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Mobility and the IP Multimedia Subsystem (IMS)

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Overview

- **IMS: A big step towards All-IP in Mobile Networks**

- **Roaming, Interworking and Mobility in the Context of IMS**

- **Integration of multiple Access Technologies**

Future Multimedia Services will be based on IP technology

Communication

- Push-to-talk / push-to-show
- Multimedia Messaging
- Multi-Party Chat
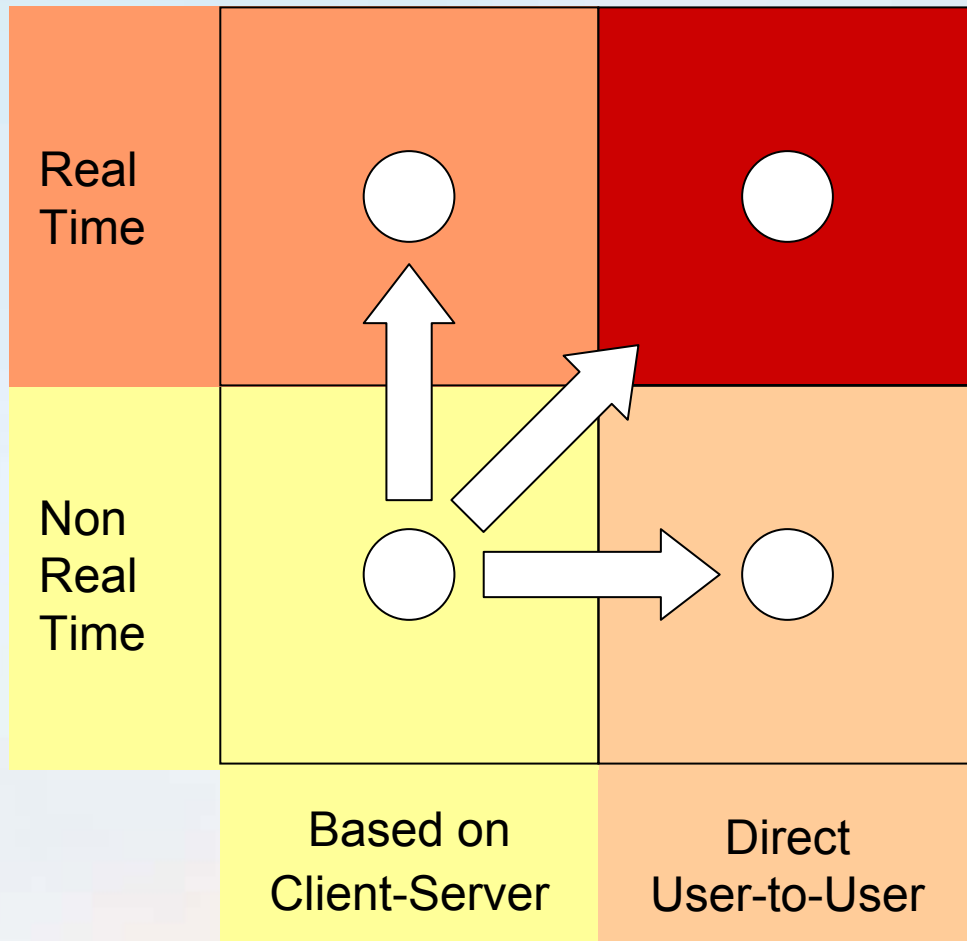- Multimedia Conferencing

Entertainment

- Person-to-Person Gaming
- Interactive Shows and Events
- Multimedia Advertisement
- Audio and Video Streaming

Enterprise and on the road

- Dynamic Info Services
- Interactive guidance
- Remote Facility Control
- Collaborative working

Service Evolution in Mobile Networks

- **Initial Services will be based on client-server paradigms:**
  – Presence
  – Buddy Lists
  – Messaging
  – Push-to-Talk
  – Chat

