# NGN Architectures and its Management

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# Plan

- Introduction
- 3GPP IP Multimedia Subsystem
- TISPAN NGN Architecture
- NGN Management
- Conclusion

# What is NGN ?

- The “Converged” **Next Generation Network** will provide:
  - A multi-service, multi-protocol, multi-access, IP based network - secure, reliable and trusted
    - Multi-services: delivered by a common QoS enabled core network.
    - Multi-access: several access networks; fixed and mobile terminals.
  - An enabler for Service Providers to offer:
    - real-time and non real-time communication services
    - Flexible environment for rapid delivery of new services
  - Nomadicity and Mobility
    - of both users and devices
    - intra- and inter-Network Domains, eventually fully between Fixed and Mobile networks

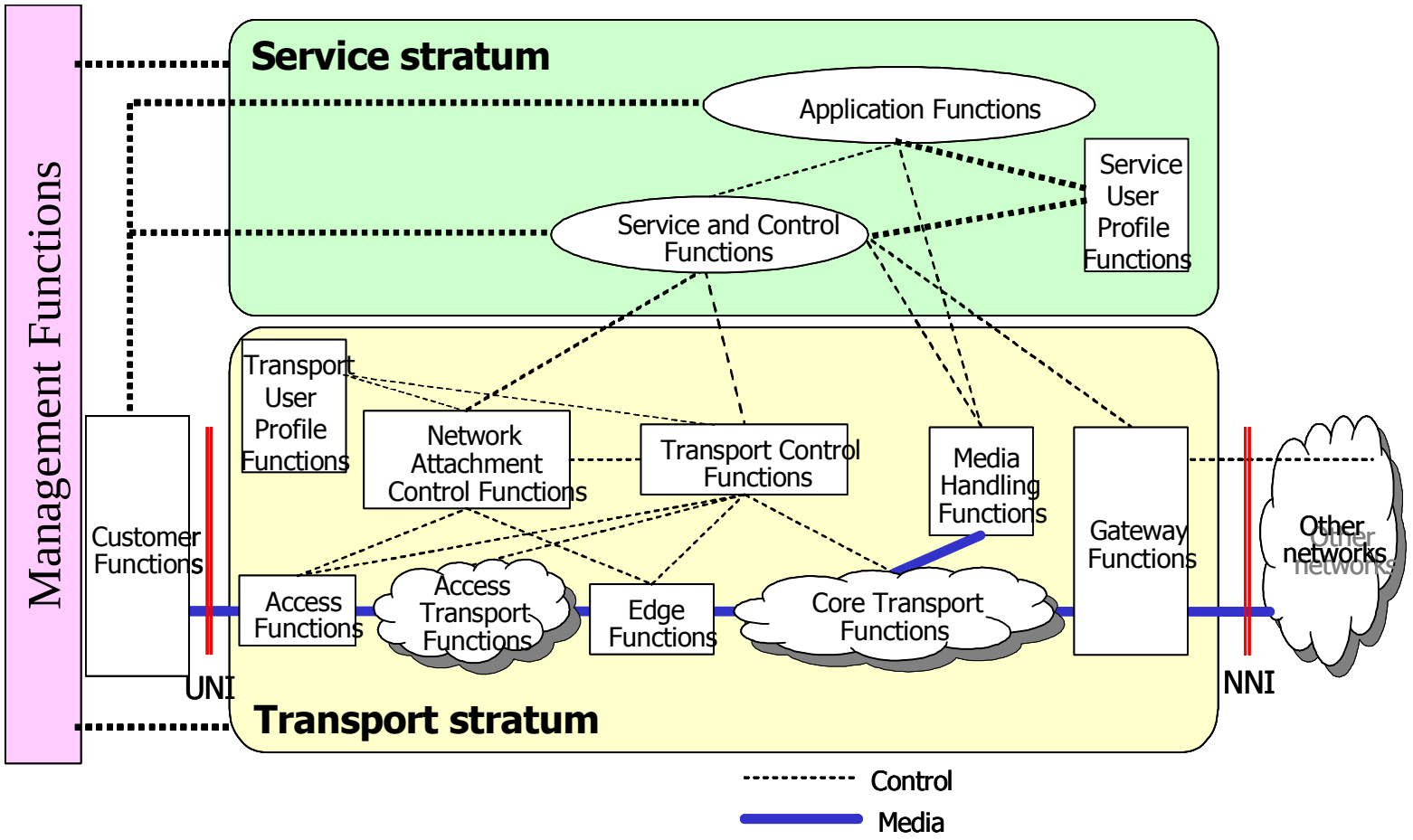
**“My communications services” always reachable, everywhere, using any terminal.**

# Business drivers for NGN

- OPEX cost reduction
- Revenue enhancement
- Coping with various form of disruptive competition (eg supply of VoIP)
- Market saturation of existing services
- Rapid / cost reduced supply of new services
- Renewal of old networks (e.g. PSTN)
- Deployment of single networks for any access networks

# NGN Architecture Framework

**Source: FGNGN-OD-00097 – NGN Release 1 scope document**



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# Mobile Networks History

- 1G: 1st Mobile Networks: 80's → Analog networks
  - Proprietary or national solutions :
  - No compatibility
  - Very expensive for the user
  - Very low penetration
- 2G: 82: Creation of "Groupe Spéciale Mobile" within the European Conference of Postal and Telecommunications Administrations (CEPT)
  - 90-91 : The GSM Phase 1 recommendations are frozen
  - 92 : First GSM networks in operation
  - 94 : GSM Phase 2 recommendations publication
- 2.5G: 1997: GPRS – EDGE
- 3G: 2000: UMTS
- 2002: IMS (Release 5)
- 3G+: 2005: HSDPA-HSUPA
- 4G: Currently: Toward LTE/SAE
- In addition
  - UMA/GAN
  - I-WLAN
  - FemtoCell

# Toward IMS

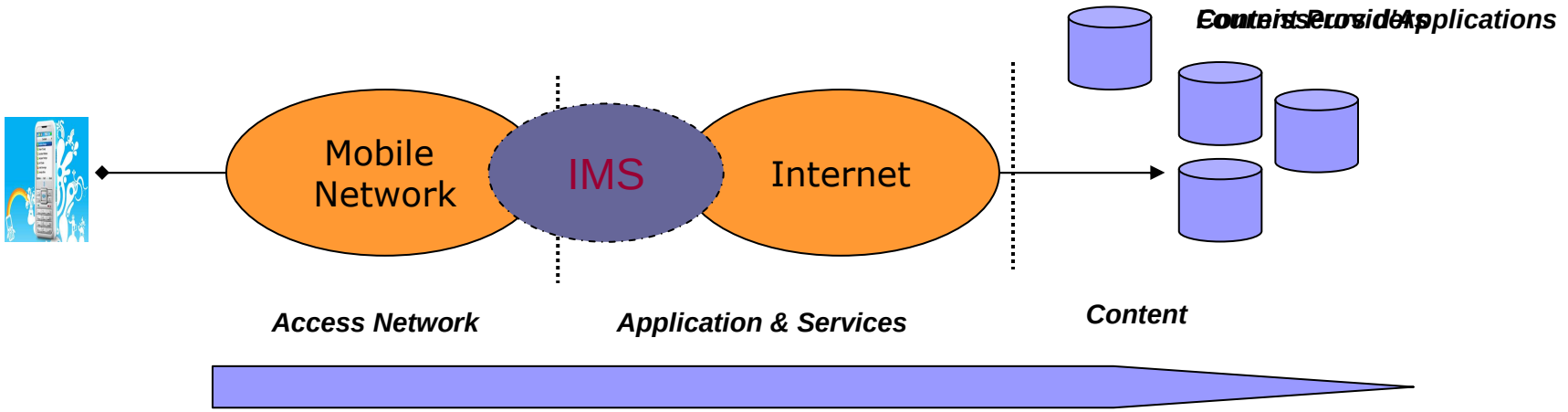
- Why IMS ?
  - Evolution of Mobile Networks
    - Use of CS and PS Networks
    - More Bandwidth
    - Delivery of data services with voice on CS
  - Emergence of multimedia services
    - Growth and large penetration of Internet
    - Development of content applications
    - Competitive voice services like Skype, ..
    - Access to Internet from different network access
  - Mobile Operators
    - Gain control of the extended value chain, otherwise they will become bandwidth provider
    - Keeping ownership of subscribers
    - Extend revenue and potential profits
  - The main advantage of mobile operators
    - Experience of service delivery
    - Value added services, not only voice but more …
    - Quality of services
- IMS
  - 1st step towards all IP Network Architectures
  - SIP based multimedia control subsystem independent of network access
  - Offer SIP converged and multimedia services
  - Single sing-in features for services,

# What is IMS?

- An enabler for Service Providers to offer:
  - real-time and non real-time communication services
  - Flexible environment for rapid delivery of new services
- Nomadicity and Mobility
  - of both users and devices
  - intra- and inter-Network Domains, eventually fully between Fixed and Mobile networks
- IMS (IP Multimedia Subsystem) specifications are being developed by 3GPP (3rd Generation Partnership Program)
  - I… nt (…
  - IMS is a collection of core network functional entities for the support of SIP (Session Initiation Protocol) based services.
  - IMS builds upon other standards eg IETF – SIP, SDP (Session Description Protocol), Diameter (user authorization and subscriber service profile access), AAA (Access, Authorisation and Accounting)
  - IMS is being accepted and incorporated into specifications being produced by other standards bodies – eg 3GPP2, ETSI/TISPAN, OMA.
  - IMS Architecture and SIP can be extended to support new services

**"My communications services" always reachable, everywhere, using any terminal on any network access**

# Why IMS ?

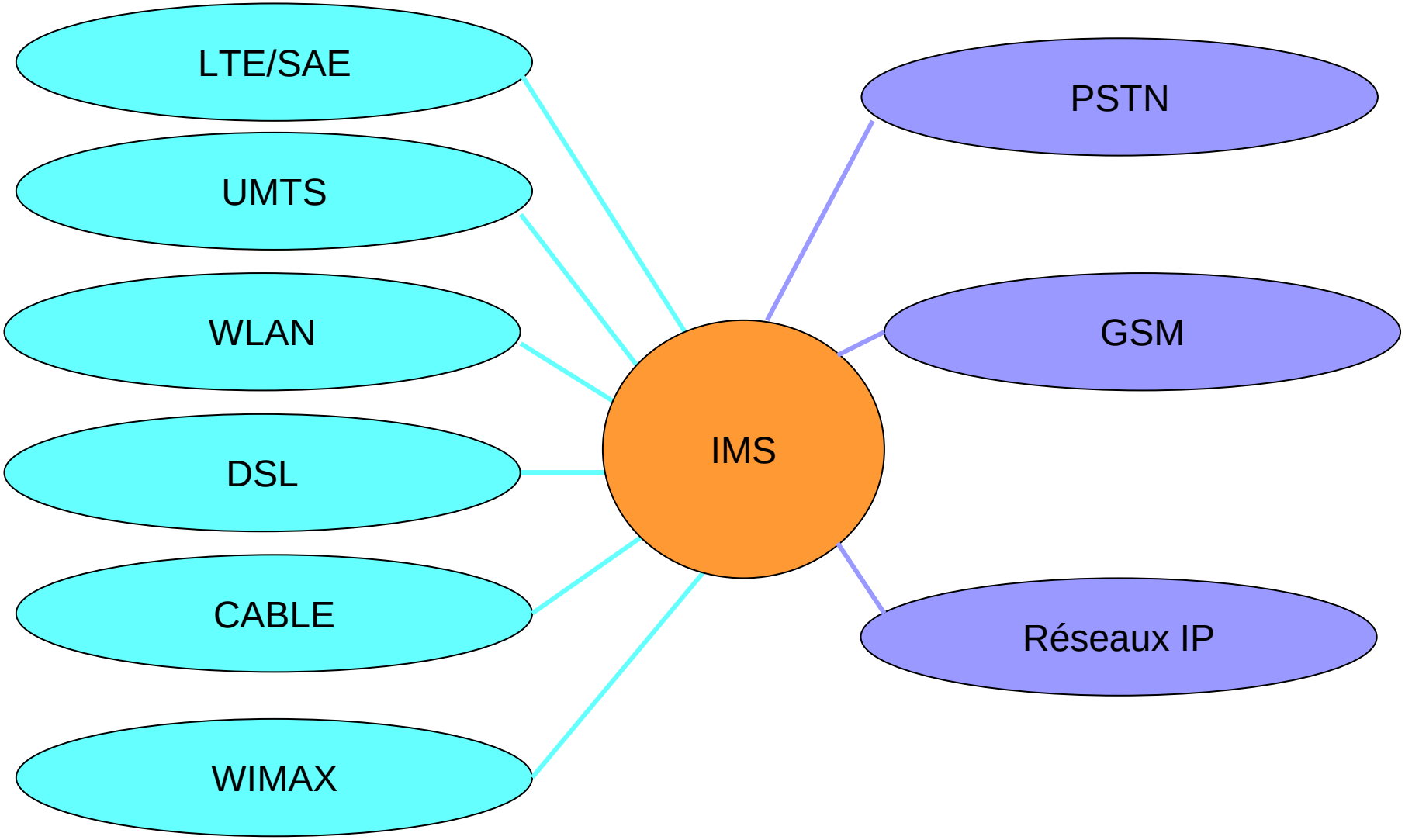



***Challenges***

- ***Control the complete value chain***
- ***Extend revenues and benefits***
- ***Keep ownership of subscribers***

- ***SIP based Multimedia Control platform***
- ***Control all SIP traffic to add value***
  - ***Convergent applications and services***
  - ***Single authentication***
- ***Full IP architecture***

# Convergence



# 3GPP

- 3GPP consortium was created in 1998 by :CCSA, ARIB, ETSI, TTC, TTA, et ATIS
- Composed of:
  - TSG GERAN GSM EDGE (Radio Access Network)
  - TSG RAN new Radio Access Network
  - TSG SA Service & System Aspects
  - TSG CT Core Network & Terminals
- 3GPP Standards
  - 3GPP R99, 3GPP R2000, 3GPP R4, 3GPP R5 (IMS), 3GPP R6, 3GPP R7, et 3GPP R8 (All IP Network)

# 3GPP

- Work closely with OMA, IETF, and ETSI TISPAN
  - 3GPP is in charge of  network architecture and SIP profiles.
- OMA: Open Mobile Alliance
  - Development of mobile service enablers (presence, push to talk, ..)
- IETF (Internet Engineering Task Force)
  - Development of Internet protocols (routing, SIP, RTP, Diameter, …)
- ETSI TISPAN
  - NGN development → Fixed access for IMS, IPTV ..

# 3GPP specifications

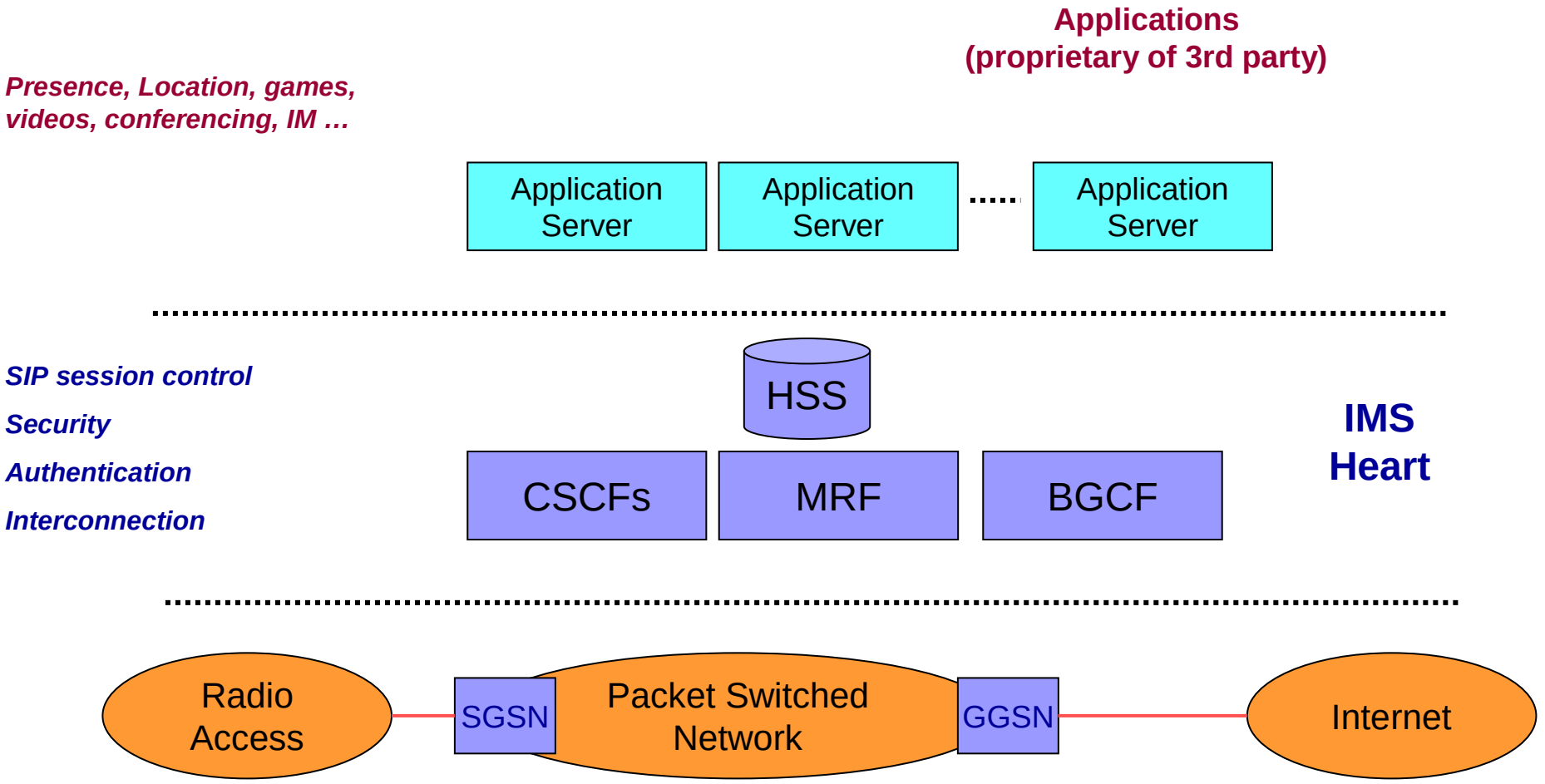
| Subject of specification series | 3G/GSM R99 and later | GSM only (Rel-4 and later) | GSM only (before Rel-4) |
|---|---|---|---|
| General information *(long defunct)* | | | 00 series |
| Requirements | 21 series | 41 series | 01 series |
| Service aspects ("stage 1") | 22 series | 42 series | 02 series |
| Technical realization ("stage 2") | 23 series | 43 series | 03 series |
| Signalling protocols ("stage 3") - user equipment to network | 24 series | 44 series | 04 series |
| Radio aspects | 25 series | 45 series | 05 series |
| CODECs | 26 series | 46 series | 06 series |
| Data | 27 series | 47 series (none exists) | 07 series |
| Signalling protocols ("stage 3") - (RSS-CN) | 28 series | 48 series | 08 series |
| Signalling protocols ("stage 3") - intra-fixed-network | 29 series | 49 series | 09 series |
| Programme management | 30 series | 50 series | 10 series |
| Subscriber Identity Module (SIM / USIM), IC Cards. Test specs. | 31 series | 51 series | 11 series |
| OAM&P and Charging | 32 series | 52 series | 12 series |
| Access requirements and test specifications | | 13 series (1) | 13 series (1) |
| Security aspects | 33 series | (2) | (2) |
| UE and (U)SIM test specifications | 34 series | (2) | *11 series* |
| Security algorithms (3) | 35 series | 55 series | (4) |
| Evolved UTRA aspects | 36 series | - | - |

# IMS specifications

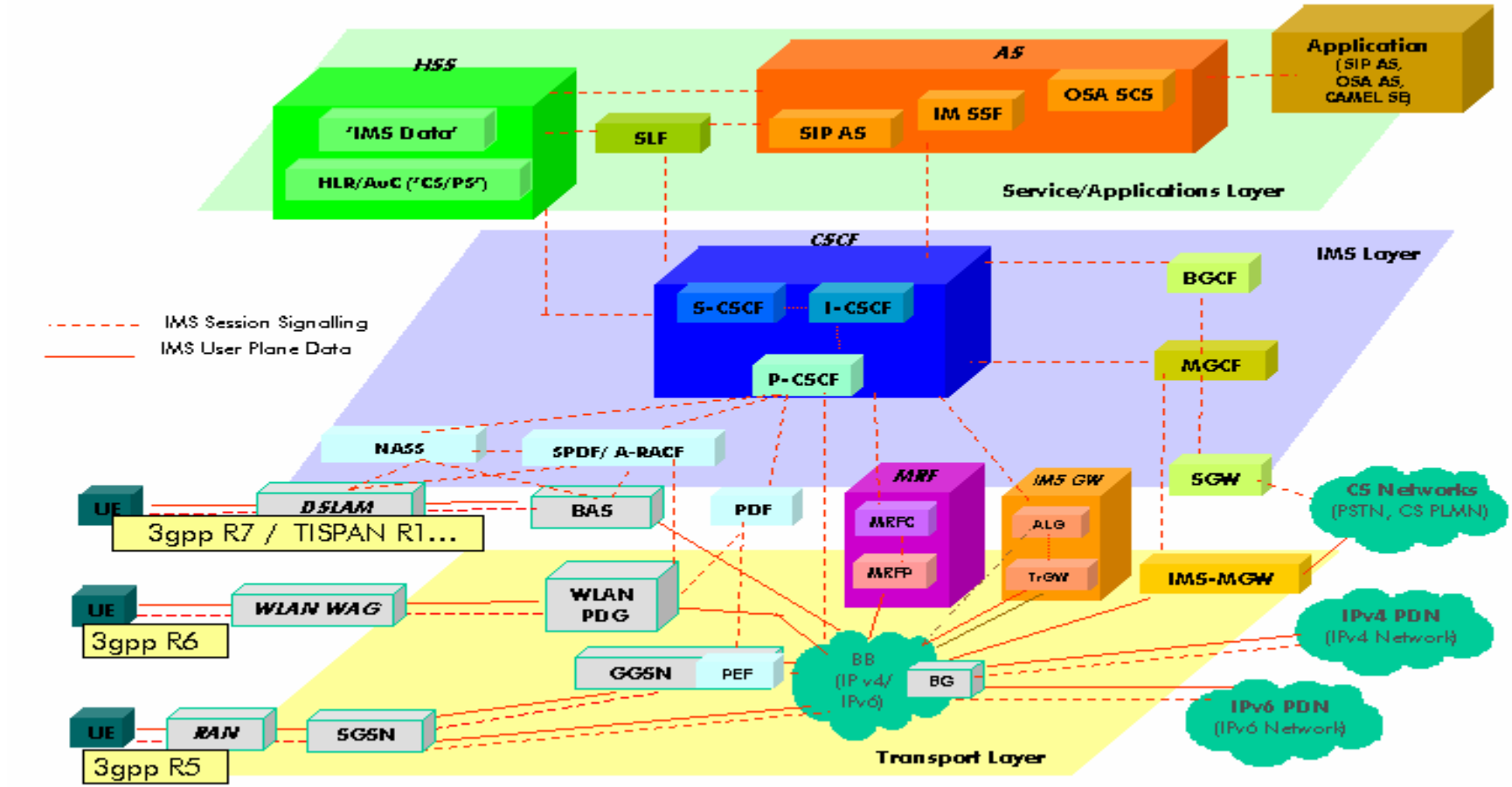
- Stage 1:
  - TS 22.228: Service requirements for the IP multimedia core network subsystem (stage 1)
- Stage 2:
  - TS 23.002: Network Architecture
  - TS 23.003: Numbering, Addressing and Identification
  - TS 23.008: Organisation of Subscriber Data
  - TS 23.218: IP Multimedia session handling
  - TS 23.228: IP Multimedia System (IMS)
- Stage 3
  - TS 24.228: signalling flows for the IP multimedia call control based on SIP and SDP
  - TS 24.229: IP call control based on SIP and SDP
  - TS 29.163: Interworking between IMS and CS networks
  - Autre: TS 29.208, TS 29.228, TS 29.229 ….
- Management et Facturation
  - TS 32.225, TS 32.240, TS 32.260, TS 32.295, TS 32.299 ….
- Sécurité
  - TS 33.102, TS 33.203

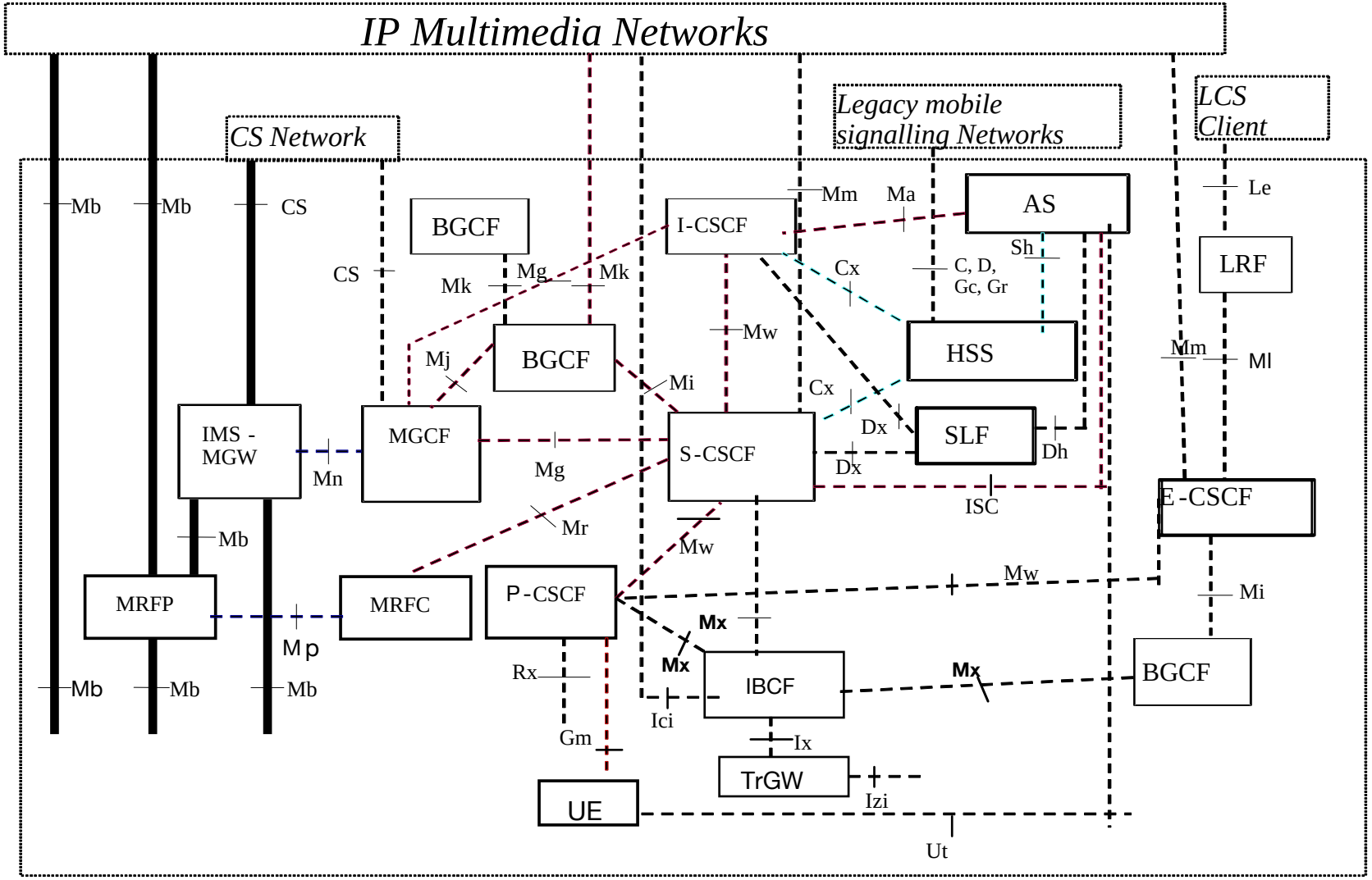
- RFC IETF utilisé ou référencé
  - SIP et SDP: RFC 2327, RFC 3261, RFC 3262, RFC 3263 ……..
  - Securité: RFC 3323,

# IMS Architecture



# Simplified IMS Architeture




IP Multimedia Networks
CS Network
Legacy mobile signalling Networks
LCS Client
Mb
Mb
CS
BGCF
I-CSCF
Mm
Ma
AS
Le
CS
Mk
Mg
Mk
Cx
C, D, Gc, Gr
Sh
LRF
Mw
Mj
BGCF
HSS
Mm
MI
Mi
Cx
IMS - MGW
MGCF
S-CSCF
Dx
SLF
Dh
Mn
Mg
Dx
ISC
E-CSCF
Mb
Mr
Mw
Mw
MRFP
MRFC
P-CSCF
Mi
Mp
Mx
Mx
Mx
Rx
IBCF
BGCF
Mb
Mb
Mb
Ici
Gm
Ix
TrGW
Izi
UE
Ut

# Interface

- Iinterface Gm UE←→ P-CSCF
  - Registration
    - Mutual authentication
    - De-registration initiated by the network
  - Session Control
    - Request and answers forward
- Interface Mw  CSCF←→ CSCF
  - Registration
    - P-CSCF to I-CSCF, I-CSCF to S-CSCF
    - De-registration initiated by the network
  - Session control
    - P-CSCF to S-CSCF, S-CSCF to I-CSCF
    - I-CSCF to S-CSCF,  S-CSCF to I-CSCF
    - Session release by the network
    - Billing information

# Interface

- Interface ISC  CSCF ←→ AS
  - S-CSCF analyze initial requests and send them to AS for treatment
    - AS can terminate, redirect, or proxy the request
  - AS can generate a request
- Interface Cx  CSCF ←→ HSS
  - Location Management
    - registration, de-registration
    - Location information (assigned S-CSCF)
  - forward user data to S-CSCF
  - Authentication
    - forward Authentication vector from HSS to S-CSCF

