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ITU-T NGN GSI: progress in standardization of capabilities for an evolving NGN

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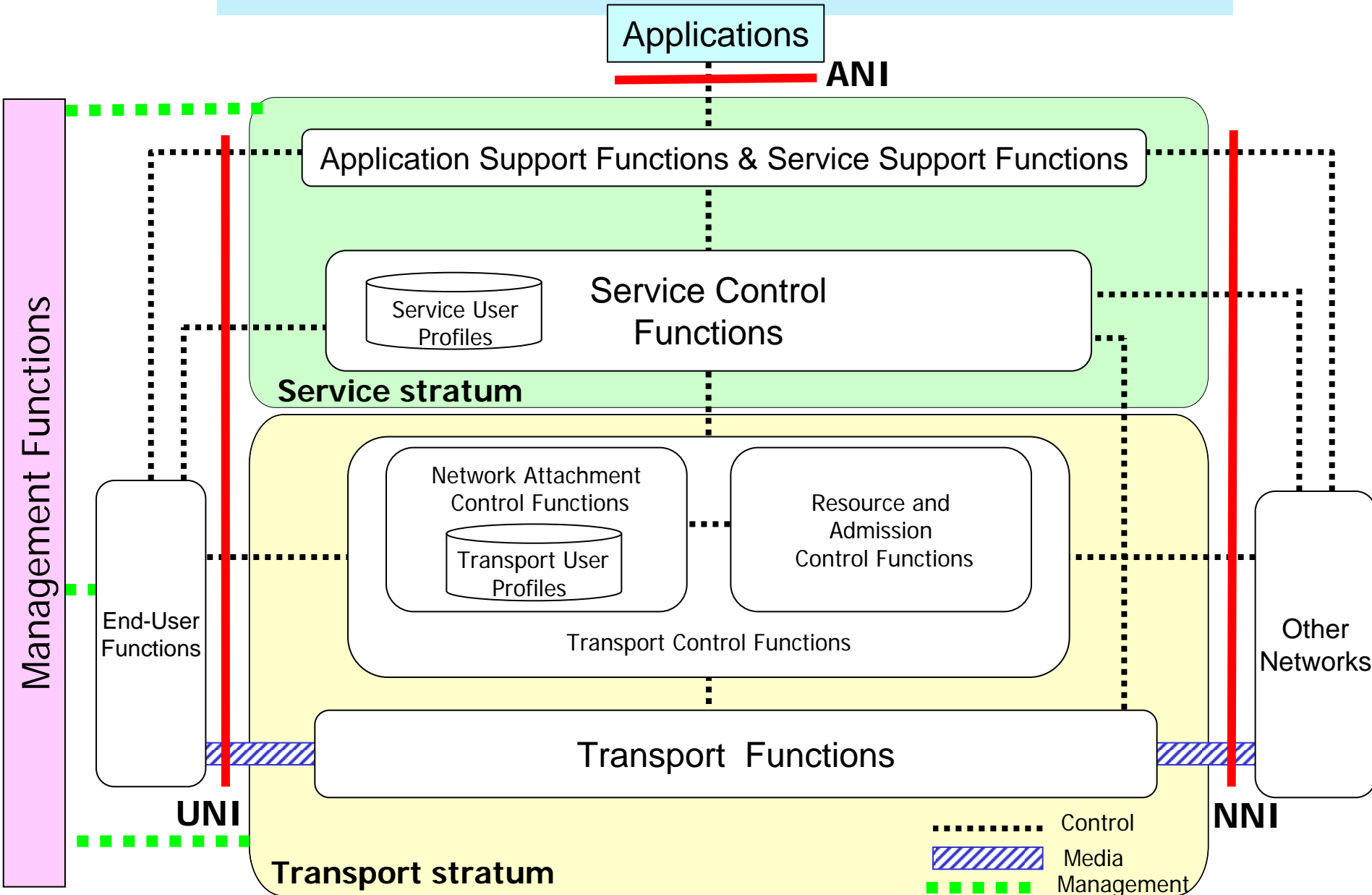
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Outline