- **Over time, real-time requirements and high data volumes will create the need to support direct user-to-user traffic**
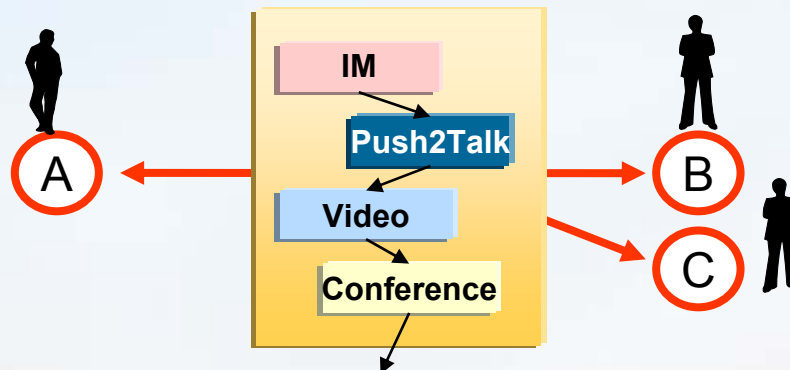 – P2P Gaming
  – Instant file transfer
  – Conferencing/Netmeeting
  – Voice & Video

Challenges for Operators

- **Control of the communication** (e.g. charging and quality of service)

Control

A ←→ B

Server
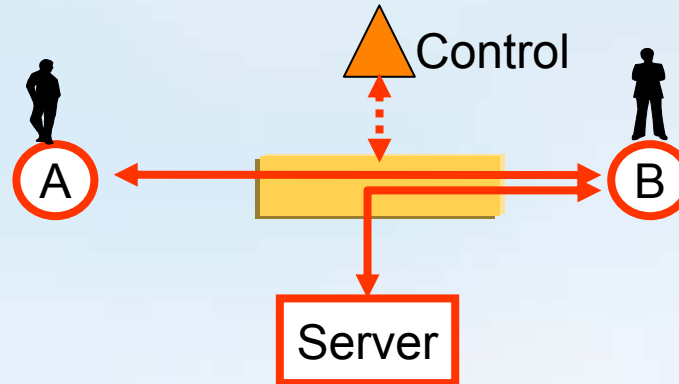
- **Present different services seamlessly to the users**

IM

Push2Talk

Video

Conference

A   B   C

- **Manage the introduction and the withdrawal (!) of a multitude of new services**

IMS provides common enablers for a multitude of services

Examples of service enablers provided by IMS:

■ Authentication and Authorisation

■ Naming and Addressing

■ Control of QoS and Charging

■ Presence and Location

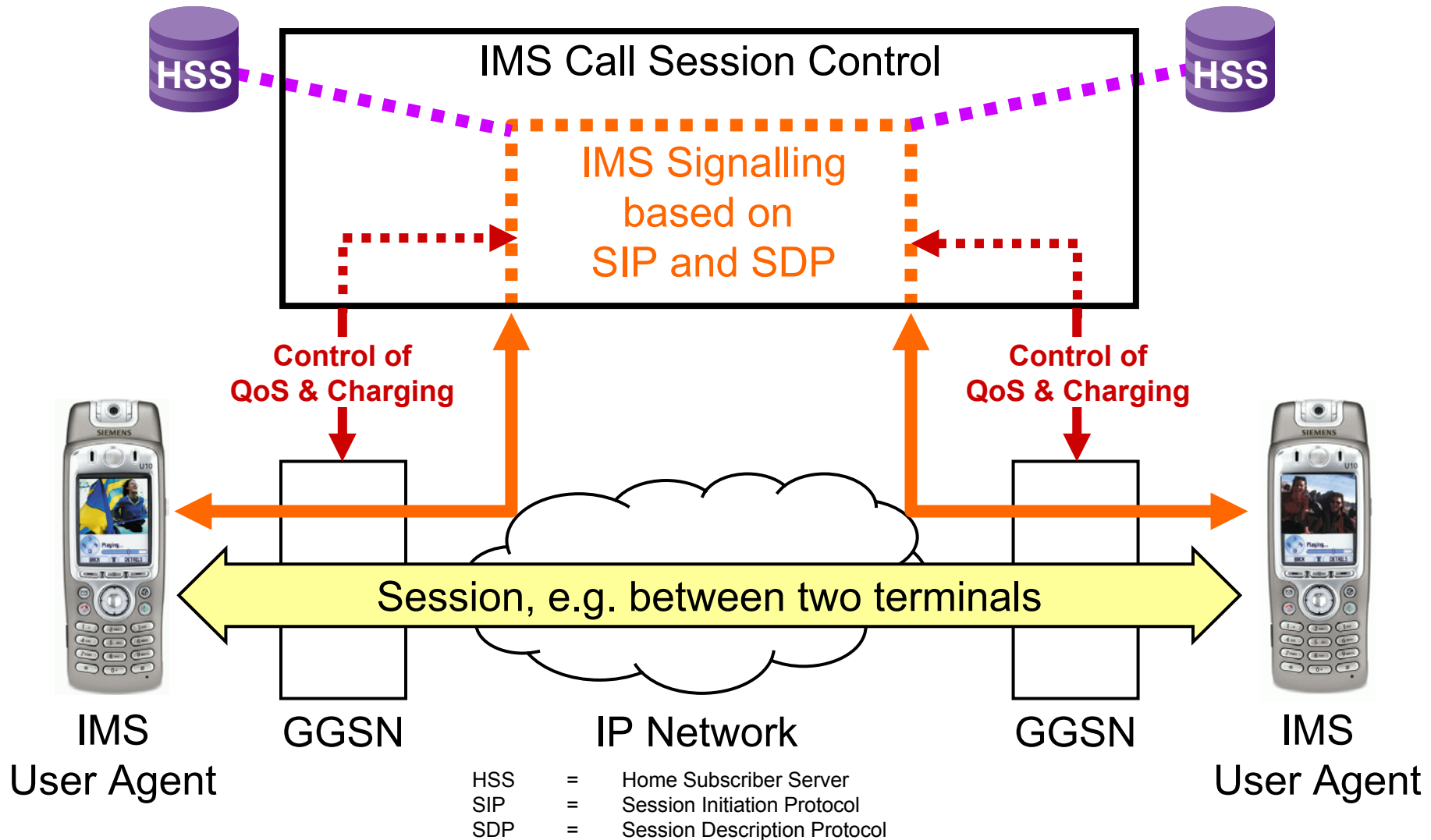■ Group Management

■ Session Management

➲ **Services will be volatile with high dynamics, but the service enablers will stay.**

IMS = Multimedia Control Platform for Mobile Networks and beyond

What is IMS?

- **IMS is a multimedia control platform,**
  i.e. it enables operators to support and to control
  SIP-based applications and communications services

- **3GPP has defined the "IP Multimedia Core Network Subsystem" (IMS) as part of UMTS Releases 5**

- **3GPP re-uses existing IETF protocols wherever possible**
  (SIP, SIMPLE, IPv6, IPSec, COPS, MeGaCo, …)

- **IMS is defined for UMTS, but intends
  to be independent of the access technology**
  Example: Authentication and IPSec based encryption
  between SIP user agent (in the terminal) and IMS.

The IP Multimedia Subsystem (IMS) in the 3GPP Network Architecture

IMS Call Session Control

HSS

HSS

IMS Signalling based on SIP and SDP

Control of QoS & Charging

Control of QoS & Charging

Session, e.g. between two terminals

IMS User Agent

GGSN

IP Network

GGSN

IMS User Agent

HSS	=	Home Subscriber Server
SIP	=	Session Initiation Protocol
SDP	=	Session Description Protocol

The Go Interface:
Control of QoS and Charging

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- **Authorises** access bearers and their QoS parameters
- Provides information for **packet filtering and charging**
- Builds on concepts for **policy based networking**:
  - GGSN is Policy Enforcement Point
  - Policy Decision Function is controlled by IMS
  - Based on COPS-PR
- Works in combination with GPRS session management:
  - Primary PDP Context for SIP
  - Secondary PDP Contexts for media
  - Set-up message for Secondary PDP Context carries authorisation token