# Protocols

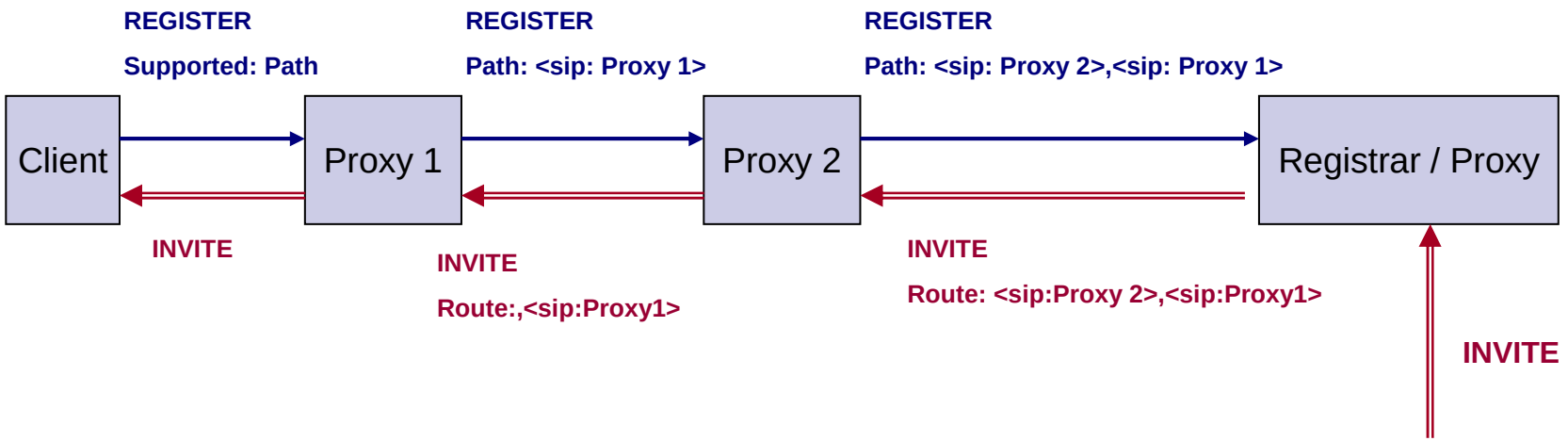
- Signalisation
  - SIP: Session Initiation Protocol
- AAA
  - Diameter
  - HSS access
  - Billing
  - PDF interaction
- Control
  - COPS
    - GGSN Control
  - H.248
    - MGW Control

# Protocols

- SIP: standard RFC 3261 and others
- Extensions requested by 3GPP to IETF
  - RFC 3608 : Service Route
  - RFC 3320 et RFC 3486: SIP compression
  - RFC 3327: Path
  - RFC 3455 : P-Headers
- P-Headers : private header extensions
  - Used for carrying information about traversed networks
  - Defined headers
    - P-Charging-Vector (??)
    - P-Charging-Function-Addresses
    - P-Access-Network-Info
    - P-Visited-Network-ID: identify the home network and used for roaming
    - P-Called-Party-ID
    - P-Associated-URI: allow association of a URI to 0 multiple URI
      - Contain all implicitly registered identities

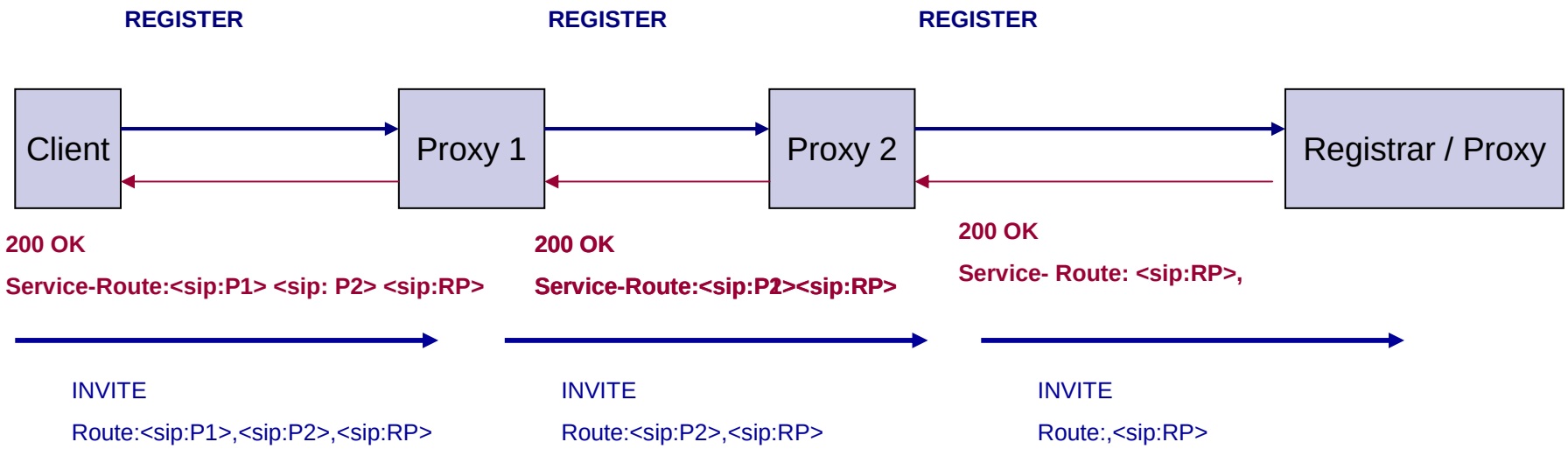
# Header Path

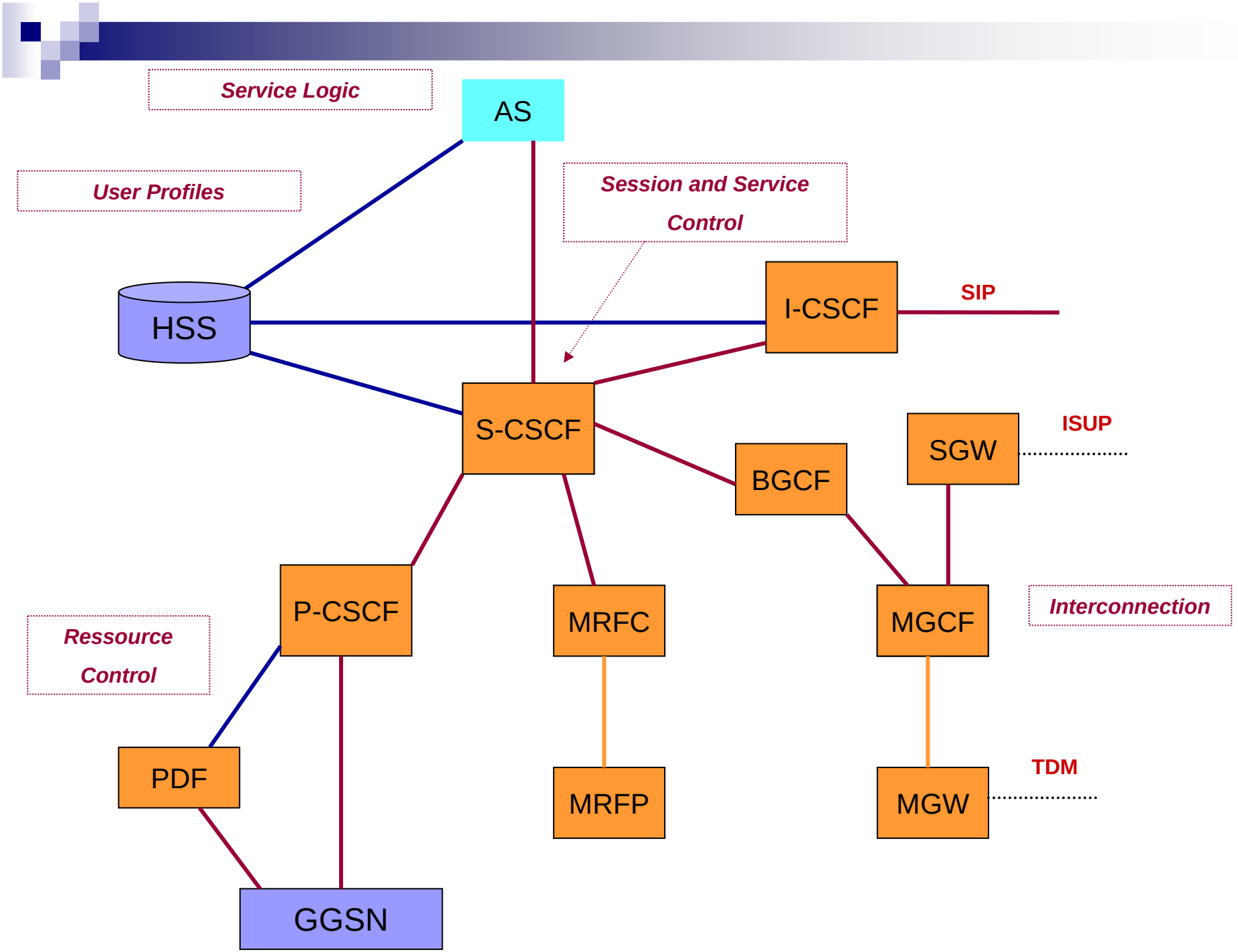
- Have all SIP proxies between SIP terminal and its registrar.
  - All request from the network to the terminal must go through the proxies (path)



# Header Service Route

- Contain a route that is used by a terminal for its services
  - Applyed only for requests from terminals




Service Logic
AS
User Profiles
Session and Service Control
HSS
I-CSCF
SIP
S-CSCF
SGW
ISUP
BGCF
P-CSCF
MRFC
MGCF
Interconnection
Ressource Control
PDF
MRFP
MGW
TDM
GGSN

# P-CSCF (Proxy)

- 1st IMS point of contact for users
  - SIP signaling from and to users go through P-CSCF
- Proxy functions specified in RFC 3261
- One or more P-CSCF for an operator depending
  - Client number, P-CSCF capacities, architecture …
- Can act as a user agent

# P-CSCF (Proxy)

- Functions
  - forward SIP REGISTER to le I-CSCF based on domain name provided by the terminal
  - forward SIP requests and answers between S-CSCF and terminals
  - Send billing information
  - Compression and decompression of SIP messages
  - Detect emergency calls
  - Media handling
    - Verify SDP information
    - Bandwidth allocation
    - Maintain session timers
- Interact with PDF for policy enforcement

# PDF

- Act as  PDP (policy decision point) for IP resource control
- take decisions for resources allocation
- Interact with GGSN for resource reservation

# I-CSCF (Interrogating)

- Operator network point of contact for all sessions toward its users
  - Located at domain border
- Act as SIP proxy
- Interact with HSS in order to have the assigned S-CSCF for a specific user
  - During registration
  - During session initiation for non registered users
- Forward SIP requests and answers to S-CSCF
- Realize network hiding function

# S-CSCF

- IMS heart
  - Located in home network
  - Control user registration and sessions
  - Realize authentication
  - Manage sessions state
  - Act as registrar and proxy
  - May act as user agent
- Functions
  - Download user profiles from HSS
  - Launch services
  - Interact with application servers
  - Generate billing information
  - Route traffic to P-CSCF for incoming calls
  - Route traffic to I-CSCF, AS, BGCF for outcoming calls
  - Contain an ENUM client : translate E.164 to SIP URI
  - Timers supervision

# BGCF

- Determine next hop for SIP messages routing
- Used to interconnect IMS users with CS/PSTN users
  - Determine in which PSTN will occur the interconnection
  - Select the appropriate MGCF

# MGCF

- Communicate with CSCF, BGCF, and CS network equipments
- Determine next hop based on phone numbers
- Realize protocol conversion between ISUP/TCAP and IMS control protocols
- Out band information received by the MGCF are forwarded to CSCF or MGW

# SGW/MGW

- SGW: Signaling gateway
  - Realize protocol conversion at transport level between SS7 networks (MTP) and IP networks (SCTP)
  - Realize low level conversion
    - ISUP or BICC over SS7 MTP to ISUP or BICC over SCTP/IP
- MGW: Media Gateway
  - Terminate media flows from CS and PS networks
    - Media conversion, control, payload treatment
  - Interact with MGCF for resource control purposes

# IBCF/IWF

- IBCF: Interconnection Border Control Function
  - Provides application specific functions at the SIP/SDP protocol layer in order to perform interconnection between two operator domains.
  - Interaction with transport resources, through the resource and admission control subsystem (including NAPT and firewall functions, IPv6 and IPv4 mapping)
  - Insertion of the IWF in the signaling route when appropriate
  - Screening of signaling information based on source/destination, beyond what is already performed inside each of the subsystems (e.g. by the THIG functionality of the I-CSCF for the IMS core subsystem).

- IWF (Interworking Function)
  - Performs the interlocking between protocols used within a service control subsystems and other IP-based protocols (e.g. between the SIP profile used in the IMS and other SIP profiles or IP-based protocols such as the H.323 protocol).

# MRFC / MRFP

- MRFC: Multimedia Resource Function Controller
  - Control the media resource in the MRFP (e.g. Announcements?)
  - Interprets information coming from AS and S-CSCF (session ID) and control MRFP accordingly.
  - Generate CDRs

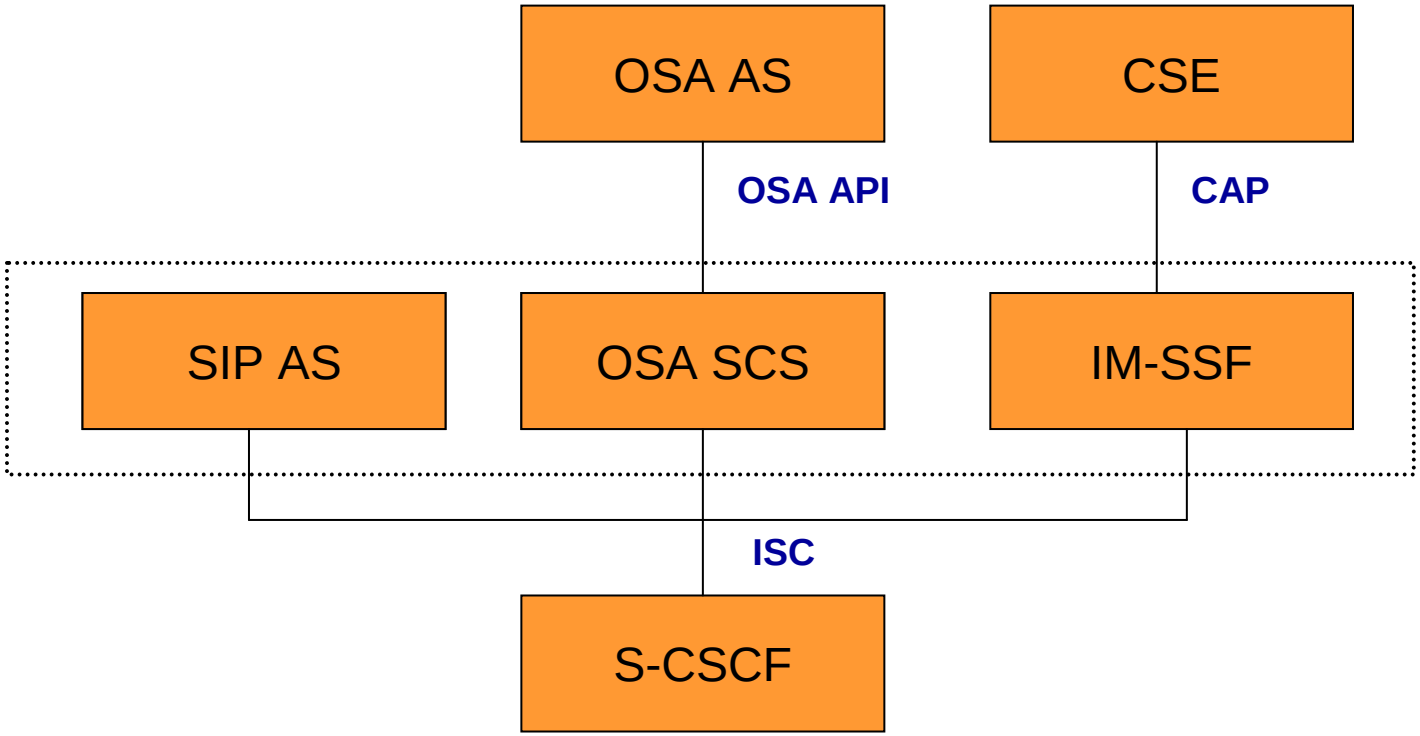
- MRFP: Multimedia Resource Function Processor
  - Control Bearer on Mb ( MRFP→IMS-MGW )
  - Mixes incoming media streams (e.g. multiple parties)
  - Source Media streams (for multimedia announcements).
  - Media Resource Management (e.g. manage access rights to shared resources in conferencing environment)

# Application Servers (AS)

- An Application Server (AS) i.e., SIP Application Server, OSA Application Server, or CAMEL IM-SSF, offers value added IM services
  - Resides either in the user's home network or in a third party location.
  - The OSA Application Server does not directly interact with the IMS network entities but through the OSA Service Capability Servers (OSA SCS-s)
  - The AS (SIP Application Server and/or the OSA Service Capability Server and/or IM-SSF) can communicate with the HSS.

- Tasks
  - Process and may transform incoming SIP sessions
  - Originate SIP sessions
  - Generate charging information

# Application Server



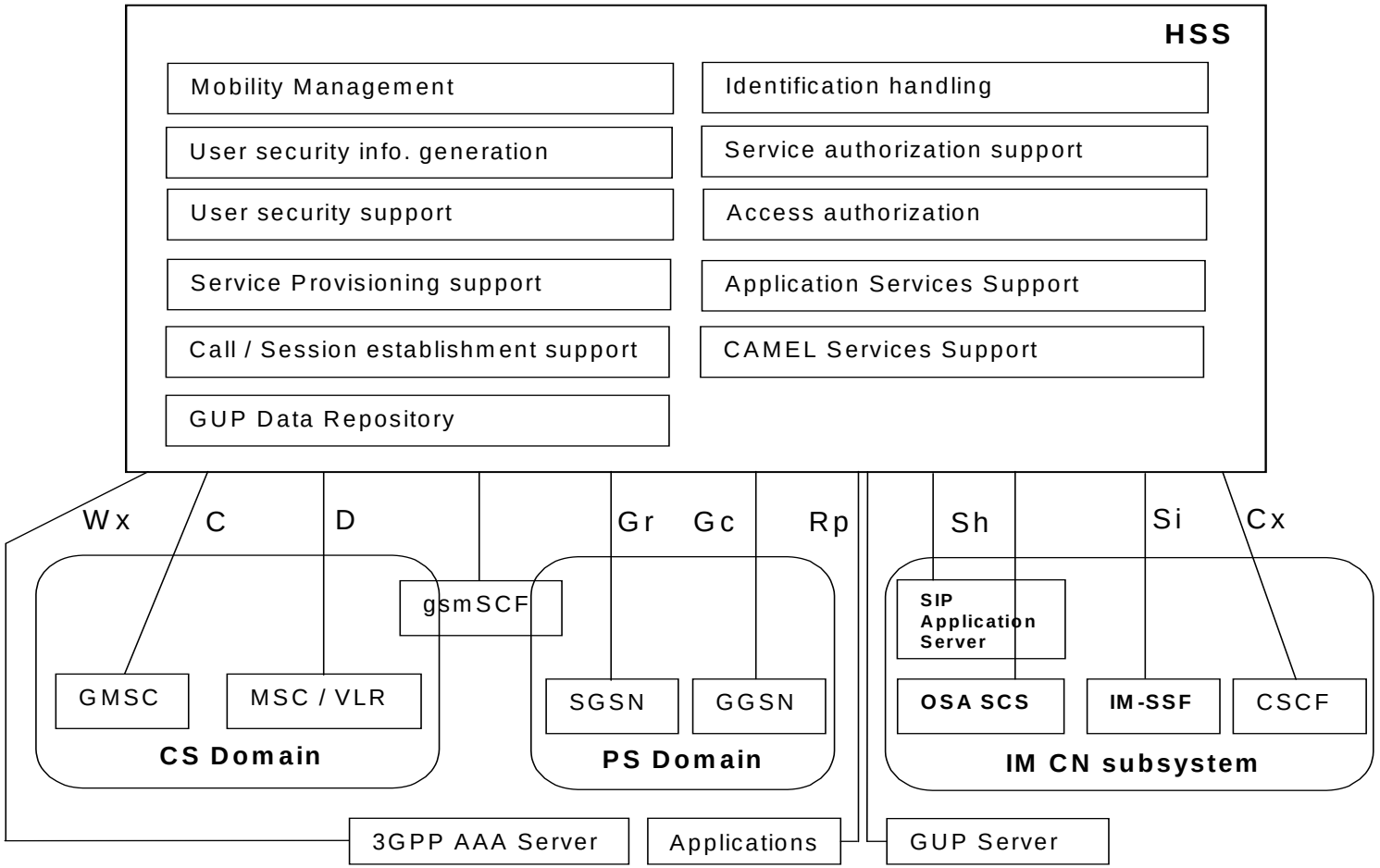
# Application Servers (AS)

- Enabling Services
  - Presence,
  - Location,
  - Group
  - Content sharing
  - …
- Applications (on top of enabling services)
  - Games,
  - Conferences
  - Video,
  - IM
  - ….

# HSS: Home Subscriber Server

- Master database for a given user.
  - Evolution of the HLR (Home Location Register)
  - Entity containing the subscription-related information to support the network entities actually handling calls/sessions.
  - Subscription Related information
    - User Identities, Registration information (assigned S-CSCF), Access parameters (authentication, roaming, ..) and service data
- Home Network may contain one or several HSS,
  - It depends on the number of mobile subscribers, on the capacity of the equipment and on the organisation of the network.
- SLF (Subscription Locator Function)
  - Resolution server used to find the HSS responsible of a given subscriber.

# HSS : Fonctions Logiques



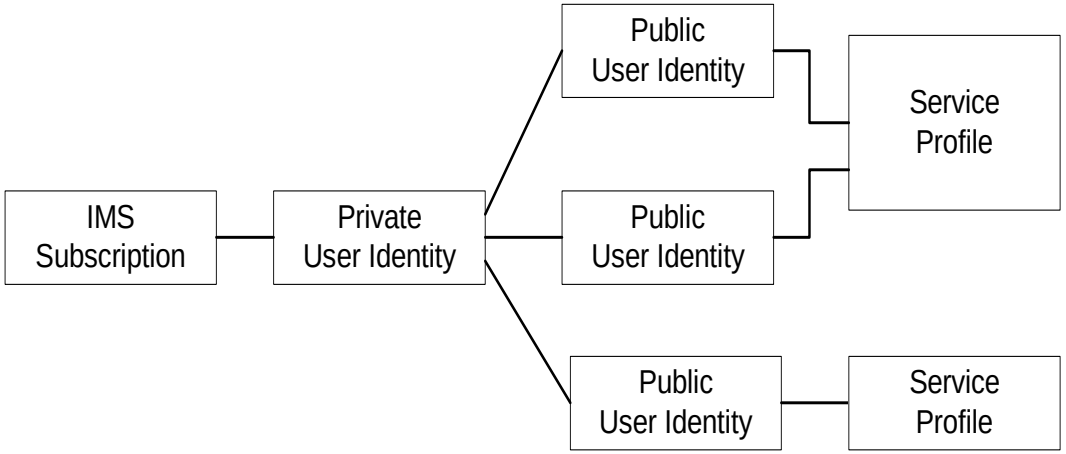
# HSS

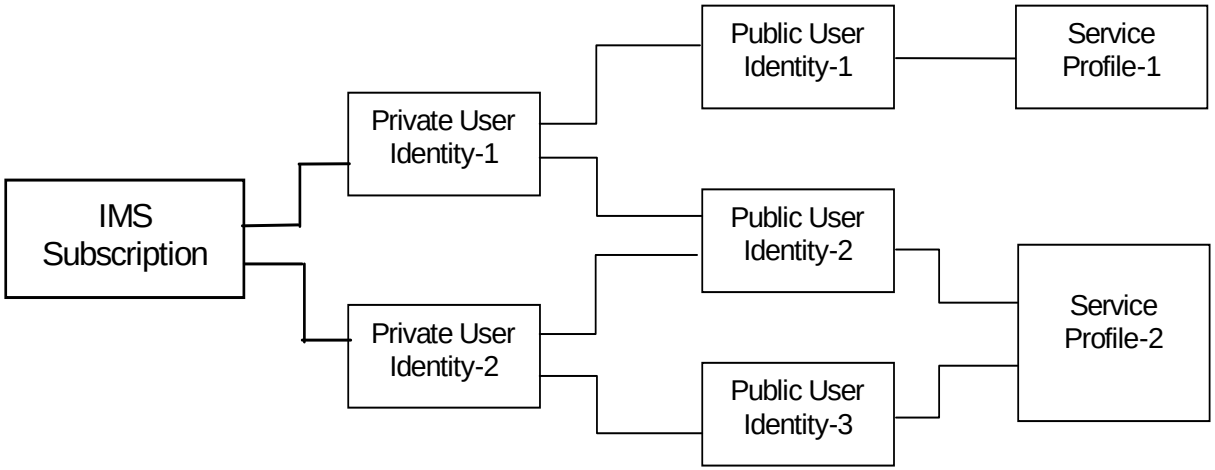
- Data
  - User Identities
    - Private and Public Identities
  - Registration Information
    - Assigned S-CSCF
  - Access parameters
    - Authentication, roaming
  - Services  (filtering criteria …)
- If multiple HSS are deployed, a SLF  is used by the I-CSCF/AS to get the right HSS

# Identities

- Definitions
  - The private identity is assigned by the home network operator, and used, for example, for Registration, Authorization, Administration, and Accounting purposes. This identity shall take the form of a Network Access Identifier (NAI) as defined in IETF RFC 2486
  - The Public User Identity/identities are used by any user for requesting communications to other users. For example, this might be included on a business card.

# Identities


IMS Subscription
Private User Identity
Public User Identity
Public User Identity
Public User Identity
Service Profile
Service Profile


IMS Subscription
Private User Identity-1
Private User Identity-2
Public User Identity-1
Public User Identity-2
Public User Identity-3
Service Profile-1
Service Profile-2

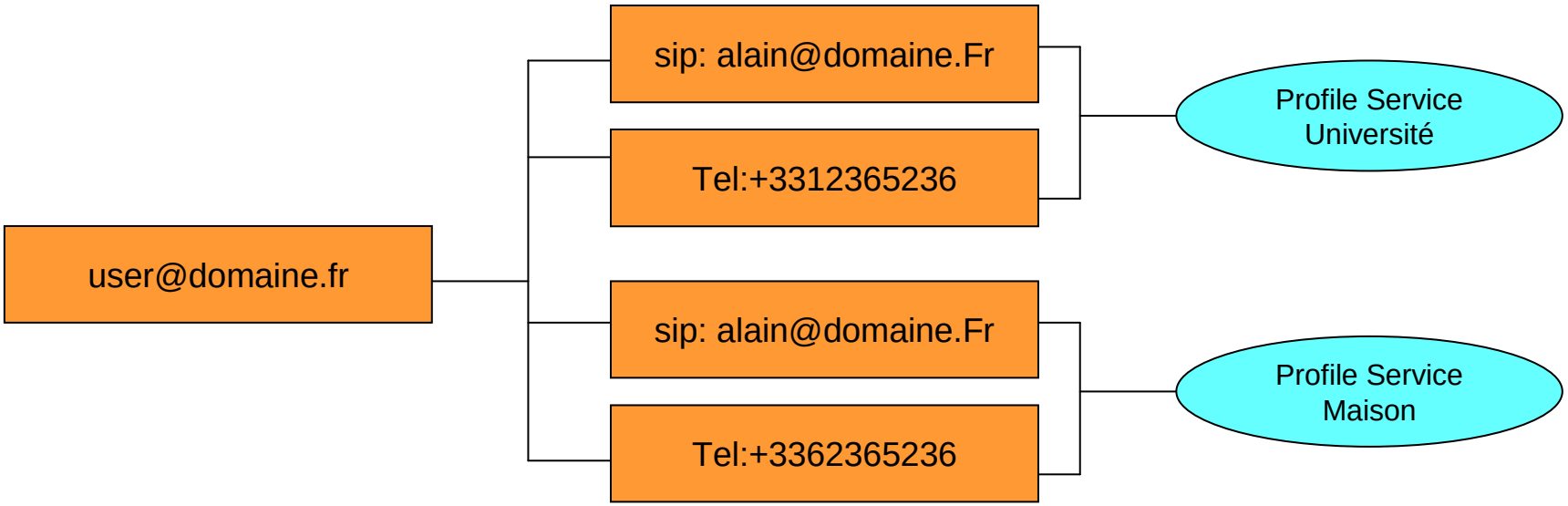
# Private User Identity (IMPI)

- Network access identifier
- Permanently allocated to a user and stored in ISIM.
- Valid during home network subscription
- Used in all registration requests
- Stored in the HSS
  - Format:  username@realm
  - Ex: user@domaine.fr
- Identify a subscription and not a user.

