Operator's network evolution and NGN

Challenges and opportunities for the creation of new services

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Summary

- Context and problem description

- Standardization work

- PTIN example: *ShIPnet*

- Conclusions

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Context (1)

Big increase in data traffic compared to pure voice traffic

Users want to become mobile and want more mobile bandwidth and services

Fixed voice is giving place to mobile voice

Users willingness for integrated and customized services

Very competitive market, with margins being drastically reduced

Operators need to differentiate from their competitors

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Context (2)

Operators with a vertical structure, developed by service (PSTN, Cable, Internet, …)

General increase in the available bandwidth (local, access and core network)

Compensate reduction in incoming from traditional services (e.g. circuit based fixed voice – PSTN) with the introduction of added value services

Better capacity and flexibility to target especial users and new users

Better time to market for new services and applications

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Media & networks

	Fixed phone networks	Broadcast networks	Data networks
	Voice	**Video**	**Data**
Bandwidth	narrow	broad	narrow/broad
Jitter effect	big	medium	small
Traffic type	continuous	continuous	bursty
Errors effect	small	medium	big

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Actual model

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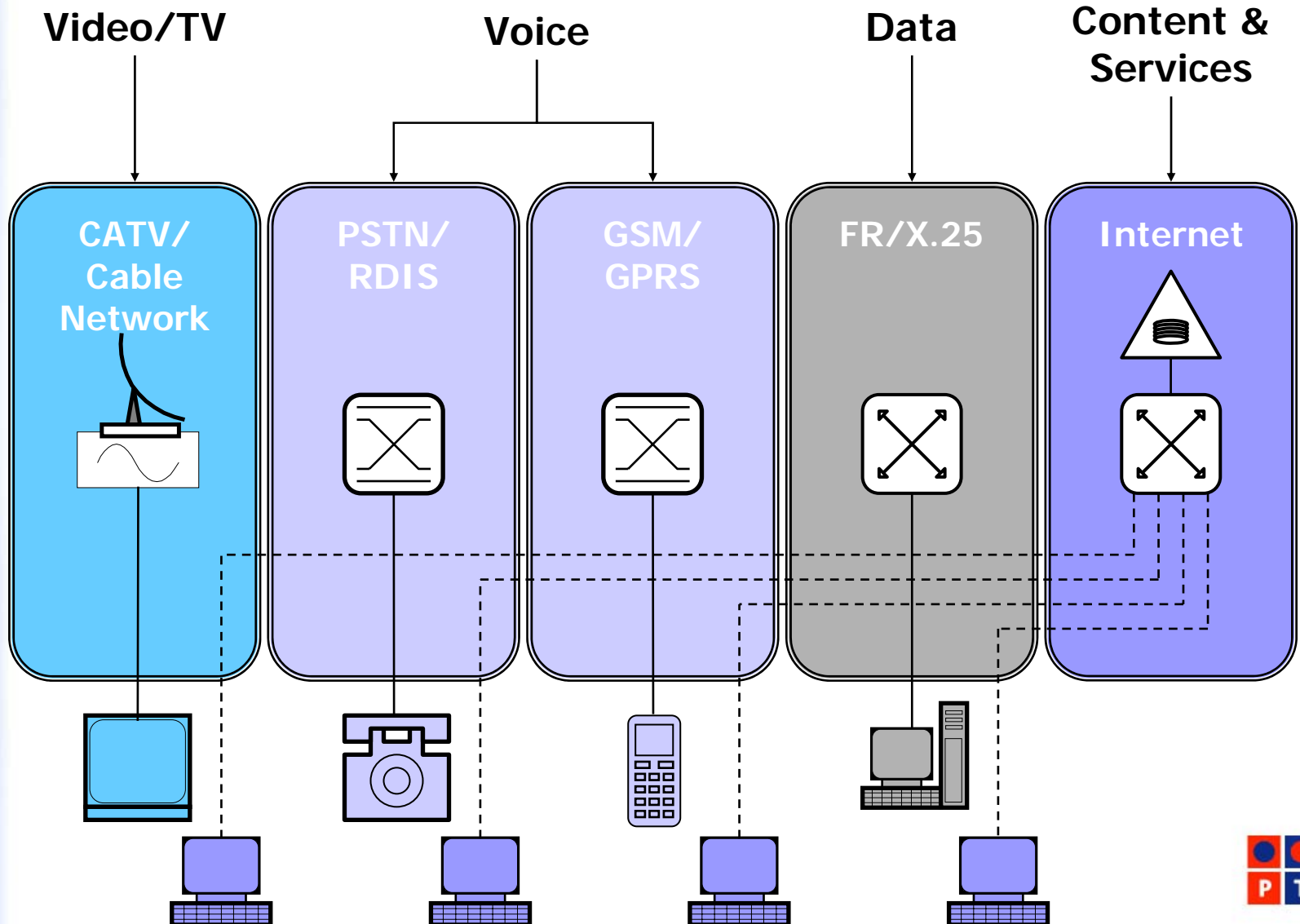
Requirements

I want to have my services, the way I like them, at any time, any place and using any terminal!

- A single access with multiple services

- Services available over any type of access

- The user defining his profile and controling his services

- The user is recognised by the network in different access interfaces

There is a need for an integrated and rational development of operator's networks, targeting a unique optimized network and supporting services

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The new services offer must be focused on contents, entertainment, business and value creation …

Mobility ...

Residential ...

Broadband Internet
Home Networks
Home Gateways over broadband (security, automation)
Video (VOD, Broadcast)
Music, Gaming Online
Video Telephony,
VoIP-VoBB
Convergence Fixed-Mobile (dual mode terminal)

Internet

WiFi

VPN Access
Enterprises

Enterprises ...

Broadband Internet
VPN IP with voice and data
LAN interconnect
Housing & hosting of applications
SANs over Ethernet,
Videoconference, Corporative video services
Vigilance e security
VoIP, PABX IP, wireless PABX, Wireless LANs
Tele-working, e-learning

Mobile voice
(GSM, UMTS,
 multi-mode
terminals)

… moving from connectivity and using IP technology as an element for convergence

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- Mobility
  - Personalisation
    - Ubiquiteness

Convergence!

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What is convergence?

Fixed and Mobile convergence...

Mobile and Internet convergence...

Broadcast and Unicast convergence...

Circuits and packets based networks convergence...

A single network for everything...

Only a converged network can support converged services!