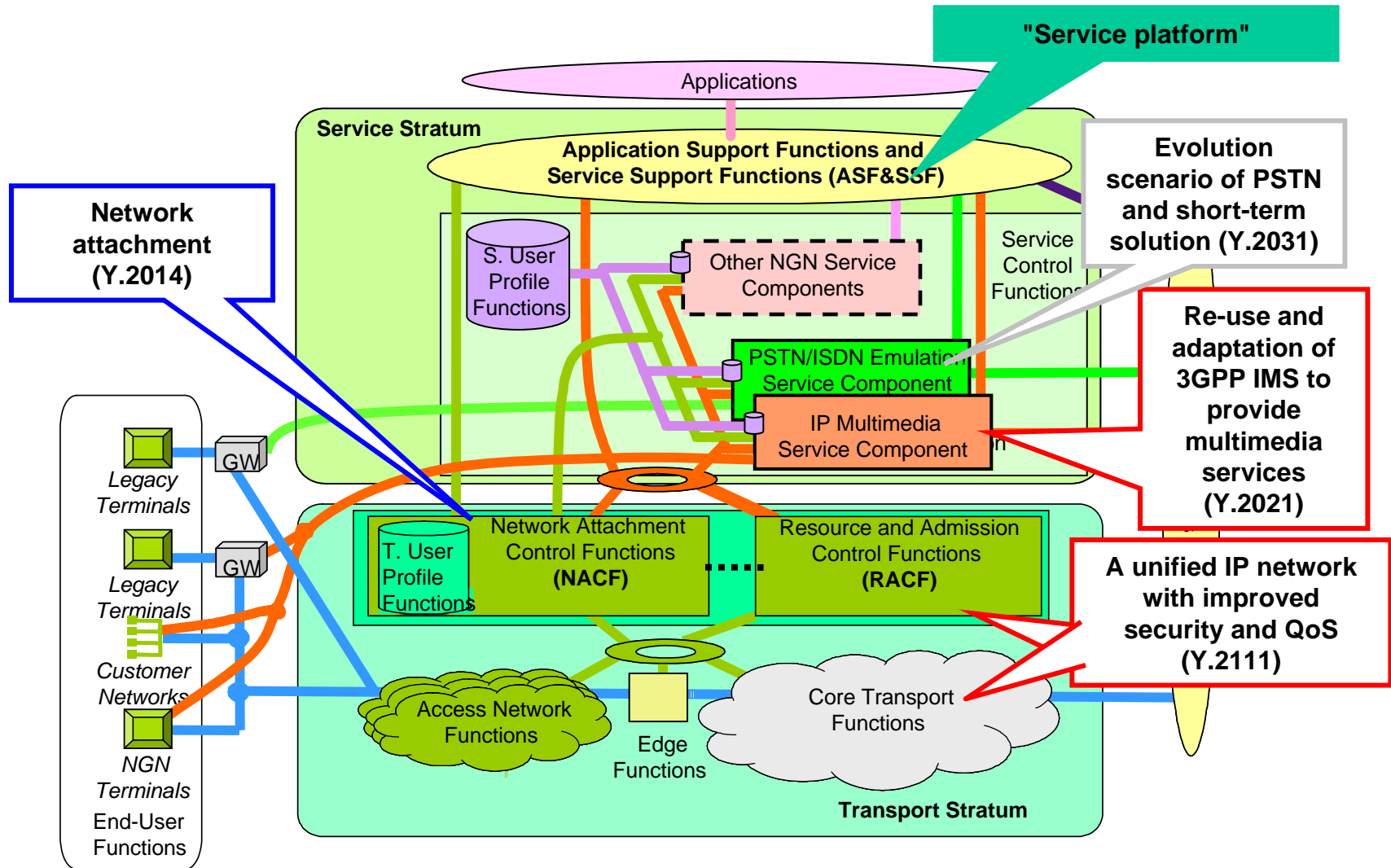
- o NGN capabilities [Y.2201]
- o Requirements and ITU-T NGN GSI standardization progress in some key technical areas
 - Architecture
 - QoS
 - Mobility and FMC
 - Security and Identity Management
 - Interconnection
 - Accounting and charging

NOTE: this presentation focuses on the work of SG13 and SG11 - core SGs of ITU-T NGN GSI - but other SGs have also produced NGN deliverables (SG2, ex-SG4, SG9, SG12, SG15, SG16, SG17, ex-SG19)

Y.2012 : basic functional view of NGN



A "NGN components" view




Requirements and Capabilities of NGN

- o **Y.2201 "High level requirements and capabilities to support NGN Release 1 service objectives"** - approved in April 07
 - Only network capabilities (no user equipment capabilities)
 - No service-specific requirements
 - Identified capabilities derived from functionalities developed in various SDOs and ready for use at Rel.1 time frame
 - No precise "functional requirements" for specific NGN entities, rather guidelines for the NGN architecture so that the Architecture FEs are able to support these capabilities and associated requirements

- o **Y.2201 Rev.1 (formerly NGN Rel.2) Requirements and capabilities for ITU-T NGN** - determined in May 09
 - Includes user related and service-specific requirements

NOTE: each specific NGN realisation may support an arbitrary set of services, thus requiring the implementation of an arbitrary set of capabilities

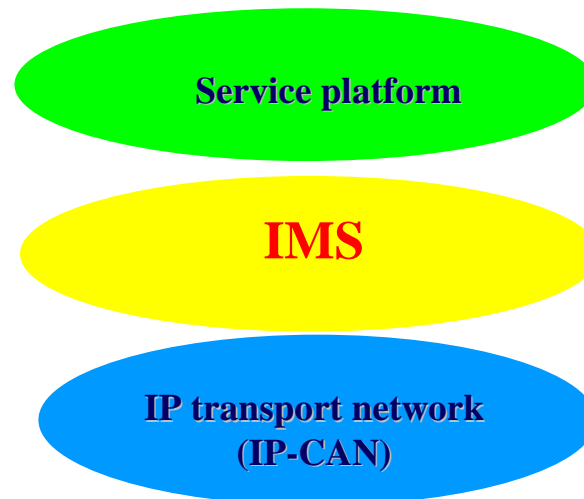
The NGN capabilities identified in Y.2201

