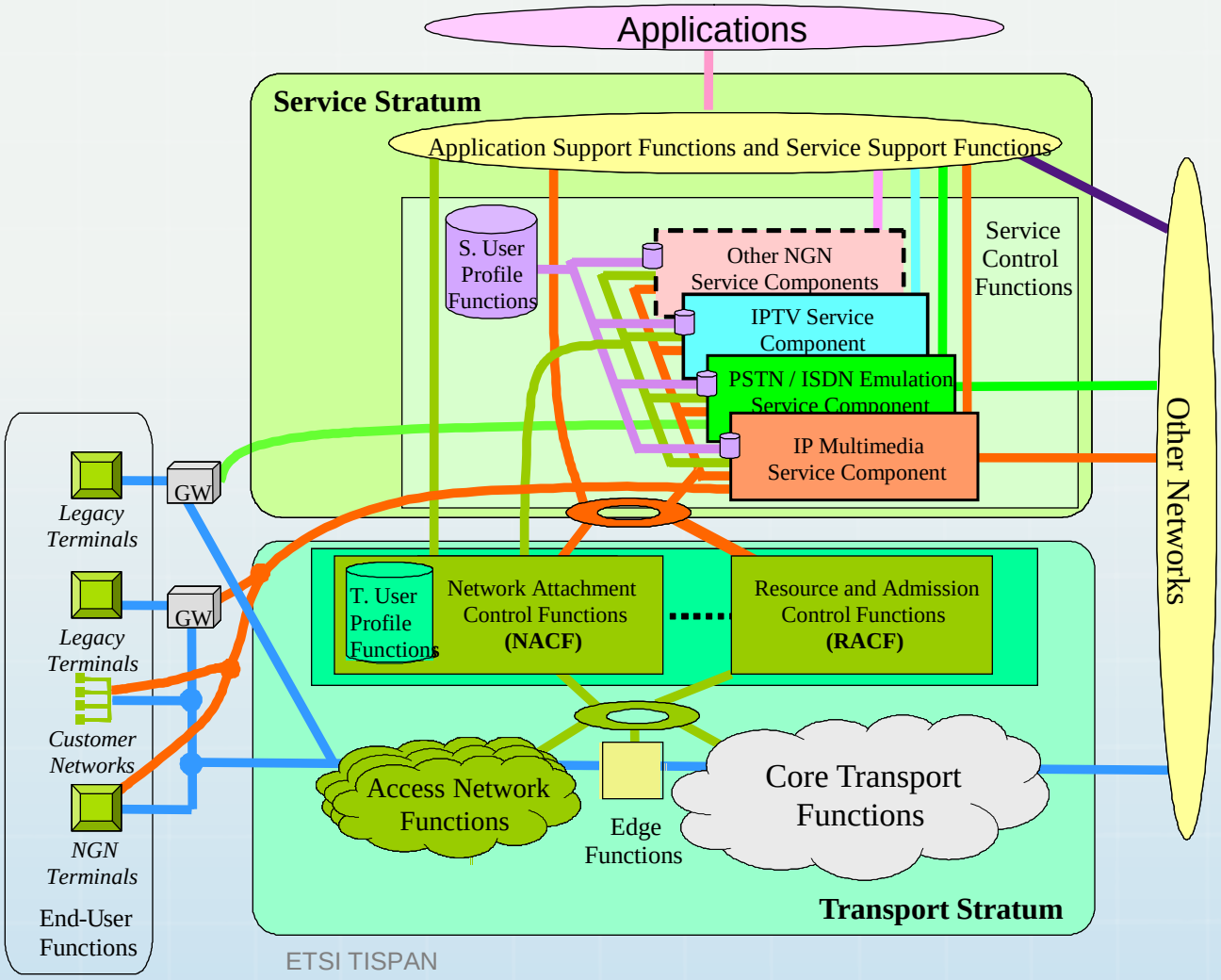
IMS & NGN (ITU-T Y.2021)





- The 3GPP IMS is the central service control component in NGN

IMS & NGN (cont)

