FORUM ON NEXT GENERATION STANDARDIZATION

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Requirements and capabilities for an evolving NGN infrastructure

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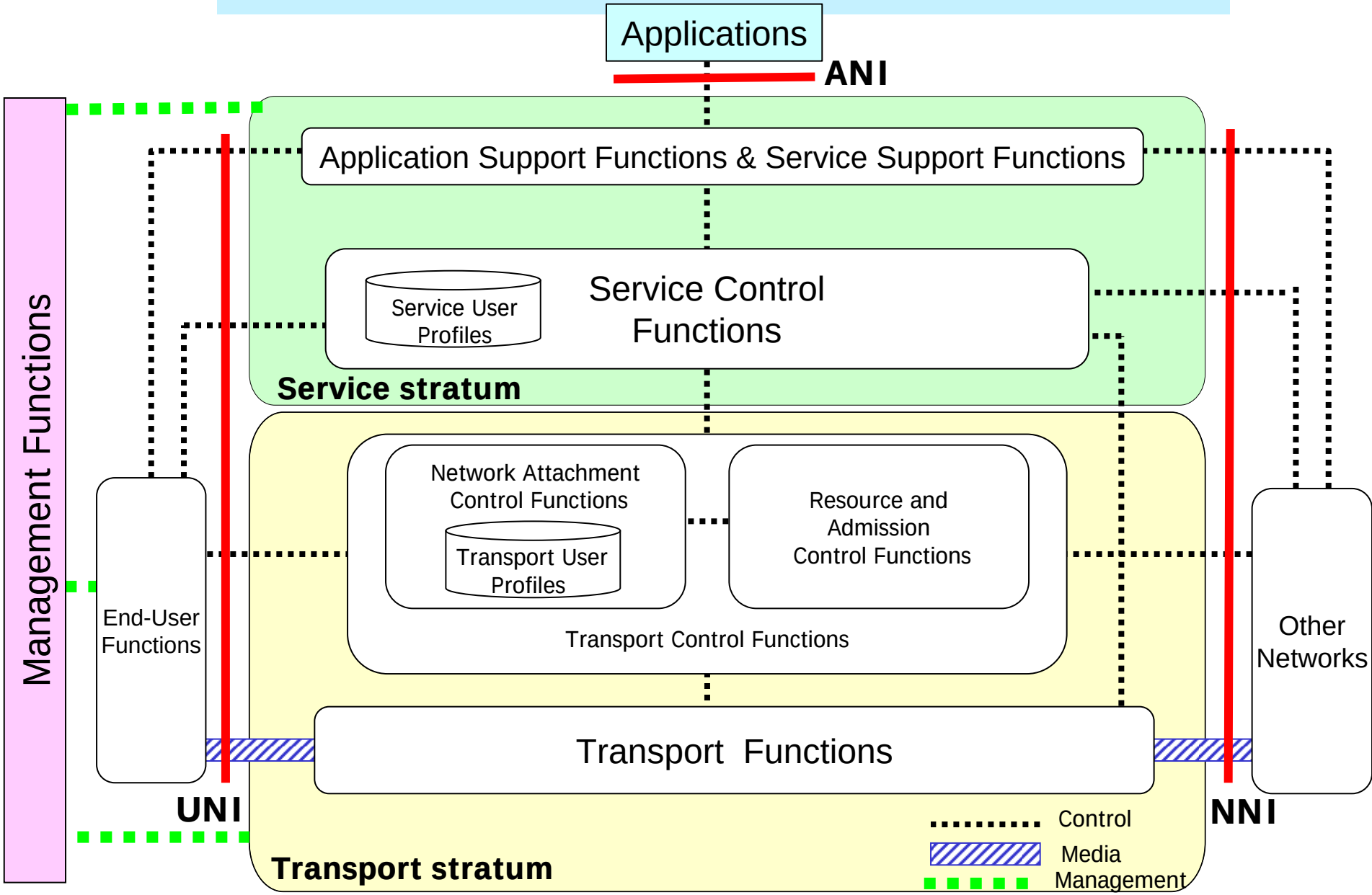
Outline

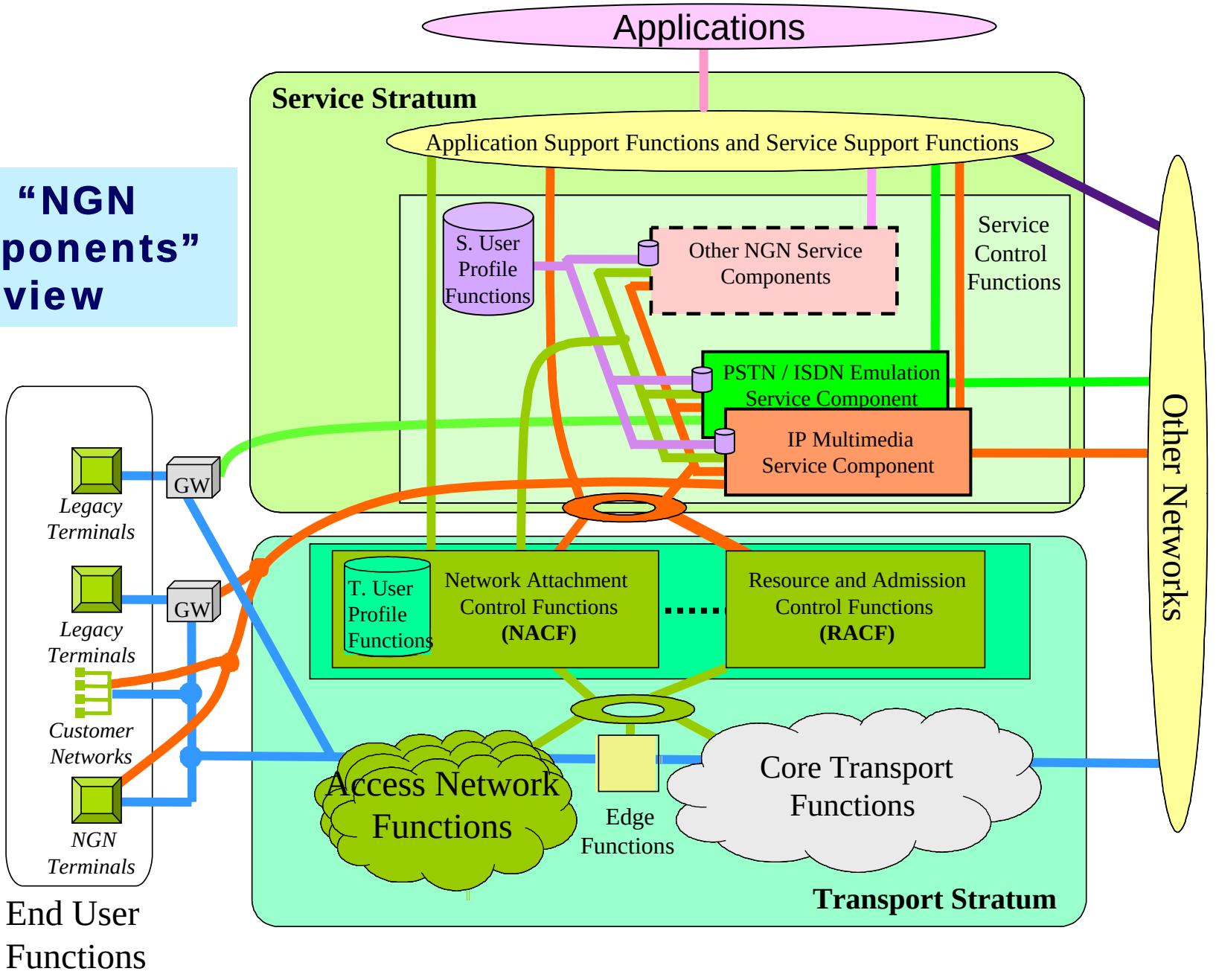
- Requirements and capabilities of an evolving NGN infrastructure in some key technical domains
  - Architecture
  - QoS
  - Mobility
  - Security and Identity Management
  - Interconnection
  - Accounting and charging

- NOTE: presentation focused on ITU-T SG13 work (but NGN related deliverables have been developed in various Study Groups)

Y.2012: basic functional view



A "NGN components" view



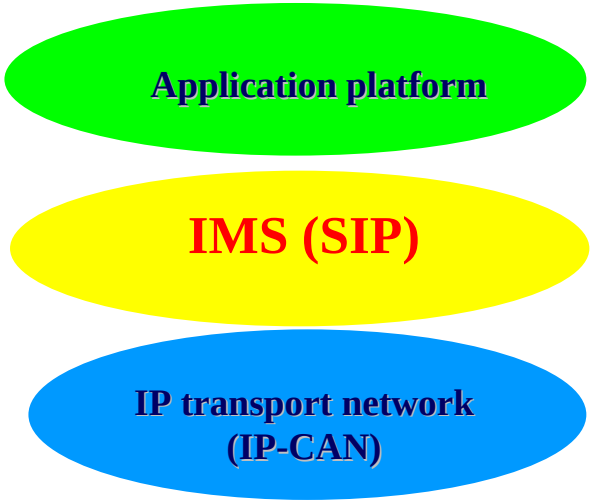
Y.2201 : NGN Release 1 Requirements and Capabilities