P-CSCF
PDF

Control of QoS & Charging

Go

GGSN
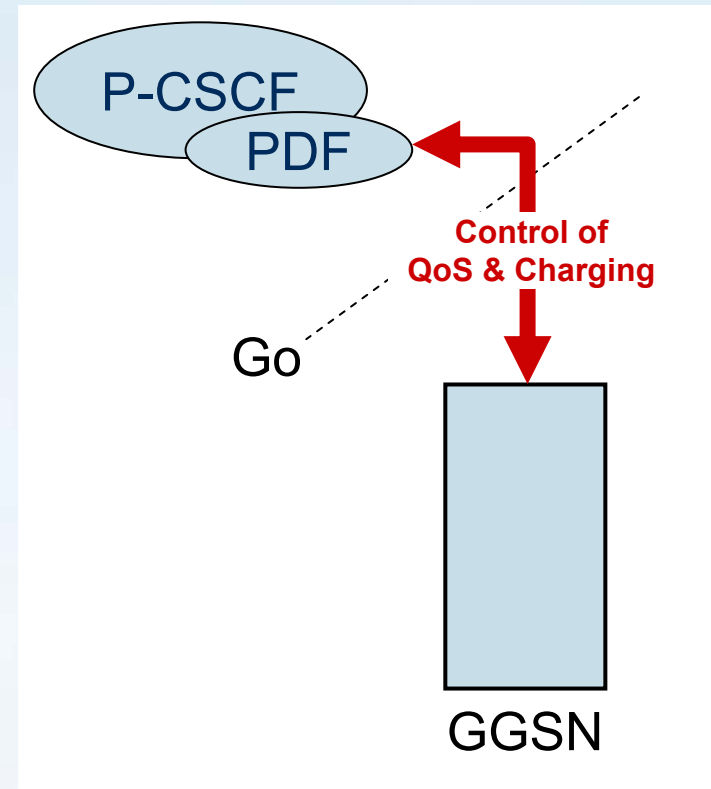
CSCF	=	Call Session Control Function
PEP	=	Policy Enforcement Point
PDF	=	Policy Decision Function
COPS	=	Common Open Policy Service (Protocol)

Part II

■ **IMS: A big step towards All-IP in Mobile Networks**

■ **Roaming, Interworking and Mobility in the Context of IMS**

■ **Integration of multiple Access Technologies**

Introduction Strategy
for Roaming and Interworking

Phase 1: GPRS-based Roaming

- User get connected to a GGSN in their home network
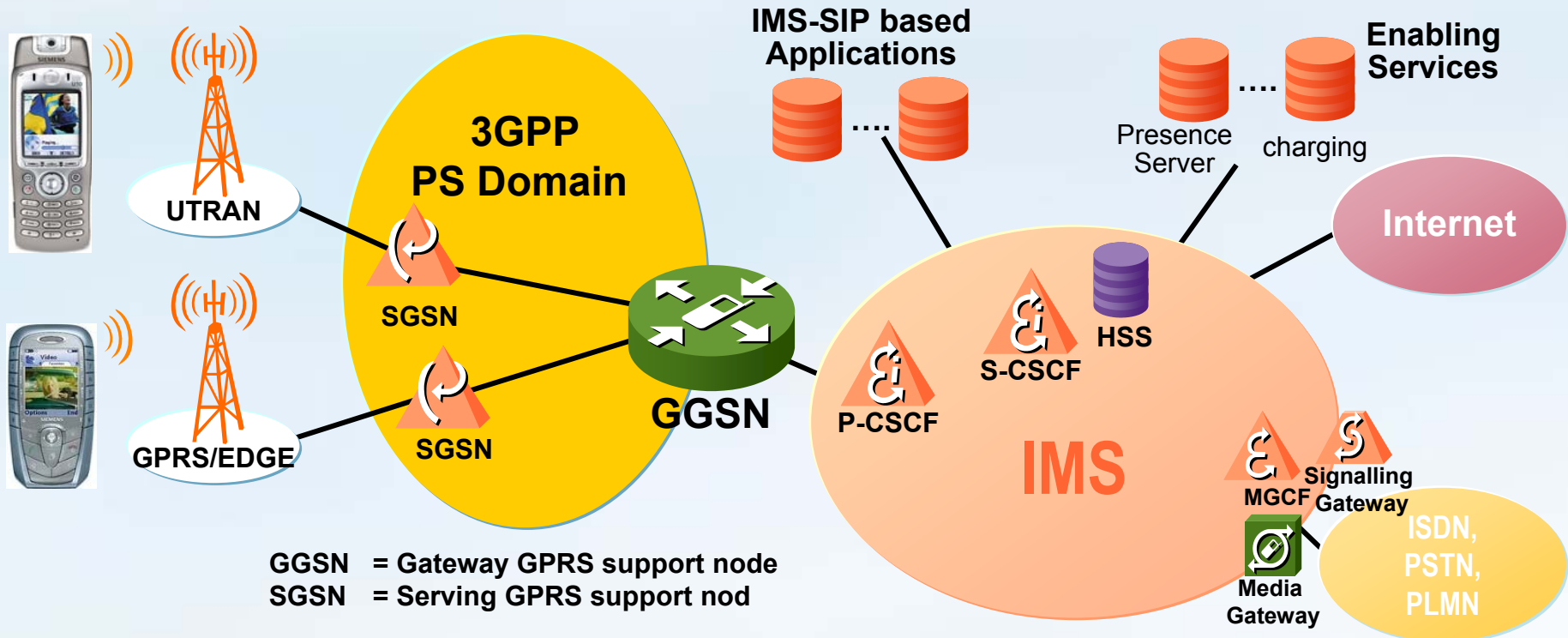- ⮑ Access to IMS services from all over the world