# Public User Identity (IMPU)

- A user can have one or multiple IMPU
- Used for communication with other users
- Take the form of:
  - Tel URI:  tel: +33 -14526 – 9854
  - SIP URI : sip:usert@domaine.fr
- We can register all identities by using a single registration
  - Implicit registration sets

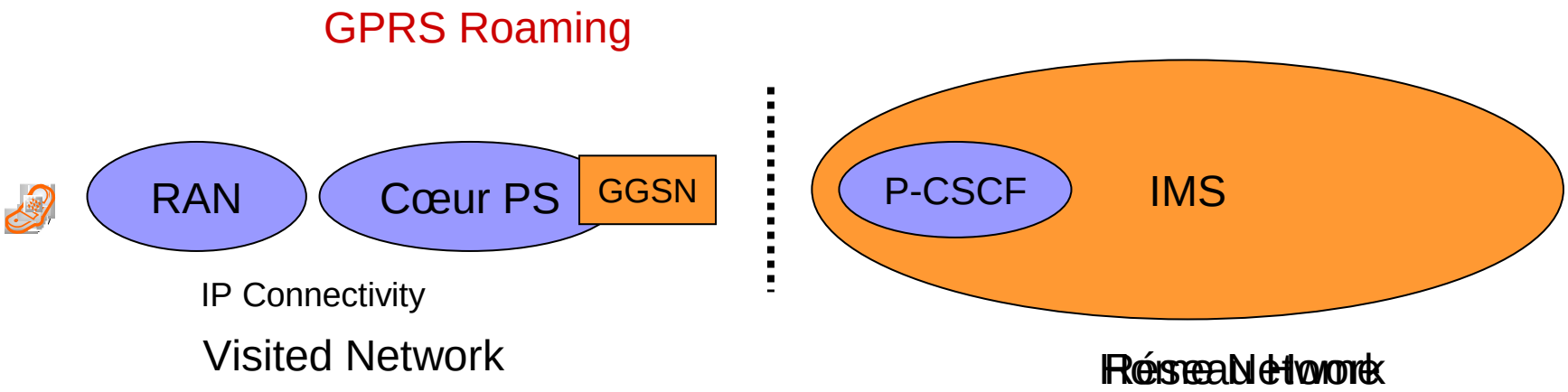
# Exemple

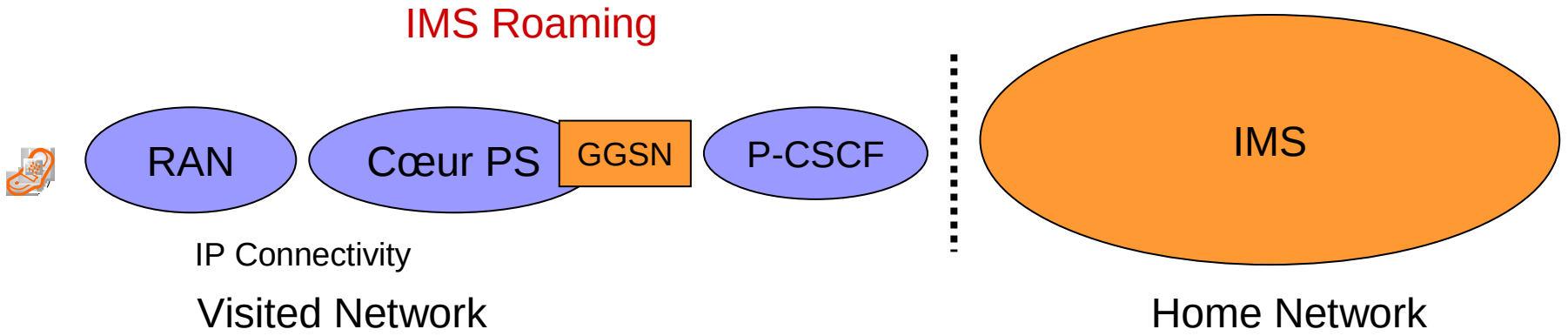

user@domaine.fr
sip: alain@domaine.Fr
Tel:+3312365236
sip: alain@domaine.Fr
Tel:+3362365236
Profile Service
Université
Profile Service
Maison

# Domain Concept

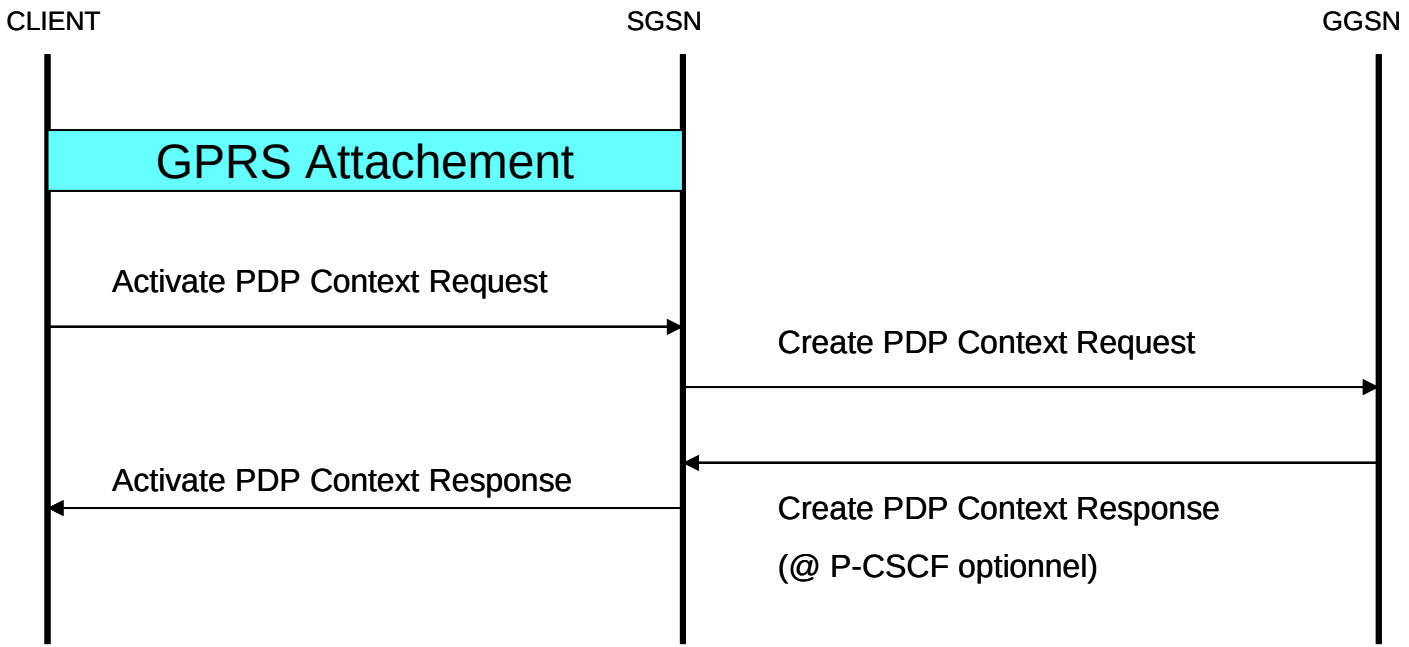
- Definitions
  - Home network: operator network
  - Visited Network: roaming scenario
- IMS
  - S-CSCF always located in home network
  - P-CSCF can be the one of the visited network
  - Two roaming types
    - IMS , GPRS

# Roaming


GPRS Roaming
RAN
Cœur PS
GGSN
P-CSCF
IMS
IP Connectivity
Visited Network
Home Network


IMS Roaming
RAN
Cœur PS
GGSN
P-CSCF
IMS
IP Connectivity
Visited Network
Home Network

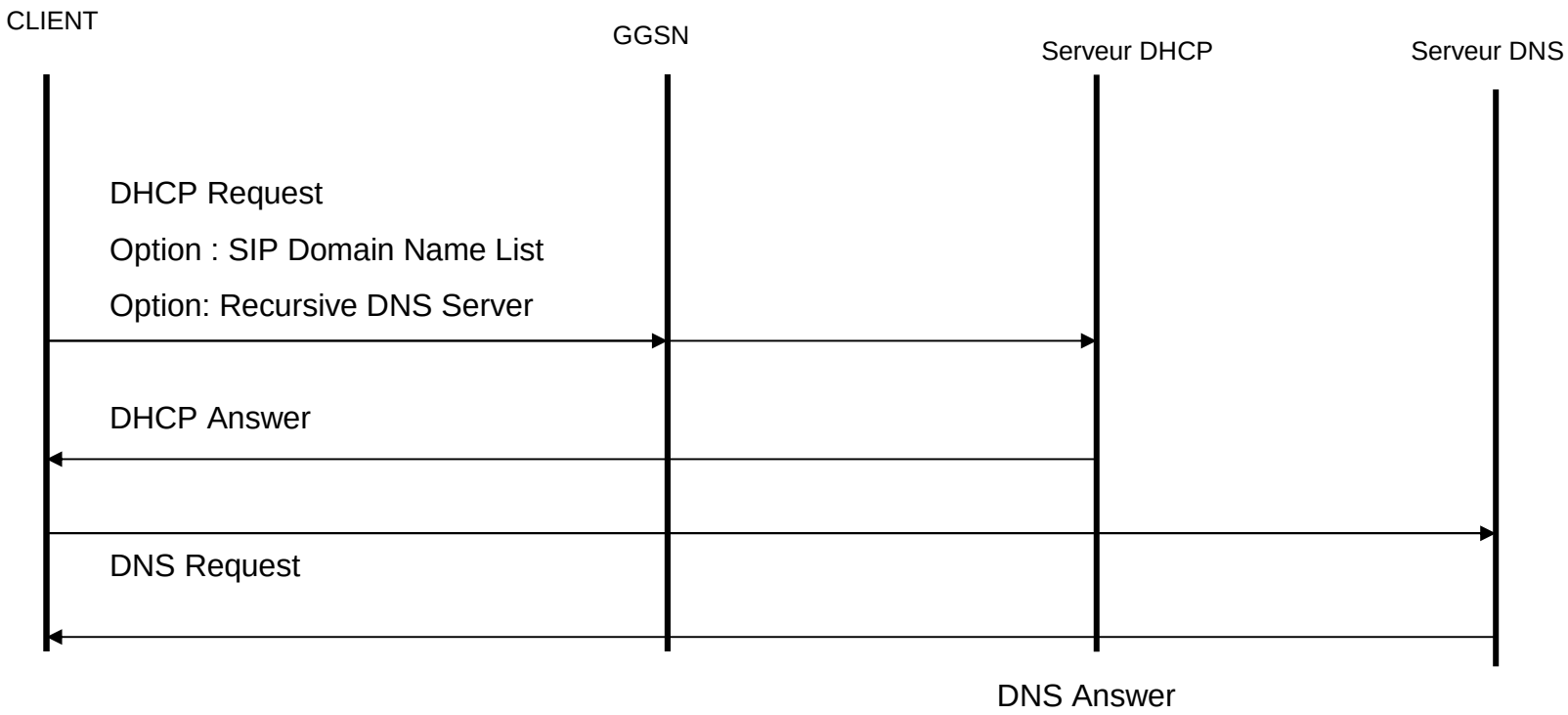
# Registration – Phase 1



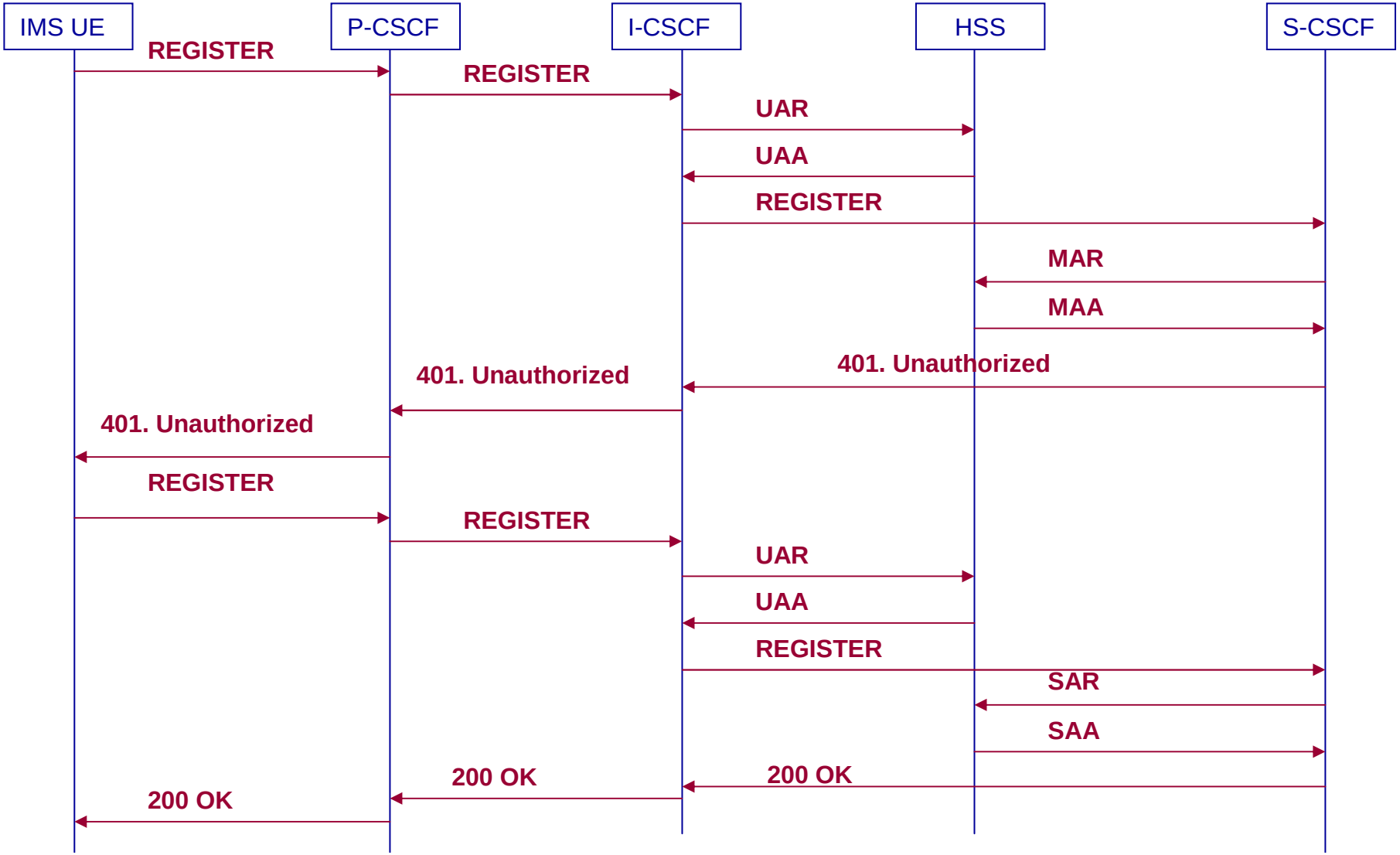

P-CSCF discovery

- PDP Context Activation Procedure
- Using DHCP and if necessary DNS

# P-CSCF Discovery



# Registration – Phase 2



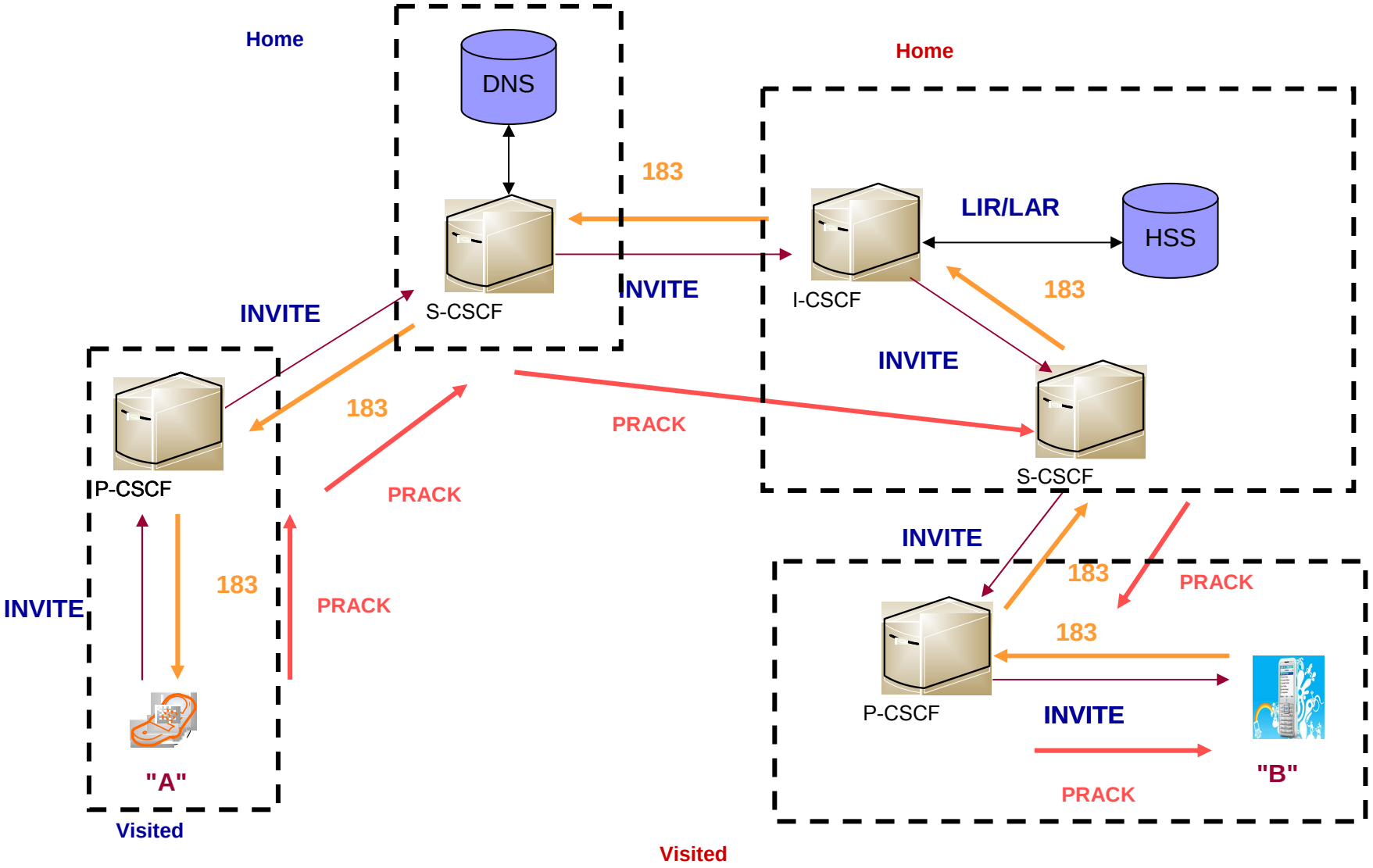
# Registration – Phase 2

- P-CSCF
  - Determine the I-CSCF by using the DNS
  - Add the headers:  Path, P-Visited-Network-ID
- I-CSCF
  - Does not keep any state about the registration
  - Play a load balancer function
  - In the UAR (user authentication request), add: IMPI, IMPU, and P-Visited-Network-ID
- HSS
  - Check the identities, and roaming
  - Check if a S-CSCF is assigned or send a list of possible S-CSCF

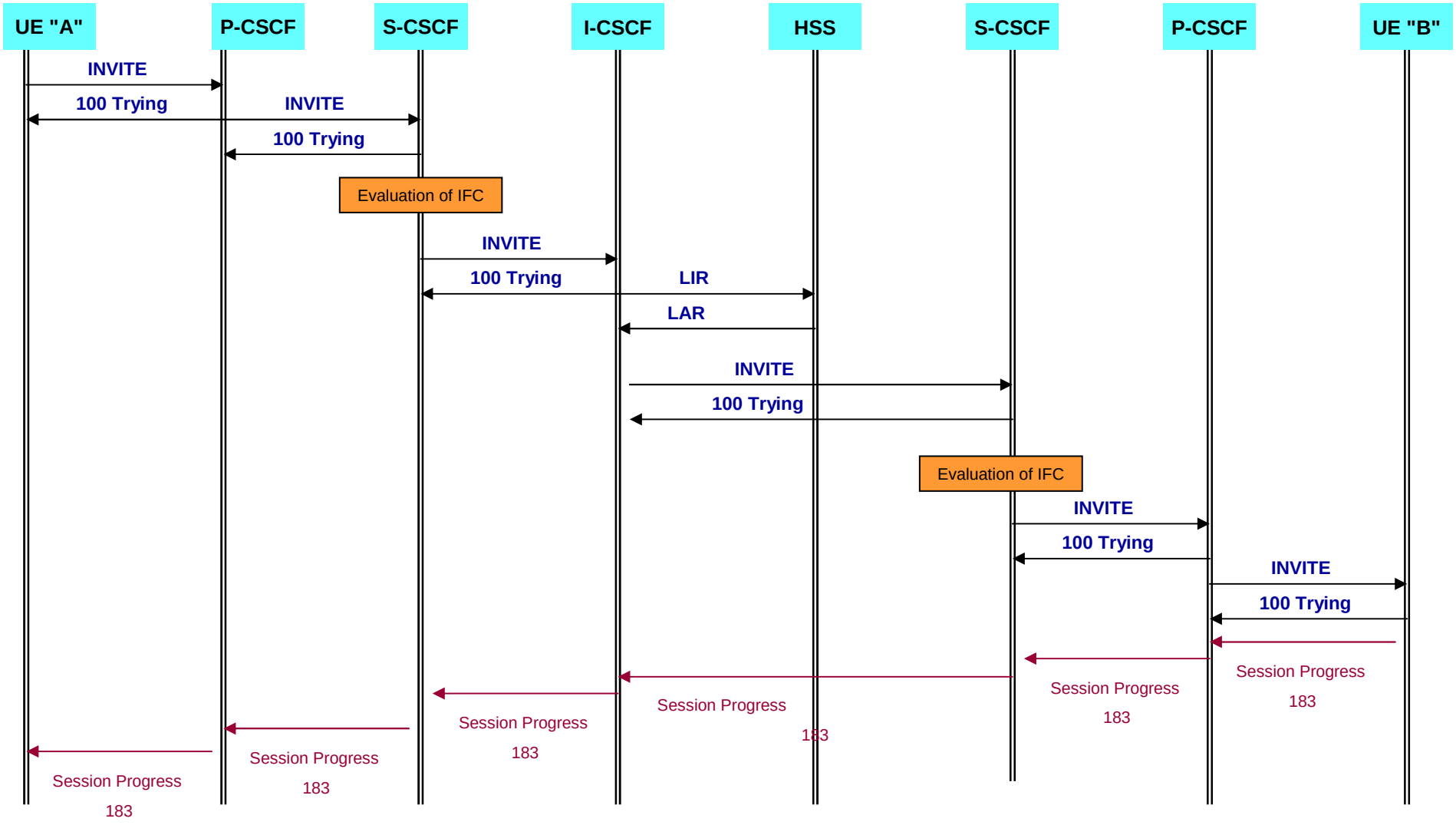
# Registration – Phase 2

- S-CSCF
  - Download user authentication data
  - Challenge the user using SIP 401 message
- User
  - Establish an IPSEC association with P-CSCF
  - Send a new REGISTER
- S-CSCF
  - Authentication validation
  - Download User Profile
  - Send  SIP 200 OK message containing
    - P-Associated-URI
    - Service-Route

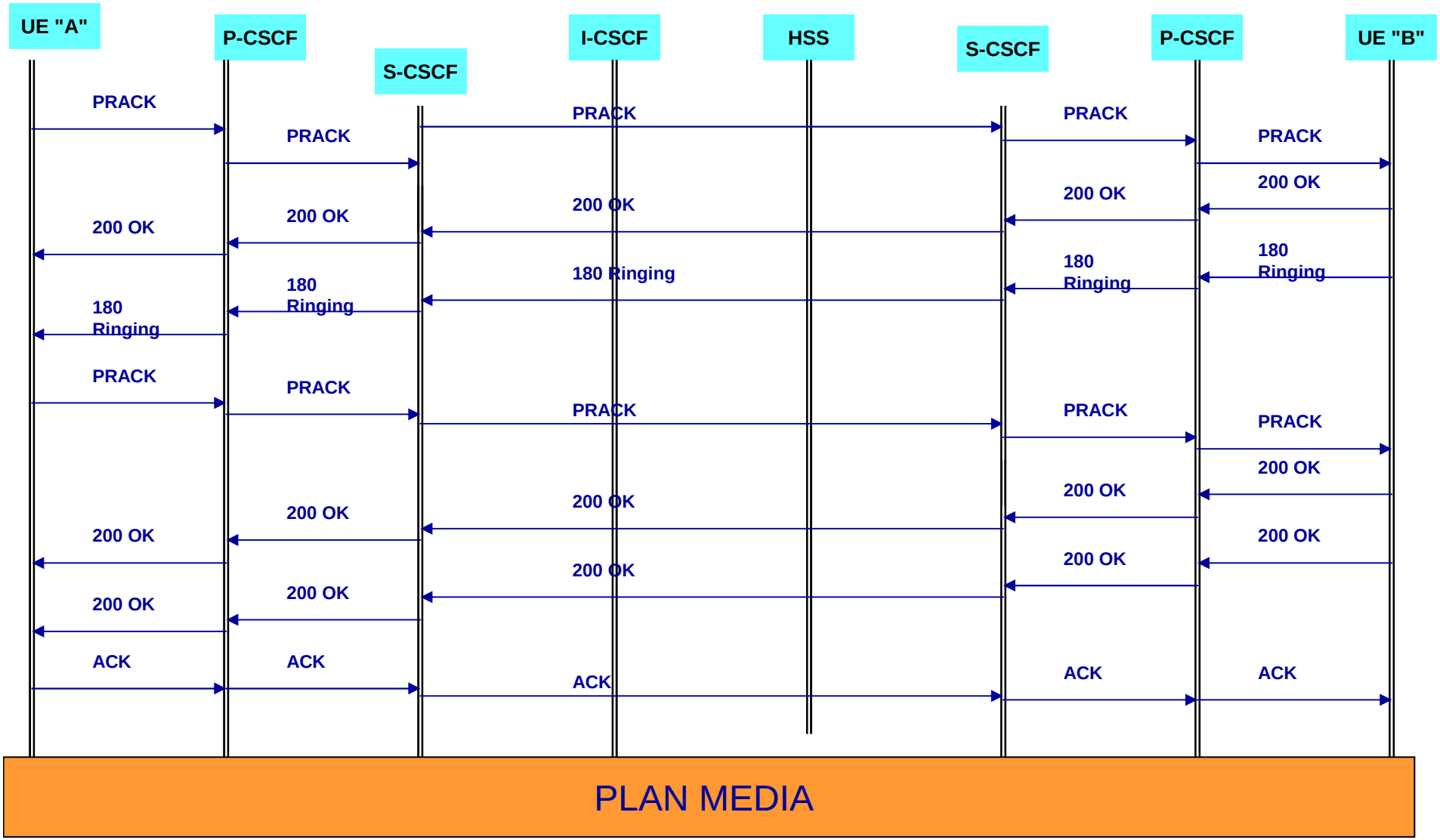
# IMS Session


Home
DNS
183
Home
LIR/LAR
HSS
INVITE
S-CSCF
I-CSCF
183
INVITE
INVITE
183
PRACK
P-CSCF
S-CSCF
PRACK
INVITE
183
PRACK
INVITE
183
PRACK
183
P-CSCF
INVITE
"A"
"B"
PRACK
Visited
Visited

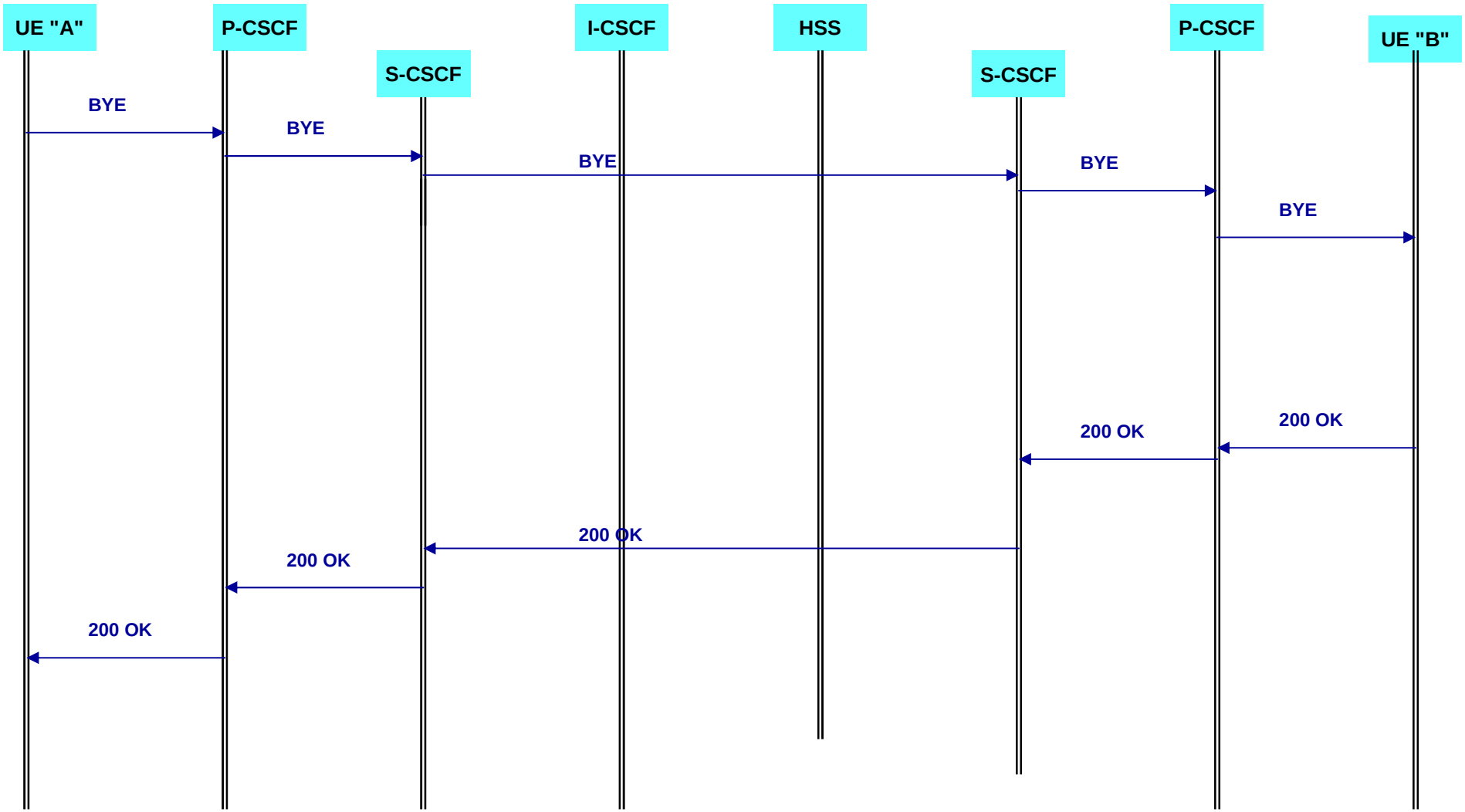
# IMS Session


UE "A"
P-CSCF
S-CSCF
I-CSCF
HSS
S-CSCF
P-CSCF
UE "B"
INVITE
100 Trying
INVITE
100 Trying
Evaluation of IFC
INVITE
100 Trying
LIR
LAR
INVITE
100 Trying
Evaluation of IFC
INVITE
100 Trying
INVITE
100 Trying
Session Progress
183
Session Progress
183
Session Progress
183
Session Progress
183
Session Progress
183

# IMS Session


UE "A"
P-CSCF
S-CSCF
I-CSCF
HSS
S-CSCF
P-CSCF
UE "B"
PRACK
PRACK
PRACK
PRACK
PRACK
200 OK
200 OK
200 OK
200 OK
200 OK
180 Ringing
180 Ringing
180 Ringing
180 Ringing
PRACK
PRACK
PRACK
PRACK
PRACK
200 OK
200 OK
200 OK
200 OK
200 OK
200 OK
200 OK
200 OK
ACK
ACK
ACK
ACK
ACK
PLAN MEDIA

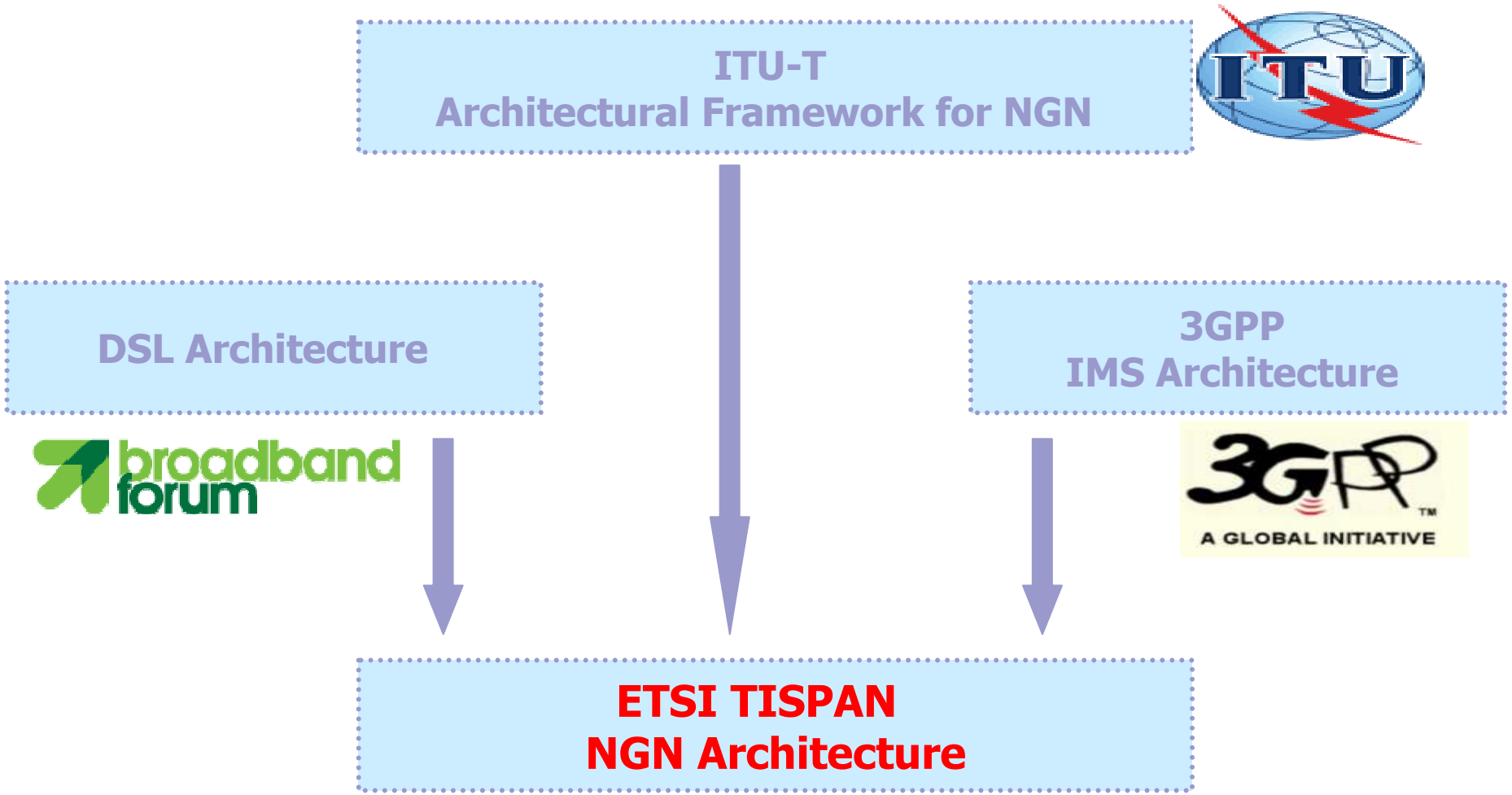
# IMS Session


UE "A"
P-CSCF
S-CSCF
I-CSCF
HSS
S-CSCF
P-CSCF
UE "B"
BYE
BYE
BYE
BYE
BYE
200 OK
200 OK
200 OK
200 OK
200 OK

# Plan

- Introduction
- 3GPP IP Multimedia Subsystem
- TISPAN NGN Architecture
- NGN Management
- Conclusion

# ITU-T, ETSI, 3GPP architectures



# TISPAN and ITU-T architecture relationship

- Both architectures comply with the principles defined in Recommendation Y.2011 (w.r.t transport/service functional split).
- The ITU architecture Y.2012 (FGNGN-FRA) should be considered as a generic architectural framework while the ETSI TISPAN NGN functional architecture should be viewed as a particular – subsystem oriented - realisation of this framework.