- Scope of Y.2201
  - **High level requirements and capabilities to support NGN Release 1 service objectives**

  NOTES:
  - Rel.1 addresses only NGN "network capabilities" (no user equipment)
  - Service-specific requirements are out of scope
  - Each NGN realisation may use an arbitrary set of services & capabilities
- The NGN Capabilities identified in Y.2201
  - Derived essentially from functionalities already developed in various technical bodies and considered ready for use in Rel.1 time frame
  - Described in terms of requirements (but these are not precise "Functional Requirements" for specific NGN entities)
  - Providing guidelines for the NGN architecture work so that the specified architecture FEs are able to support these capabilities and associated requirements (**architecture FEs and related protocol specifications)**
- **Y.2201 NGN Release planned for approval in Q2-Q3 2009**

IMS (IP Multimedia Subsystem)

- **3GPP IMS subsystem**
  - **Provision of call processing and a variety of multimedia services in an IP-based packet-switching domain**
  - Compliance with IETF standardized session control (SIP); profiling
  - Unique features of SIP for interactive end-to-end communications
  - Voice, video, presence, messaging, conferencing and others
  - Independence from Access Network
  - Application platform itself is outside the scope of IMS

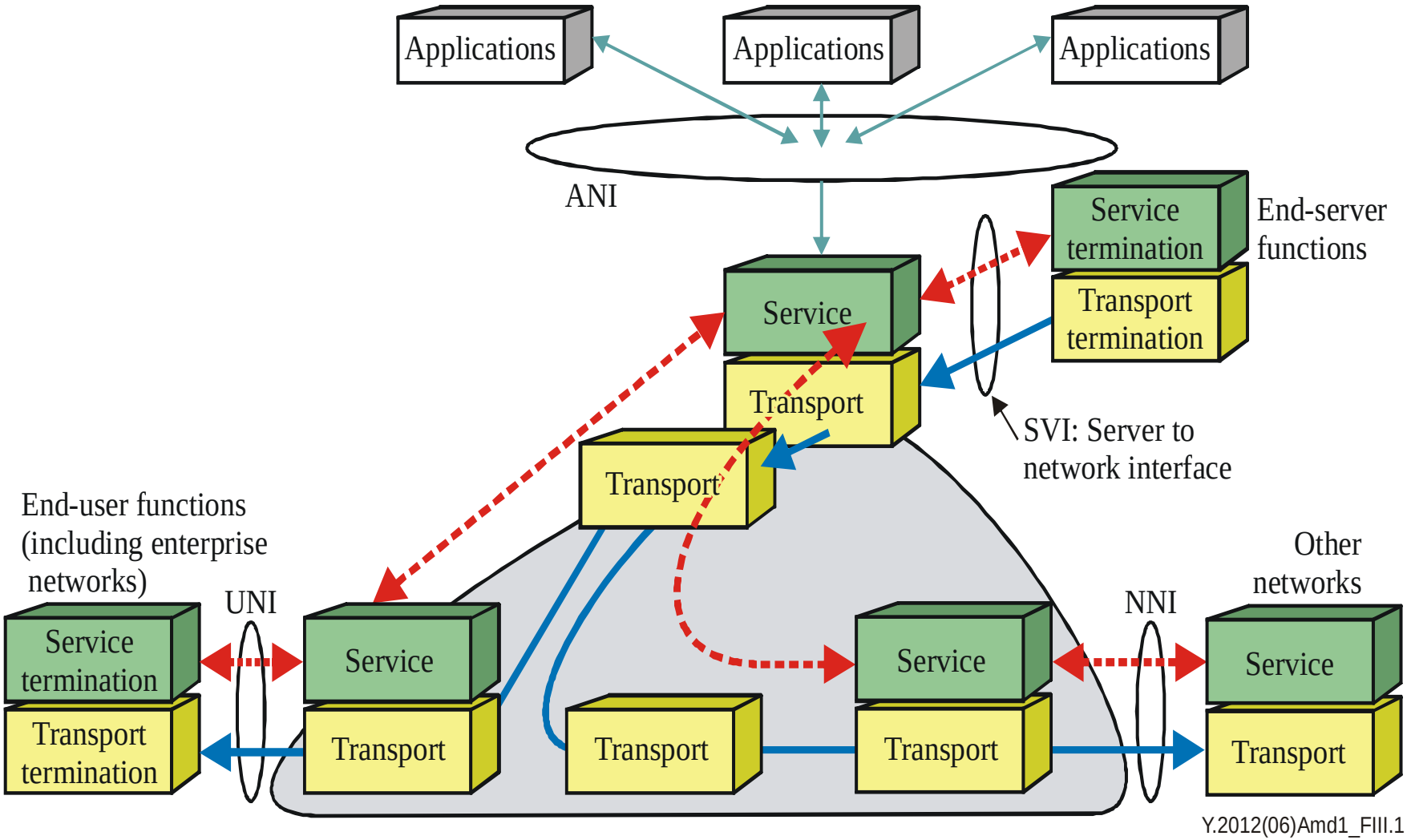


The central role of 3GPP IMS in NGN Release 1 Architecture

- **Advanced Architecture objectives**
  - Comprehensive set of services over a unifying IP layer network
  - Services separable from transport stratum into service stratum
  - Transport stratum support of a multiplicity of access networks and a variety of mobile and fixed terminal types
  - Services not limited to those provided by the "home network"
  - Services shall be able to traverse multiple providers' networks

- **About IP Multimedia Subsystem (IMS) in NGN**
  - IMS was unanimously agreed as central component in NGN
  - Leveraging the 3GPP IMS capabilities
    - but they need some extensions
    - other functions still needed
  - **Y.2012 (NGN Rel.1 functional requirements and architecture)**
  - **Y.2021 (IMS for NGN)**

Instantiation of NGN reference points – Appendix III Y.2012



Key architectural challenges

- Application-driven QoS:
  - QoS classes
  - Explicit bandwidth selection
  - Mapping & Control from Service to Transport
  - Flow awareness (monitoring, accounting)
- Mobility
  - Seamless handover
  - Fixed Mobile Convergence (FMC)
- Scalability
  - Multicast
  - Ubiquitous networking

"Ubiquitous networking" as a future target

- Which capabilities to enable "Any Service, Any Time, Any Where, Any Device" operations using NGN
- Human-to-human, but also human-to-machine and machine-to-machine communications
- "Draft" definition of ubiquitous networking [Y.NGN-UbiNet]
  - Ability for all of objects to communicate and access services without any restrictions at services, places, time, users, etc., in the context of the service(s) subscribed to
- Y.NGN-UbiNet - Overview and principles for ubiquitous networking in NGN (work just started)
  - Objectives of ubiquitous networking in NGN, fundamental characteristics and design principles including architectural model and enhanced capabilities

Quality of Service (QoS)

High level objectives in NGN Release 1

- End-to-end QoS environment for the services offered to end users via QoS coordination across the transport stratum
- NGN Release 1 shall provide an initial set of requirements, architectures, mechanisms and guidelines to enable end-to-end QoS

Key items under study

- Dynamic QoS controls, including
  - **Resource and admission control**
  - **Negociation of QoS requirements**
  - **Interworking of QoS mechanisms**
  - **Inter-domain considerations**
  - Frameworks aspects
- Performance objectives
  - Network performance classes and allocation
- Performance measurement, management and prediction