- o Transport connectivity
 - o Communication modes
 - o Multicast
 - o Media resource management
 - o Codecs
 - o Access Networks, network attachment
 - o User networks
 - o Interconnection, Interoperability and Interworking
 - o Numbering, naming, addressing
 - o Identific., authentic., authoriz.
 - o Security
 - o Routing
 - o QoS
 - o OAM and Survivability
 - o Accounting and Charging
 - o Management
- Y.2201 Rev.1 
- o Mobility handling
 - o Service enablers
 - o Open service environment
 - o Profile management
 - o Policy management
 - o PSTN/ISDN emulation and simulation
 - o Public Interest Services support
 - o Critical infrastructure protection
 - o Non disclosure of info across NNI
 - o Inter-provider exchange of user-related information
 - o Context management
 - o Identity management
 - o Content management
 - o IPTV services support capabilities
 - o Enterprise Networks support capabilities
 - o IPV6 support capabilities

3GPP IP Multimedia Subsystem (IMS)

o IMS highlights

- 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 other features
- Independence from the Access Network
- The Service platform itself is outside the scope of IMS

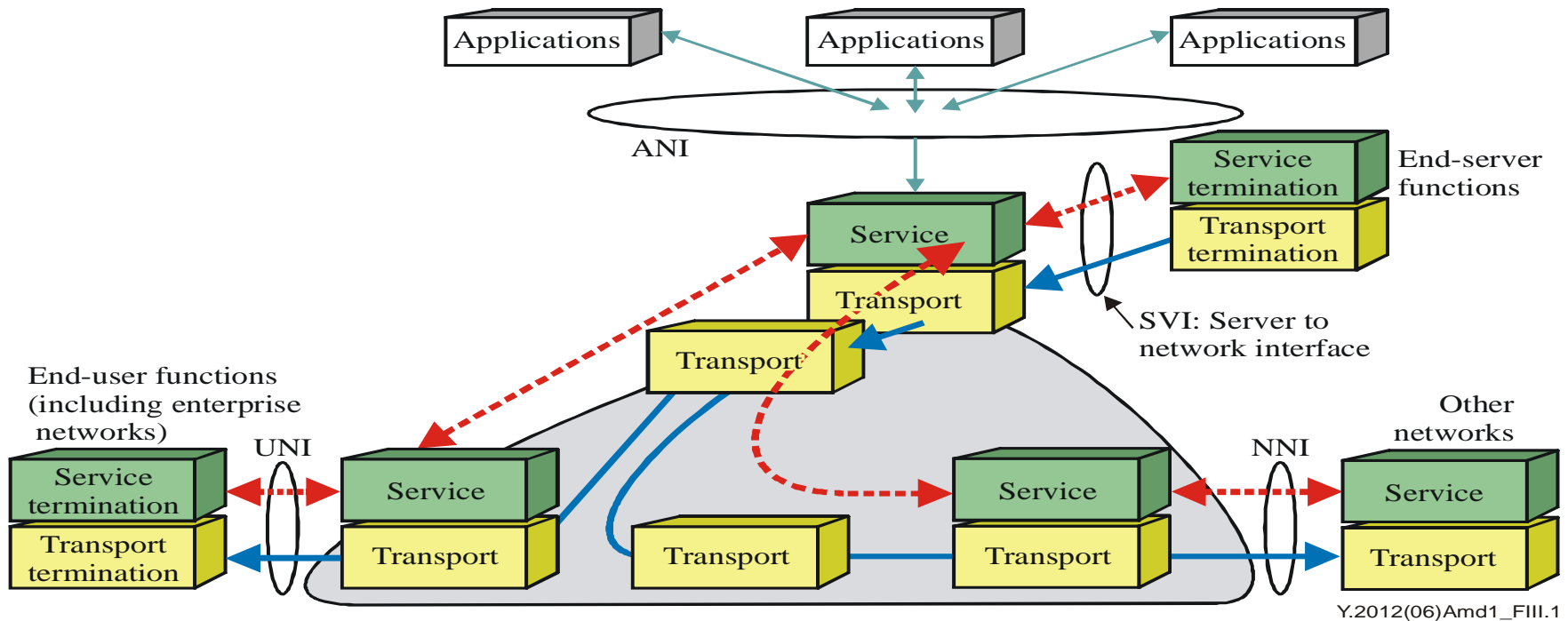


NGN Architecture objectives and IMS

- **The advanced objectives of the NGN Architecture**
 - Support of a comprehensive set of services over a unifying IP layer network
 - Transport stratum support of a multiplicity of access networks and a variety of mobile and fixed terminal types
 - Services separable from transport stratum into service stratum
 - Services not limited to those provided by the “home network”
 - Services able to traverse multiple providers’ networks

- **IMS is a core component of the NGN Architecture**
 - IP Multimedia Service component
 - The capabilities of 3GPP IMS can be used by the NGN
 - but some extensions of 3GPP IMS specifications are required
 - IMS alone is not sufficient for the NGN
 - Y.2012 “NGN Rel.1 functional requirements and architecture”
 - Y.2021 “IMS for NGNs” - NGN Rel.1 deliverable

NGN reference points in the NGN Architecture



Instantiation of NGN reference points - Appendix III Y.2012 (Jan 08)

- ANI provides control-level interaction (no media flows across ANI)
- SVI introduced as access interface for service partners (content providers, data information providers, application service providers)
 - Support of special requirements (transport and signalling resource capacity, customized policy, multicast injection of media flows, unrestricted server role)
 - Exchange of transport-level media flows and service-level signalling flows
 - How to implement SVI as detailed functional entities is for further study

Key NGN architectural challenges

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

Quality of Service (QoS)

High level objectives (NGN Release 1)