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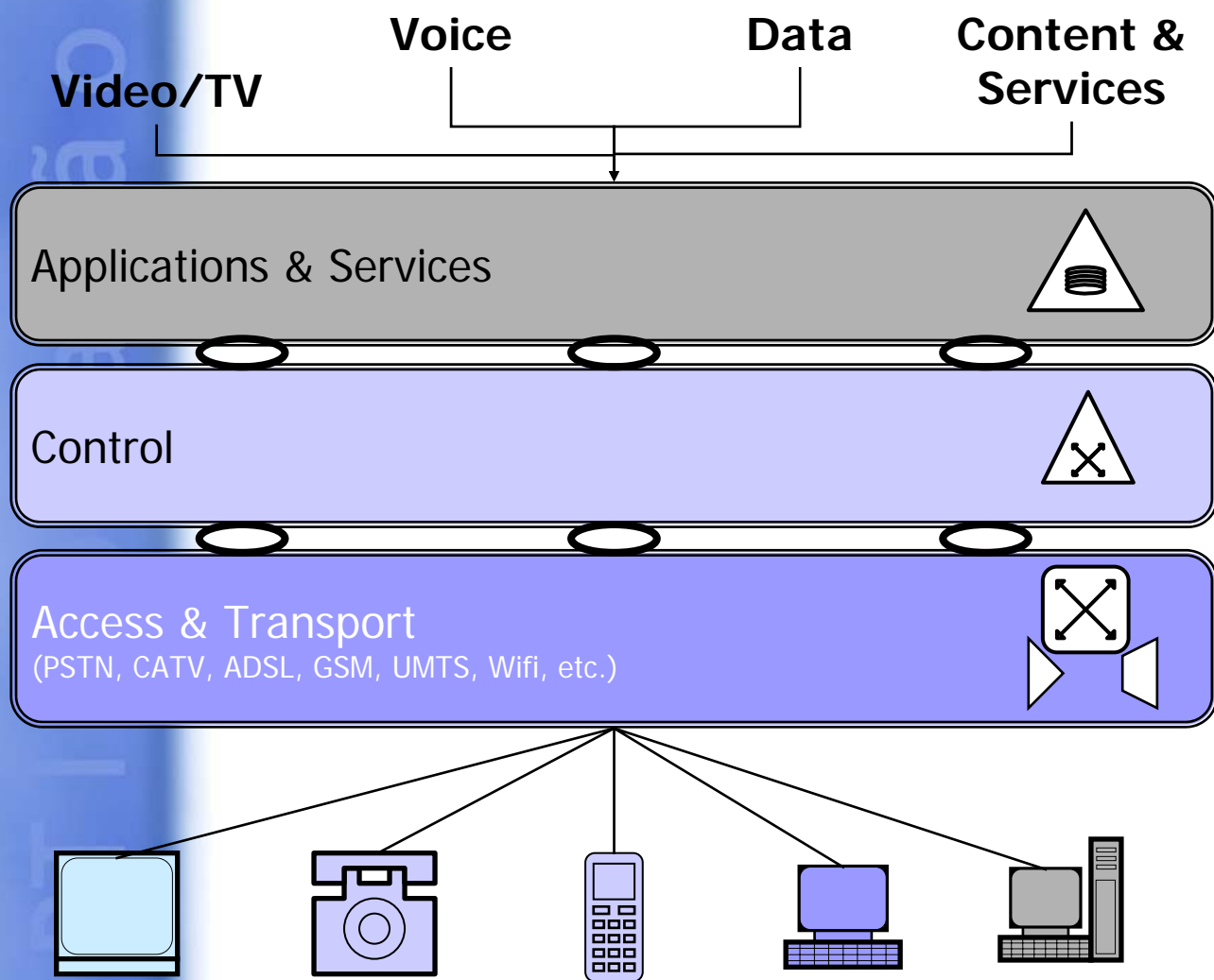*18/Jul/05 - Lisbon/Portugal*

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Media & networks

	Next Generation Network (NGN)		
	Voice	**Video**	**Data**
Bandwidth	narrow	broad	narrow/broad
Jitter sensibility	big	medium	small
Traffic type	continuous	continuous	bursty
Errors sensibility	small	medium	big

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Model change:
Integrated horizontal levels

Video/TV   Voice   Data   Content & Services

Applications & Services

Control

Access & Transport
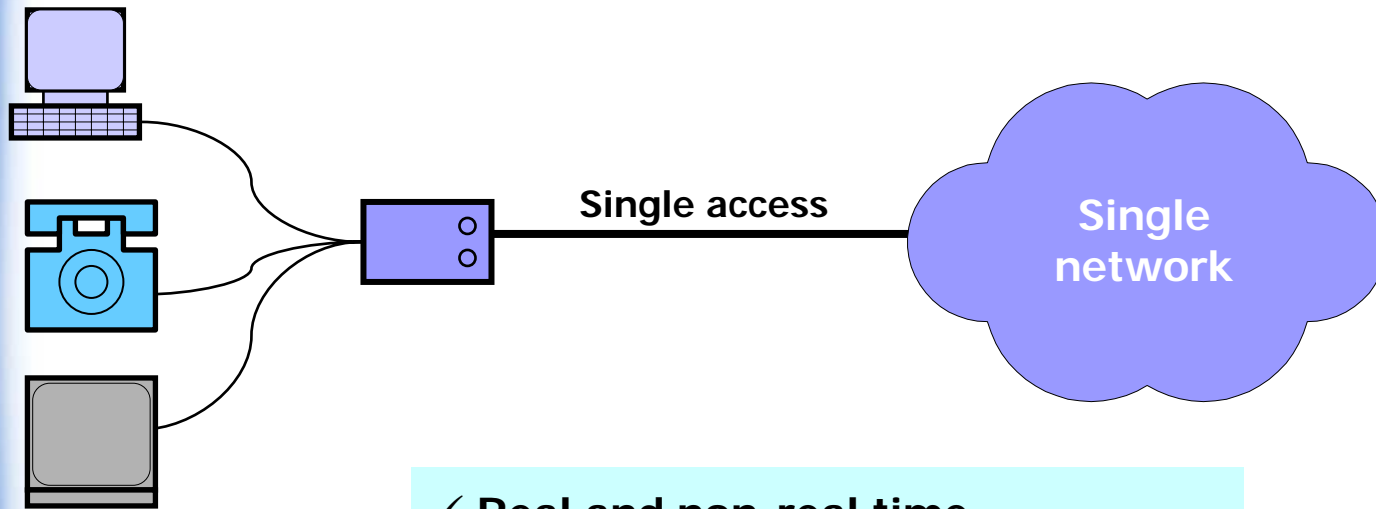(PSTN, CATV, ADSL, GSM, UMTS, Wifi, etc.)

Applications and services level, communicating through open interfaces with the control level

Control level for connections and sessions, separated from transport level

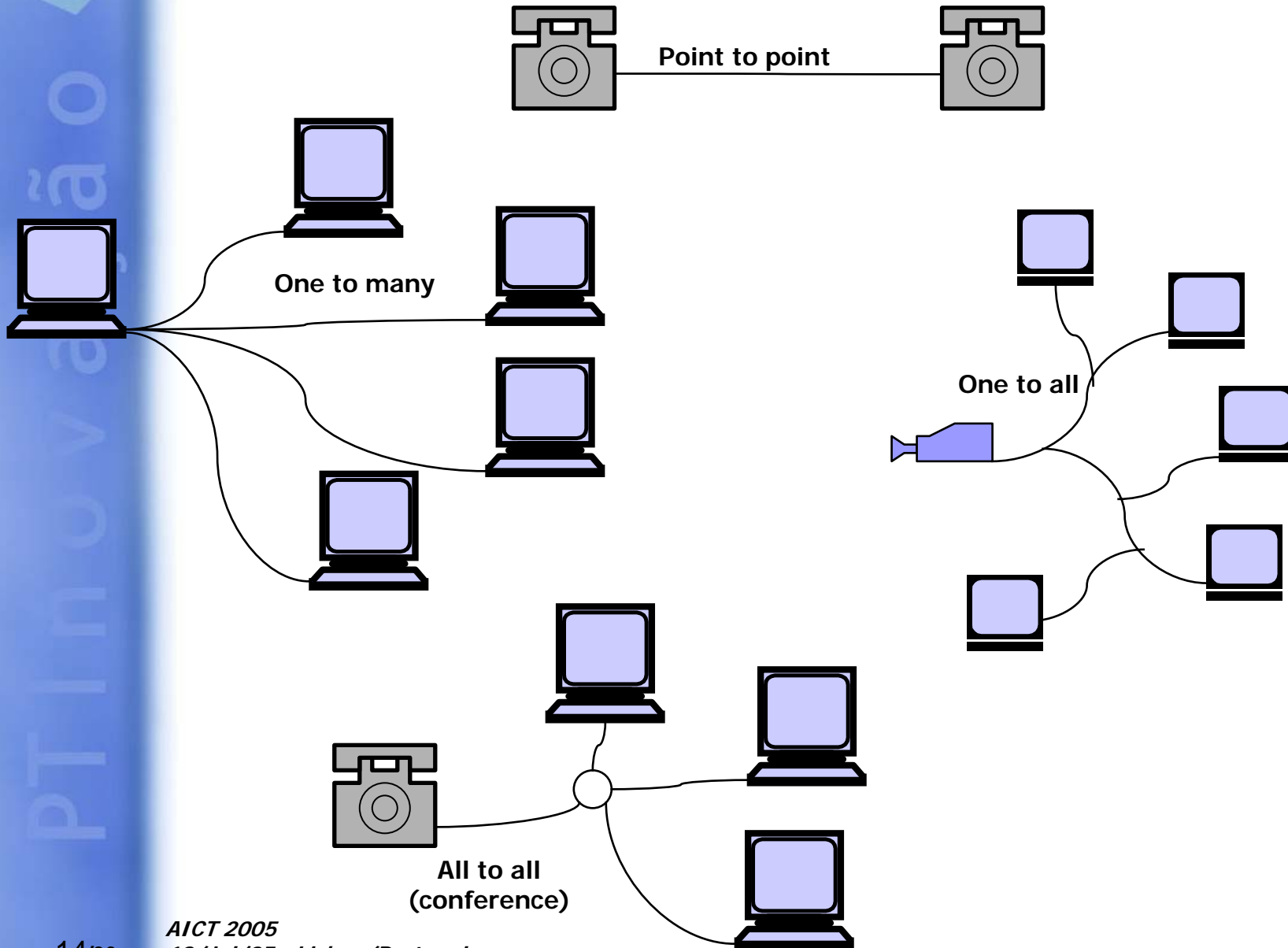Common transport level based on packets switching/routing (IP)