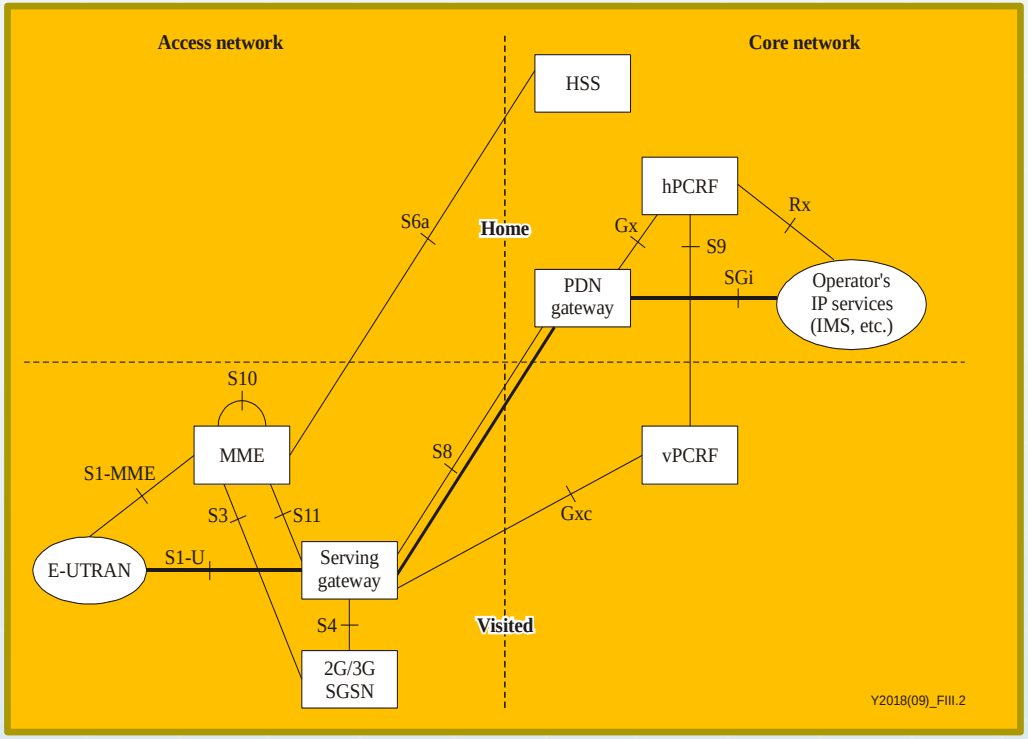

Applications
Service Stratum
Application Support Functions and Service Support Functions
S. User Profile Functions
Other NGN Service Components
IPTV Service Component
PSTN / ISDN Emulation Service Component
IP Multimedia Service Component
Service Control Functions
Other Networks
GW
GW
Legacy Terminals
Legacy Terminals
Customer Networks
NGN Terminals
End-User Functions
T. User Profile Functions
Network Attachment Control Functions (NACF)
Resource and Admission Control Functions (RACF)
Access Network Functions
Edge Functions
Core Transport Functions
Transport Stratum

IMS & NGN (cont)

- The 3GPP IMS is the central service control component in NGN

3GPP functional entities	NGN functional entities
S-CSCF	S-CSC-FE
P-CSCF	P-CSC-FE
I-CSCF	I-CSC-FE
MGCF	MGC-FE
MRFC	MRC-FE
BGCF	BGC-FE