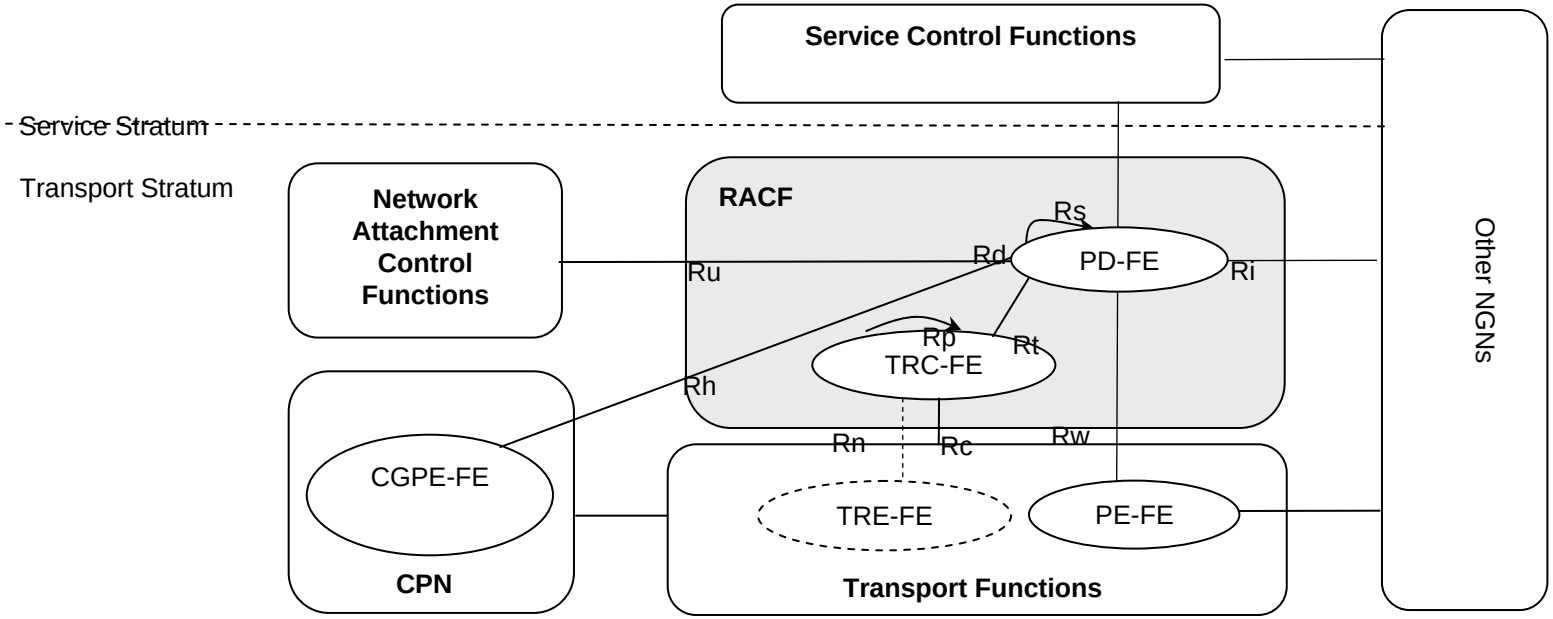
Aiming to develop a comprehensive QoS solution allowing incremental deployment

Resource and Admission Control Functions (RACF)

- Application-driven, policy-based resource management

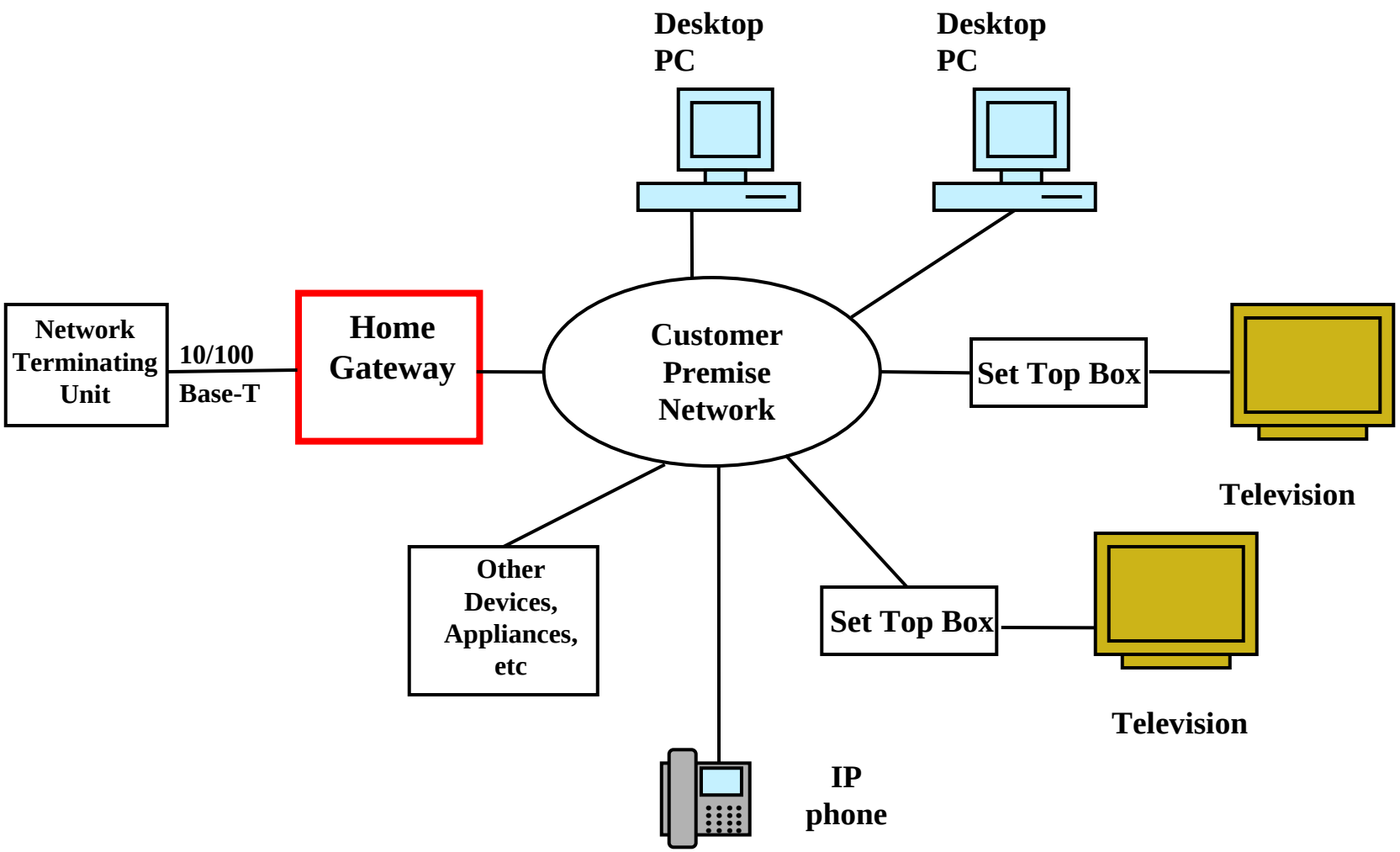
- Bridging service control and packet transport to dynamically guarantee QoS and enforce certain network security measures
  - QoS coordination in transport stratum through Access Network, Core Network and other NGNs
  - Different modes for policy control
  - Different resource management methods measurement, reservation
  - Endpoints of various QoS control capabilities
  - Relative and absolute QoS, including priority
  - Existing and emerging QoS transport mechanisms

Generic RACF architecture in NGN – Y.2111



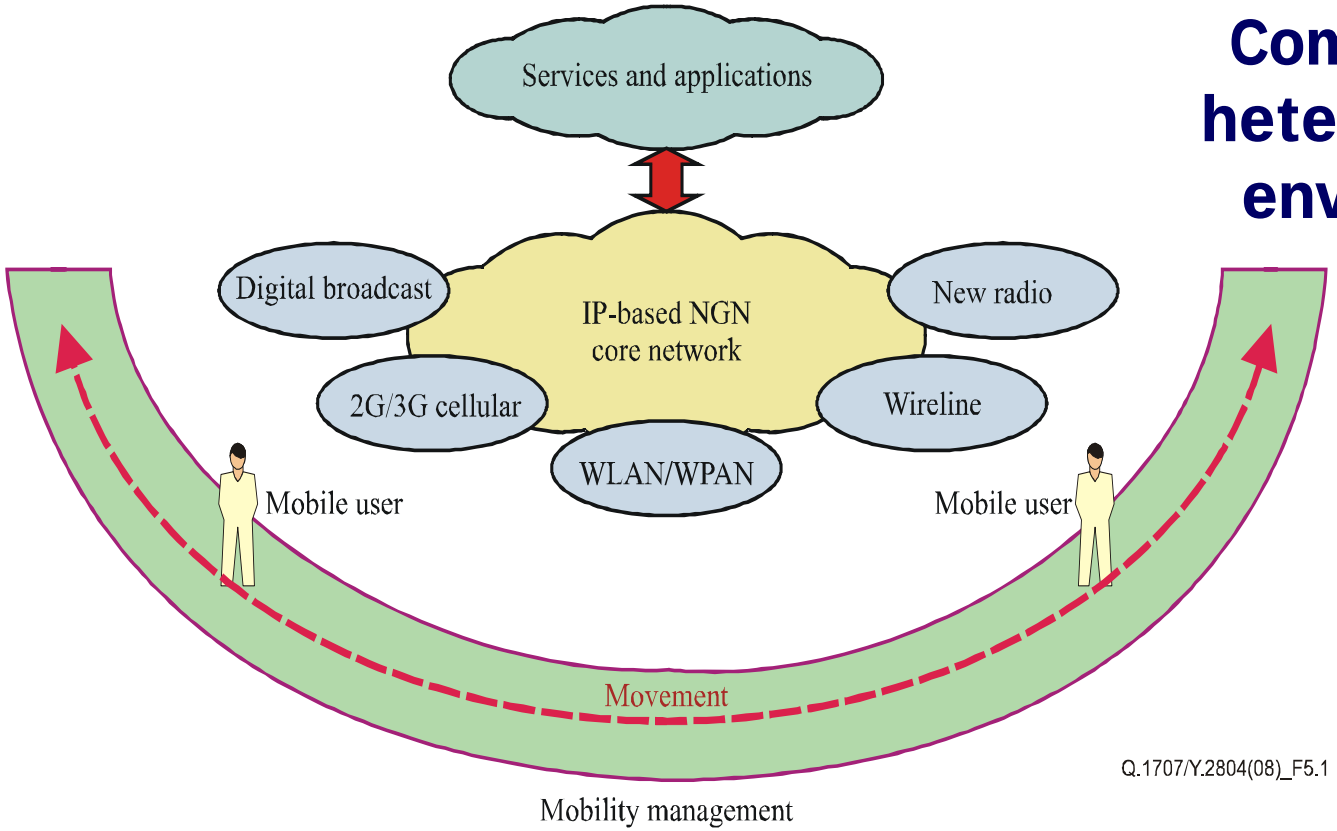
- Decomposition of PD-FE (Policy decision functional entity) and TRC-FE (Transport resource control functional entity) enables RACF to support a variety of access and core networks (e.g. fixed and mobile access networks) within a general resource control framework.
- PE-FE (Policy enforcement functional entity), packet-to-packet gateway at the boundary of different packet networks and/or between the CPN and access network, is key injection node to enforce dynamic QoS and resource control, NAPT control and NAT traversal.
- CGPE-FE (CPN Gateway Policy Enforcement Functional Entity) in CPN enforces transport policy rules for upstream traffic instructed by PD-FE.
- TRE-FE (Transport resource enforcement functional entity) enforces transport resource policy rules instructed by TRC-FE at the technology-dependent aggregate level.