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All type of media

Single access

Single network

✓ **Real and non-real time**

✓ **High and slow rates**

✓ **Different level of service (QoS)**

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All type of connections
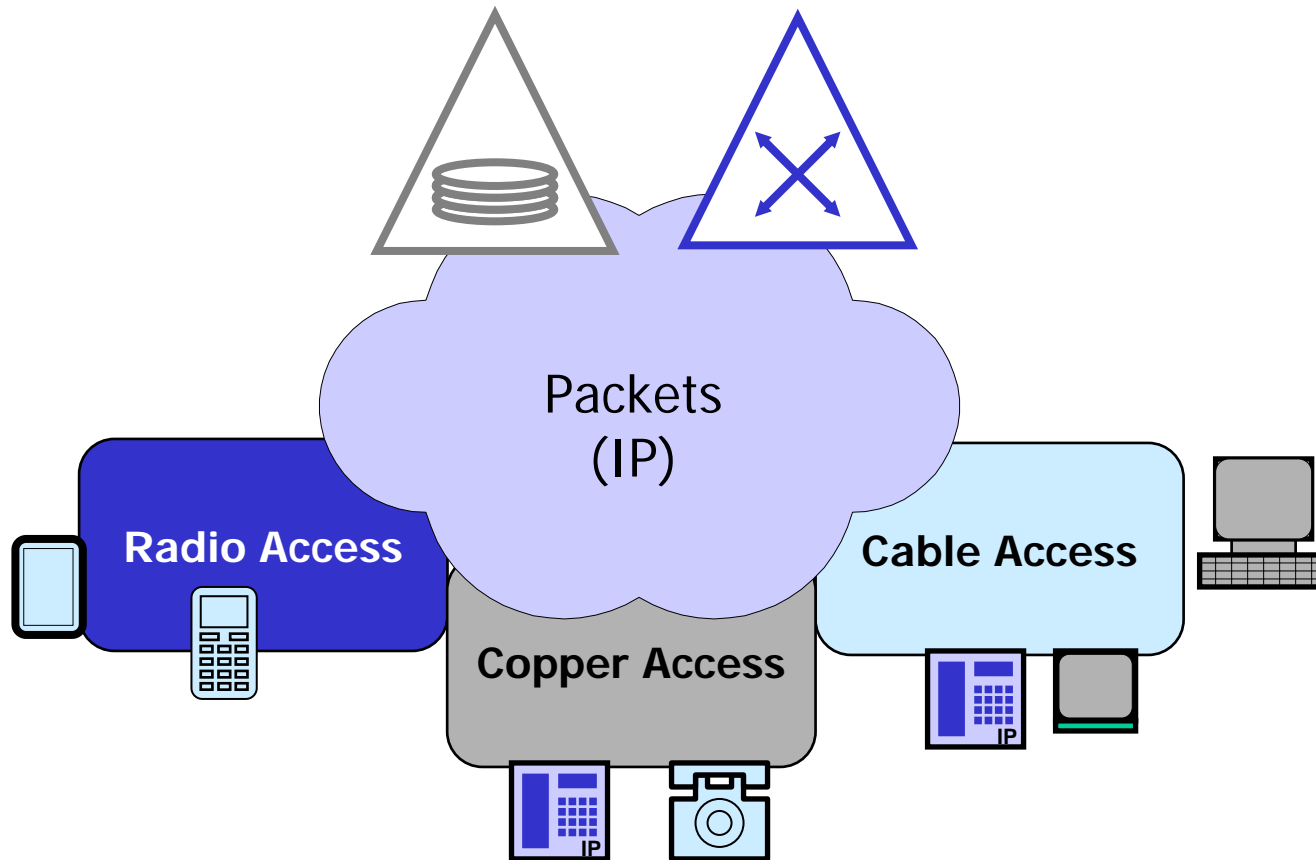

Point to point

One to many

One to all
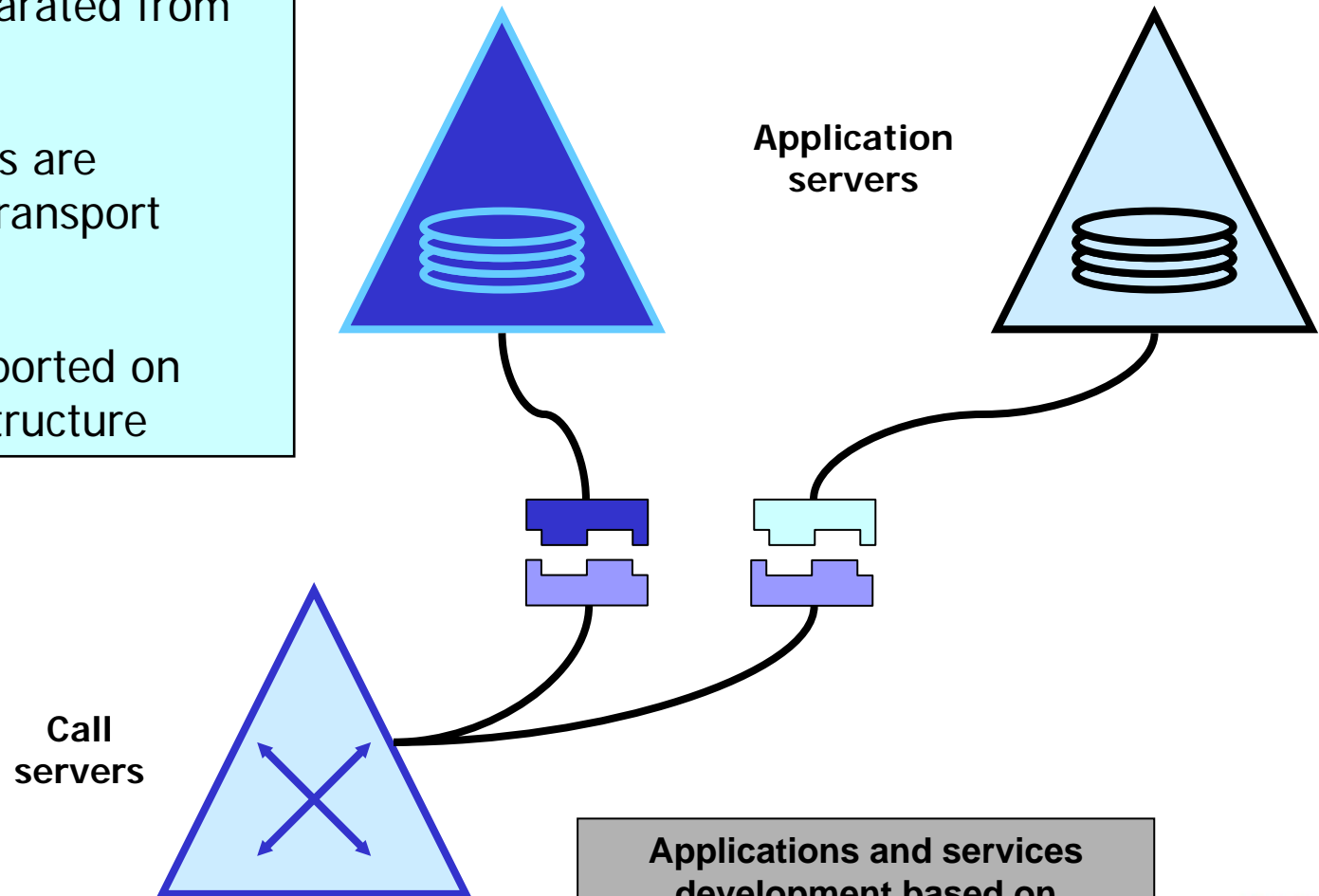
All to all
(conference)