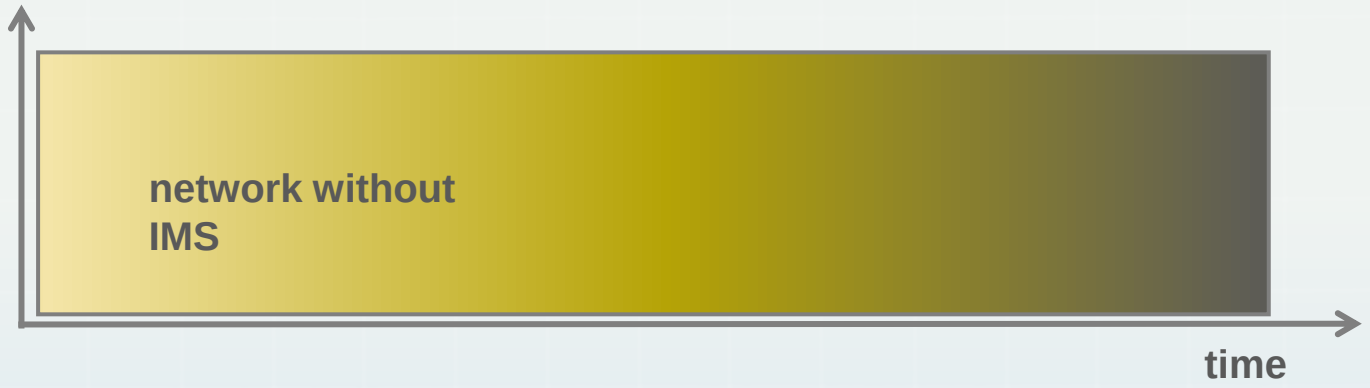
Relationship EPC/ NGN-FE's



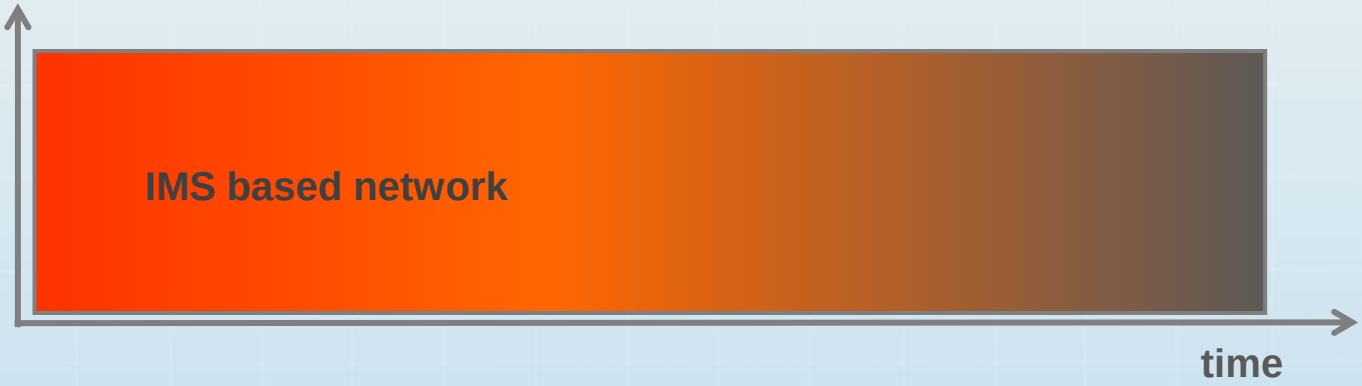
3GPP entity	Functions performed	ITU-T Y.2018 entity responsible
Mobility management entity (MME)	NAS signalling	NACF
	NAS signalling security	NACF
	AS security control	NACF
	Inter CN node signalling for mobility between 3GPP access networks	NACF
	Idle mode UE reachability (including control and execution of paging retransmission)	TBD*
	Tracking area list management (for UE in idle and active mode)	TBD (Note 1)
	PDN GW and serving GW selection	TBD (Note 2)
	MME selection for handovers with MME change	NACF
	SGSN selection for handovers to 2G or 3G 3GPP access networks	NACF
	Roaming	NACF (TAA-FE)
	Authentication	NACF (TAA-FE)
	Bearer management functions including dedicated bearer establishment	HDC-FE
	Support for ETWS message transmission	NACF
Serving gateway	The local mobility anchor point for inter-eNB handover	L2HE-FE
	Mobility anchoring for inter-3GPP mobility	L2HE-FE
	E-UTRAN idle mode downlink packet buffering and initiation of network triggered service request procedure	L2HE-FE
	Lawful interception	EN-FE
	Packet routing and forwarding	EN-FE
	Transport level packet marking in the uplink and the downlink	EN-FE
	Accounting on user and QCI granularity for inter-operator charging	EN-FE
	UL and DL charging per UE, PDN, and QCI	EN-FE
	Originator of PMIP signalling. Proxy point for PMIP signalling (chained PMIP)	MLM-FE(P)
	tunnel end point	L3HEF