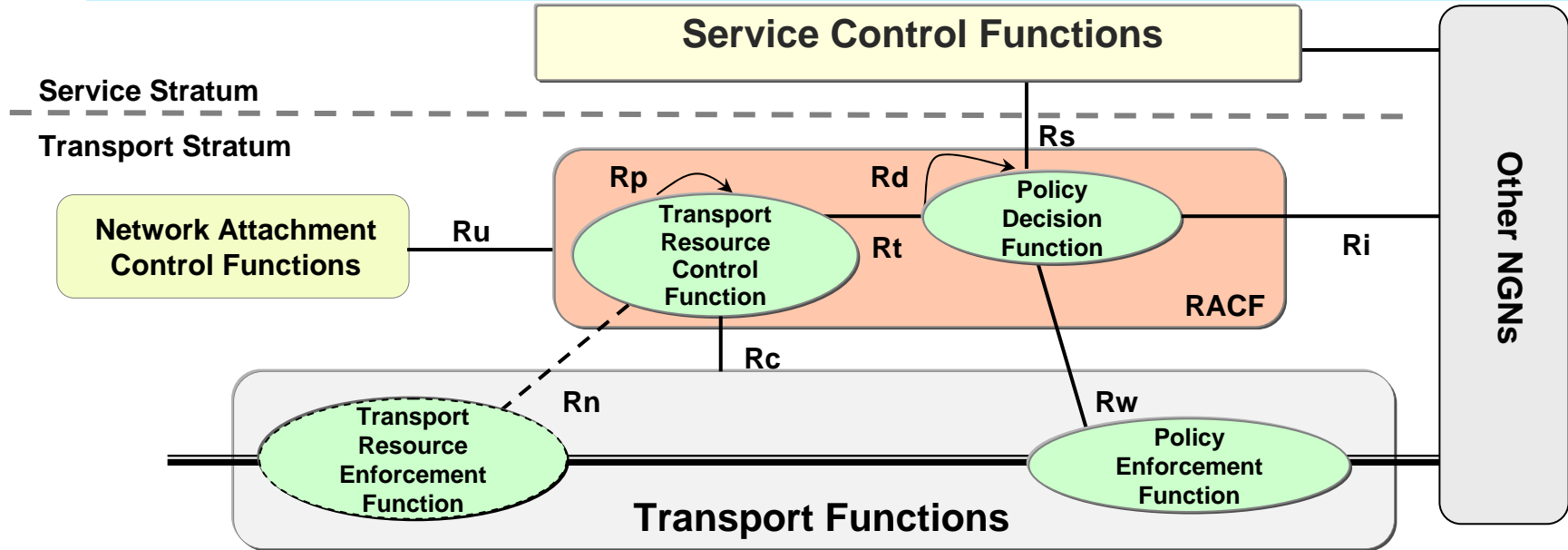
- o End-to-end QoS environment for the services offered to end users via QoS coordination across the transport stratum
- o Initial set of requirements, architectures, mechanisms and guidelines to enable end-to-end QoS

Key items

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

**Aiming to develop a comprehensive QoS solution
allowing incremental deployment**

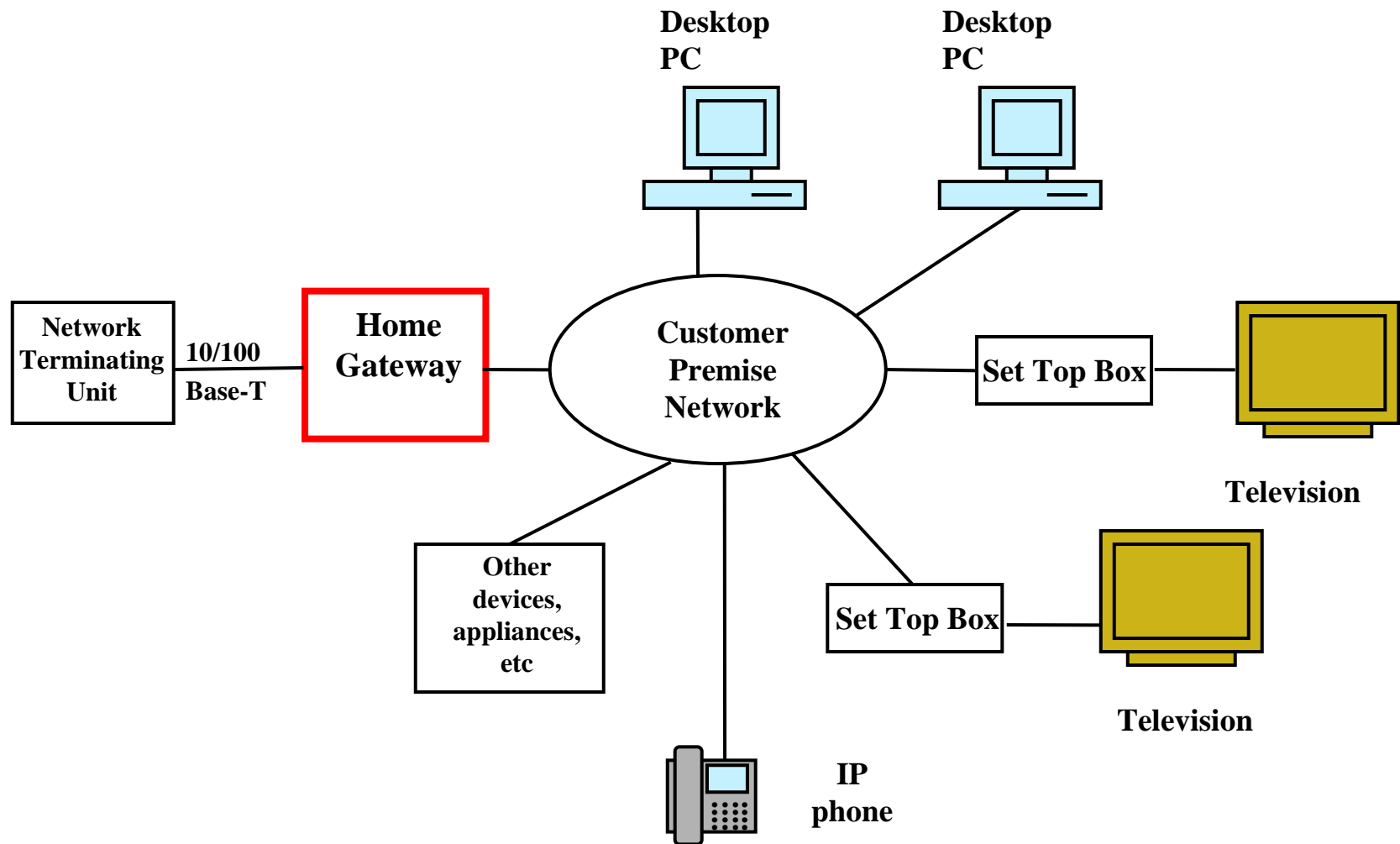
Resource and Admission Control Functions – generic RACF architecture in NGN (Y.2111)