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Allowing for all type of accesses

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Open Interfaces

- Service offer separated from network

- Services functions are separated from transport functions

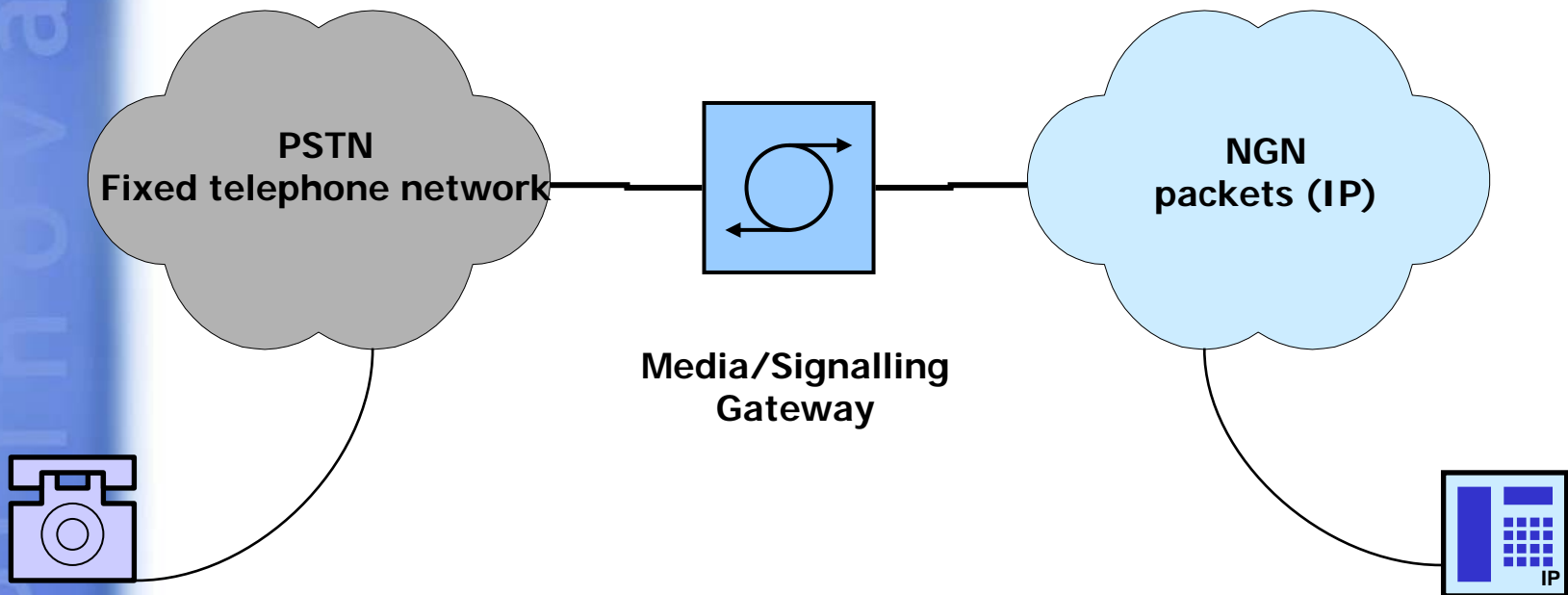- Services are supported on their own infra-structure

Application servers

Call servers

Applications and services development based on abstractions from network aspects

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Guaranteeing interworking

NGN must guarantee the interconnection with legacy networks (e.g. PSTN and GSM)

PSTN
Fixed telephone network

**Media/Signalling
Gateway**

NGN
packets (IP)

IP

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General NGN model

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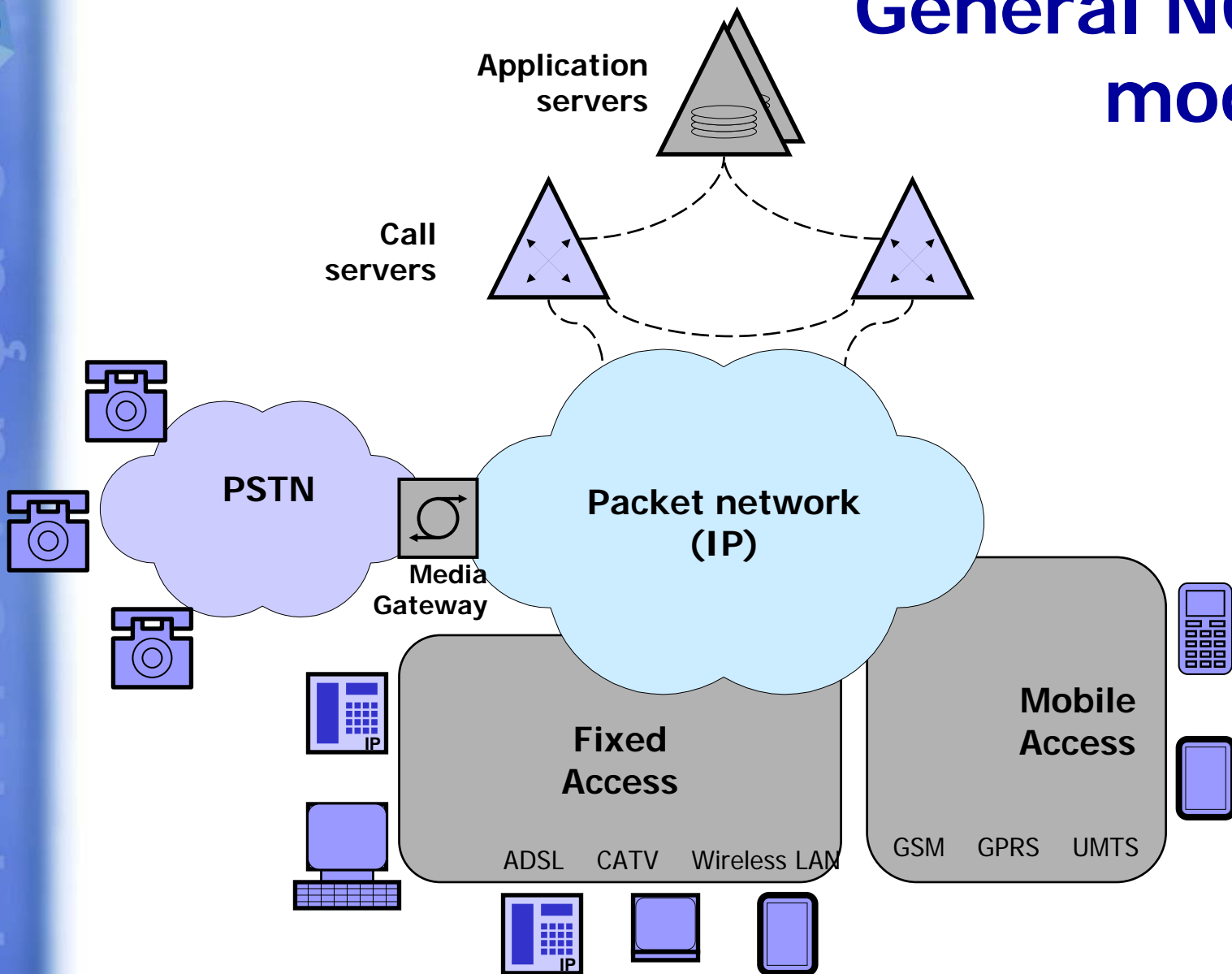
Reference architectures

- **ITU-T: IMT-2000**
  - 3GPP: IP Multimedia Sub-system (IMS)
  - 3GPP2: MultiMedia Domain (MMD)

- **ITU-T: NGN**

- **ETSI: TISPAN**
  - TISPAN NGN

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IMT-2000

- In the scope of ITU-T, the IMT-2000 (*International Mobile Telecommunications 2000*) is the global standard for the 3rd Generation mobile networks