IMS migration scenarios

- Not at all

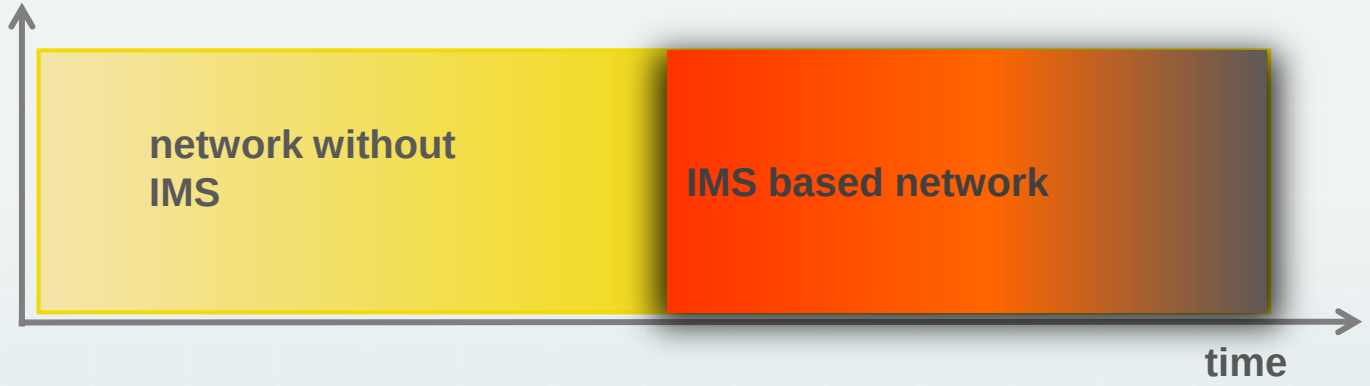


- From the beginning (Greenfield)

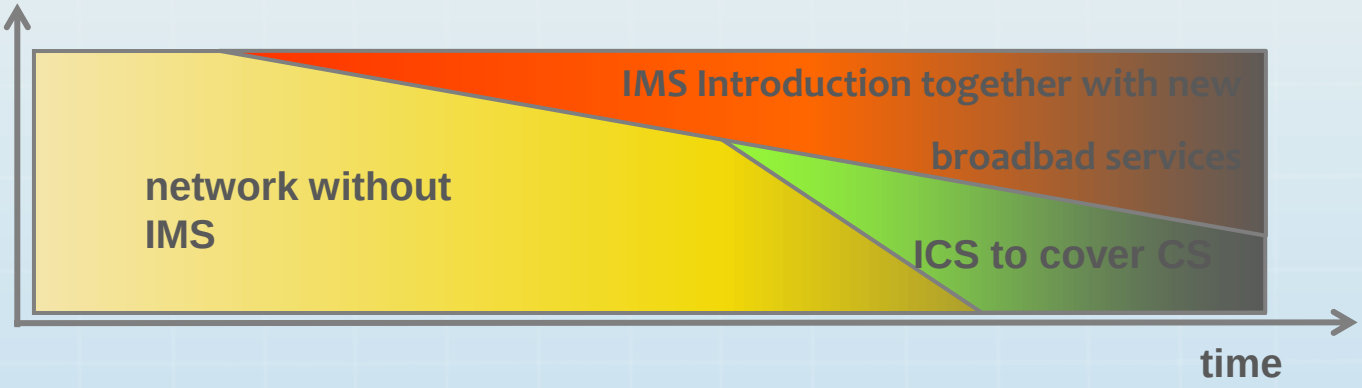


IMS migration scenarios (cont)