QoS challenges in customer premise network



Home Gateway issues and QoS per device/terminal

Mobility: a fundamental enabler of NGN

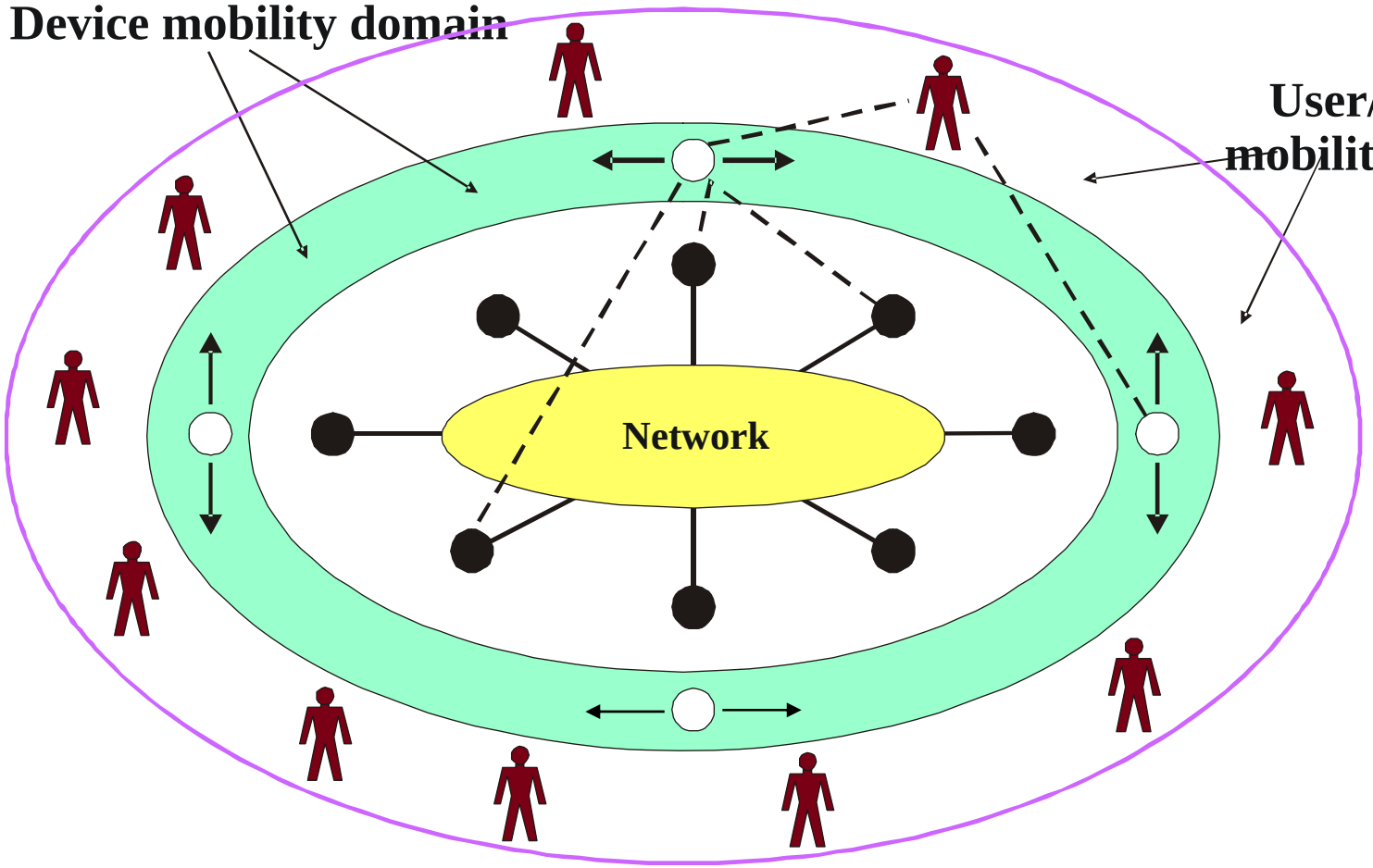


Complex and heterogeneous environment

Basic User Requirements

- Access from a variety of environments with a variety of terminals with varying capabilities
- Global roaming, and ubiquitous and seamless solutions