- In IMT-2000, it is the work about IMS (*IP Multimedia System*), being carried out by the 3GPP and 3GPP2, that is of major interest in this context

3GPP → IMS ← 3GPP2

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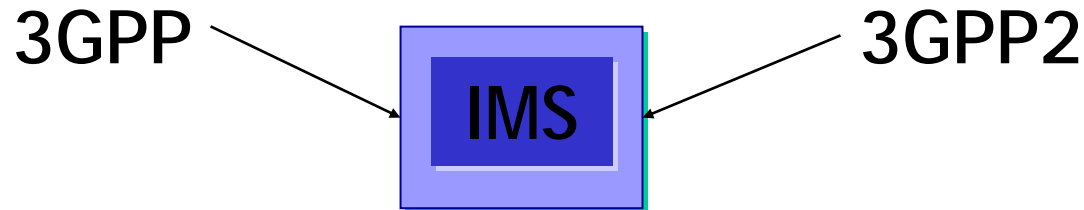
IMT-2000

Vision for the *IP Multimedia System*

3rd Generation mobile network targeted the merging of two of the biggest successes in telecommunications

… and make possible to have ubiquitous access from a mobile device to the services Internet makes available

Videoconference

web

Video TV

IM

Mobile networks   IMS   Internet

E-mail

Presence

VoIP
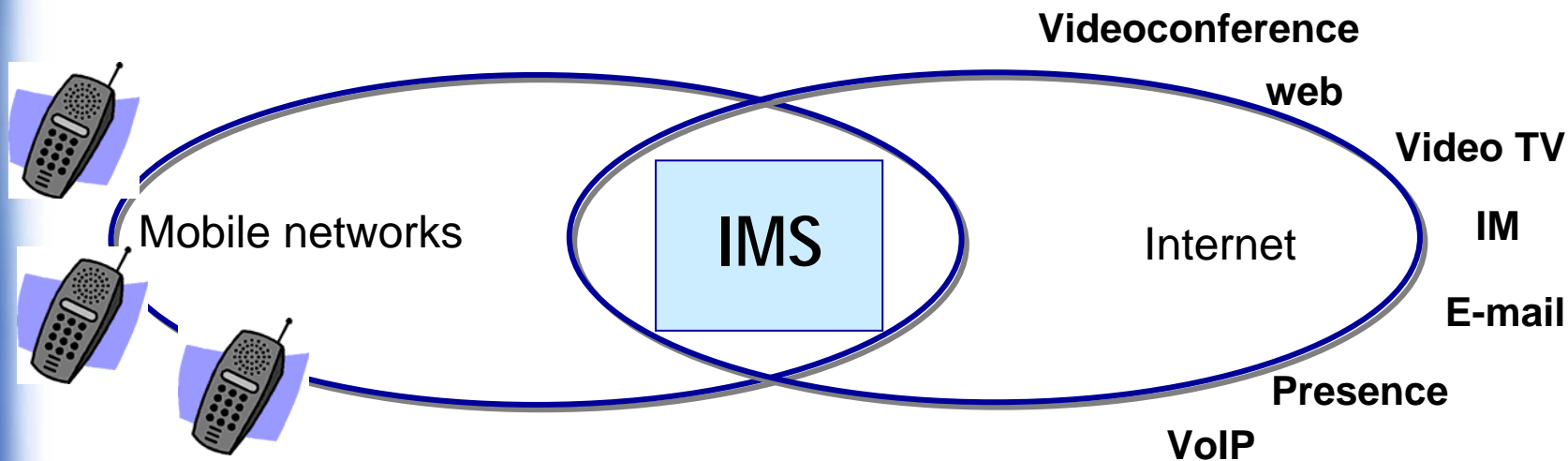
The IMS – *IP Multimedia Subsystem* – appears as the architecture component that allows the convergence between Mobile and Internet

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3GPP IMS
IP Multimedia System

Signaling
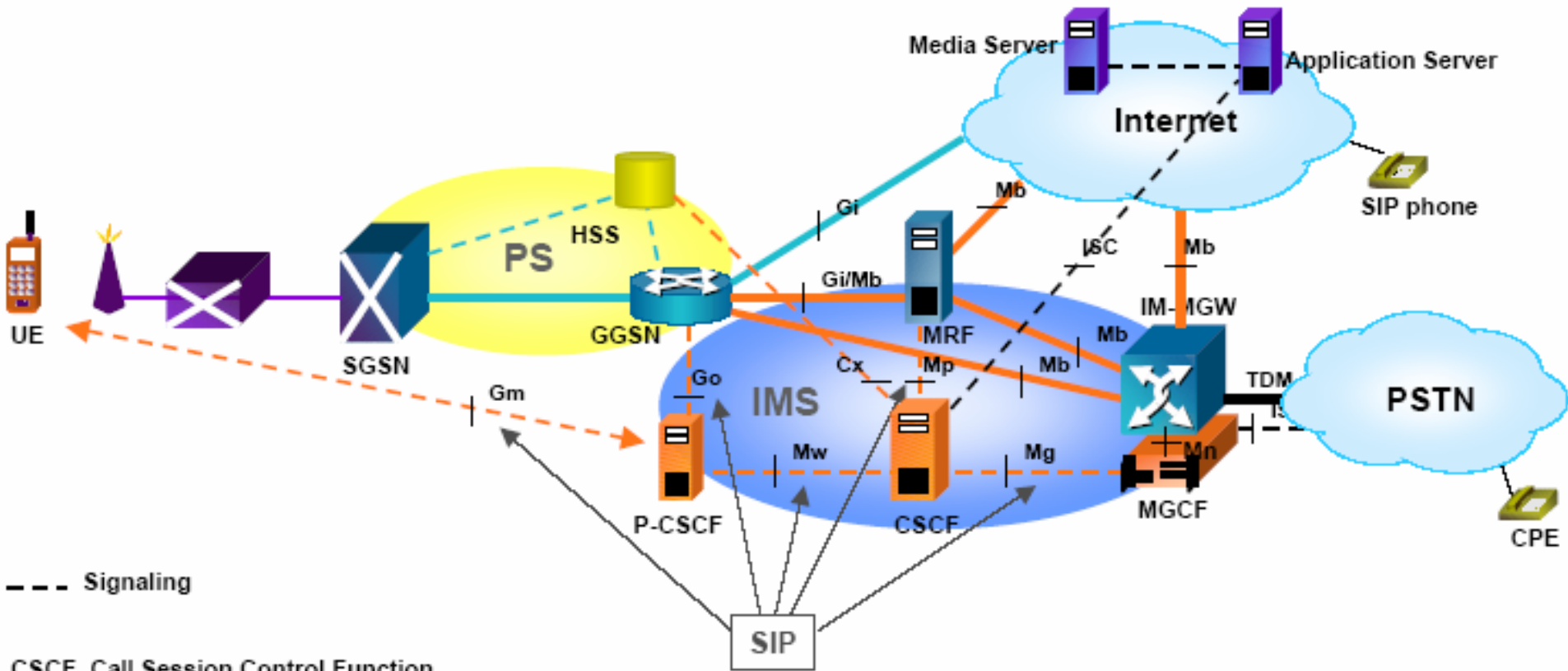
CSCF Call Session Control Function

IM-MGW IM-Media Gateway

MGCF Media Gateway Control Function

MRF Media Resource Function

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3GPP2 MMS
Multimedia Domain

AAA Authentication, Authorization & Accounting

MGW Media Gateway

MGCF Media Gateway Control Function

MRFC Media Resource Function Controller

MRFP Media Resource Function Processor

P-SCM = P-CSCF
I-SCM = I-CSCF
S-SCM = S-CSCF
L-SCM = Border Gateway Control Functions