Phase 2: IMS Interconnection

- IMS systems of different operators are interconnected
- ⮑ IMS multimedia services between subscribers of different operators

Phase 3: IMS based Roaming

- Users can connect to IMS system in visited network
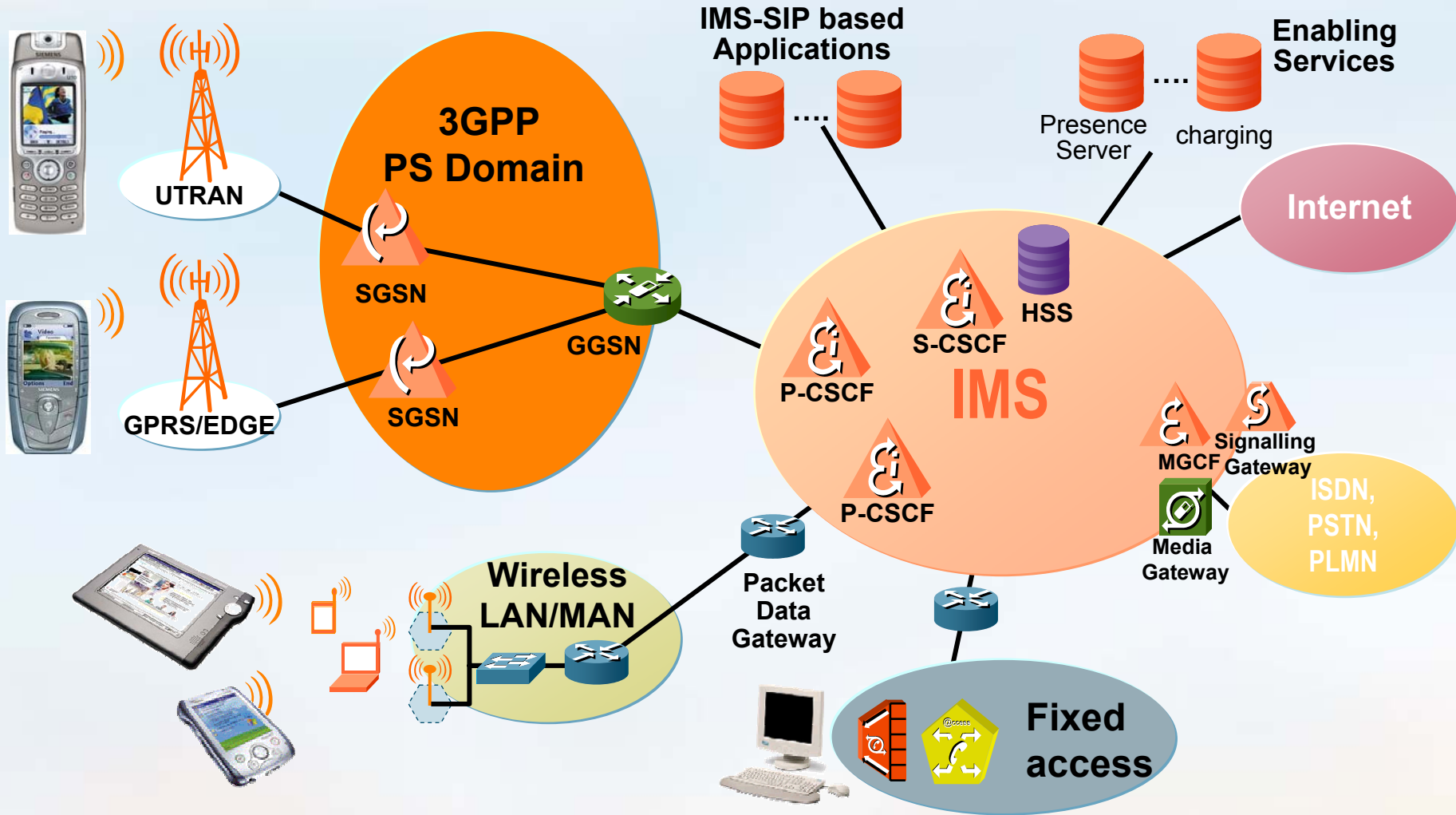- ⮑ Optimises traffic routing of media streams