Mobility domains and types - Y.2011

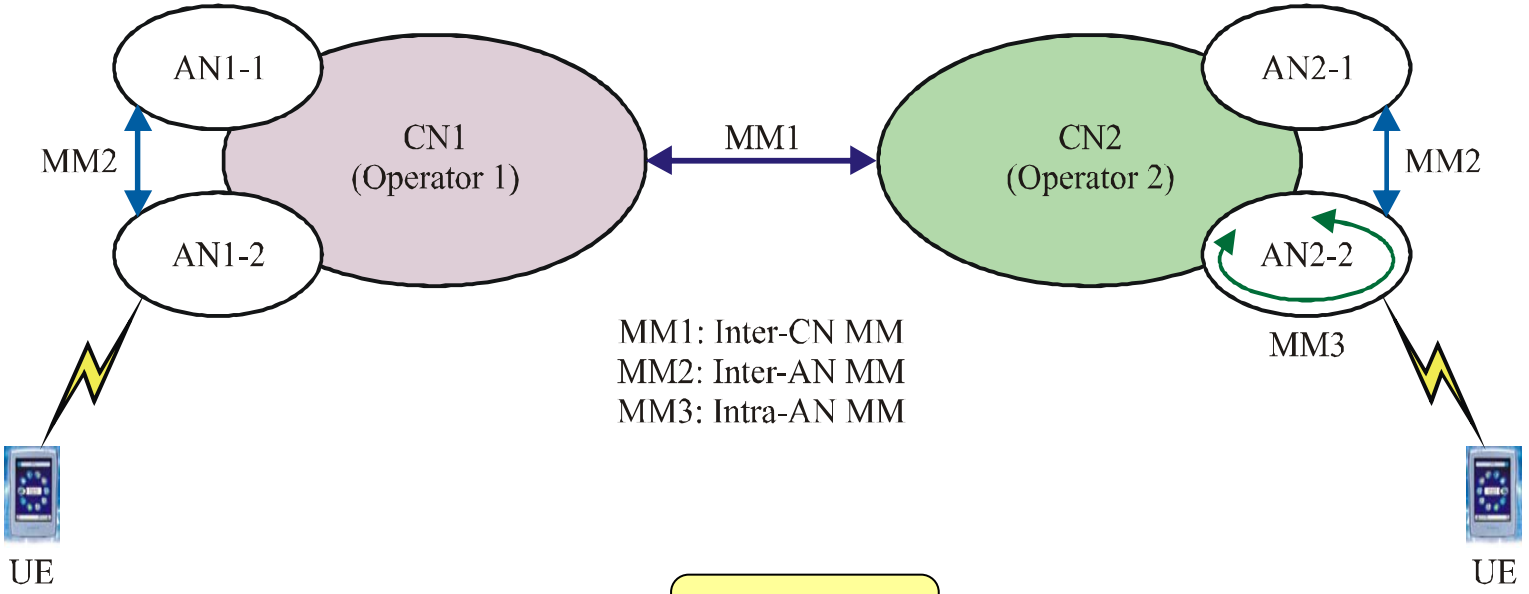


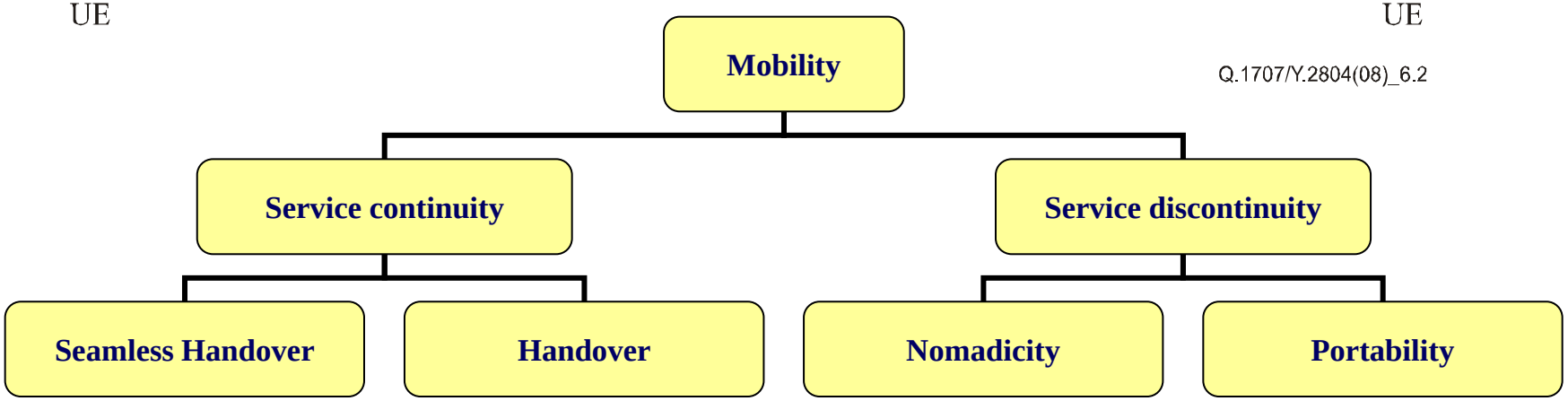
Points of attachment (POA)

Telecommunications objects (mobile with transient binding to POA)

Transient binding (mobile with transient binding to device/service)

Other dimensions of mobility





Q.1707/Y.2804(08)_6.2

Q.1706/Y.2801

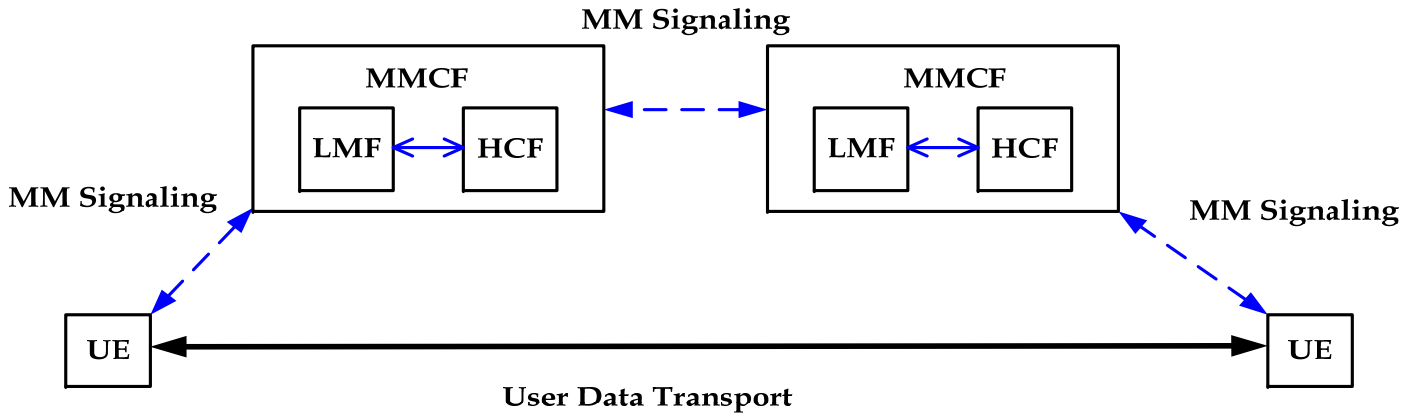
Limited Mobility objectives in NGN Release 1

- **NGN Release 1 shall support "Nomadism"**
  - **"The ability to change network access point on moving, without maintaining service continuity"**
  - To be supported between networks and within a network
  - But support for service continuity is not excluded

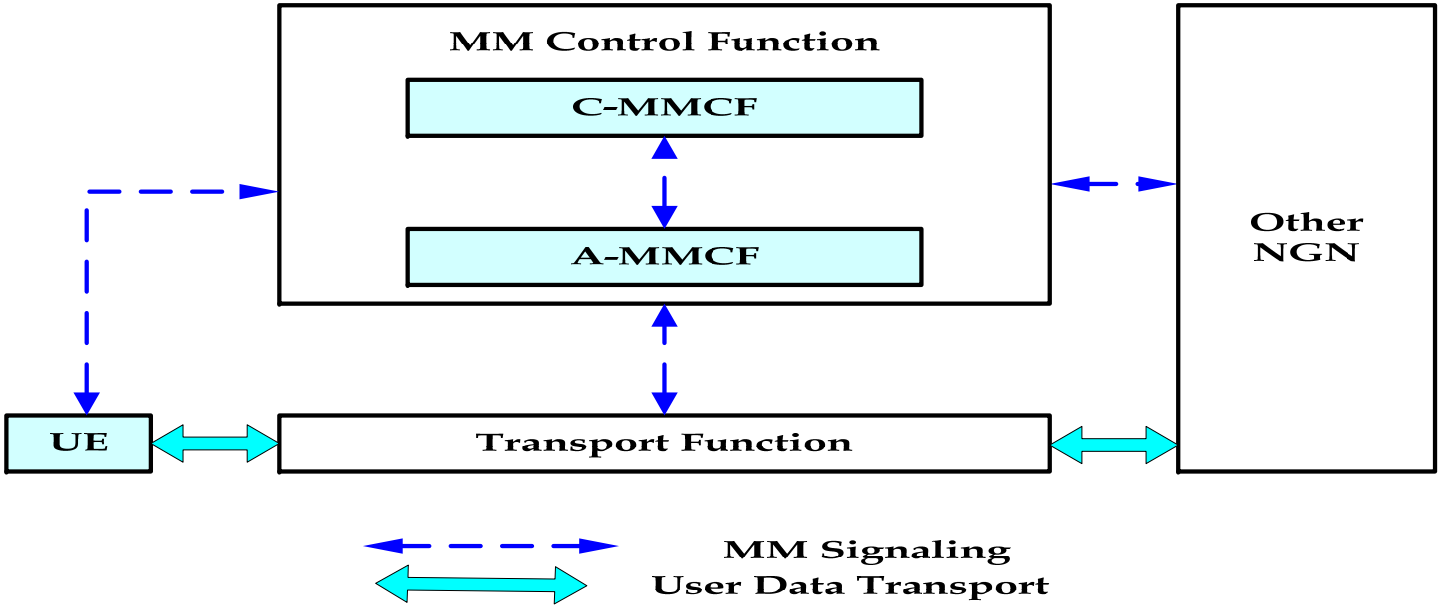
- **No new interfaces defined for Release 1 mobility**
  - **Personal mobility**
  - **Terminal Mobility**