IM-MGW + MGCF

3GPP / 3GPP2 mapping

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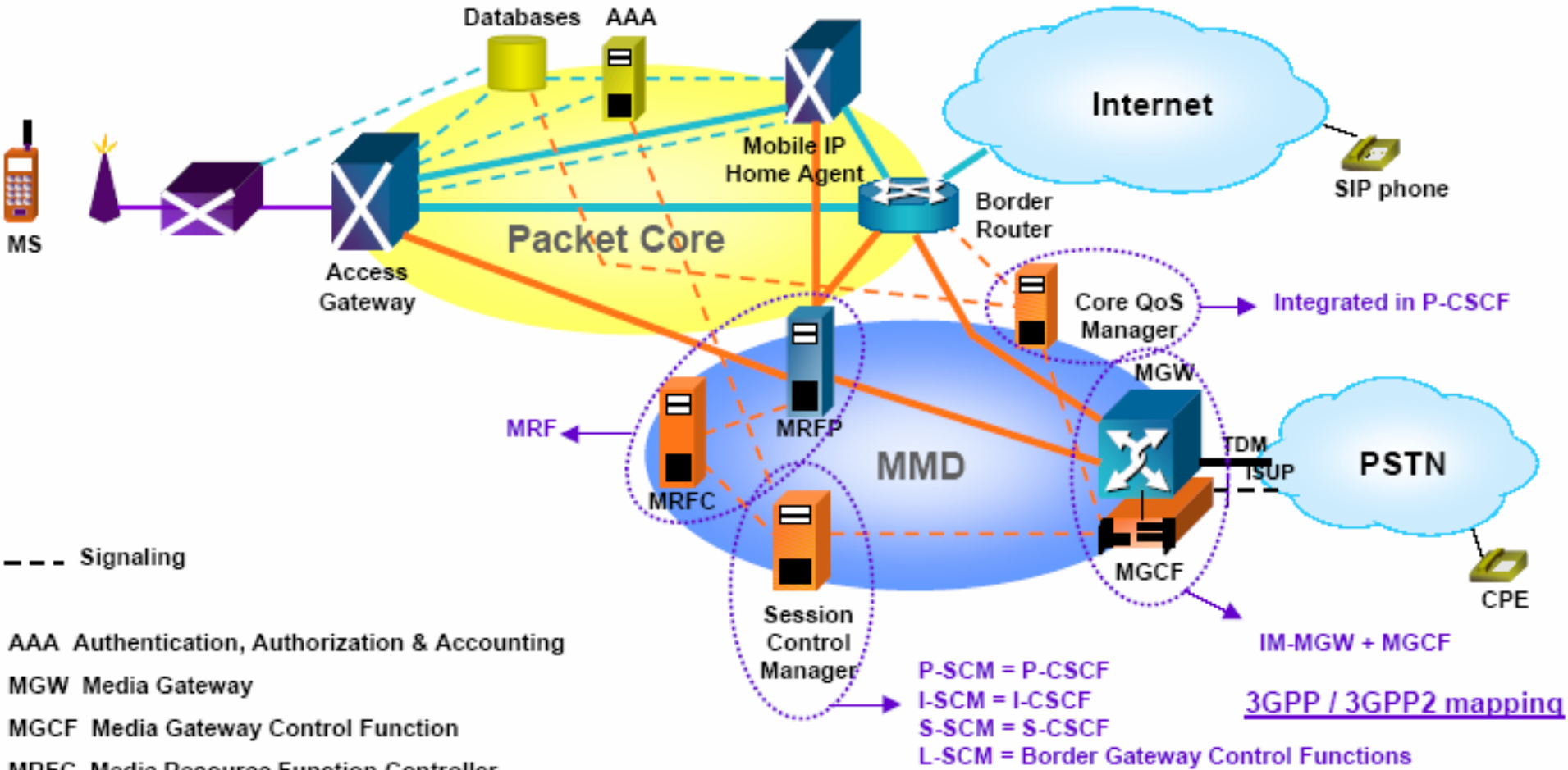
ITU-T NGN - Y.2001

- In 2001, ITU-T started a new initiative, the *Next Generation Network*, as real implementation of the GII – *Global Information Infrastructure* – which one should answer some of the new telecommunication market challenges, characterized by:

  - Competition between operators

  - Internet growing

  - Bigger demanding for new multimedia services

  - Bigger demanding for generalized mobility
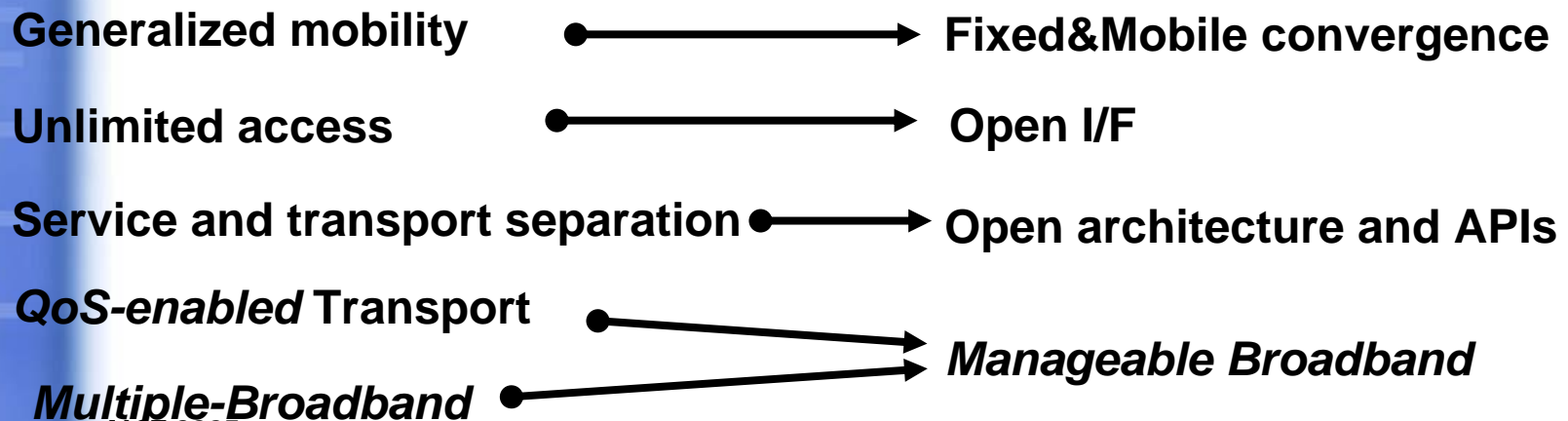
  - Convergence of network and services