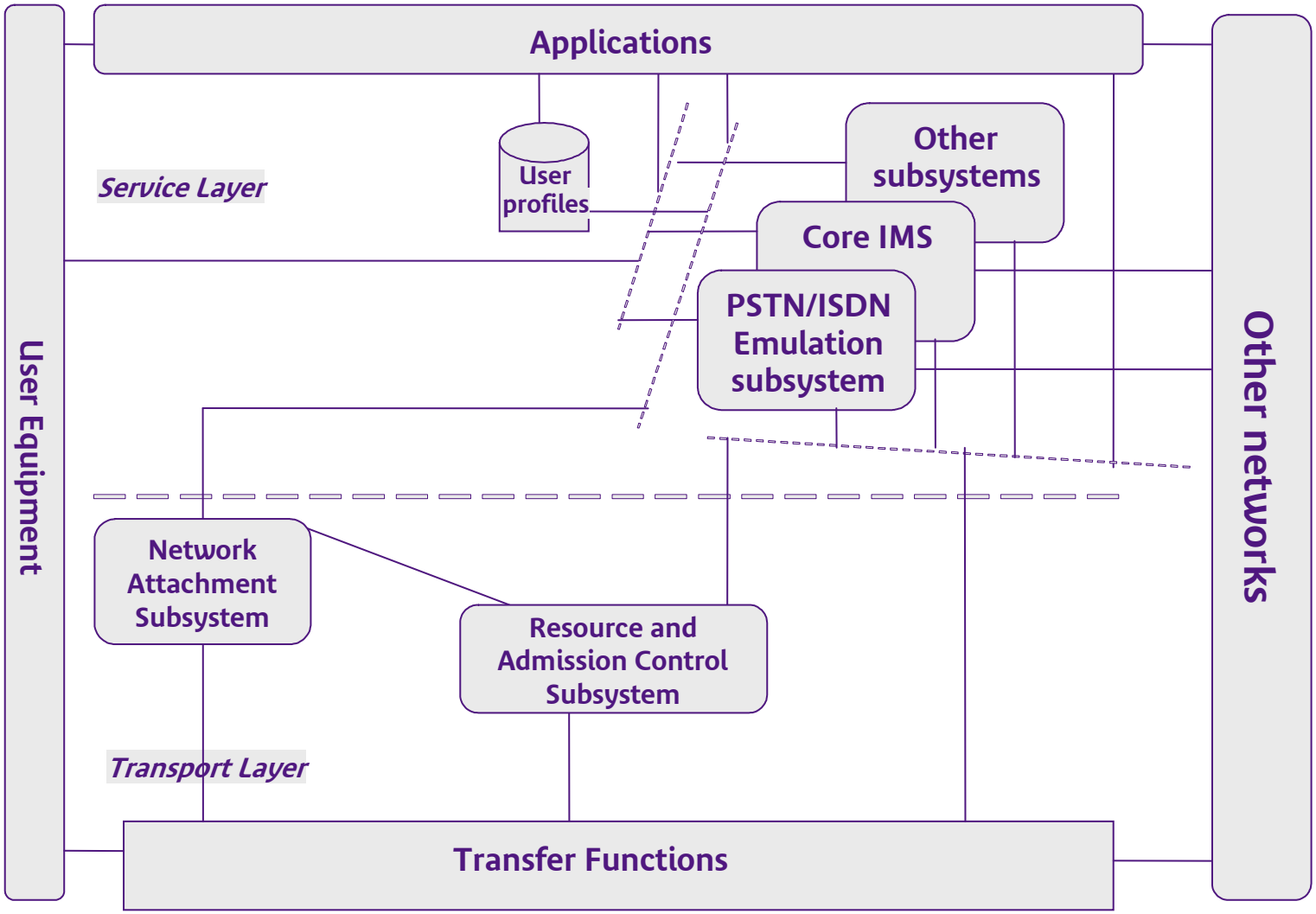
# ETSI TISPAN NGN Architecture Design

- Consistent with the ITU-T framework

- A sub-system oriented approach, enabling:
  - The addition of new subsystems over the time
  - To import (and adapt) subsystems from other standardisation bodies.
  - Flexibility to adjust a subsystem architecture with almost no impact on others.

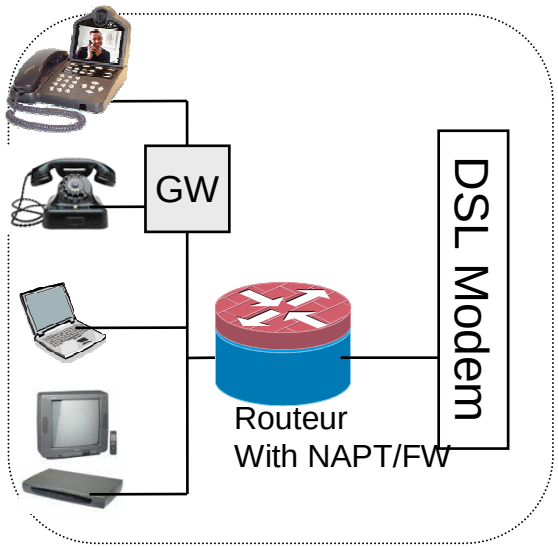
- IP connectivity is provided using two subsystems over IP transport resources (DSL access & aggregation + IP backbone):
  - **NASS:** Network Attachment Subsystem
  - **RACS:** Resource and Admission Control Subsystem

# TISPAN NGN Architecture (ES 282 001)



# Customer Premises Equipment

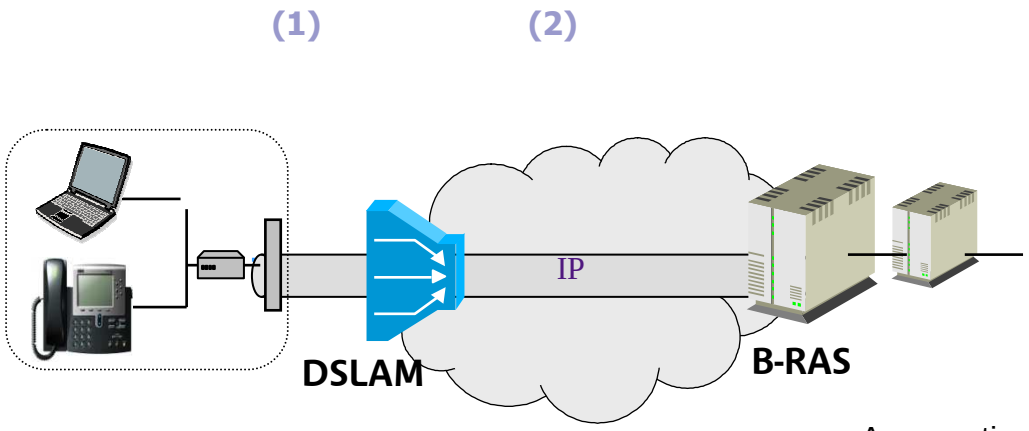
- The Customer Premises Equipment may be in the form of
  - a single SIP Device (IP Phone, Soft Phone …) behind a DSL modem
  - a Home Gateway (HGW) connecting several SIP Devices and/Analog Terminals.
- The HGW may include NAT functions (also known as Hosted NAT)



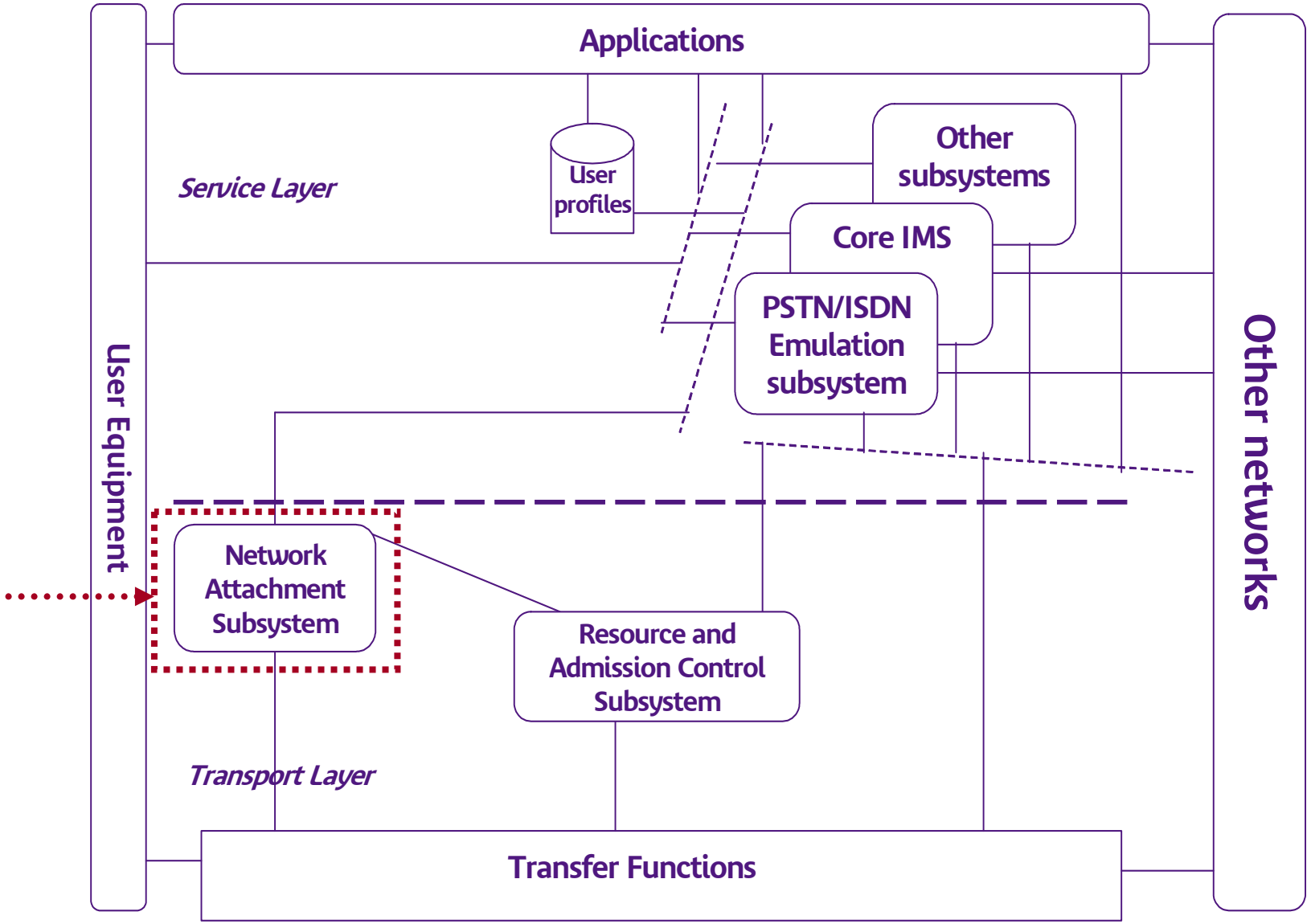
# IP-Connectivity in Fixed Broadband Access (DSL)

- Transport Functions are provided by a DSL segment (1) and an aggregation (2) segment. The aggregation segment is typically based on ATM or Giga Ethernet.

- Control Functions are provided by the Network Attachment Subsystem (NASS) and the Resource and Admission Control Subsystem (RACS)



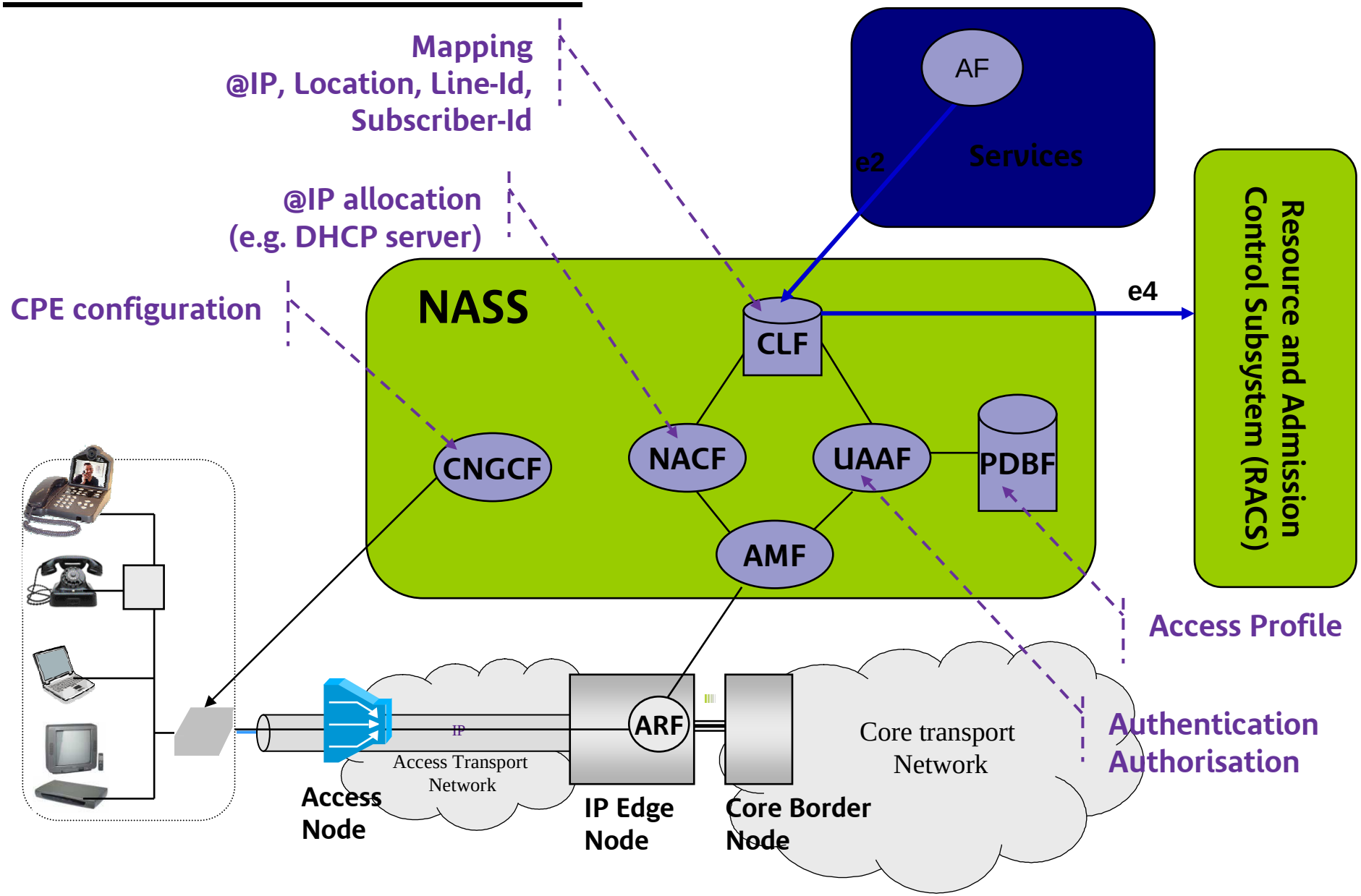
# TISPAN NGN Architecture (ES 282 001)



# Network Attachment Subsystem (NASS)

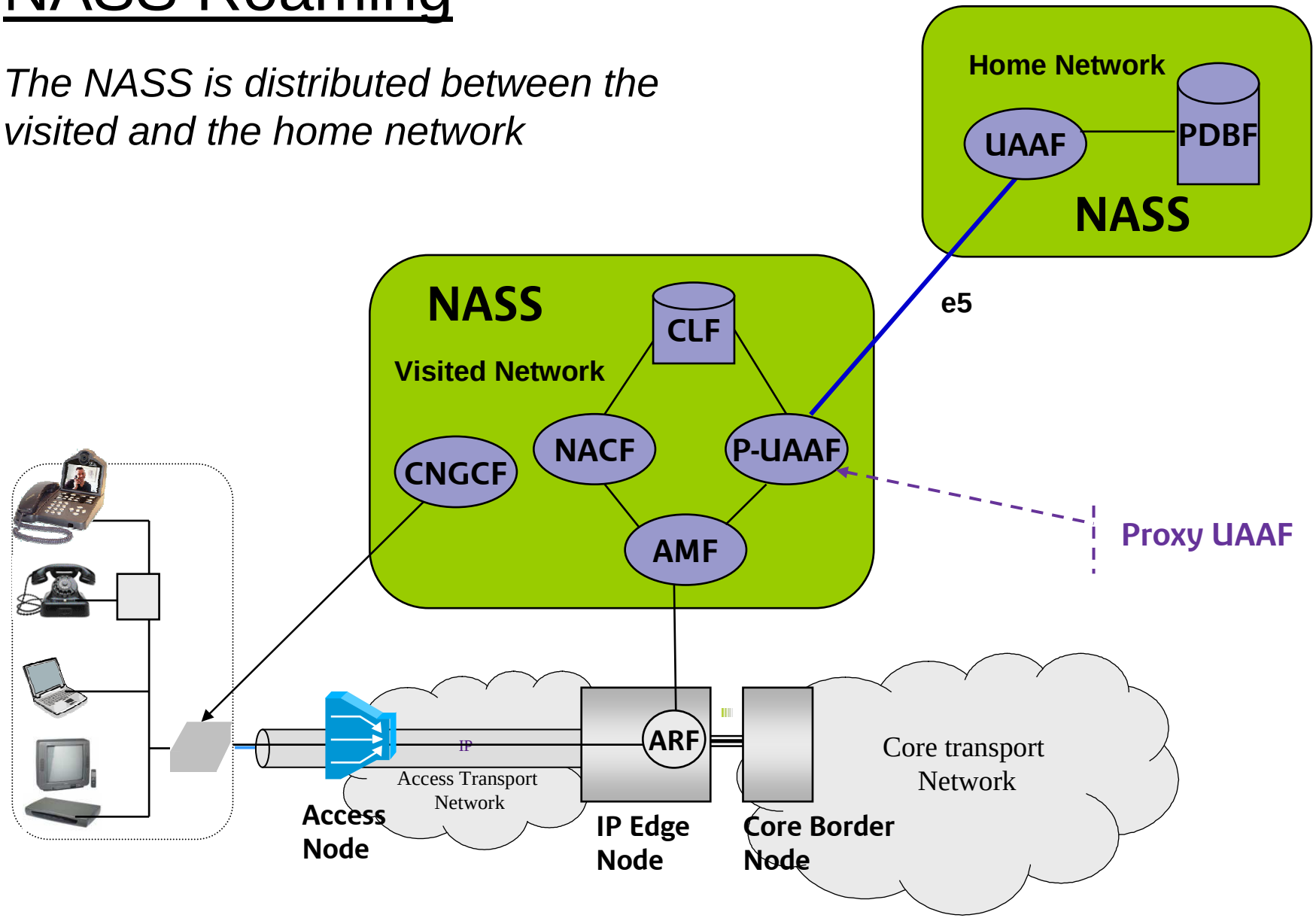
- Dynamic provision of IP address and other user equipment configuration parameters (e.g. using DHCP).
- User authentication, prior or during the IP address allocation procedure.
- Authorization of network access based on user network profile (e.g. subscribed bandwidth capacity).
- Access network configuration (default firewall setting), based on user profile.
- Location management (e.g. for emergency call, …).
- CPE configuration.

# NASS Architecture

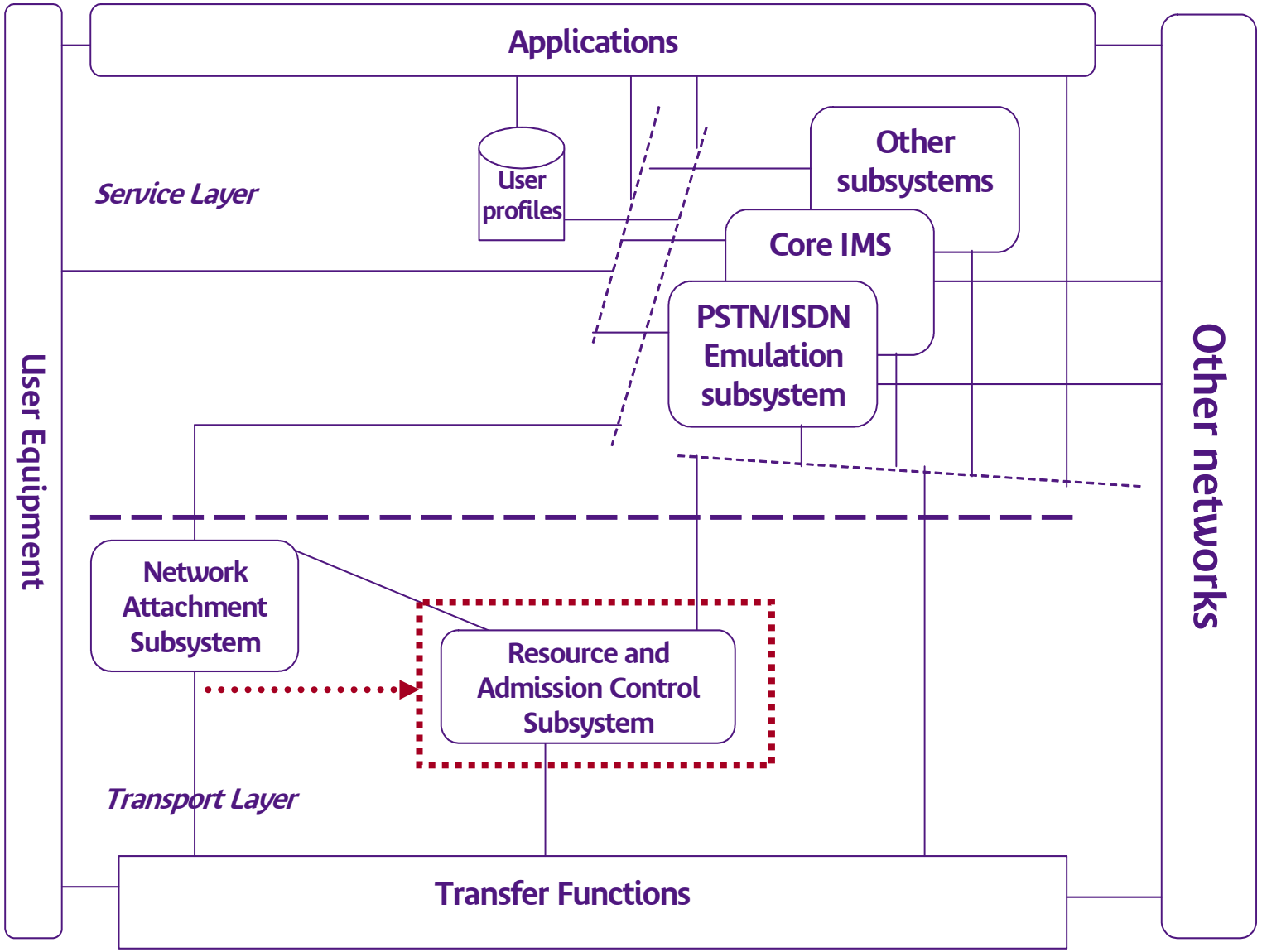


# NASS Roaming

*The NASS is distributed between the visited and the home network*



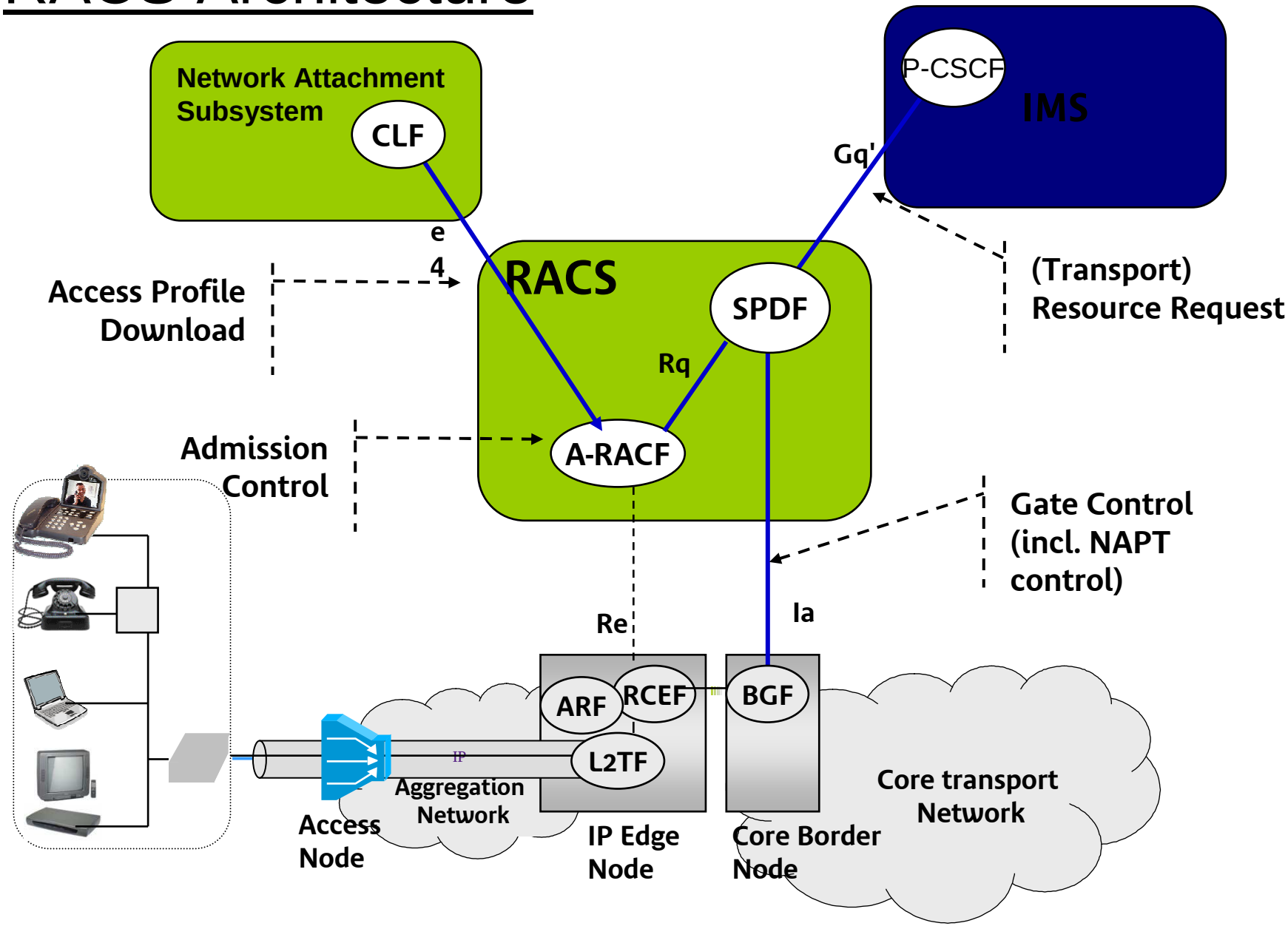
# TISPAN NGN Architecture (ES 282 001)