The initial step towards
Generalized Mobility and Fixed Mobile Convergence

MM functional architecture – Q.1707/Y.2804

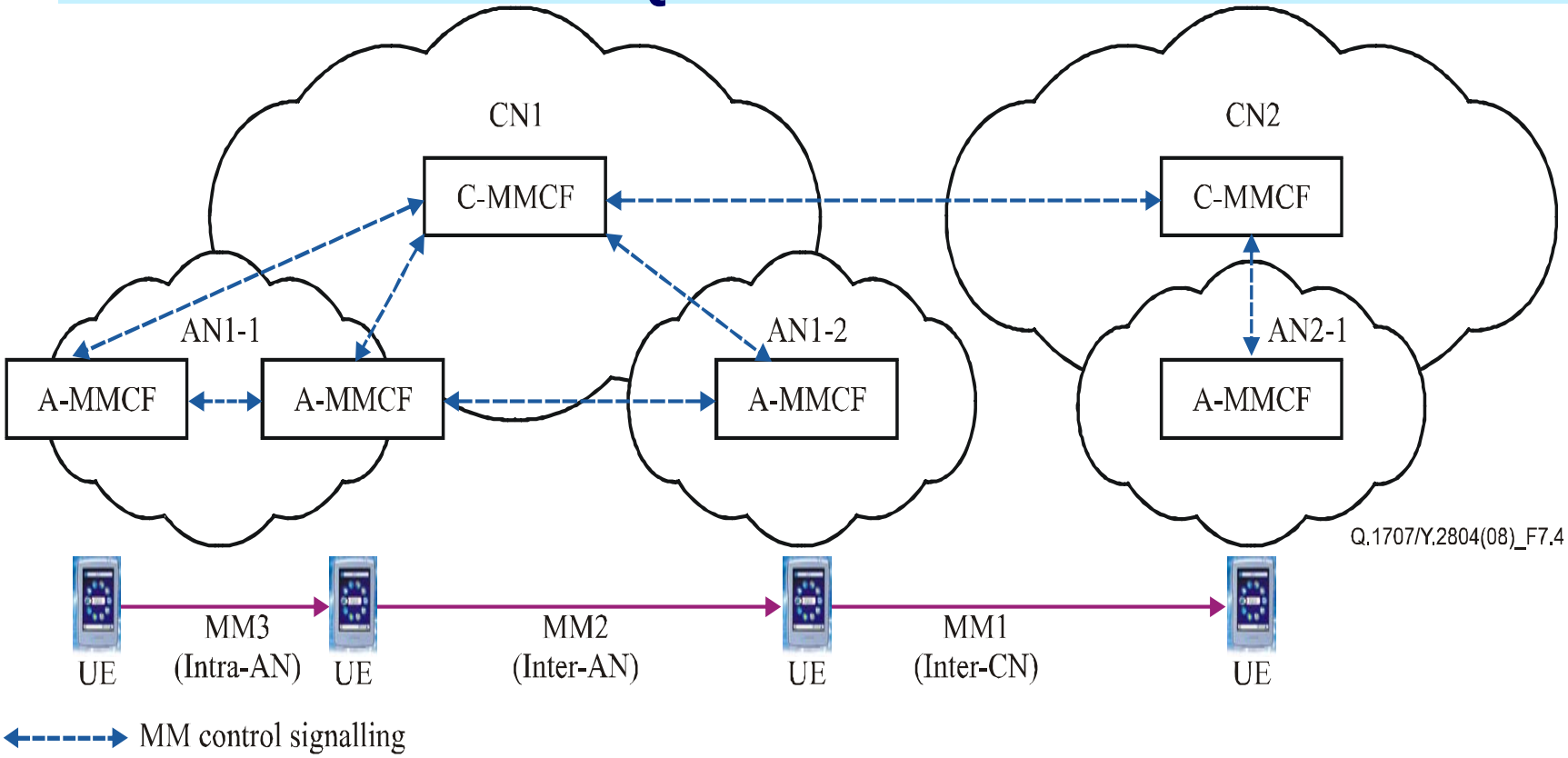


- Mobility management control function (MMCF) model



- MMCF functional architecture in NGN

Example of MMCF network configuration – Q.1707/Y.2804



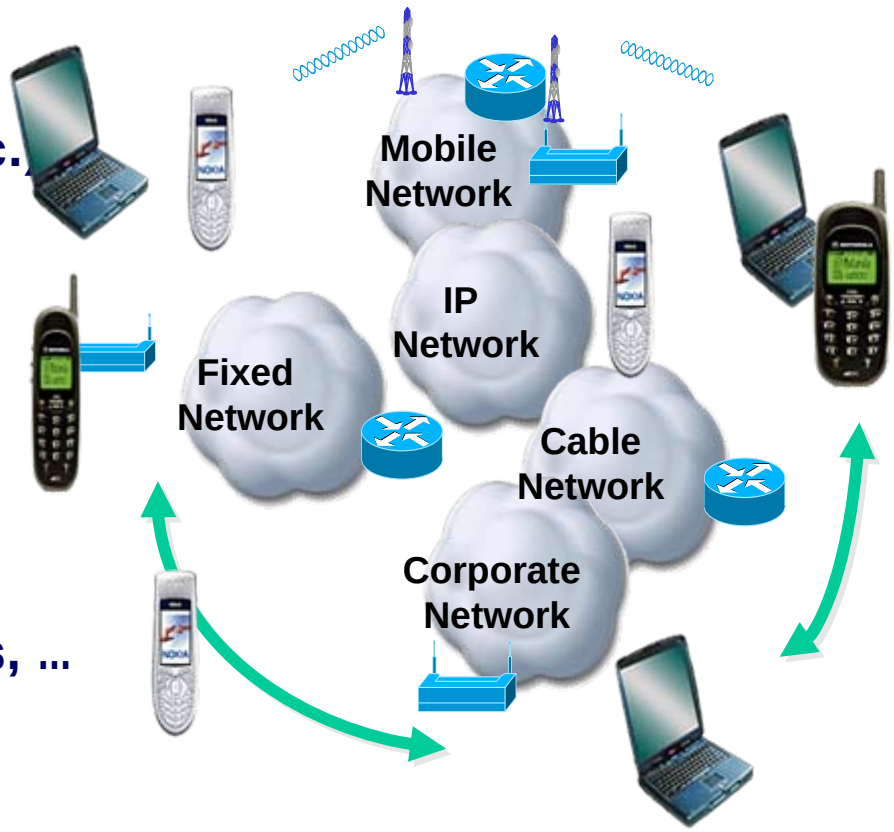
Initial step of detailed functional mapping within the NGN architecture framework is currently progressing in Y.MMCF

- Architecture and functional requirements for management of logical location information and control of mobility in NGN transport stratum

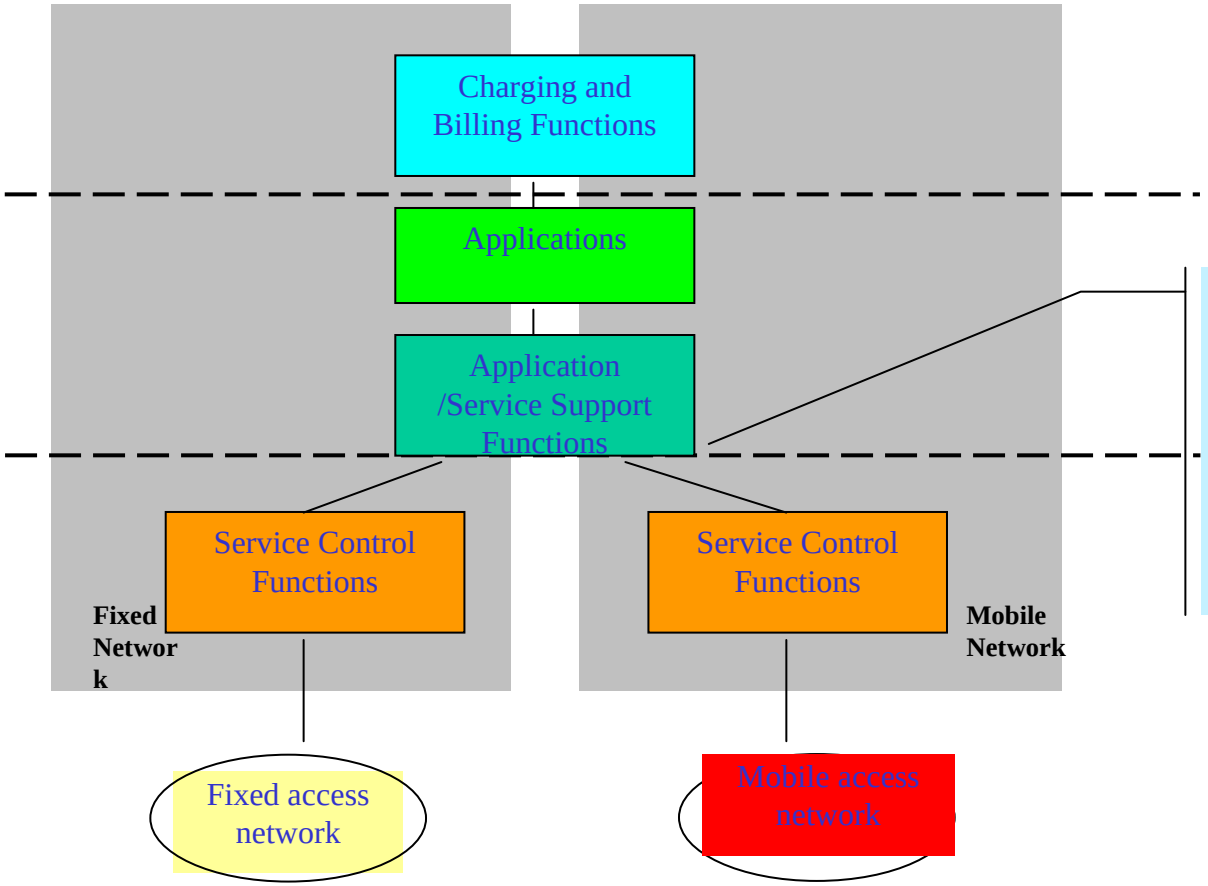
Towards Fixed Mobile Convergence: but which convergence ?