- o **Policy Decision**
service facing, transport independent
- o **Transport Resource Control**
service independent, transport dependent, network-segment specific (PD-TRC functional decoupling for support of different ANs/CNs)
- o **Policy Enforcement**
typically part of border transport elements, enforces dynamic QoS and resource control, NAPT control and NAT traversal
- o **Transport Resource Enforcement**
enforces policy rules instructed by TRC at technology-dependent level

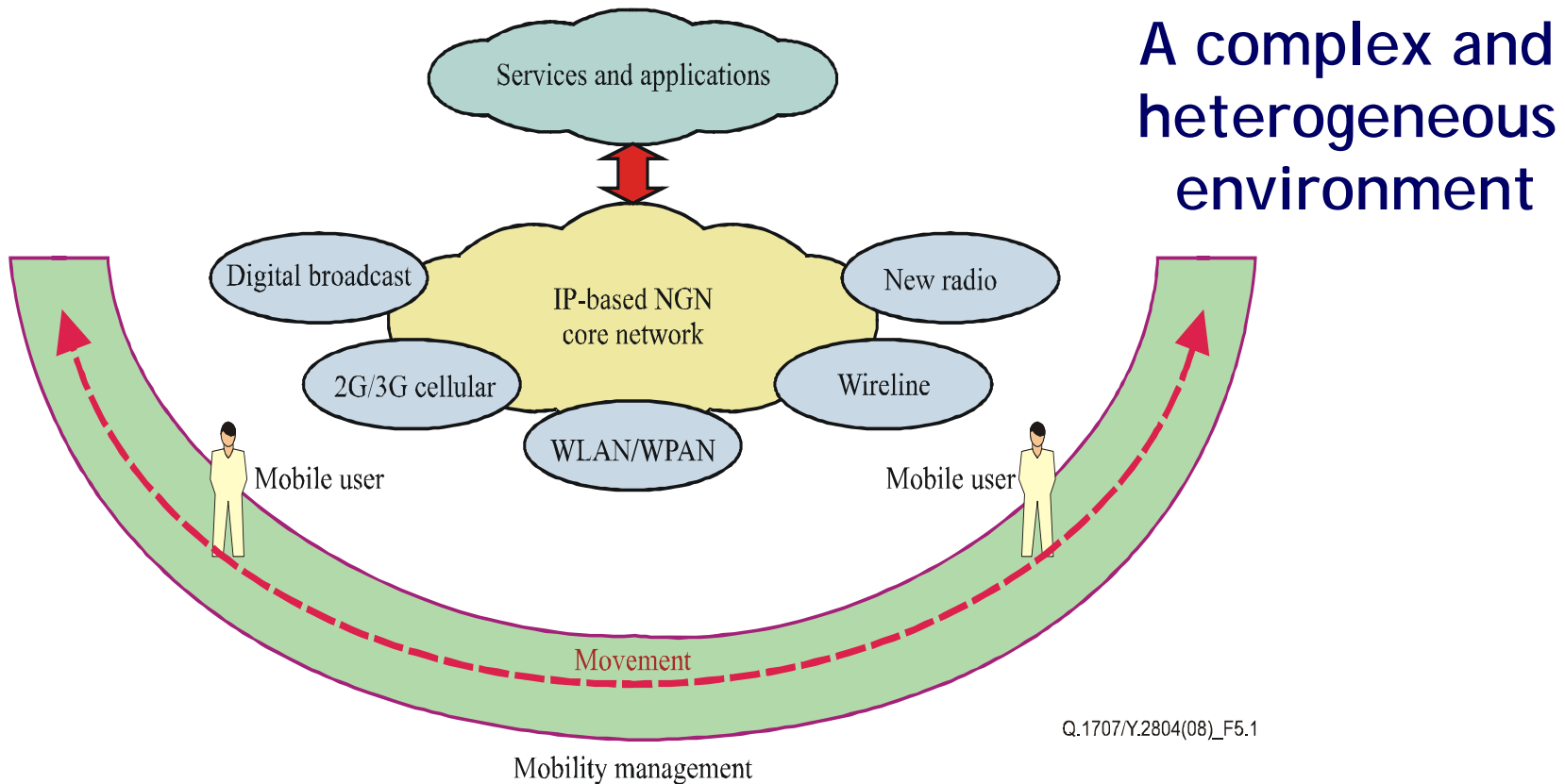
- o **RACF**
- o Application-driven, policy-based resource management for dynamic QoS guarantee
- o Bridges service control and packet transport thus augmenting native transport QoS support
 - *Preempting transport congestion at the service control layer*
 - *Protecting ongoing premium traffic*
- o Enforces certain network security measures