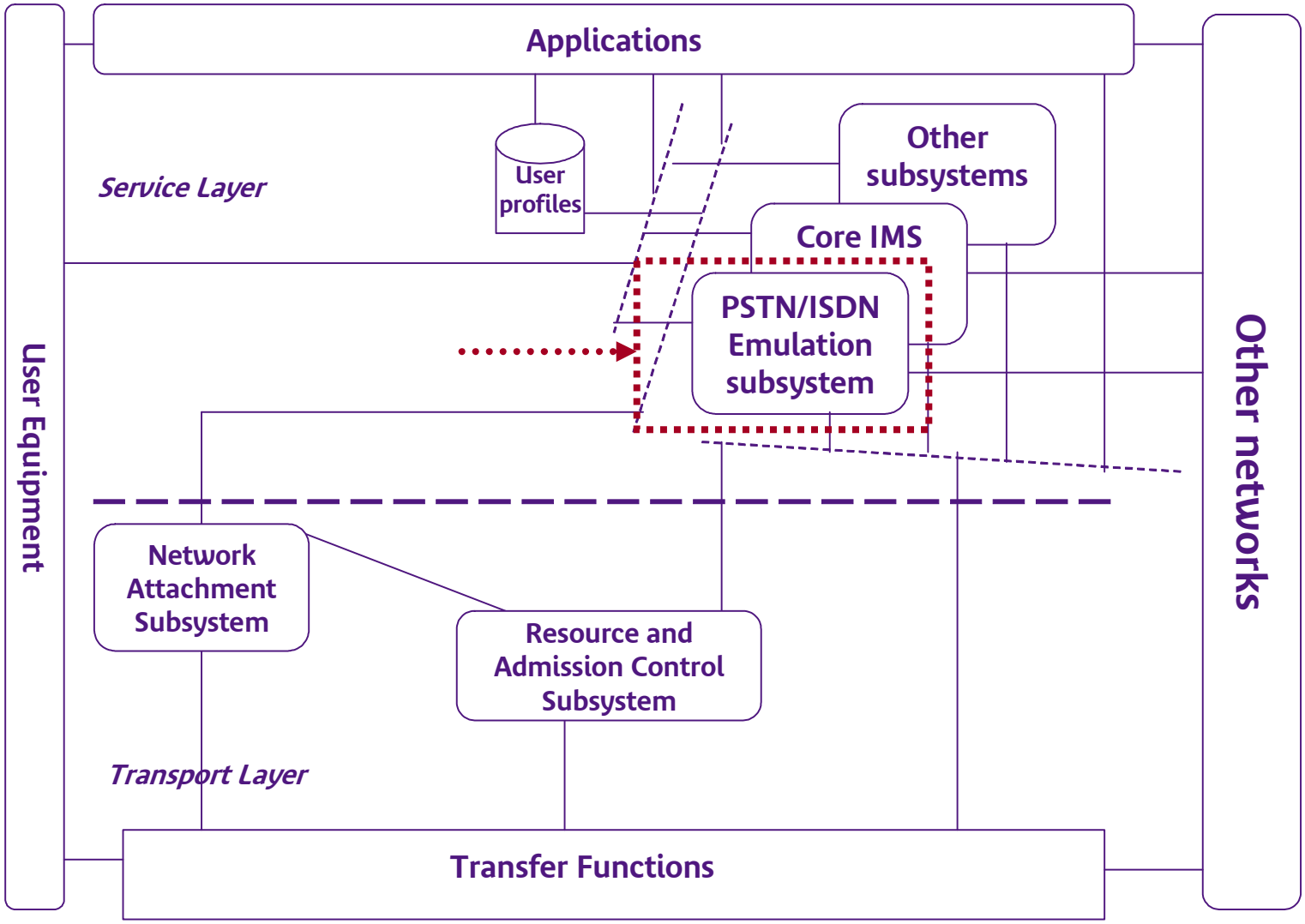
# Resource and Admission Control Subsystem (RACS)

- Authorisation of resource reservation requests
- Admission Control to access network resources
  - based on user access profiles and the knowledge of transport resource availability.
- NAPT/ Gate Control: controls near-end and far-end NAPT and FW functions
  - At the border between core and access networks
  - Between two core TISPAN NGN networks

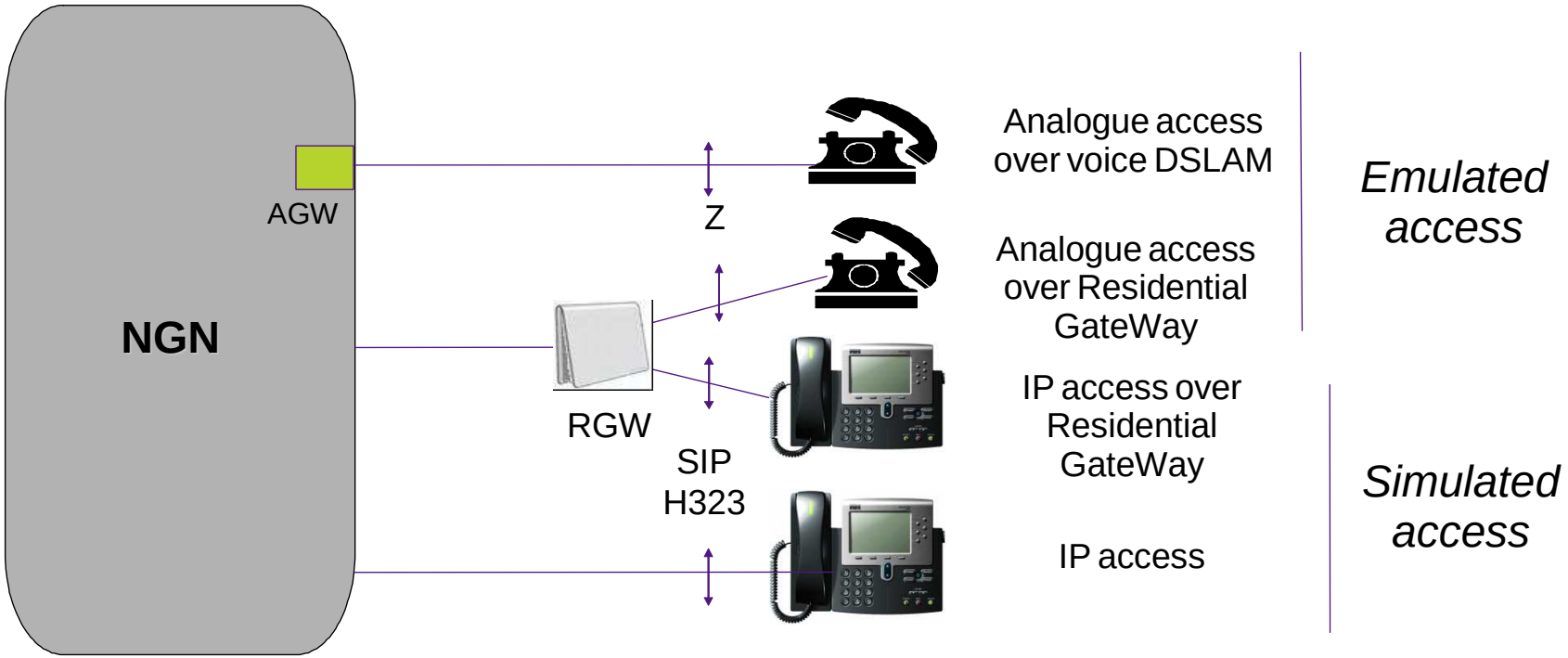
# RACS Architecture



# TISPAN NGN Architecture (ES 282 001)



# Emulation / Simulation accesses




- Emulation key Scenarios
  - PSTN/ISDN Replacement (in whole or in part)
  - Support of legacy terminal equipment connected directly or indirectly to NGN
- Simulation
  - Provision of services similar to the PSTN/ISDN to voice and other multimedia terminal equipment

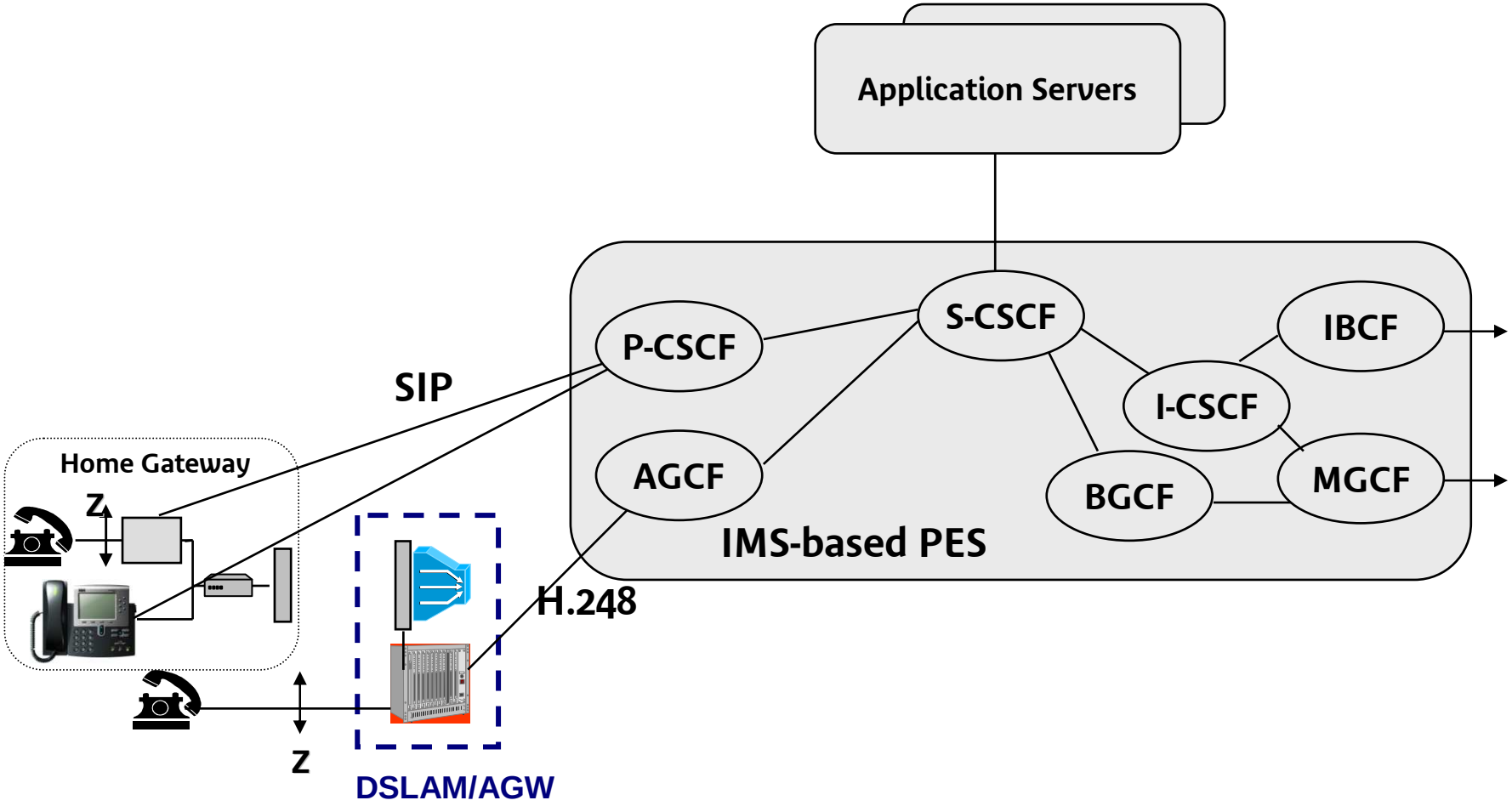
# PSTN/ISDN Emulation Subsystem (PES)

- PSTN/ISDN Emulation = Provision of PSTN/ISDN services to legacy terminals connected through a gateway.

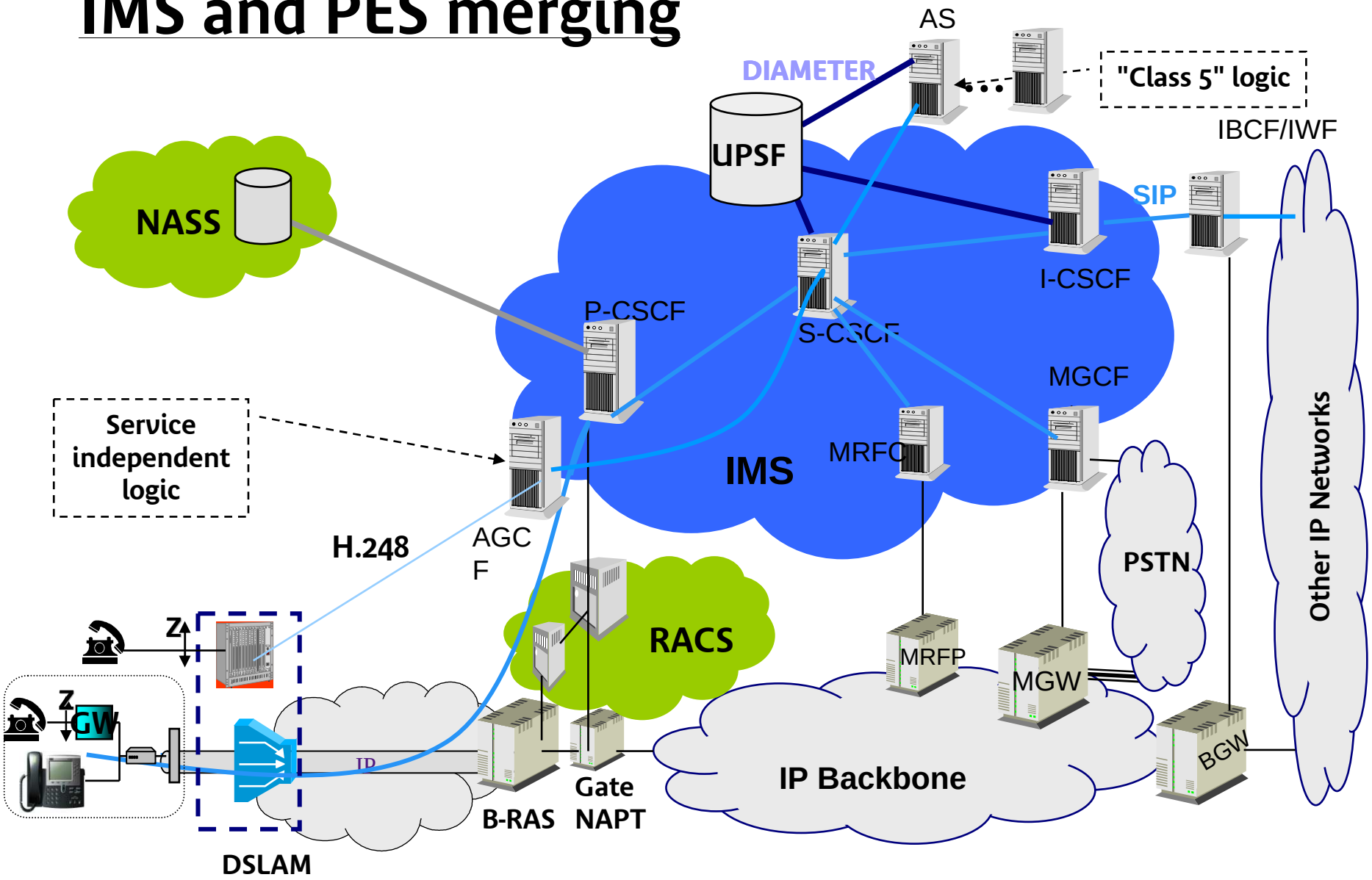
- Two competing approaches:
  - Softswitch-like approach
  - *IMS-based approach (TS 182 012)*

- IMS-Based approach: Avoid a dedicated infrastructure for supporting PSTN Emulation
  - In the mid/long term, Emulation-based configurations are likely to be substituted by Simulation-based configurations.

# IMS-based Emulation Architecture principles



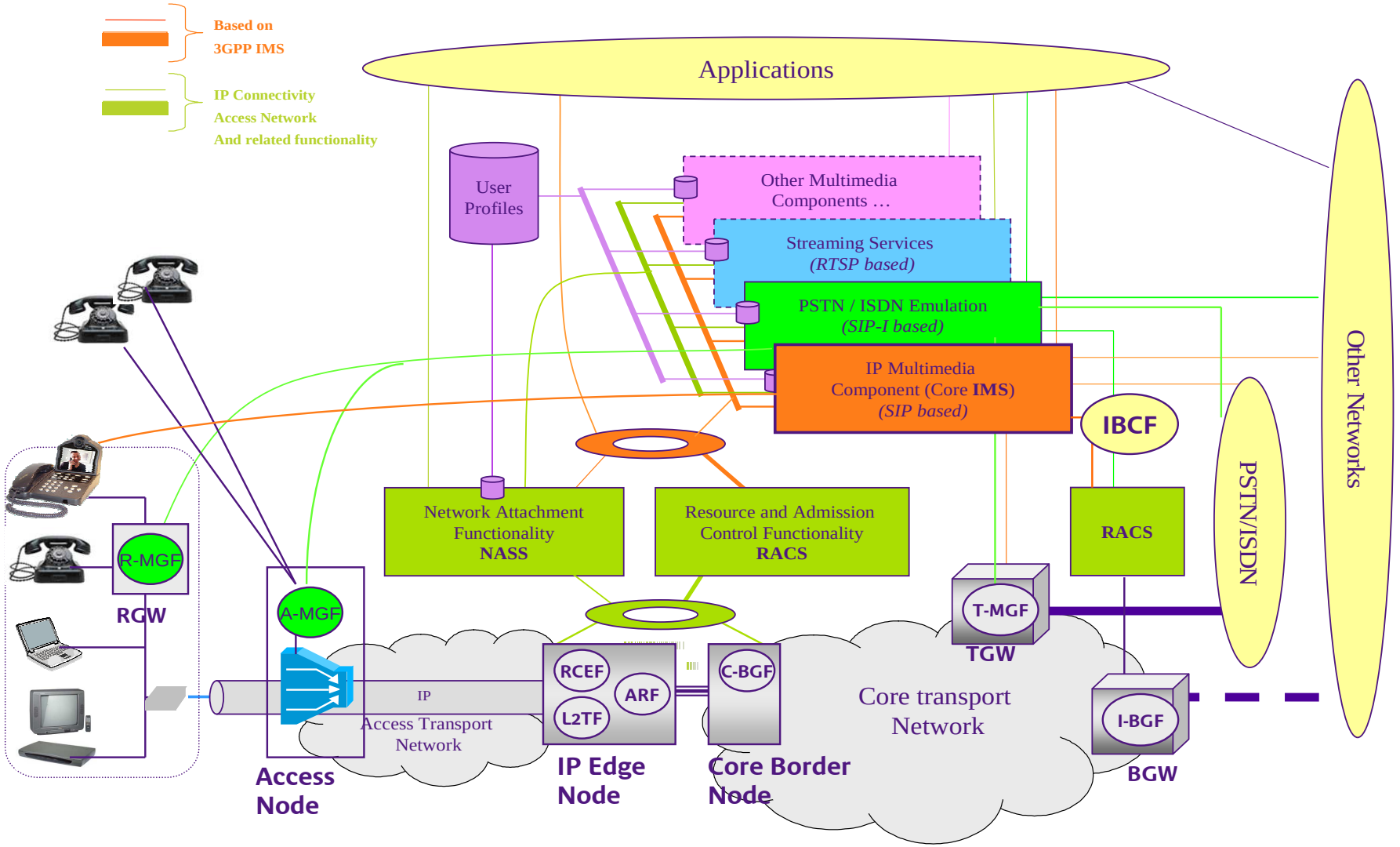
# IMS and PES merging



# AGCF main functions

- Act as an MGC for controlling media gateways functions located in residential and access gateways.
- Perform signalling interworking between SIP and analog signalling (through H.248 signals and events).
- Manage SIP registration procedures on behalf of legacy terminals connected behind the media gateways.
- Provide basic feature logic for
  - Determining end of dialling;
  - Selecting a dial tone
  - Processing mid call events (i.e. flash-hook), collecting digits and mapping received digits to appropriate SIP & H.248 commands.

# TISPAN overall architecture (DSL



# Plan

- Introduction
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- Conclusion

# NGN Environment to be Managed

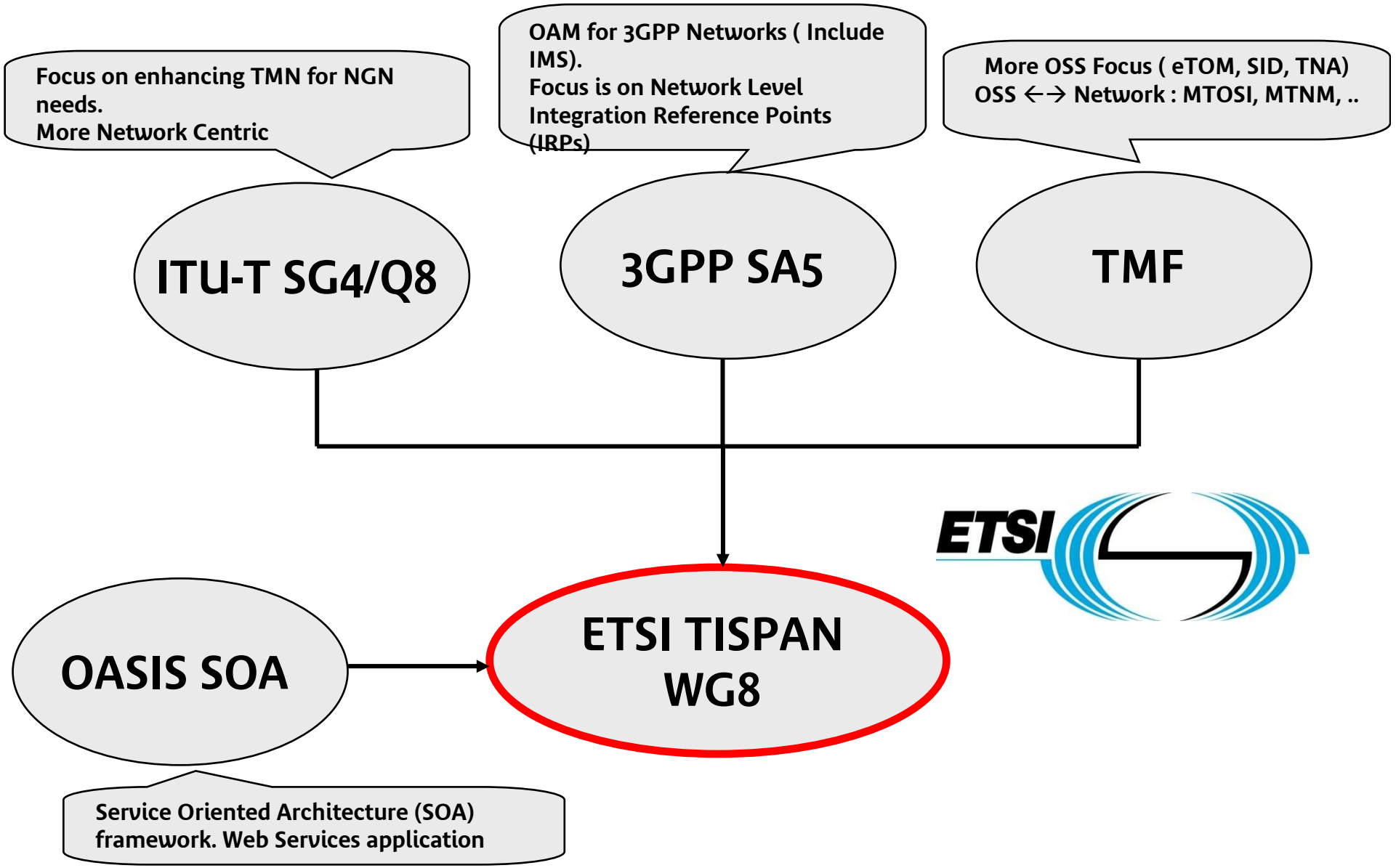
- Based on **Packet-based** transfer
- **Common control functions** supporting a wide range of applications – via session services
- Support for complex **value chains**, multiple **trading partners** / **business models** (eg B2B interactions)
- Support for a **wide range of services**, applications and mechanisms, [including real time/ streaming/ non-real time and multimedia services]
- **Broadband** capabilities with **end-to-end QoS** (Quality of Service)
- **Inter-working** with legacy networks via open interfaces
- Generalized **mobility, with converged services** between fixed/mobile
- **Personalization** of Services in a **component-oriented** environment
- Variety of customer **identification** schemes (eg Role-based access)
- **Independence** of service-related functions from underlying transport
- Compliant with all **Legal** and **regulatory** requirements [Emergency communications, security, privacy, lawful interception, etc.]

# NGN OSS Architecture – Characteristics

To fulfill the NGN business and technical vision, design of the **OSS architecture** must have the following characteristics:

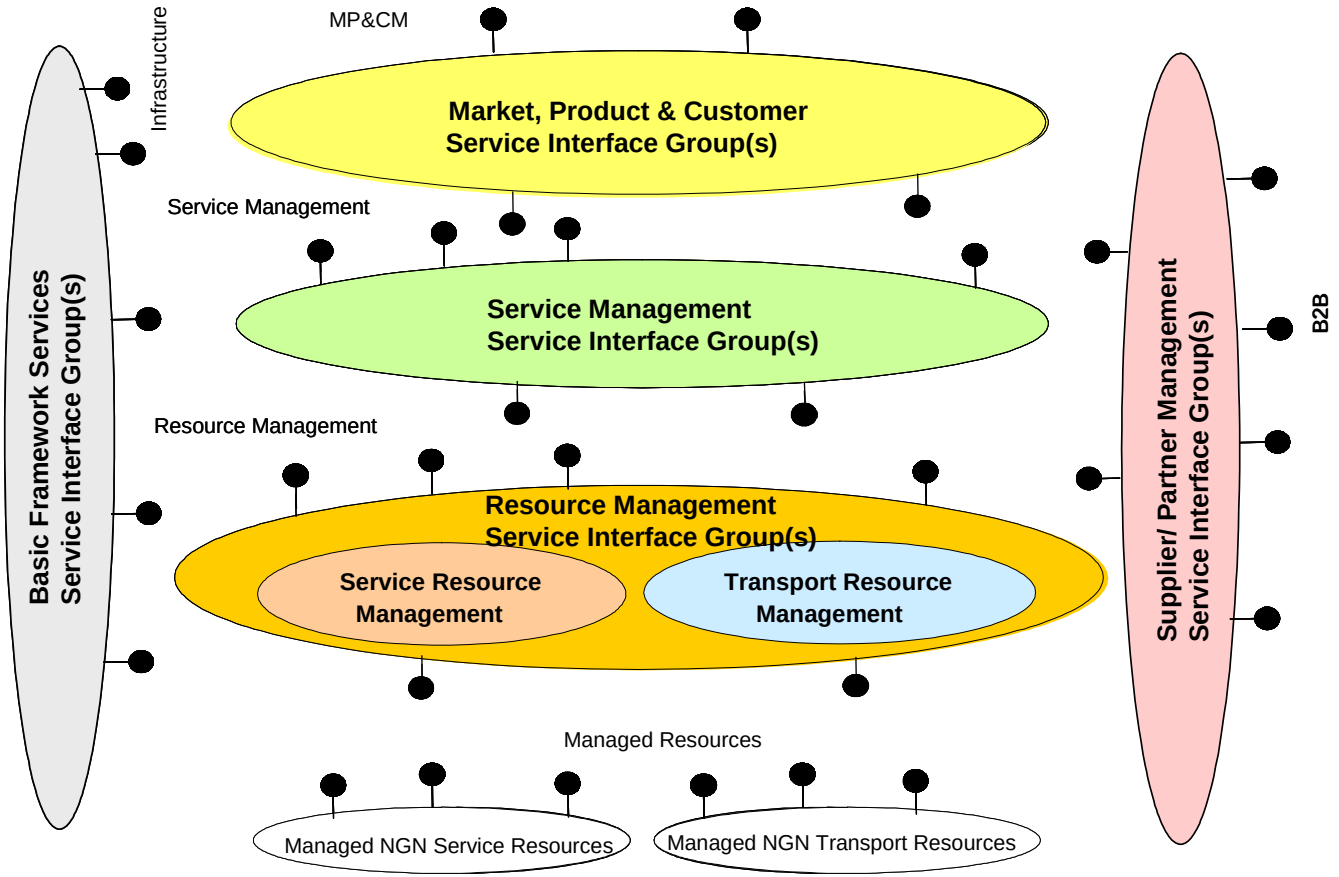
- All systems must embrace a similar **component-based**, **service-oriented architecture** "**SOA**" – defined in a technology neutral form
- Utilise a common **information architecture** across all management applications so that :
  - information can be shared across multiple areas of Management
  - capabilities can be developed for collecting end-to-end service measurement data (eg for SLA support).
  - framework provided for policy-based management for existing or yet to be defined services.
- OSS solutions must be developed according to a **common business process framework**
- **Network Technologies** managed in a common way, **Services** Managed independently of the Network technologies

# TISPAN NGN Management Architecture

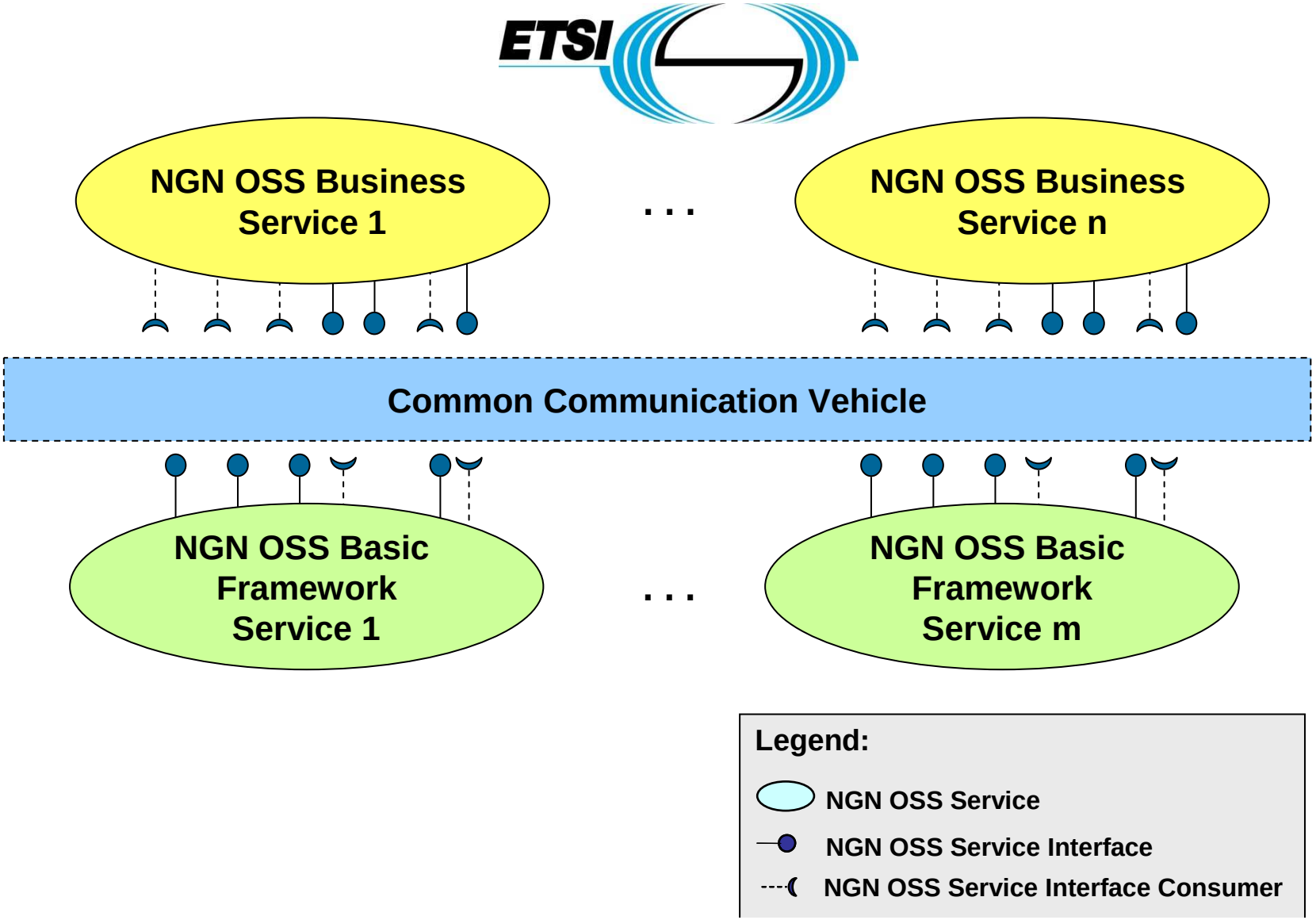


# ETSI TISPAN NGN OSS Architecture

## Source: ETSI TS 188 001 - (TISPAN) OSS Architecture Release 1



# TISPAN NGN OSS Architecture – Implementation



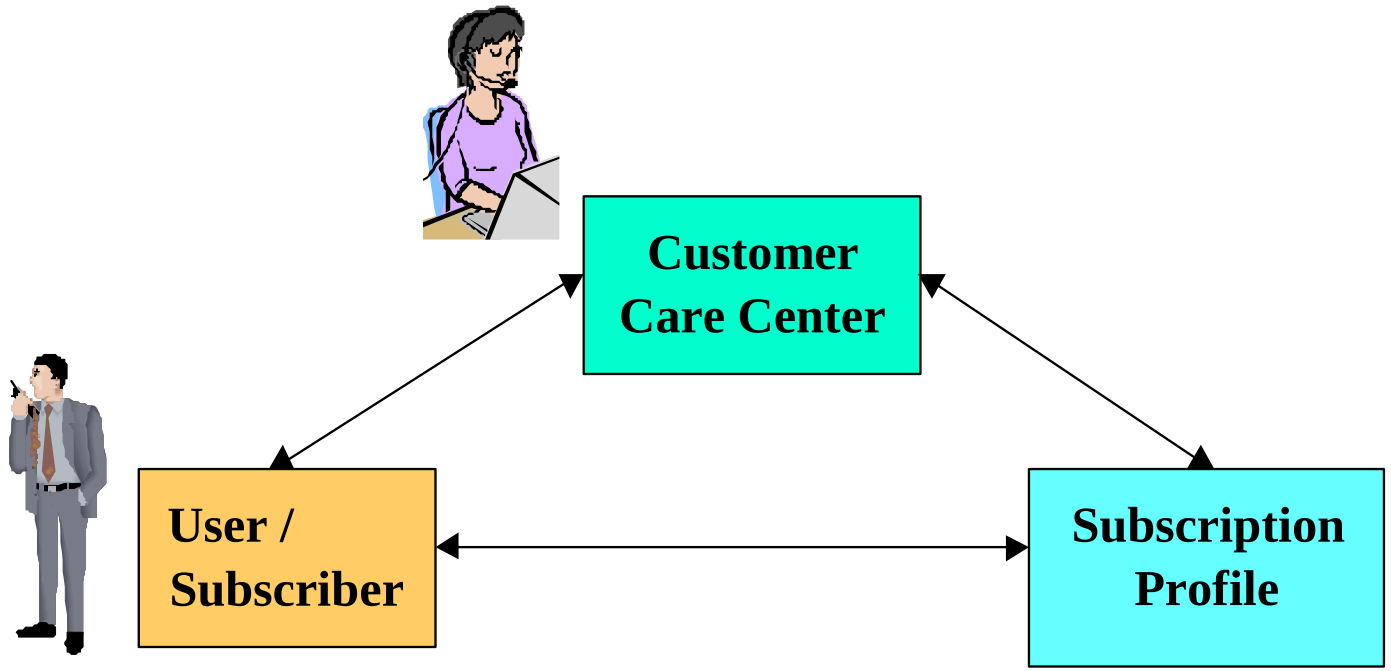
# Issues in Management of NGN

- Control V Management
  - Example: IMS Control Functions and their associated Management needs (Eg - Fulfilment, Assurance, Billing)
- Service Creation V Management
  - Example: Service Delivery Framework (SDF) and its associated Management needs (Eg - Fulfilment, Assurance, Billing)