The multiple dimensions of convergence

- Converged services
  - Service integration (voice and multimedia, messaging, presence etc.)
- Converged service platform
- Converged networks
  - Access and core, incumbent and competitive, wireline or wireless, VNO, ISPs and Broadband SPs
- Converged devices
  - Phones, smartphones, PDAs, laptops, ...
- Converged management
  - Seamless service provisioning



Functional scenarios of convergence - Q.1762/Y.2802



Example of convergence at Application/Service Support Functions

Convergence may be happen at different functional levels

Y.2802: FMC characteristics, requirements, capabilities and scenarios

Security

Security objectives

- Address security dimensions
- Address security features required for secure domain interconnection

Security Requirements for NGN Release 1 (Y.2701)

- Security dimensions and countered threats (**ITU-T X.805 principles**)
- Security threats and risks in NGN
- Security trust models
- Security architecture
- Security objectives

- **Requirements of NGN network elements**
  - Common requirements
  - In Trusted Zone
  - Network border elements
  - CPE border elements
- Objectives and reqts for Emergency Telecom. Services

Other security topics:

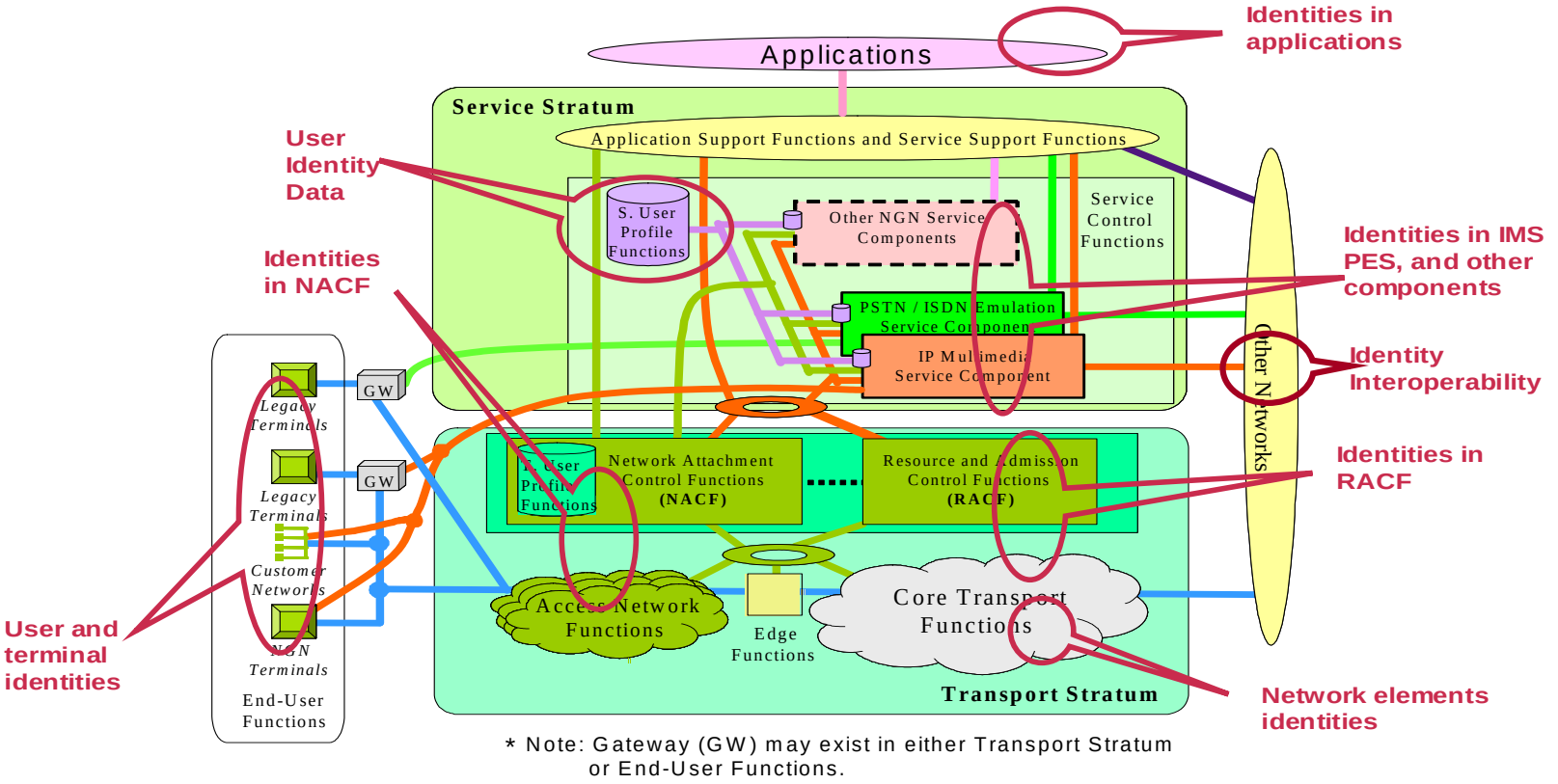
- NGN Authentication and authorization requirements (Y.2702)
- AAA service in NGN (Y.2703)
- Ongoing: NGN Certificate Mgt, NGN Security mechanisms and procedures, Mobility security framework in NGN, Secure solutions for mobile commerce and banking
- **Identity Management**

Security of financial transactions – future item

- Security solutions supporting scenarios where
  - a mobile terminal serves as a payment or banking terminal, and
  - NGN is used as transport to carry transaction flows
- Related security issues include
  - network and interface functions to support transaction protection, privacy policy, financial infrastructure protection, subscriber protection and identity management aspects
- Planned draft Recommendations
  - “Security requirements for mobile financial transactions in NGN”
  - “Architecture for secure mobile financial transactions in NGN”

Identities are not needed only for “Users”

- The figure below shows examples of identities mapped into the NGN architecture
  - Identities for devices, network elements, network components, applications, service providers etc.



Identity Management (IdM): a key ongoing activity

- Working definition for IdM (Q.16/13)
  - "Management by NGN providers of trusted attributes of an entity such as a subscriber, a device or a provider".

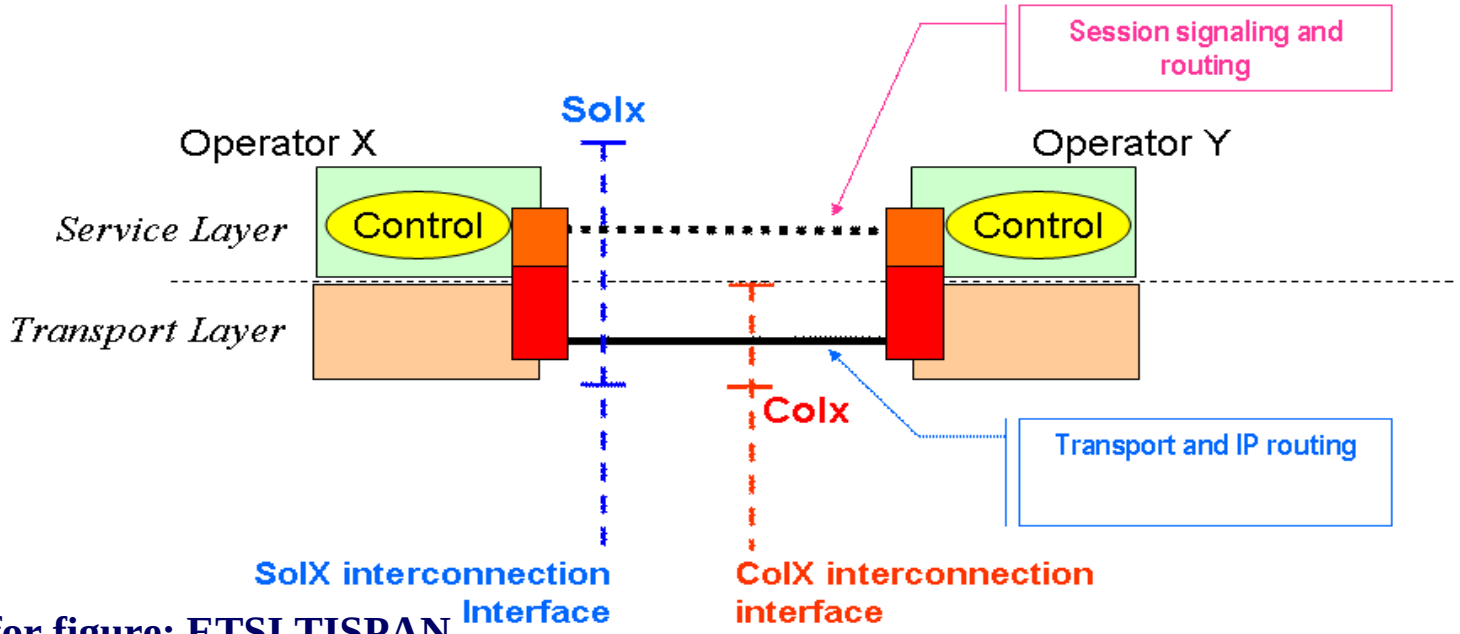
    This is not intended to indicate positive validation of a person.
- Challenges of identity information assurance, security and management
  - End users are increasingly using multiple identities
  - These identities may be associated with differing contexts and service privileges
  - The identities may only partially identify the end user
  - The identities may be used anywhere, anytime
  - The identities may not be interoperable between providers

NGN Identity Management framework - Y.2720

- A structured approach for designing, defining, and implementing *interoperable* Identity Management (IdM) solutions for NGN
- Y.2720 identifies a set of capabilities
  - e.g., administration, discovery, communication exchanges, correlation and binding, policy enforcement, authentication and authorization
- These capabilities
  - allow assurance of identity information (e.g., identifiers, credentials, and attributes)
  - allow assurance of the identity of an entity (e.g., users/subscribers, user devices, service providers, and network elements)
  - support and enhance business and security applications