QoS challenges in Customer Premise Network



Home Gateway issues and QoS per device/terminal

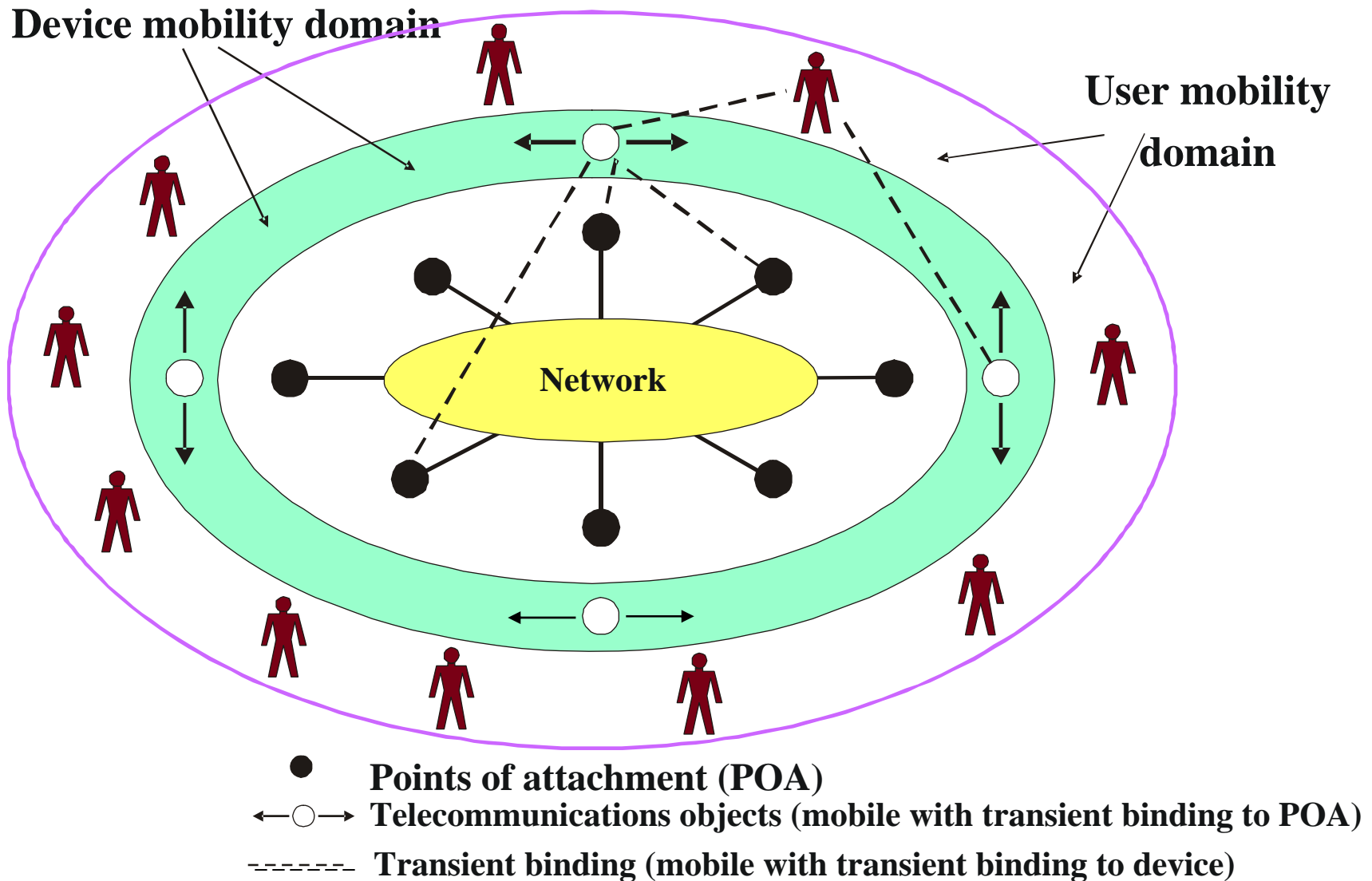
Mobility: fundamental enabler of NGN



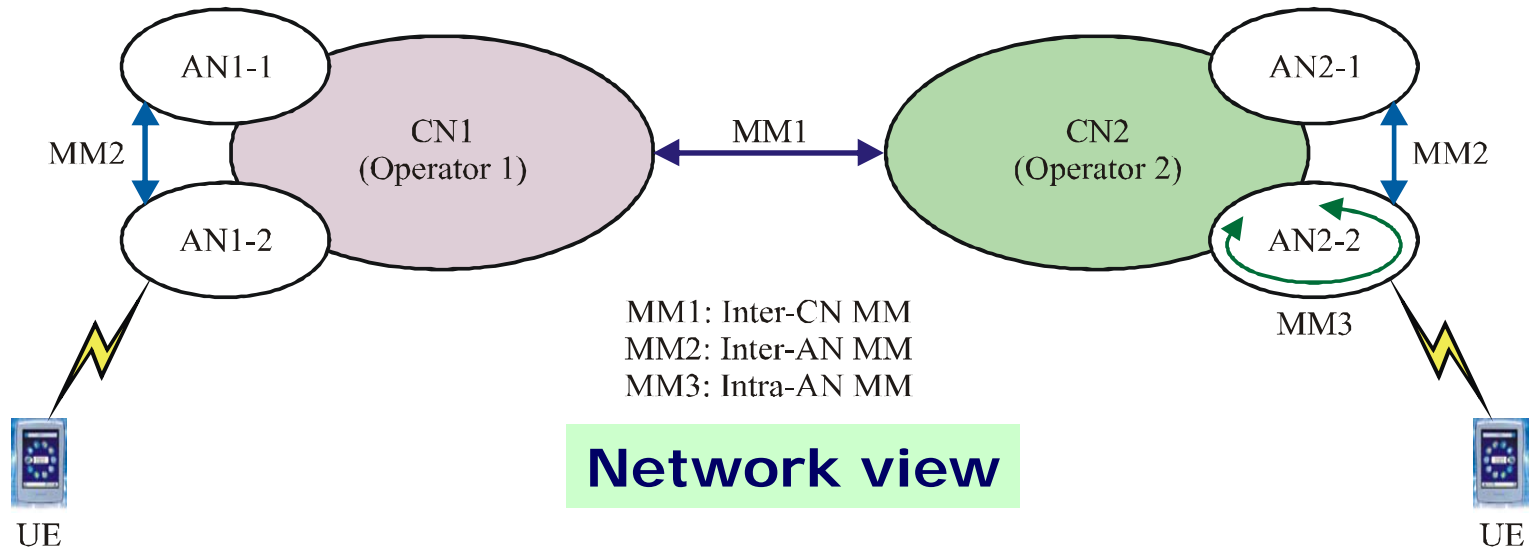
Users' basic requirements

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

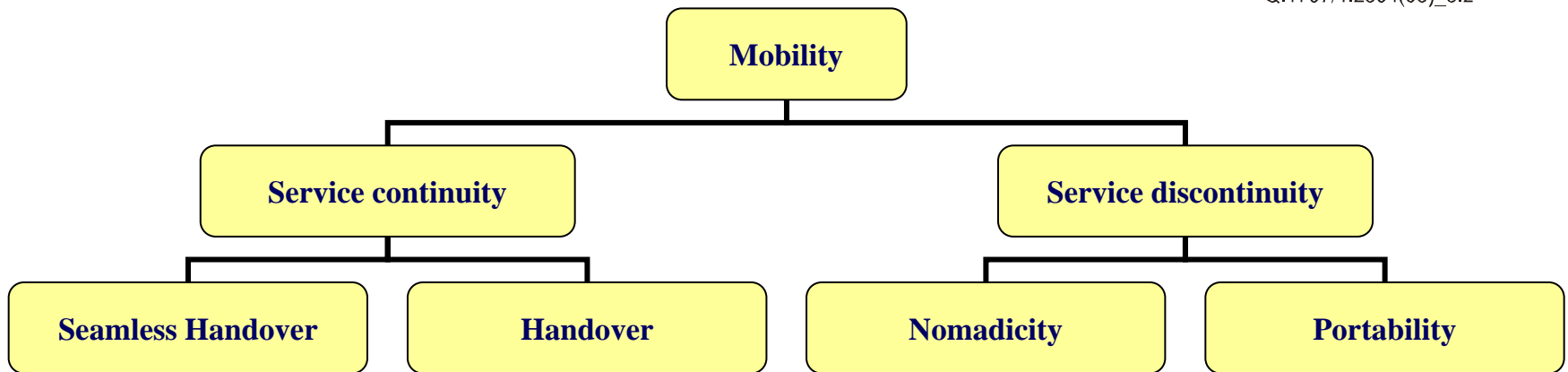
Mobility: relationship of users, devices, locations - Y.2011



Mobility dimensions



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



Quality of Service view

Q.1706/Y.2801

Limited Mobility capabilities in NGN Release 1

- NGN Release 1 requires support of “Nomadism”
 - “The ability to change network access point on moving, without maintaining service continuity”
 - To be supported between networks and within a network
 - NOTE: support for service continuity is not excluded (where specifications already exist)

- Two types of mobility [Y.2201, Q.1706]
 - Personal mobility: the user moves (between terminals)
 - Terminal (Device) Mobility: the device moves (with its binded user)

- No new interfaces defined for Release 1 mobility

*Nomadism is the initial step towards
Generalized Mobility and Fixed Mobile Convergence*