# Subscription Management

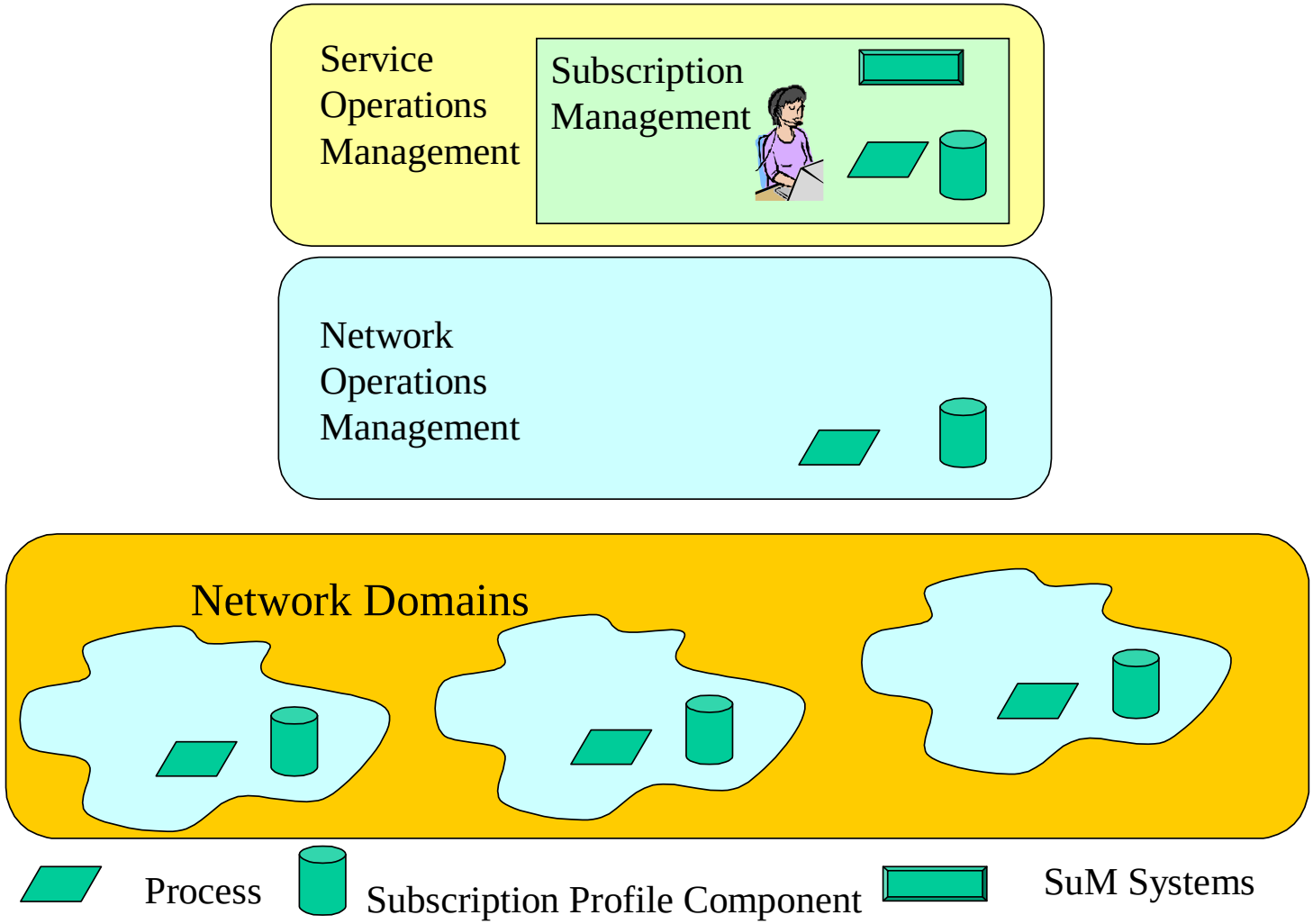
- The management of Subscriber and User Information
- Original concept started in 3GPP SA5
- Extended by TISPAN WG8 to Fixed Mobile Convergance

# Subscription Management (SuM) - 3GPP viewpoint



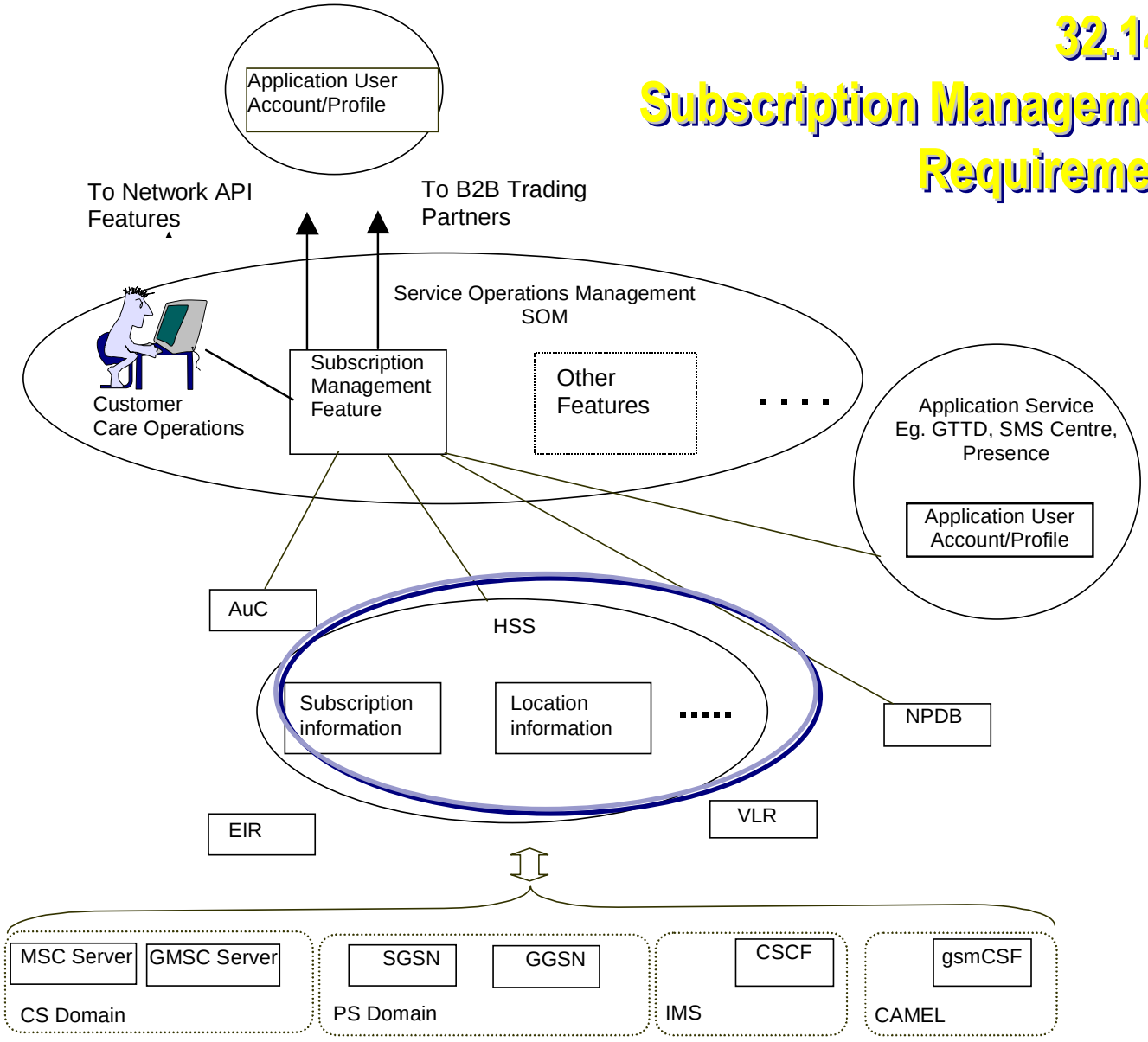

**32.140 Subscription Management Requirements**

# SuM Mapped to TMN Layers



# 3GPP SuM related to HSS

**32.140**
**Subscription Management Requirements**



# Difference between 3GPP and TISPAN SuM Requirements

3GPP

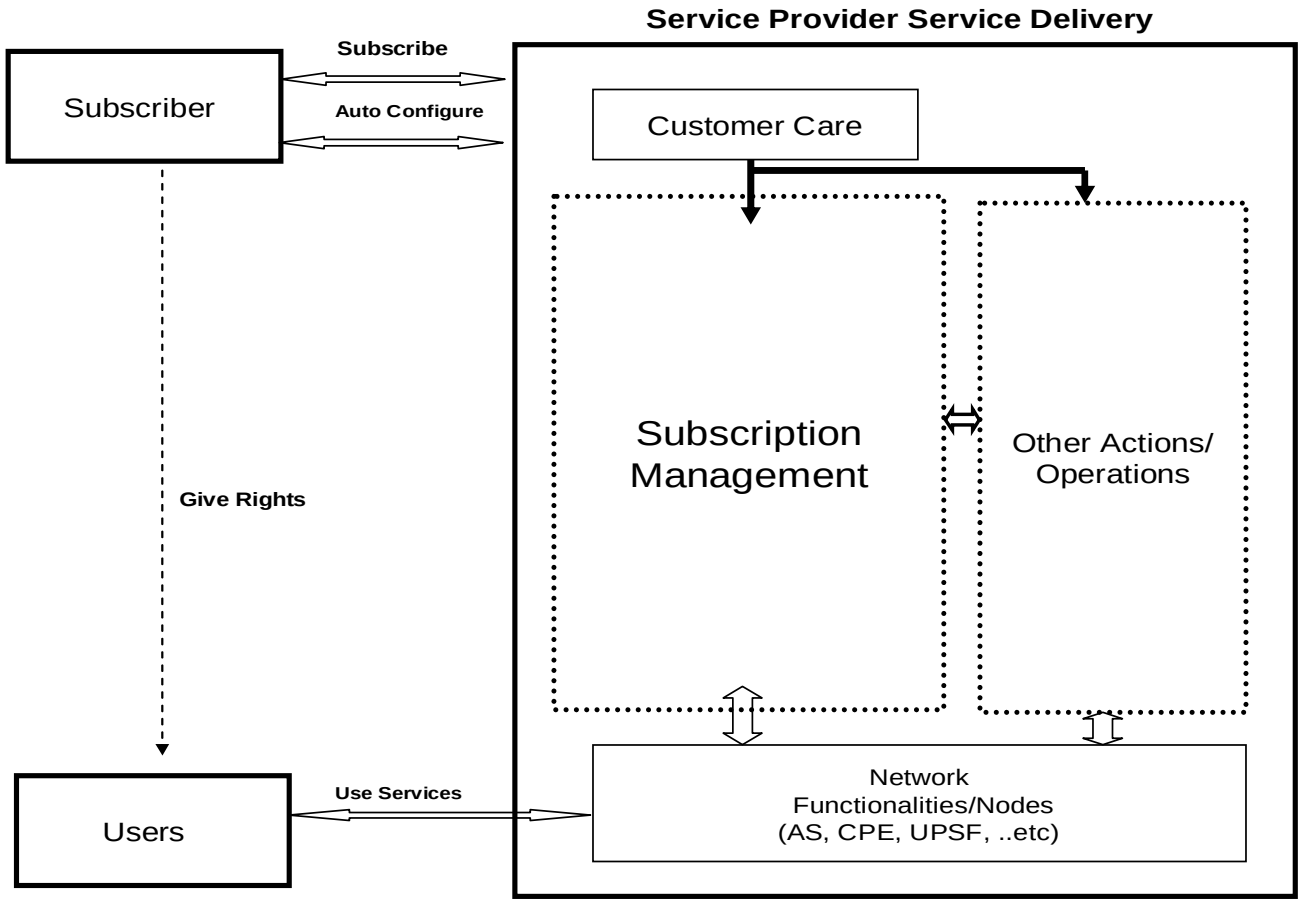
- All (Subscription) Service Profile Information ultimately held in Home HSS
- Distributed by signalling  to VHSS
- Each user equated to a SIM /UICC

# Difference between 3GPP and TISPAN SuM Requirements

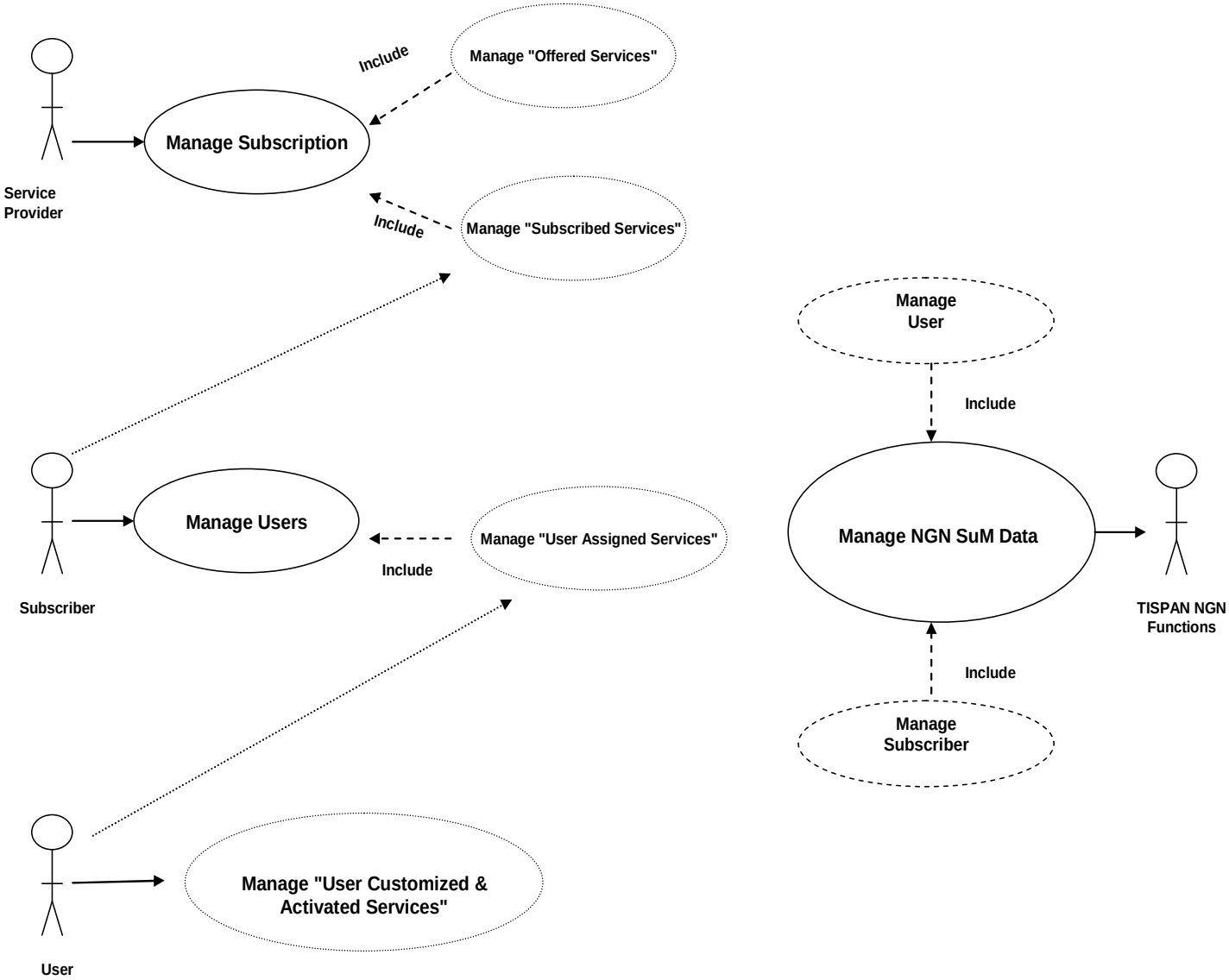
**TISPAN**

- Providers of Access and Service can be different
- Hence HSS functionality split between
  - IMS (User Profile Service functions –UPSF)
  - NASS (Profile Data Base Function – PDBF)
- Configuration of the E2E service requires
  - Transactional and referential integrity between UPSF and PDBF
  - Synchronisation of UPSF/ PDBF with providers OSS (Service Mngt)
  - Ability to synchronise SP SuM Profiles across B2B interfaces
- Broadband access means on one access line
  - multiple terminals
  - multiple Users
  - multiple Customers
- Distinguish between Customer, Subscriber and User
- Different/No Authentication -No equivalent of SIM/UICC

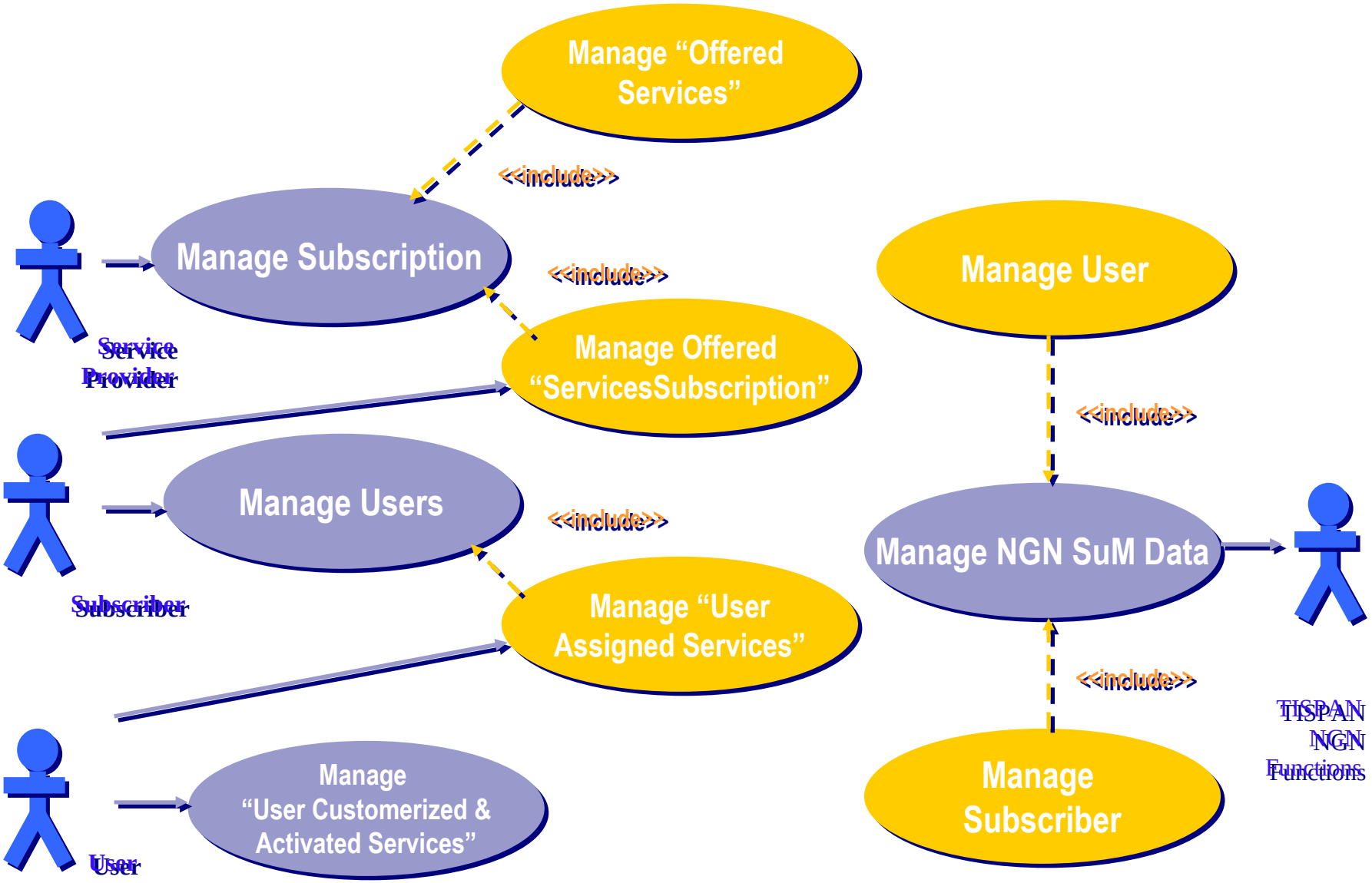
# TISPAN Subscription Management (SuM)