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NGN: Definition

- **NGN is a <u>packet switching network</u>, able to offer telecommunication services using <u>multiple types of broadband and QoS-enabled transport technologies</u>, in which <u>service functions are independent from</u> the functions given by the supporting transport technologies**
- **Promotes the <u>access, with no limitations, from users to networks and services</u>, from any providers**
- **Supports <u>generalized mobility</u>, which will allow an <u>ubiquitous and consistent provision of services</u> to users**
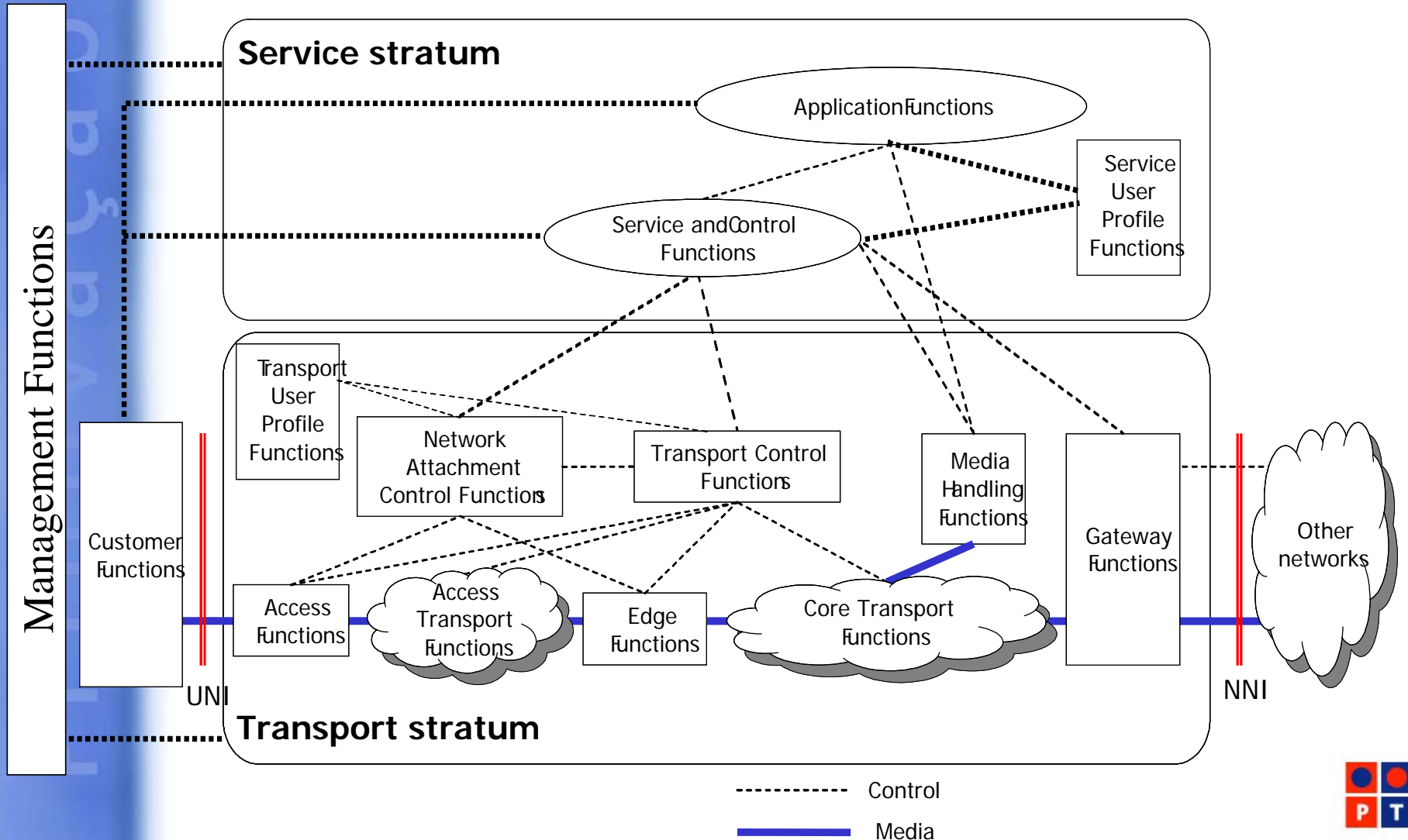
(Rec. Y.2001)

Standardization areas

Generalized mobility ●————————→ **Fixed&Mobile convergence**

Unlimited access ●————————→ **Open I/F**

Service and transport separation ●————→ **Open architecture and APIs**

QoS-enabled **Transport** ●

Multiple-Broadband ●————→ *Manageable Broadband*

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ITU-T NGN
General architecture

Service stratum

Application Functions

Service User Profile Functions

Service and Control Functions

Management Functions

Transport User Profile Functions

Network Attachment Control Functions

Transport Control Functions

Media Handling Functions

Gateway Functions

Customer Functions

Access Functions

Access Transport Functions

Edge Functions

Core Transport Functions

Other networks

UNI

NNI

Transport stratum

---------- Control

——— Media

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ETSI: TISPAN

- **TISPAN –** *Telecommunications and Internet converged Services and Protocols for Advanced Networking*

  - ETSI group created in 2003, being responsible for the standardization of convergent networks, namely for the work associated to the evolution from fixed PSTN networks to Next Generation Networks

    ## TISPAN = SPAN + TIPHON

    - SPAN (*Services and Protocols for Advanced Networks*), technical group, which was already result from the merging of SPS (*Services, Protocols & Switching*) and NA (*Network Aspects*), and,

    - TIPHON (*Telecommunication and Internet Protocol Harmonization Over Networks*), group created in 1997 as an ETSI project to study on the VoIP area, which extended its actuation to other telecommunication services, including multimedia

- Has, as main objective, the standardization of a multi-service, multi-protocol and multi-access network, based on IP
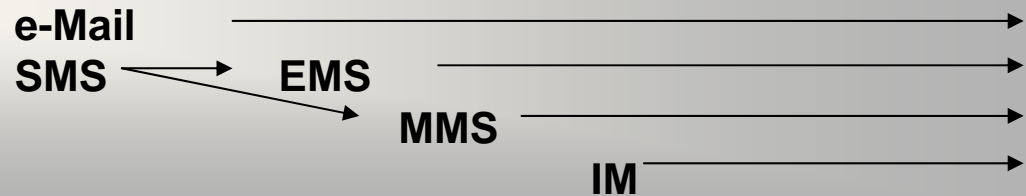
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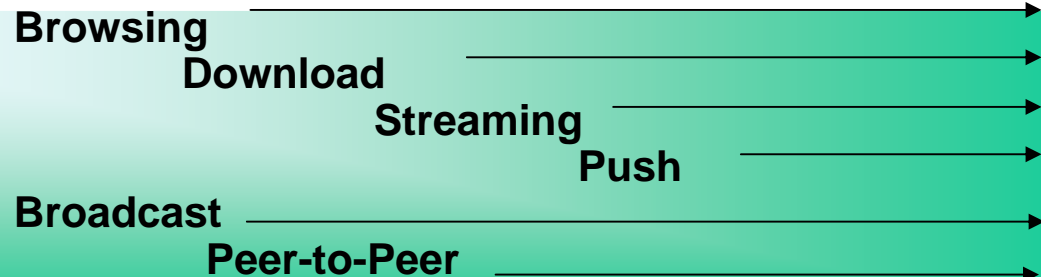
ETSI: TISPAN NGN

Expected services

Communication Services

Conversational　　Voice call →

Video call →

Chat call →

Multimedia call →

Messaging

e-Mail →

SMS → EMS →

MMS →

IM →

Content-on-demand

Browsing →

Download →

Streaming →

Push →

Broadcast →

Peer-to-Peer →

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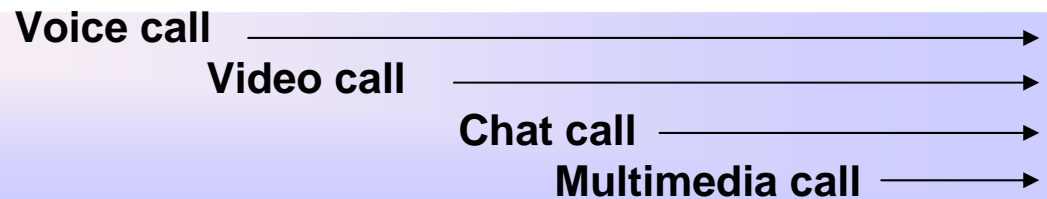
TISPAN NGN Architecture (R1)

Applications

Based on
3GPP IMS

IP Connectivity
Access Network
And related functionality

User Profiles

Other Multimedia Components …

Streaming Services
(RTSP based)

PSTN / ISDN Emulation
(SIP-I based)

IP Multimedia Component (Core **IMS**)
(SIP based)

Other Networks

Network Attachment Functionality **NASS**

Resource and Admission Control Functionality **RACS**

Legacy Terminals

GW

Customer Networks

NGN Terminals

Access Transport Network

Core transport Network

3GPP Terminals

3GPP IP-CAN

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IMS: key component for convergence