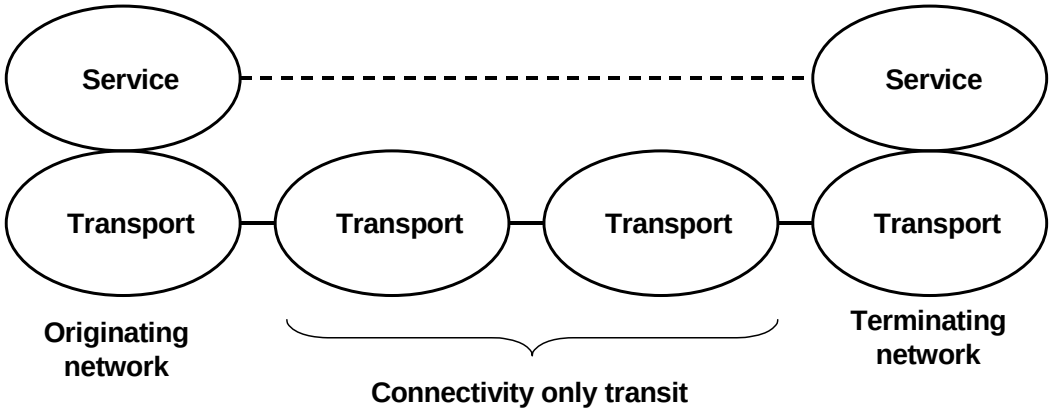
Interconnection of NGN with other networks

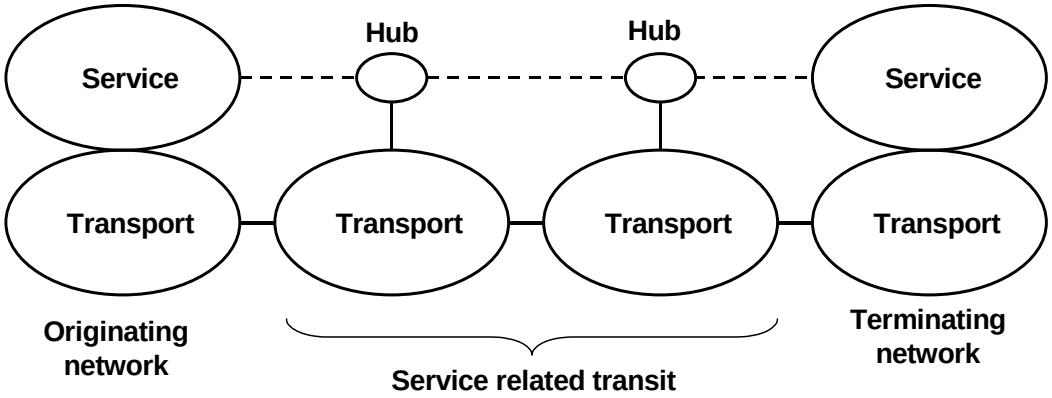
- **Interconnection at Network to Network Interface**
  - Between multiple NGN domains, between NGN and other networks
- **Two types of Interconnection**
  - **Connectivity-oriented Interconnect (ColX) is required**
    - Simple IP connectivity, irrespective of interoperability levels
    - No service awareness, no specific requirements assurance
  - **Service-oriented Interconnect (SolX) is not *precluded* (R1)**
    - **Services offered with defined levels of interoperability**



Source for figure: ETSI TISPAN

SoIX versus CoIX





- CoIX – transit network is an IP pipe
  - Transit network operator not aware of service
- SoIX – sessions routed through transit network SIP proxies
  - Transit network aware of service
- Both require a SIP NNI
- SoIX enables transit network to:
  - Account + charge based on service (phone call, video call etc.)
  - Apply dynamic (transport) resource reservation based on service

- Both likely to co-exist
  - CoIX is a special case of SoIX (with no intervention at the service layer)
  - Different markets – some carriers will want to peer with a transit network and account based on phone calls/sessions, others will want to peer at IP level only. Depends on pricing / revenue flow / traffic mix.
  - GSMA IPX allows either pure L3 or Application layer peering

Interconnection capabilities (R1 objectives)

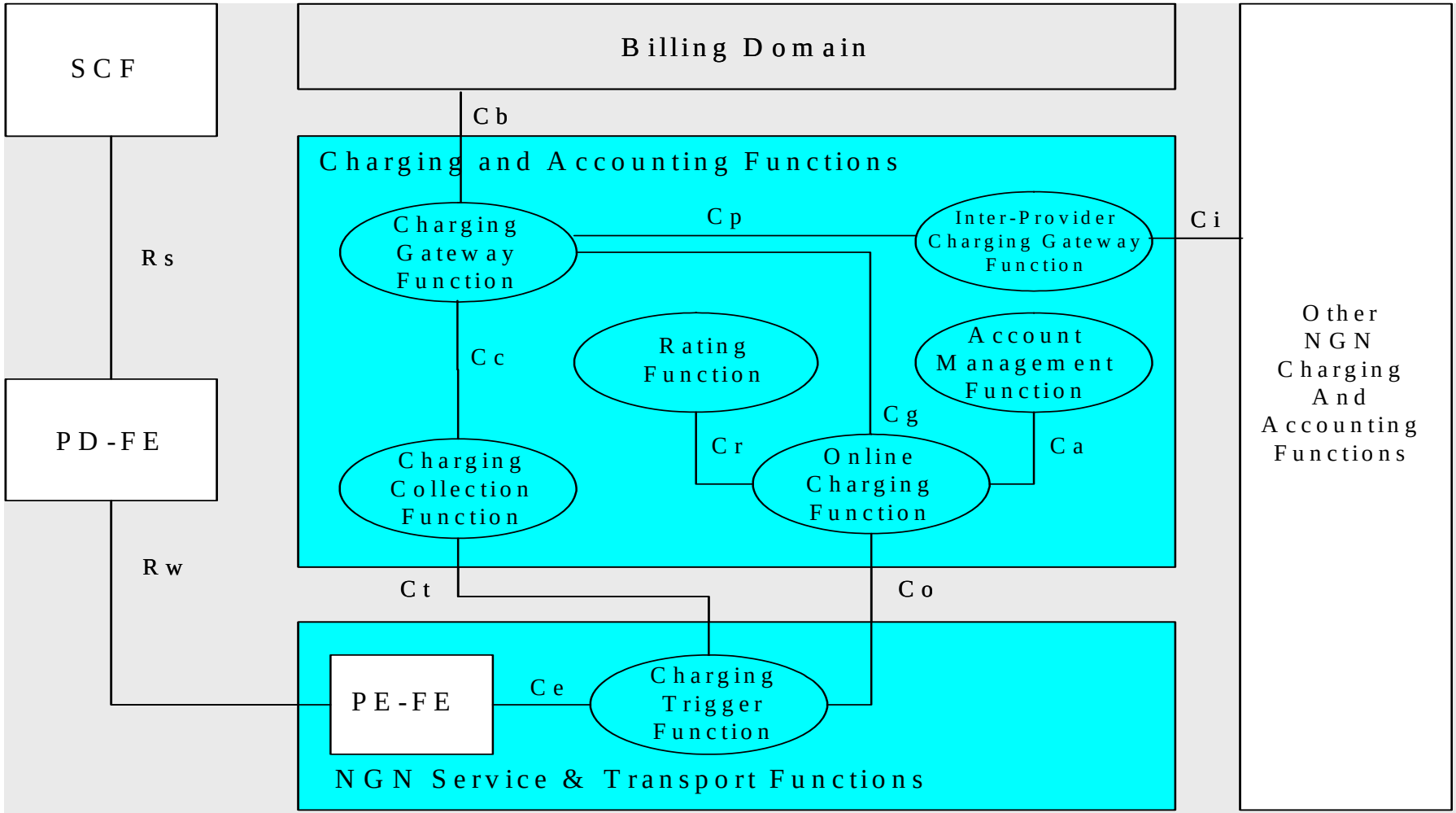
- routing;
- signalling interworking;
- numbering, naming and/or addressing interworking;
- accounting and charging related information exchange;
- security interworking;
- QoS interworking;
- user and terminal profile information exchange;
- media interworking;
- management interworking;
- policy management

ITU-T NGN NNI deliverables

- **Q.3401 NGN NNI signalling profile (protocol set 1)**
  - SIP-NNI with codecs/RTP profiles rules and recommendations
  - Includes ability to carry MIME encapsulated ISUP (SIP-I)
  - Originally for voice services only – recently amended for video/data services
- **Q.1912.5**
  - Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control protocol or ISDN User Part
  - Not an "interconnection" spec but useful in defining SIP-I

Y.2233 Rev1 (ongoing): Y.2233 extensions to enable policy-based accounting and charging capabilities in NGN

- Multiple relevant attributes for policy enabled **c**harging and accounting
  - access specific characteristics, bearer QoS, service type, time, user subscription information, others



Numerous other developments …

- ITU-T ongoing standards developments address NGN capabilities in numerous other technical domains including
  - Management,
  - Migration
  - Performance, measurement, testing
  - IPv6
  - Home networking
  - Advanced service enablers and service oriented infrastructure
  - Enhanced access and core transport
  - Emergency telecommunications and accessibility
  - And others

A global ITU standardization effort for an advanced telecommunication infrastructure able to evolve and adapt to the emerging and varying requirements of the user community

Thank you for your attention

Questions ?