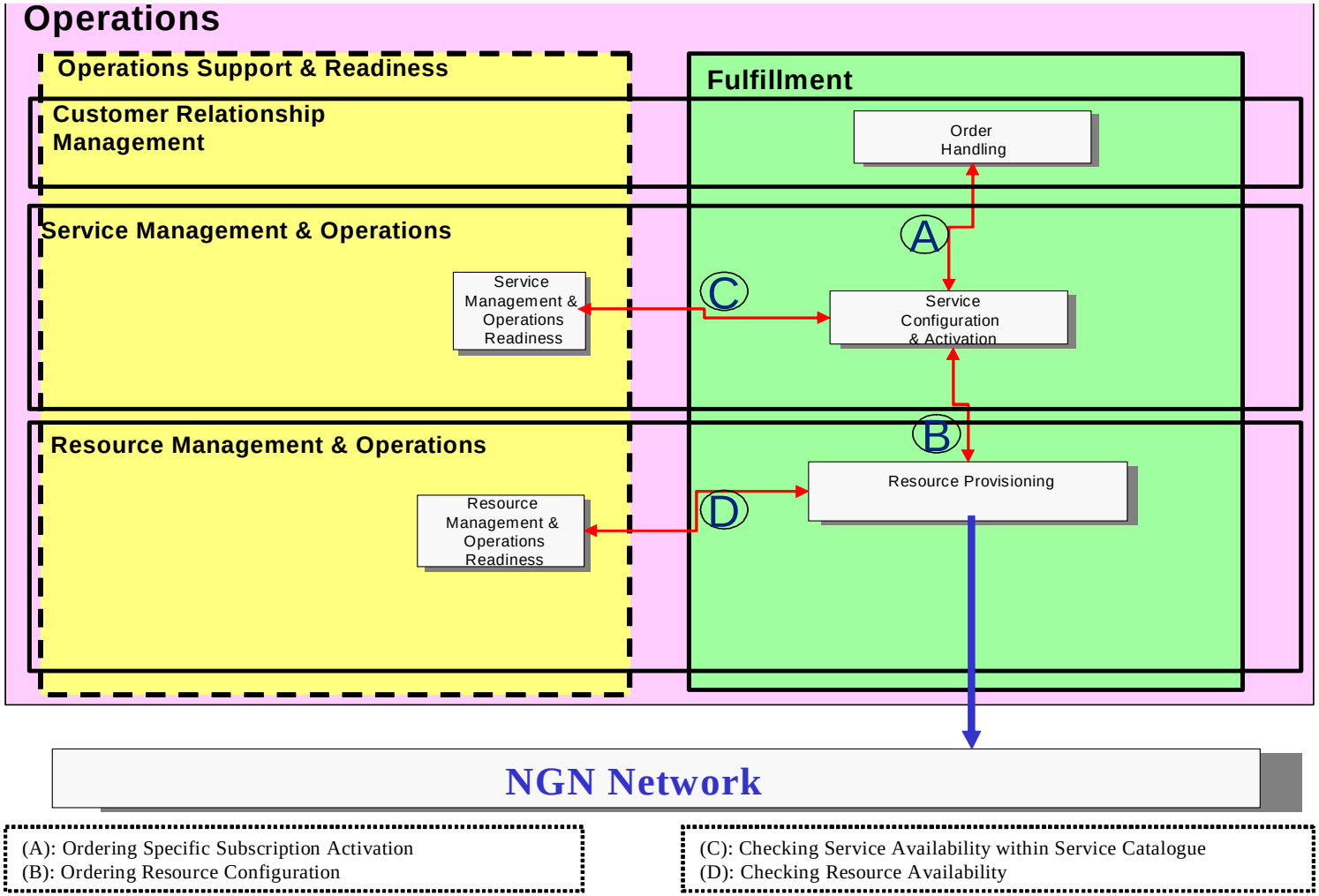
# TISPAN SuM Use Cases Original



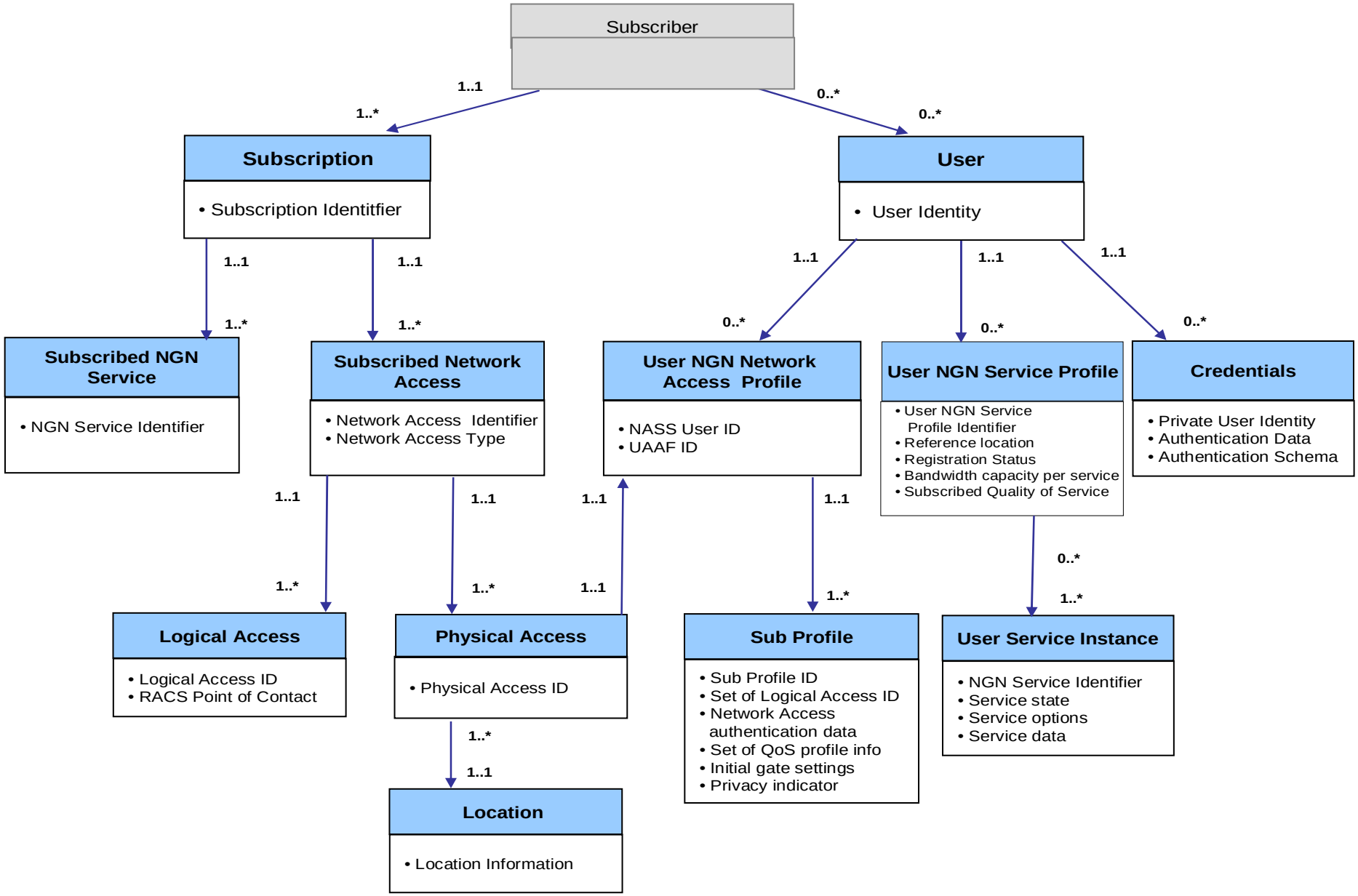
# TISPAN SuM Use Cases



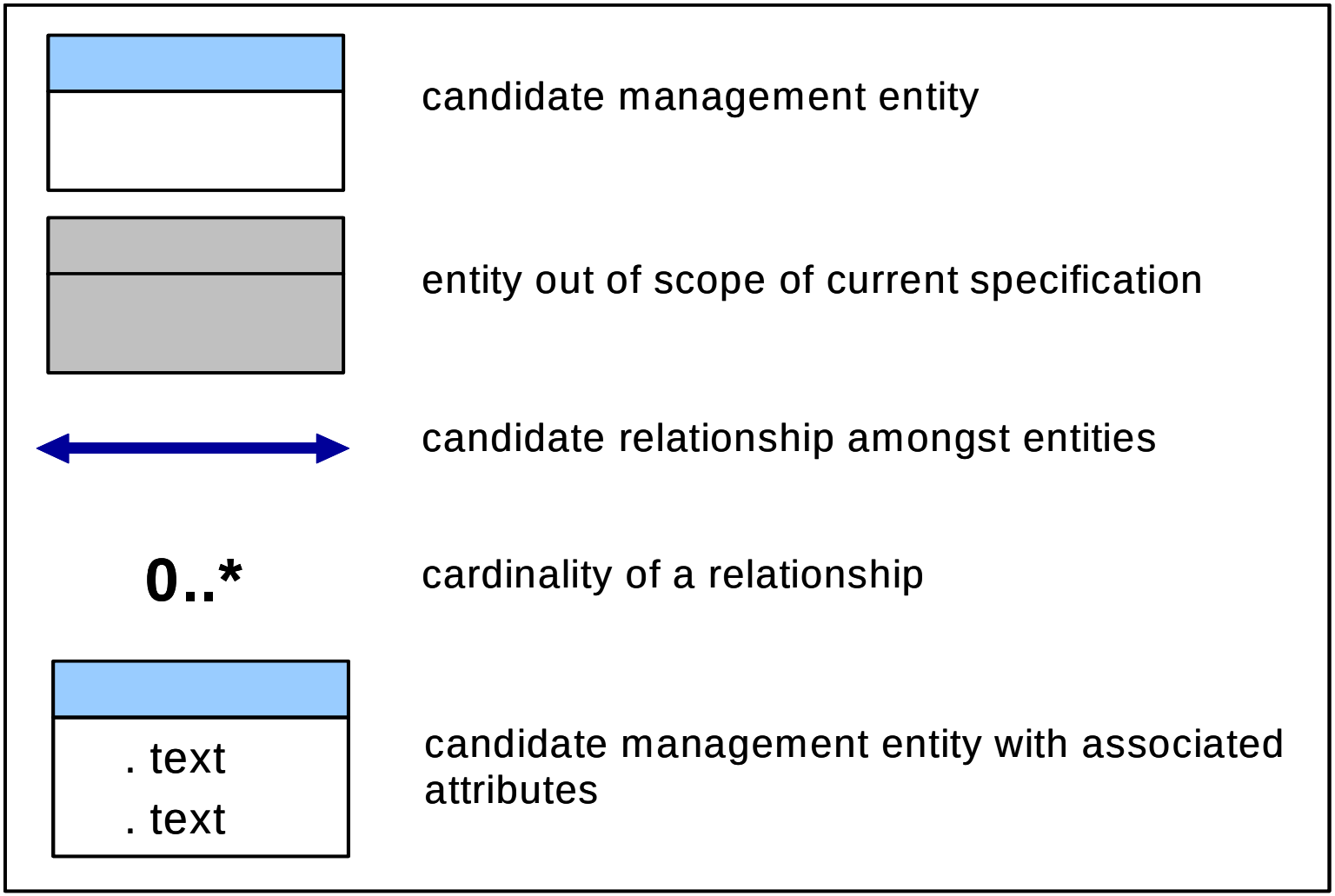
# TISPAN SuM eTOM processes



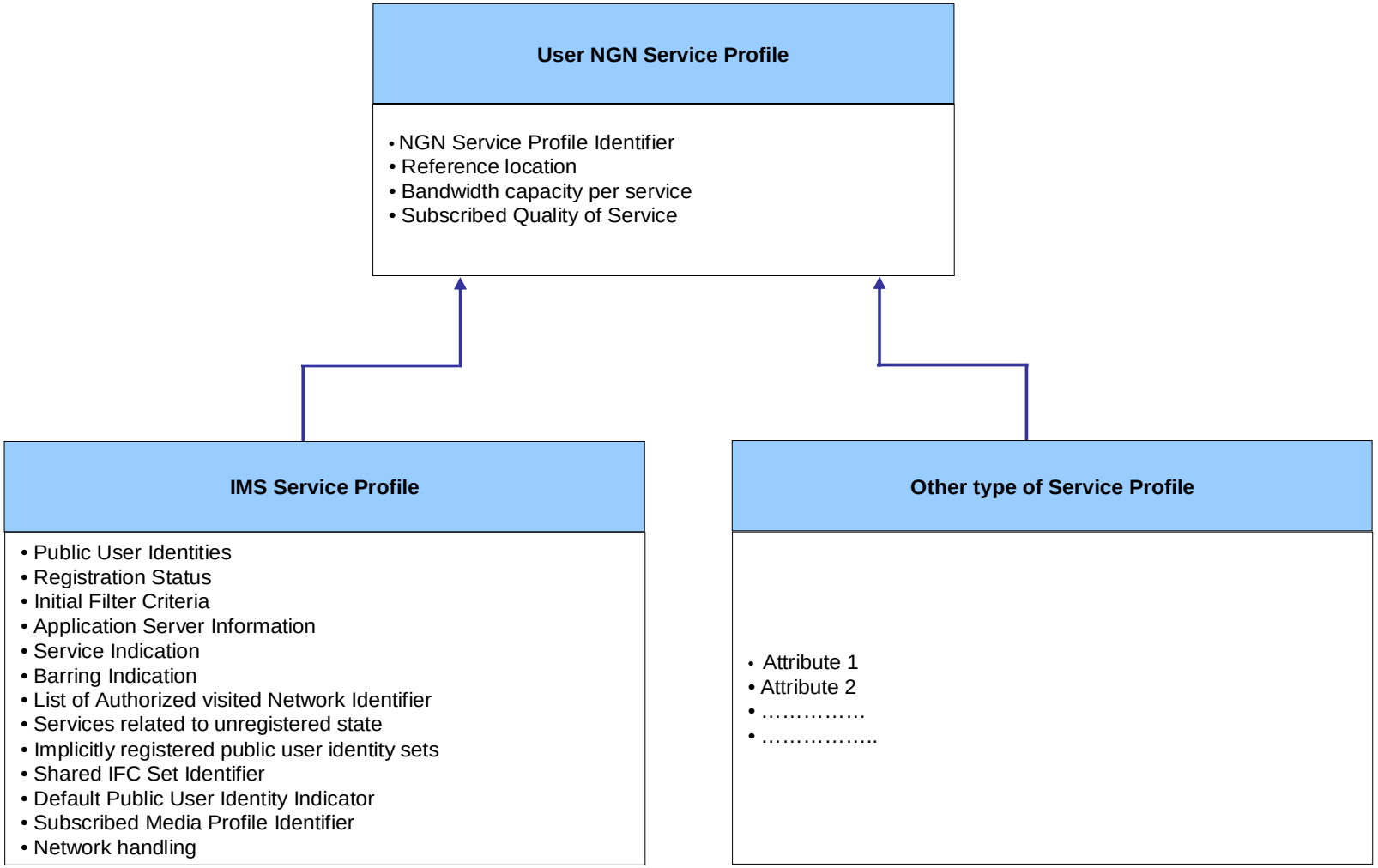
# TISPAN SuM High Level Information Model



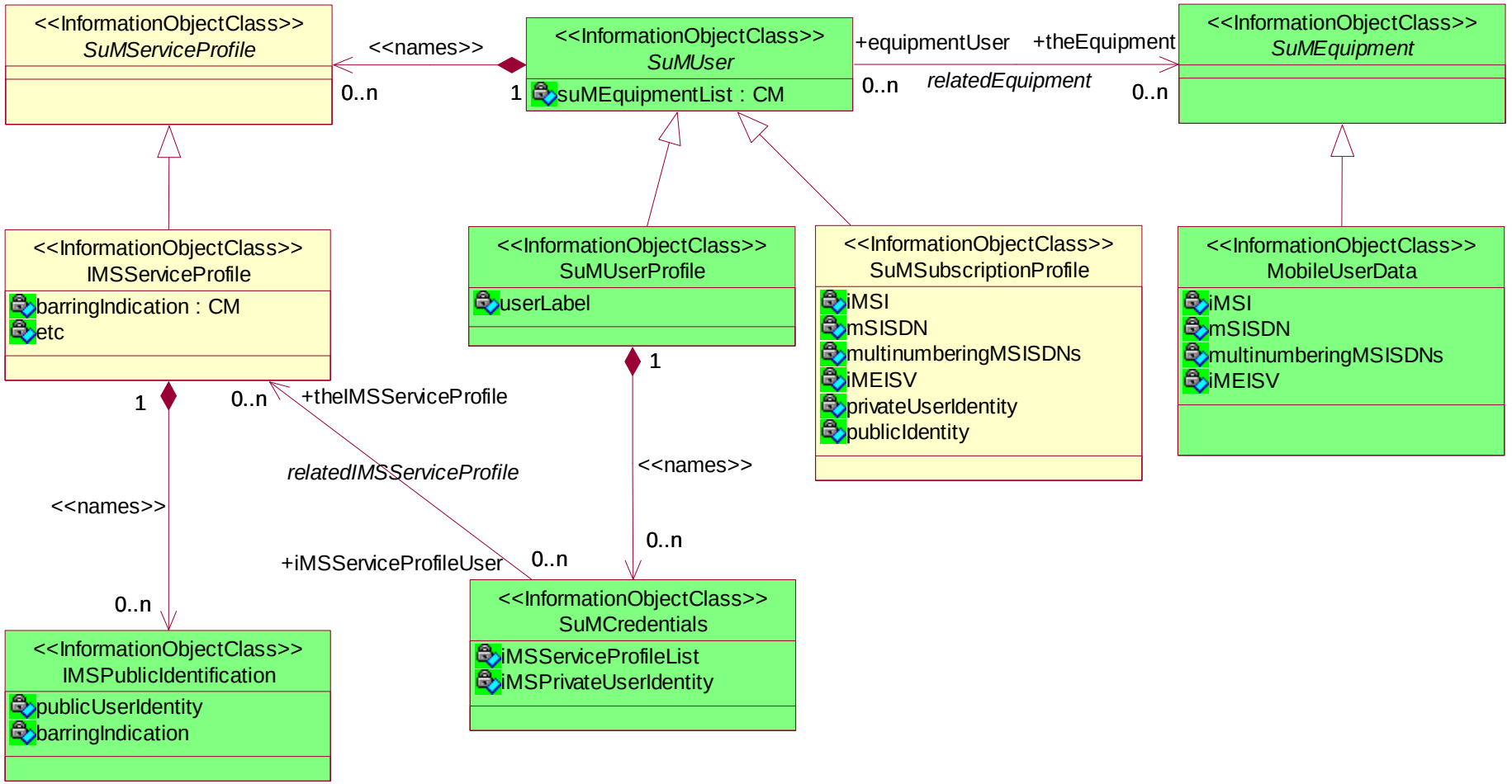
# TISPAN SuM Diagram Key



# IMS User NGN Service Profile



# Evolved 3GPP-TISPAN SuM Information Model



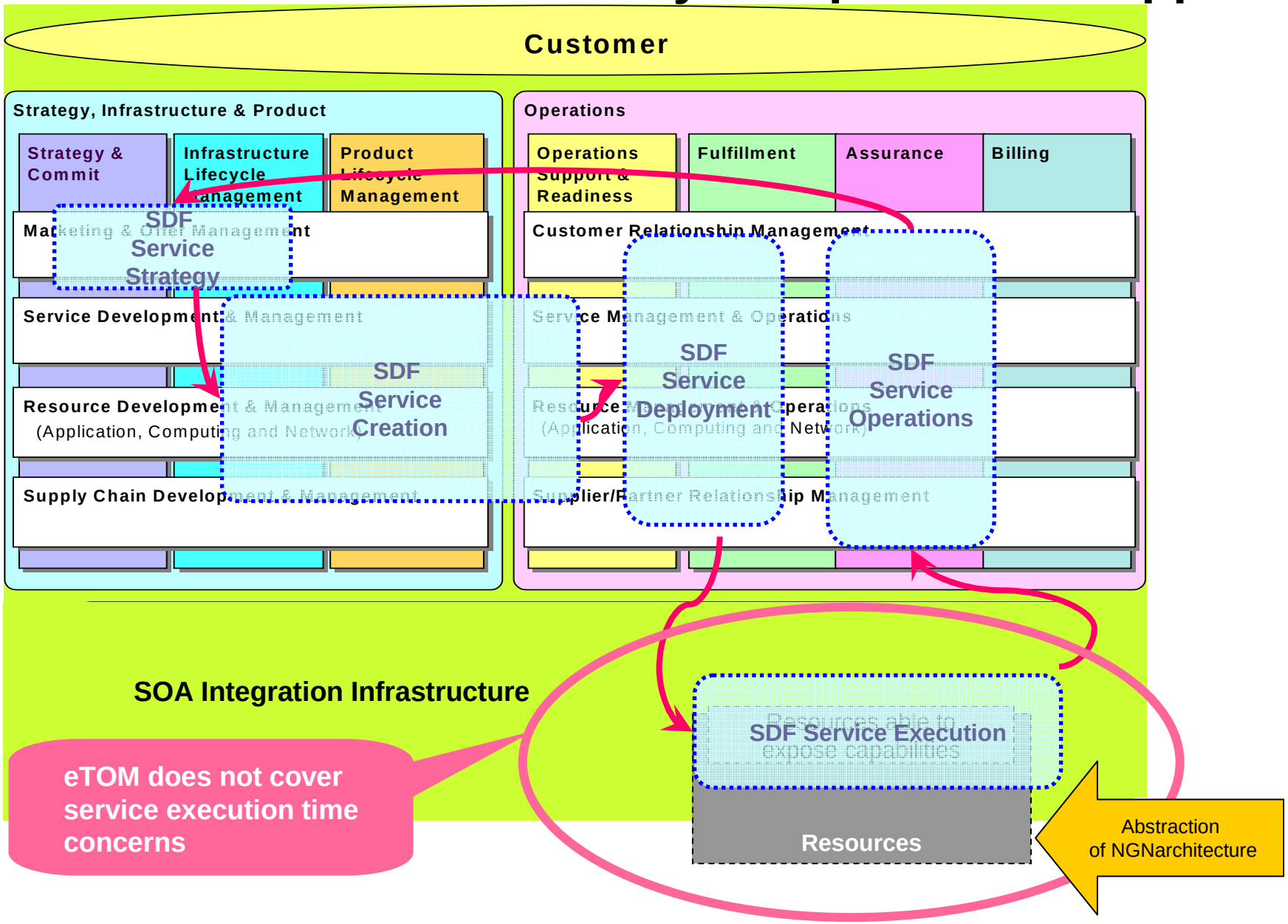
# TM Forum SDF Program Objectives: Business Perspective

- From **business perspective** the SDF should allow the stakeholders to:
  - **Reduce cost and cycle time to translate ideas to market offerings**
    - e.g. effective product lifecycle management throughout the entire ecosystem including operation support
  - **Increase opportunities and innovations for monetizing existing assets**
    - e.g.  repurposing content and applications;
  - **Adapt swiftly to market changes and customer preferences**
  - **Support many different type of business models**
    - e.g. allow the choices of being an infrastructure provider, a service wholesaler or a product retailer among different offerings
  - **Participate effectively in value networks**

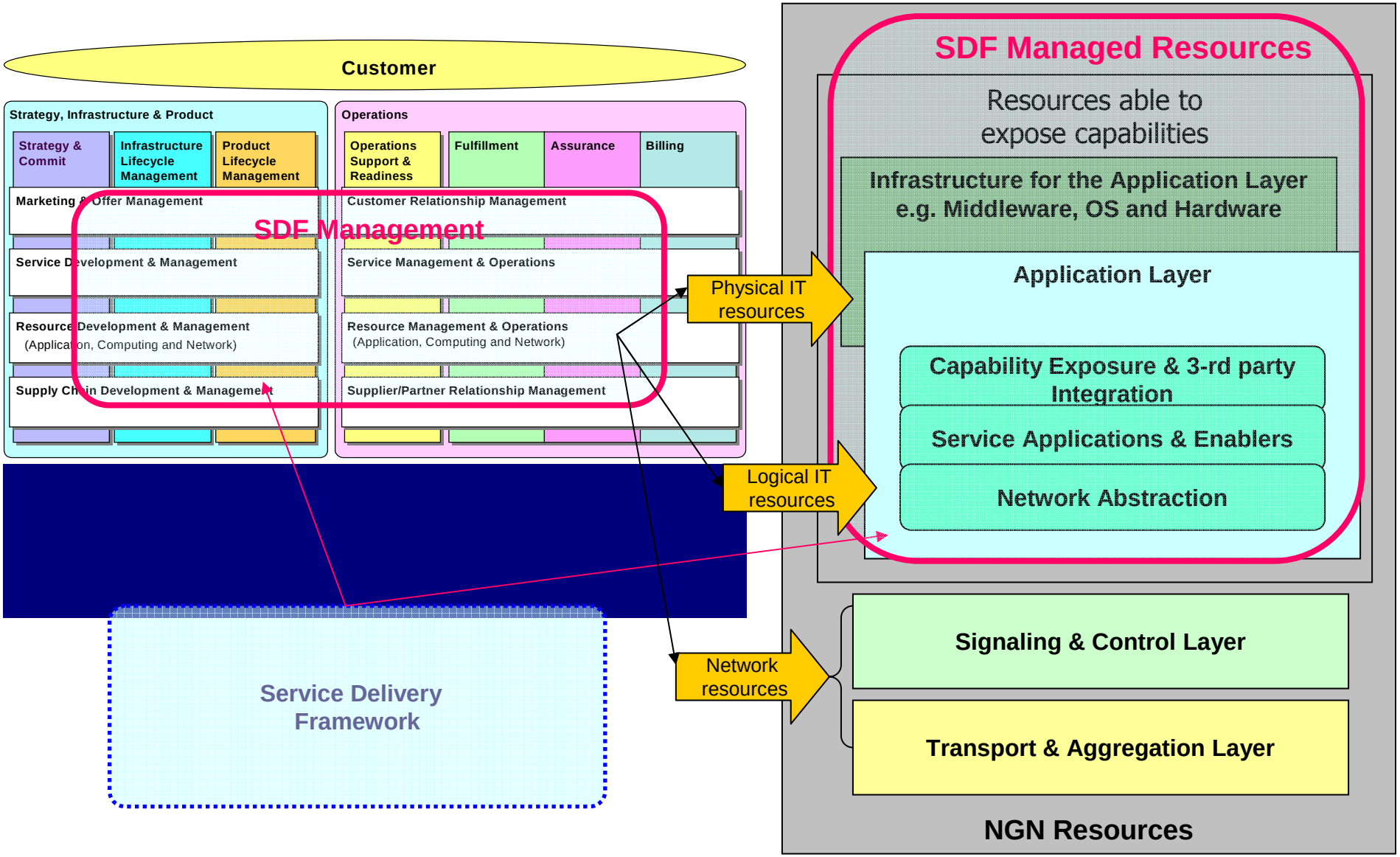
## TM Forum SDF Program Objectives: Technical Requirements

- These business objectives translate to the following **technical requirements** that the SDF must to satisfy:
  - Endorse a **component-based architecture**
  - All components within the SDF must comply to a **common management framework**
  - Consistent **service lifecycle operations support** within and across the value network.
  - **Standardized metadata** for cataloging and lifecycle management of Products, Services & Resources

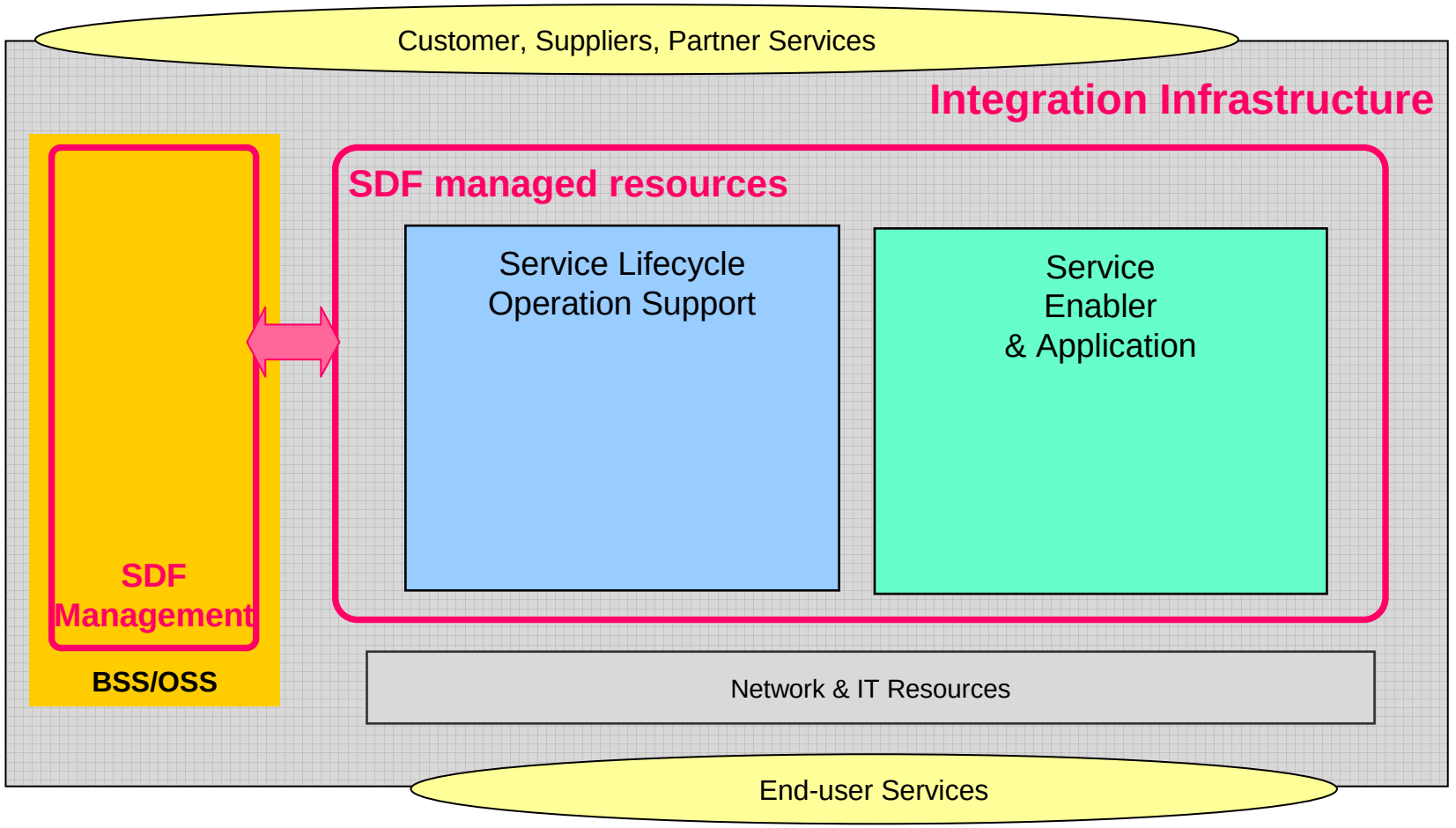
# SDF Lifecycle Operations Support



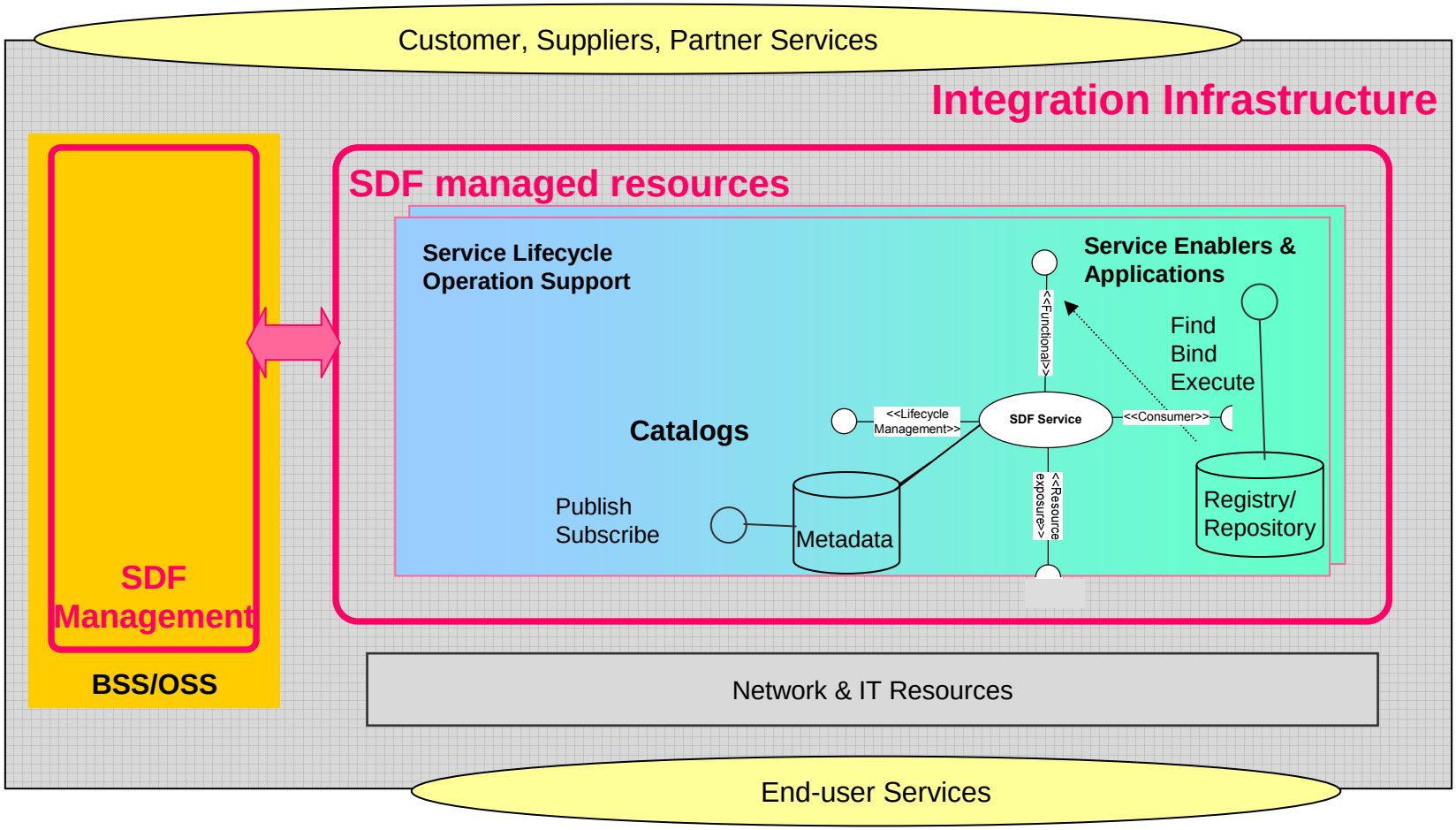
# A closer look at the SDF building blocks



# SDF Reference Model – Level 0



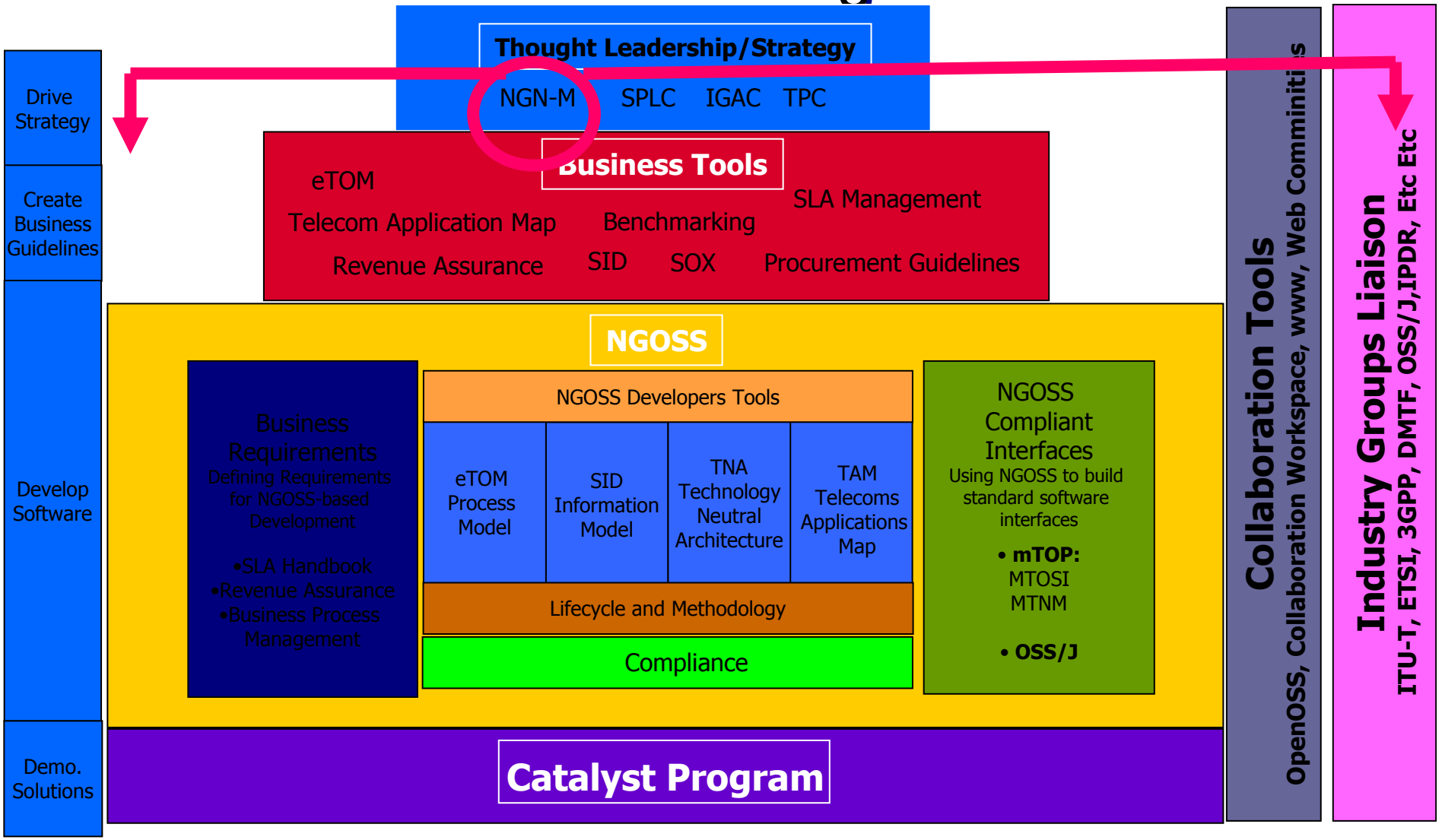
# SDF service components expose standardized service & management interfaces



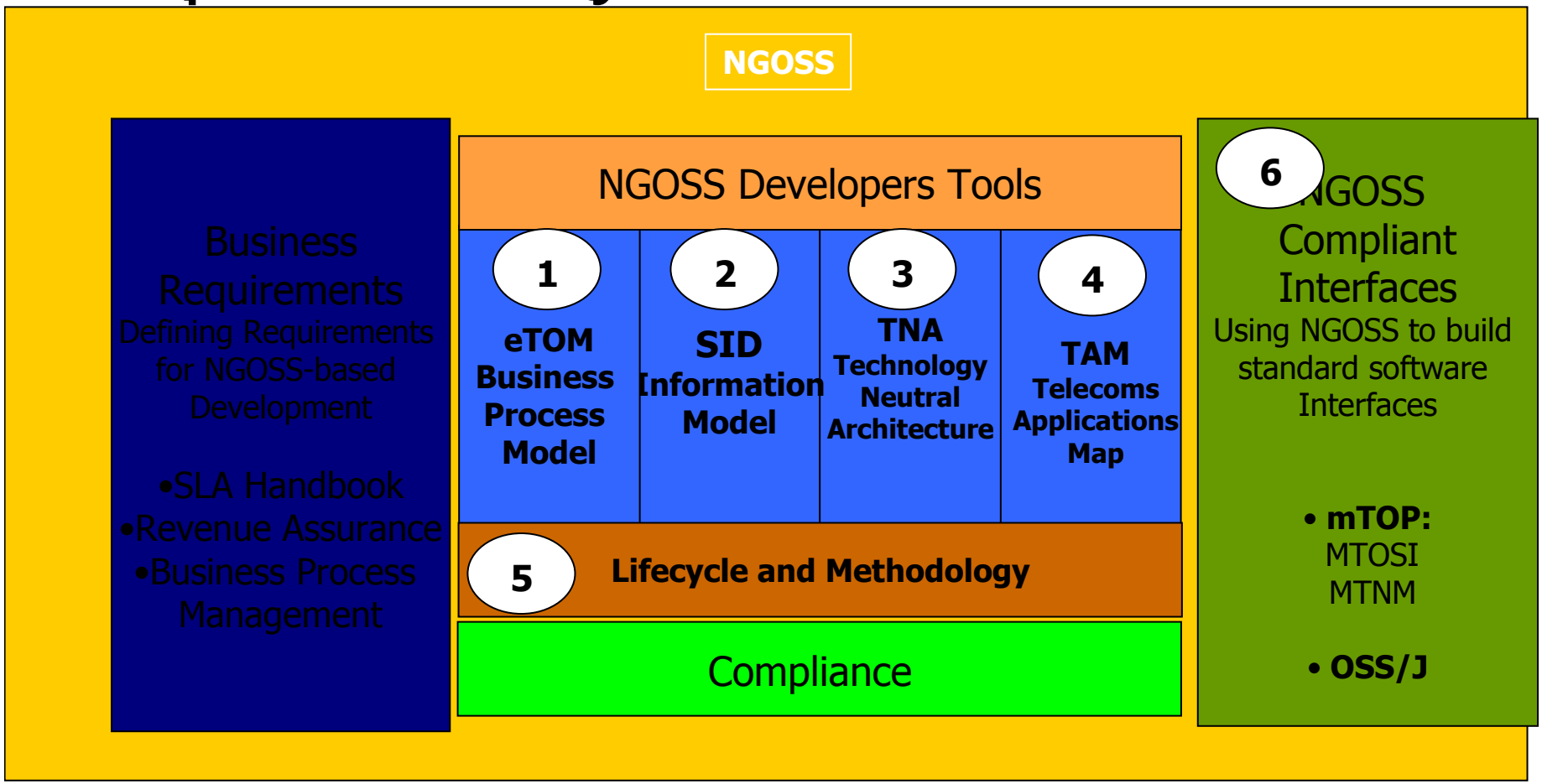
# What is TMF's NGOSS?