- Full introduction

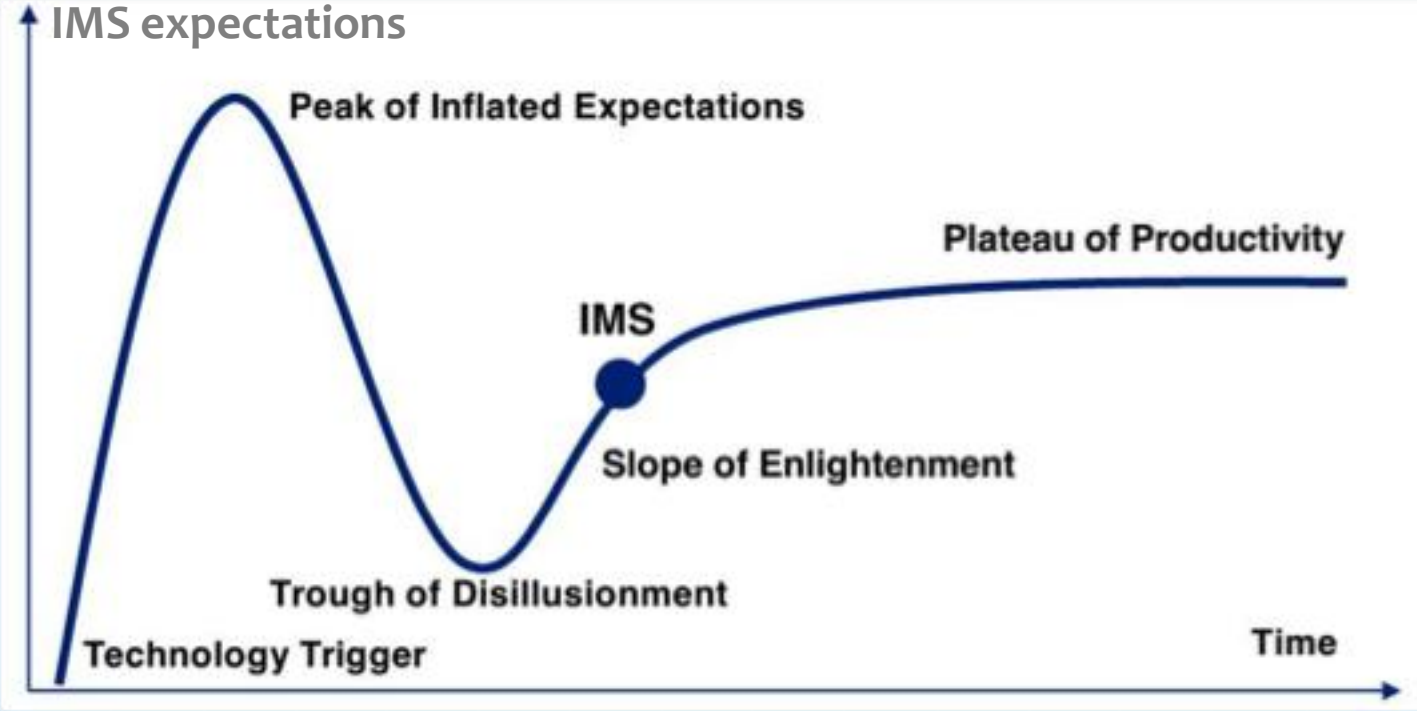


- Stepwise migration



Summary

- IMS has left the trial stage and has become an adequate System to enhance IP sessions in mobile networks with QoS/ security provision and appropriate billing capabilities
- IMS enables fix-mobile convergence and is the 3GPP-TISPAN implementation of the service control in the NGN service stratum (e.g. VoIP services via DSL and mobile access)
- Large IMS deployment is feasible in the next years based on PSTN migration from CS to IP by big incumbents as well as the deployment of LTE. The IMS benefits and the practical application have been understood and identified by the operators



Source: Hype Cycle according Gartner Inc.

Thank You !