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NGN: example

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Shipnet: PTIN initiative
Reference architecture
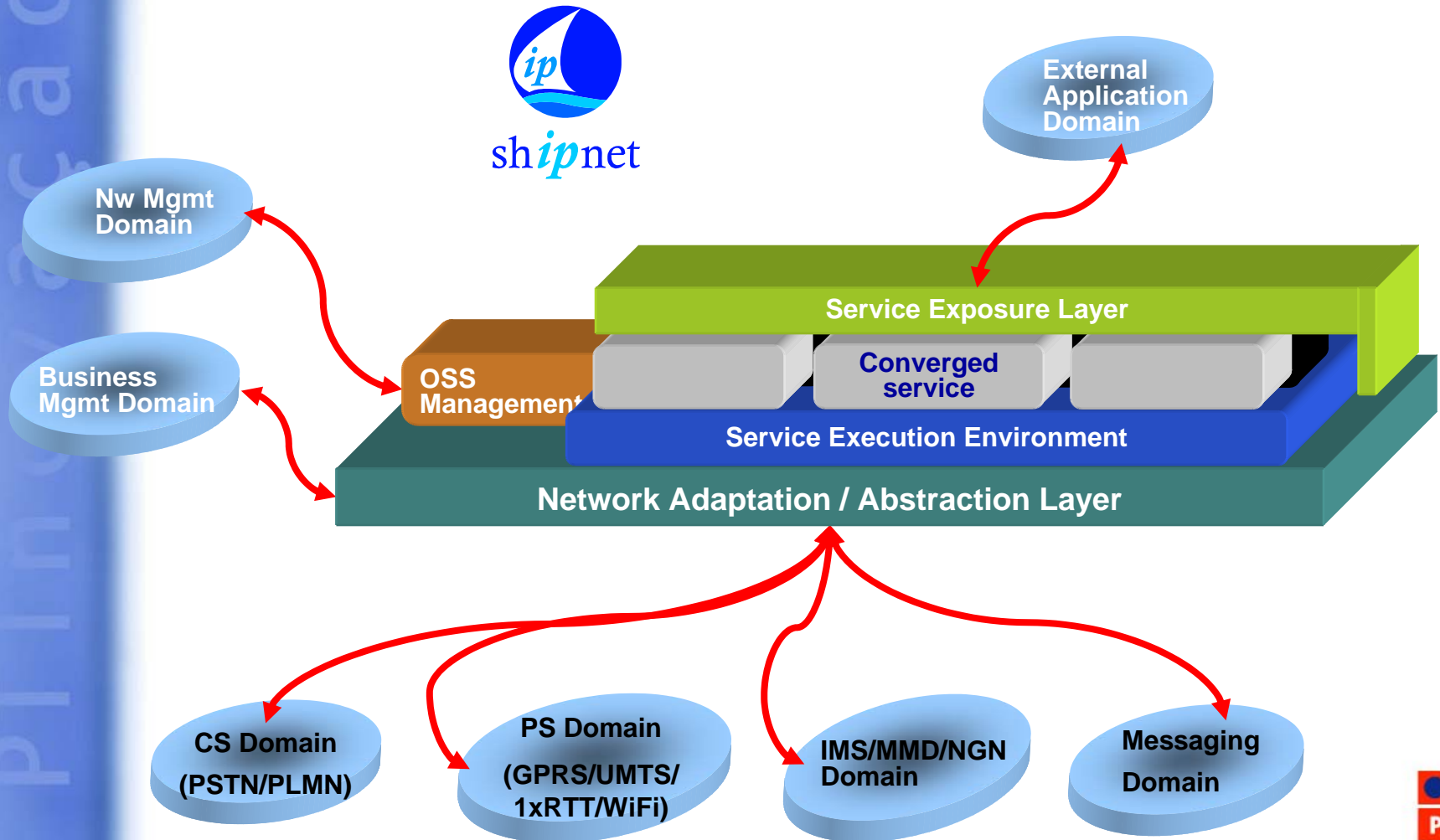
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sh*ip*net architecture: expanded view

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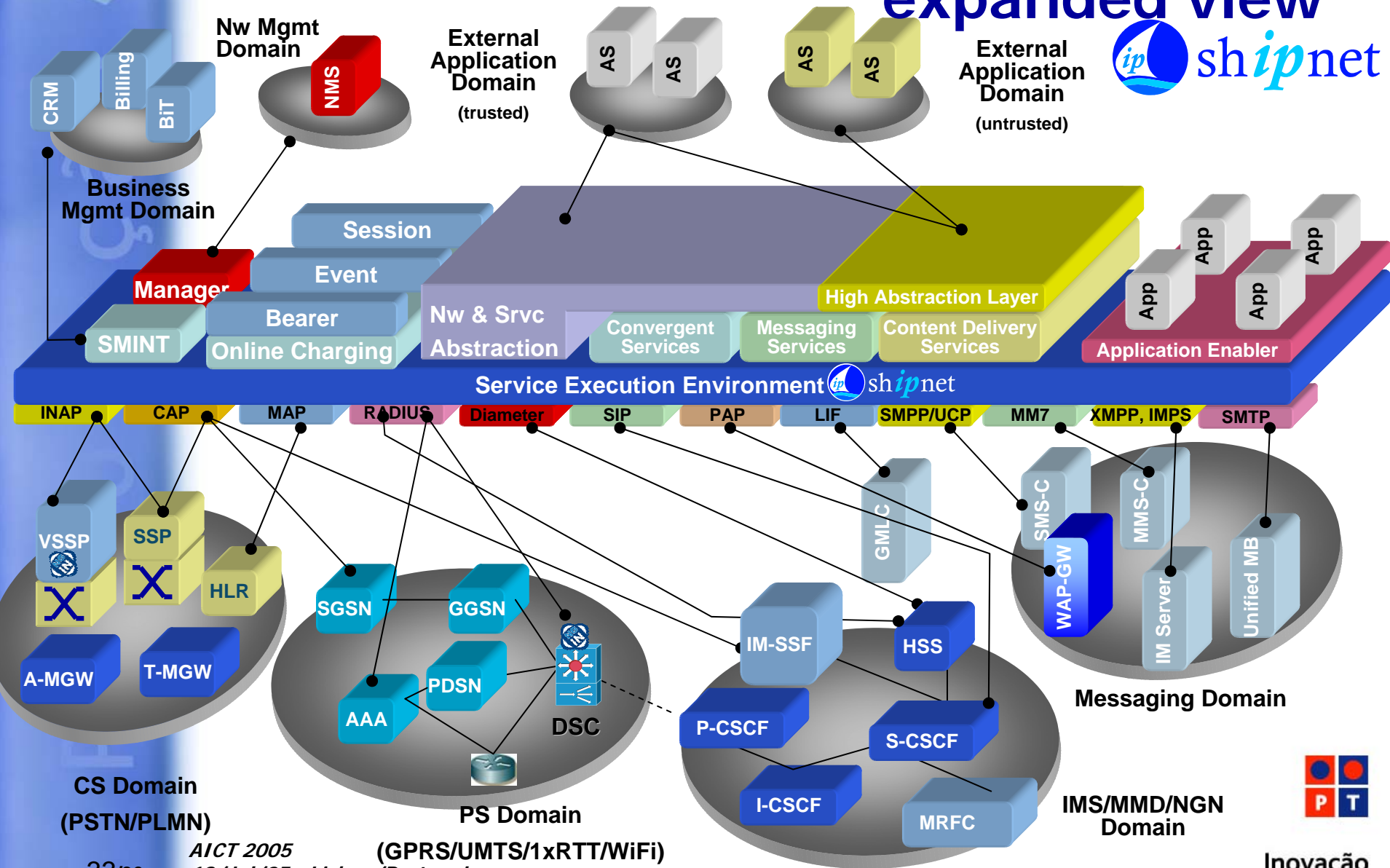
Challenges

- Different security levels, identification schemas and supporting mechanisms
  - User vs. terminal
  - Real user vs. virtual user
  - PPP, web based, …
  - Shared vs. dedicated media
- Different IP address assignment mechanisms
  - At terminal attachment moment vs. when user logs in
- Different QoS models (if any...)
  - Physical level, IP level, no level at all
  - Strict vs. relative QoS
  - End-to-end QoS, especially when including wireless packet access networks
- Development of pervasive applications and services, adapting to
  - Different users' preferences
  - Different access networks and terminals
  - Different network conditions (context)
- Development of universal services (Well-known)
  - Required to support all kinds of mobility and Operator's interworking and roaming
  - But reducing competitiveness amongst operators and
  - Prevent services personalization
- Equipments interoperability
- Interworking with legacy networks
- Accounting and charging logic and processes

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Conclusions

- Operators business sustainability is only possible if making the evolution from connectivity providers to services, applications and content providers

- The evolution to NGN is required for convergent services and networks

- The migration from actual networks presents challenges and it is not all solved

- NGN standards and architectures, fundamental for interoperability, are on their way to become reality

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Thanks for your attention!

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