- New Generation Operations Systems and Software
- Major part of TMF's technical work programme
- Has been developed over the past 5 years to support Management of NGN
- Consists of a framework of Architectures and associated Specifications

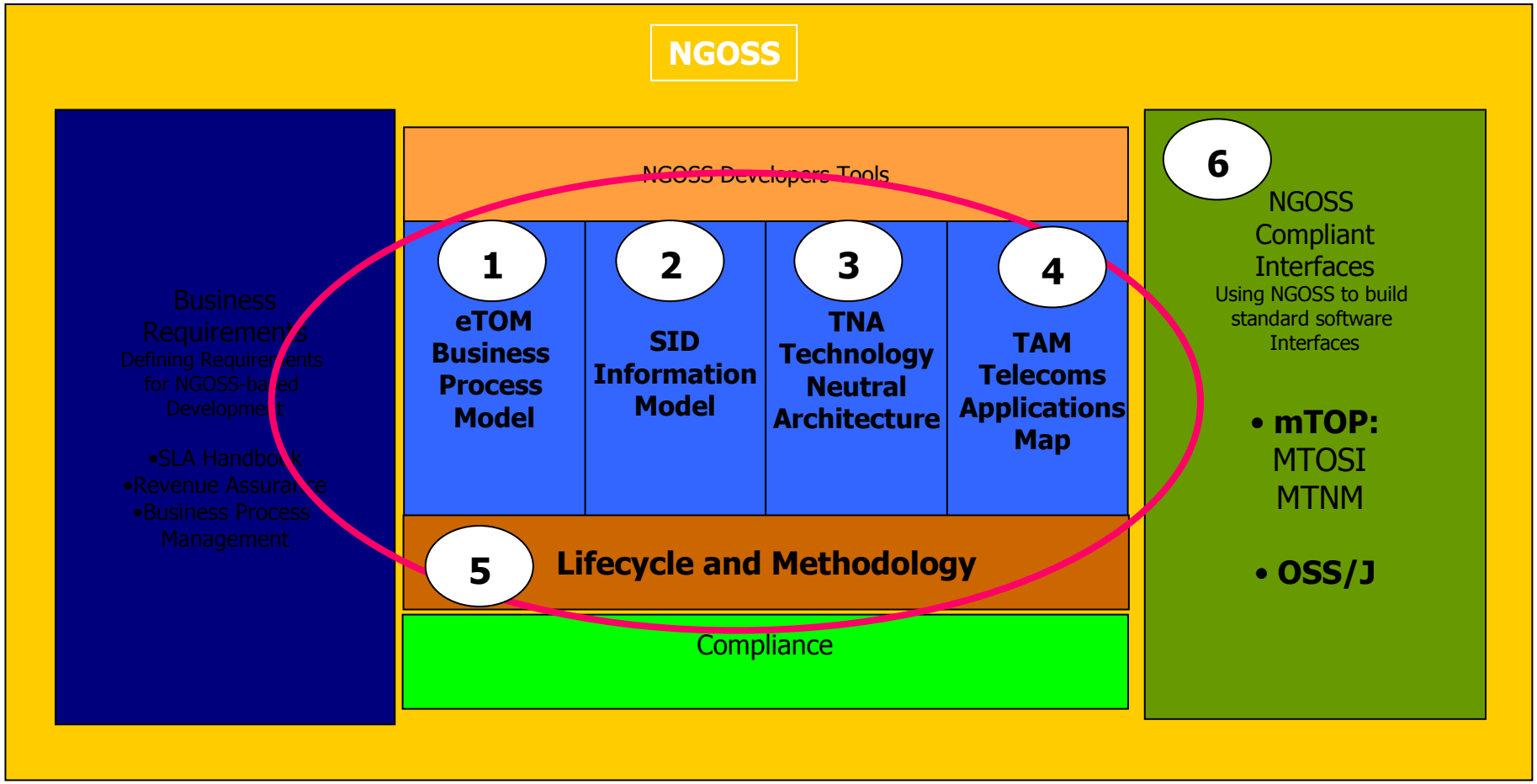
# TM Forum Collaboration Program



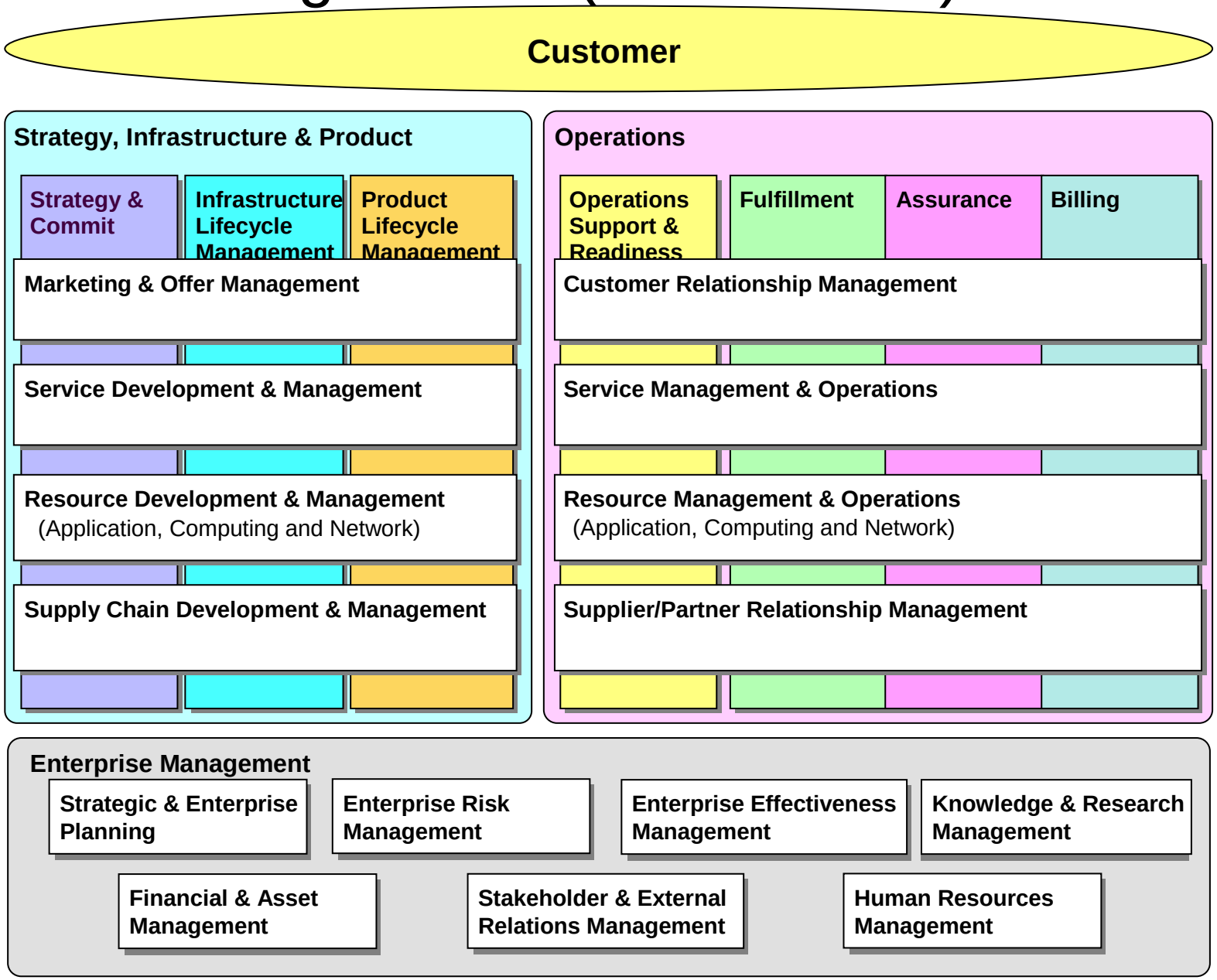
# NGOSS Next Generation Operations Systems and Software



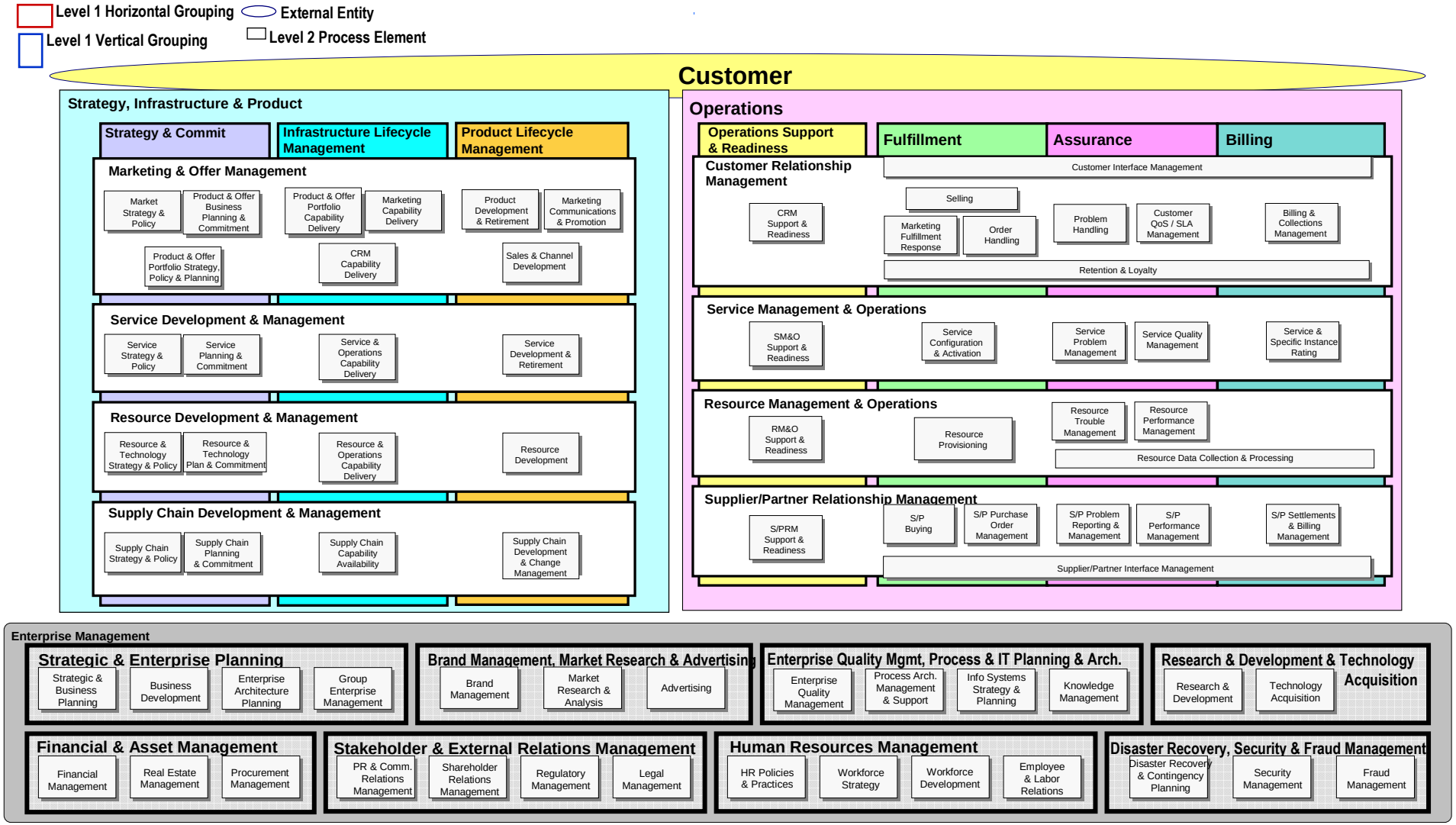
# NGOSS - Next Generation Operations Systems and Software



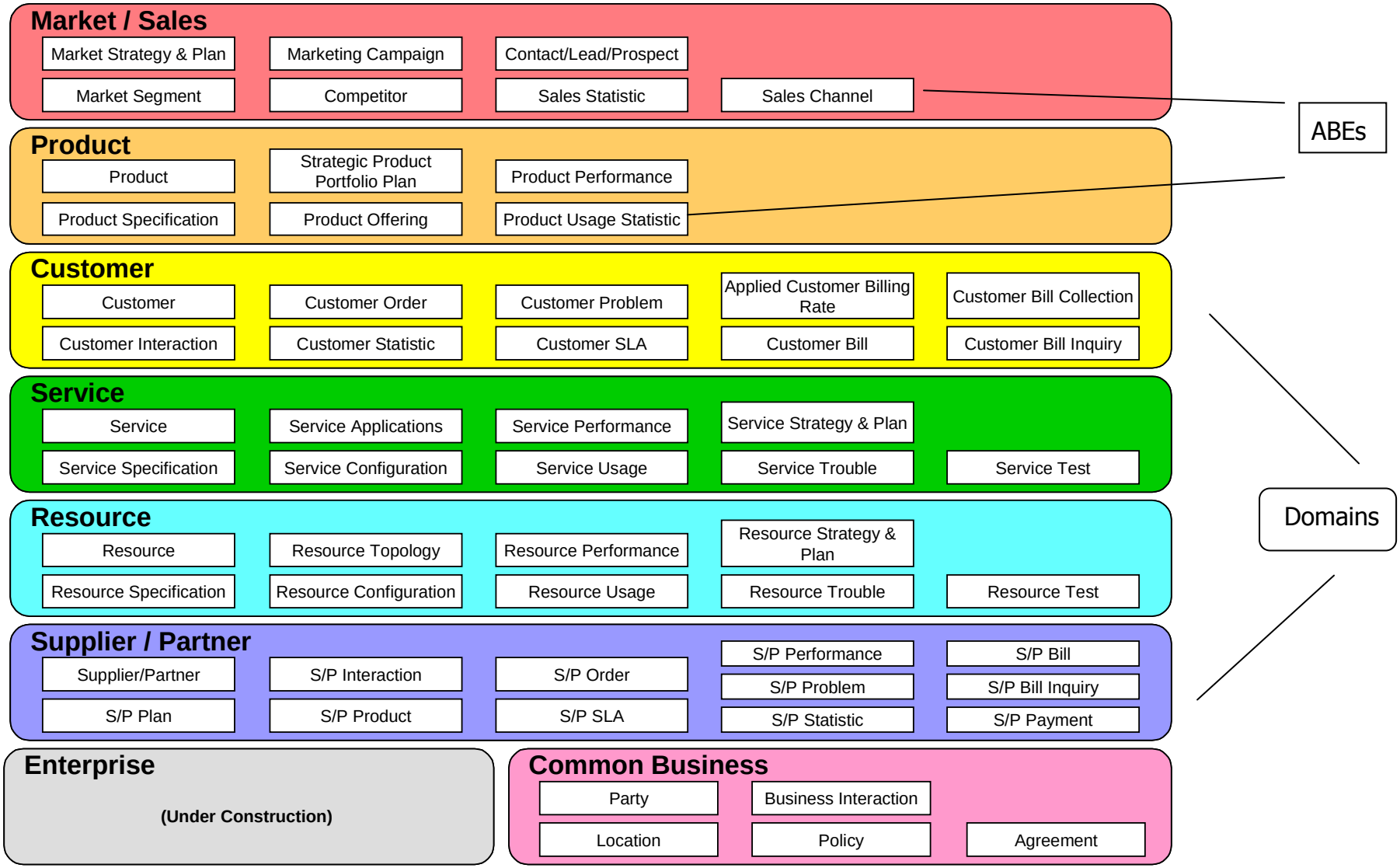
# eTOM: the Big Picture (Level 0 to 1)



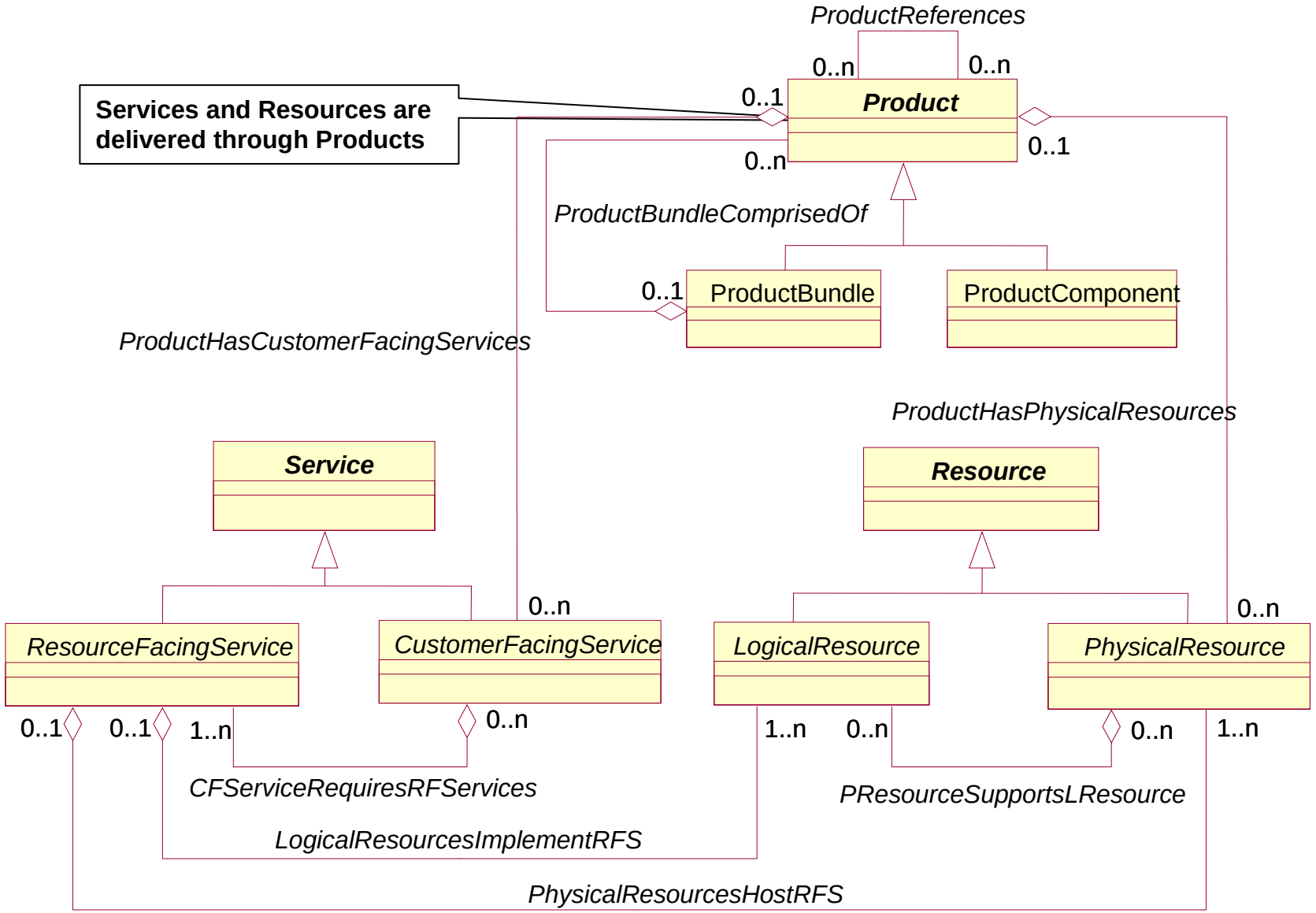
# eTOM - The Level 2 Processes



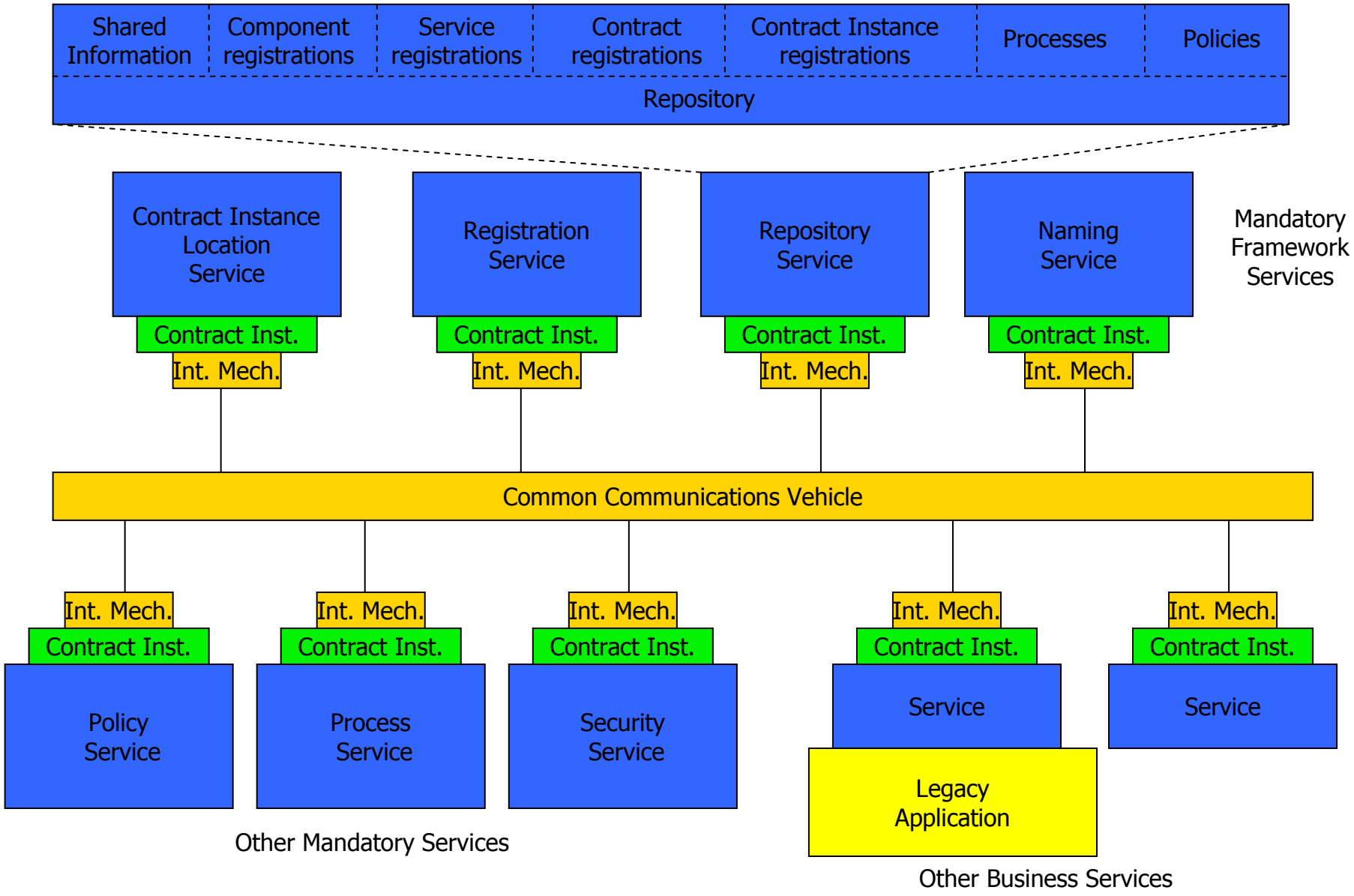
# The SID Business Framework (GB922)



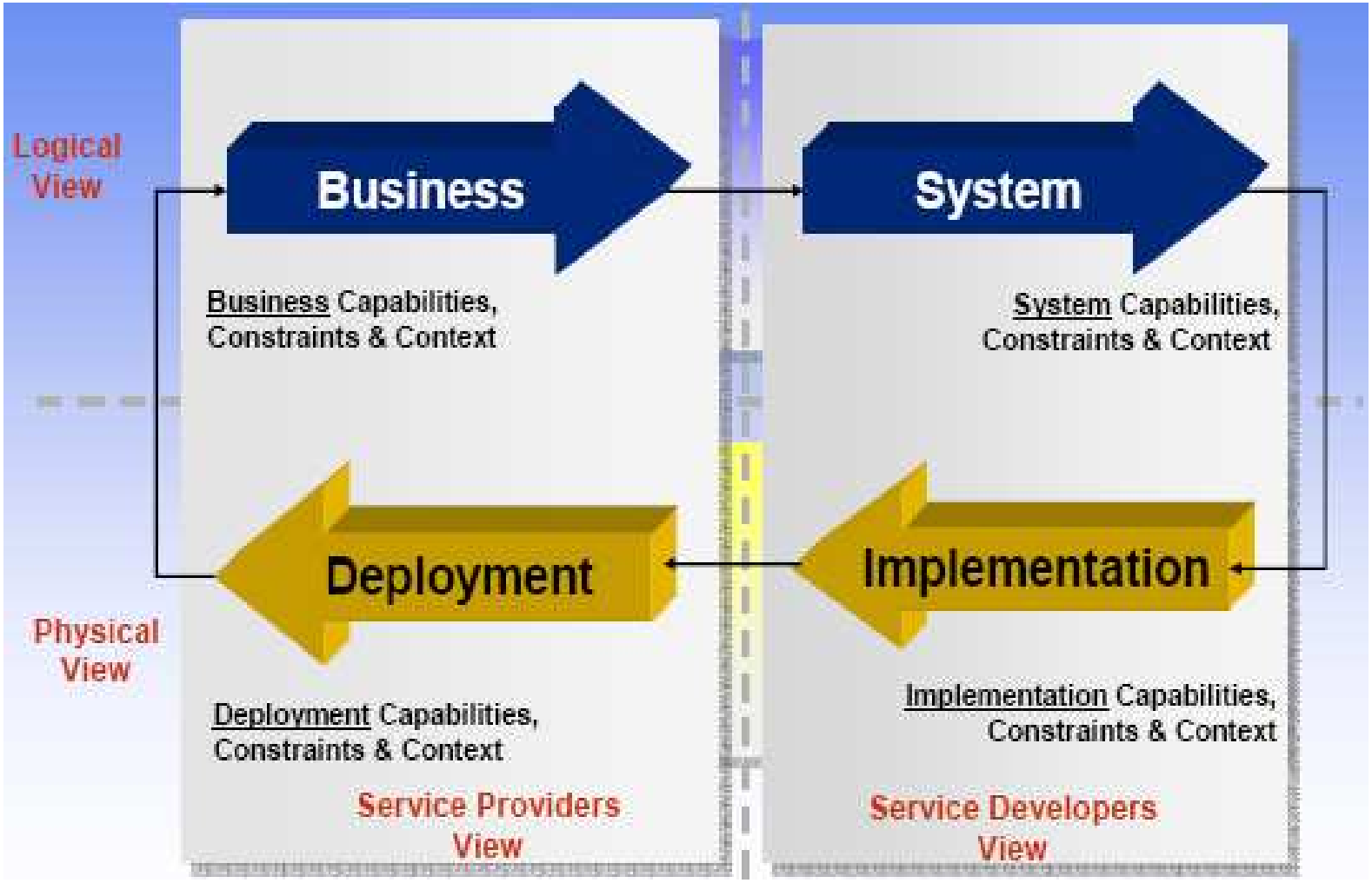
# Product – Service – Resource



# Technology Neutral Architecture



# NGOSS Lifecycle



# Plan

- Introduction
- 3GPP IP Multimedia Subsystem
- TISPAN NGN Architecture
- NGN Management
- Conclusion