Mobility in the context of IMS:
Seamless Mobility within 3GPP networks

3GPP PS Domain

IMS-SIP based Applications

Enabling Services

UTRAN

SGSN

GPRS/EDGE

SGSN

GGSN

Presence Server

charging

Internet

IMS

P-CSCF

S-CSCF

HSS

MGCF

Signalling Gateway

Media Gateway

ISDN, PSTN, PLMN

GGSN = Gateway GPRS support node
SGSN = Serving GPRS support nod

- **The GGSN is a fixed point when accessing IMS through GPRS/UMTS.**
- **It provides a stable IP address and stable bearers towards the terminal.**
- **Mobility is provided seamlessly within the 3GPP "Access Networks"** (e.g. within RAN, between SGSNs, between GPRS and UMTS).

Part III

- **IMS: A big step towards All-IP in Mobile Networks**

- **Roaming, Interworking and Mobility in the Context of IMS**

- **Integration of multiple Access Technologies**

IMS has been defined as an access independent core network subsystem

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IMS-SIP based Applications

Enabling Services

Presence Server ···· charging

3GPP PS Domain

UTRAN

SGSN

GGSN

SGSN

GPRS/EDGE

HSS

S-CSCF

P-CSCF

IMS

P-CSCF

Internet

MGCF

Signalling Gateway

Media Gateway

ISDN, PSTN, PLMN

Wireless LAN/MAN

Packet Data Gateway

Fixed access

Challenge: Mobility between different access systems

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Nomadicity between Access Systems

Definition of **Nomadicity**:

■ Ability of the users to change the access system.

■ It is assumed that users shutdown their service sessions before moving to another access system.

■ There is no session continuity or handover.

➲ **Due to its access independent definition, IMS is well prepared to support Nomadicity.**

IMS-supported Session Continuity

Definition of Session Continuity:

■ The ability of a user or terminal to change the access system while maintaining the ongoing sessions.

■ This may include a session break and resume, or a certain degree of service interruption or loss of data while changing.

Support of Session Continuity within the IMS:

■ Changing the access system usually results in changing the IP address and in changing the fixed point in the network.

■ Authentication of user and authorisation of QoS bearers (including charging information) has to be repeated.

➲ **IMS can be enabled to support session continuity** (RE-REGISTER to new P-CSCF & RE-INVITE to peers)

Mobility within Access Systems

Mobility support within Access Systems

- Is usually independent of IMS

- Implies handover capabilities within the Access System (i.e. interruption or loss of data is below certain limits)

- Examples: GPRS mobility, micro-mobility management

- May also be applied across radio access technologies
  (e.g. handover between UMTS and 3GPP WLAN-Integration
  with GGSN + integrated Packet Data Gateway as "fixed point")

Requirements from IMS on local mobility solution :

- Keep a fixed point in the network at Go interface
  (GGSN, Packet Data Gateway, Access Router, …)

- Keep the IP address stable

Mobility between Access Systems

Mobility support between Access Systems

- Changing the access system usually results in changing the IP address and in changing the fixed point in the network
- It is an open research issue how to realise handover between access systems in the context of IMS.
- Service Continuity through pure SIP mobility is too slow.
- Context transfer on different levels is necessary.
- Mobile IP will play a role but the overall solution is unclear.

Biggest Challenge:

- Keeping IP address stable (e.g. with Mobile IP) …
- … while relocating IMS resource control to new access.

Conclusions

- IMS = multimedia control platform for mobile networks

- IMS provides important service enablers
  and is defined in an access independent way

- Within cellular 3GPP networks, full support of mobility
  in the context of IMS is guaranteed.

- When adding other access technologies, the following mobility
  support can be provided:
  - Nomadicity
  - Service Continuity (supported by SIP Mobility concepts)
  - Mobility within Access Systems (supported by micro mobility)

- Mobility between Access Systems is still an open issue