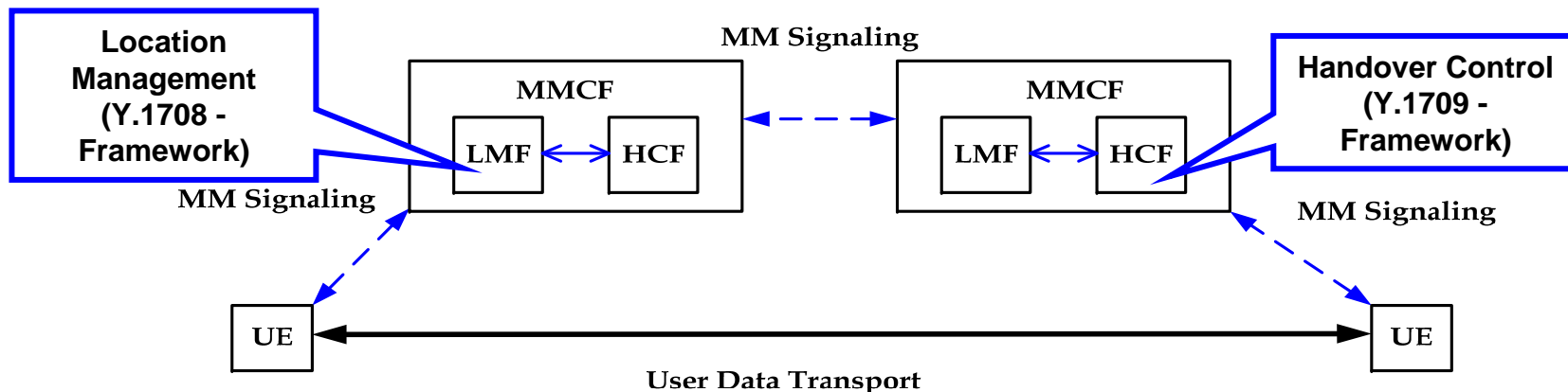
Service continuity as step 2 of mobility [Y.2201 Rev.1]

- NGN support of service continuity is recommended in Intra-AN and Inter-AN scenarios for personal and terminal mobility
 - Implementation levels may vary (depending on conditions such as access technology restrictions and Provider's service level support)
 - For voice services, service continuity required for terminal mobility
- NGN capabilities for service continuity support are required to consider network conditions and users' reqts
- NGN is recommended to allow adaptation for service continuity when users' reqts and network conditions mismatch (e.g. (re)negotiation of network QoS and terminal parameters (codec))

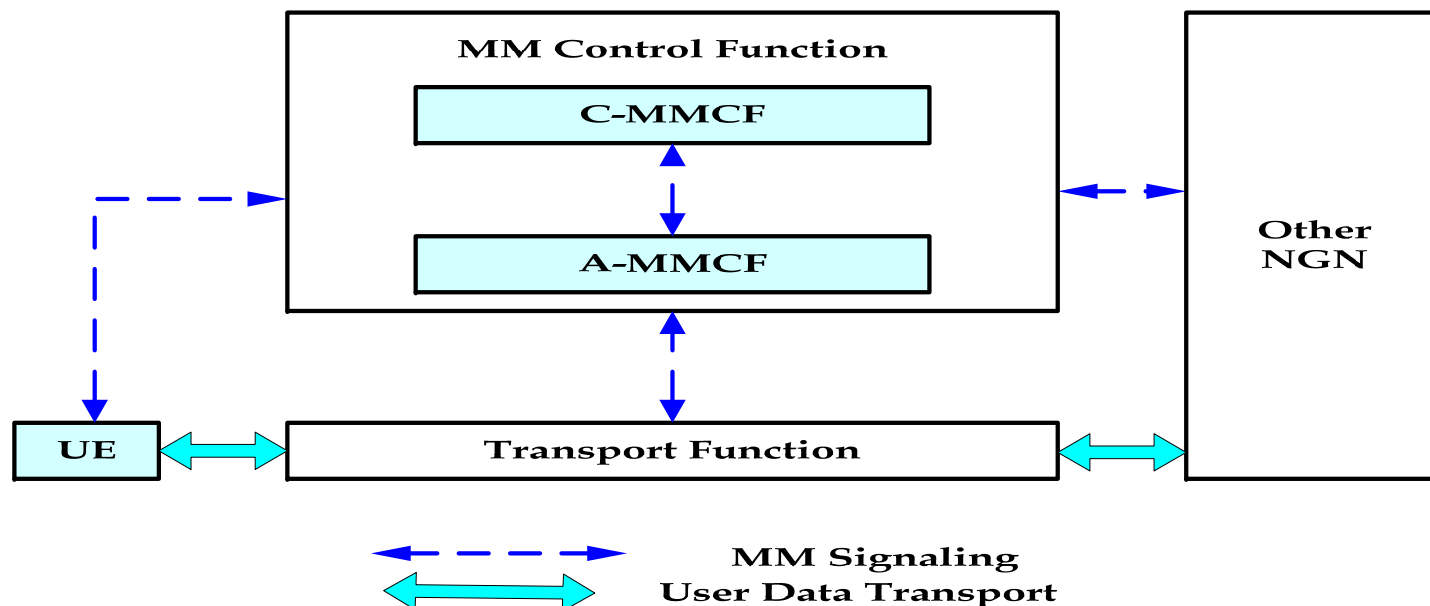
“Mobility roadmap” : an important ongoing activity

- Working on a multi-dimension matrix which includes the various mobility features, mobility scenarios and existing solution specifications

MM functional architecture – Q.1707/Y.2804

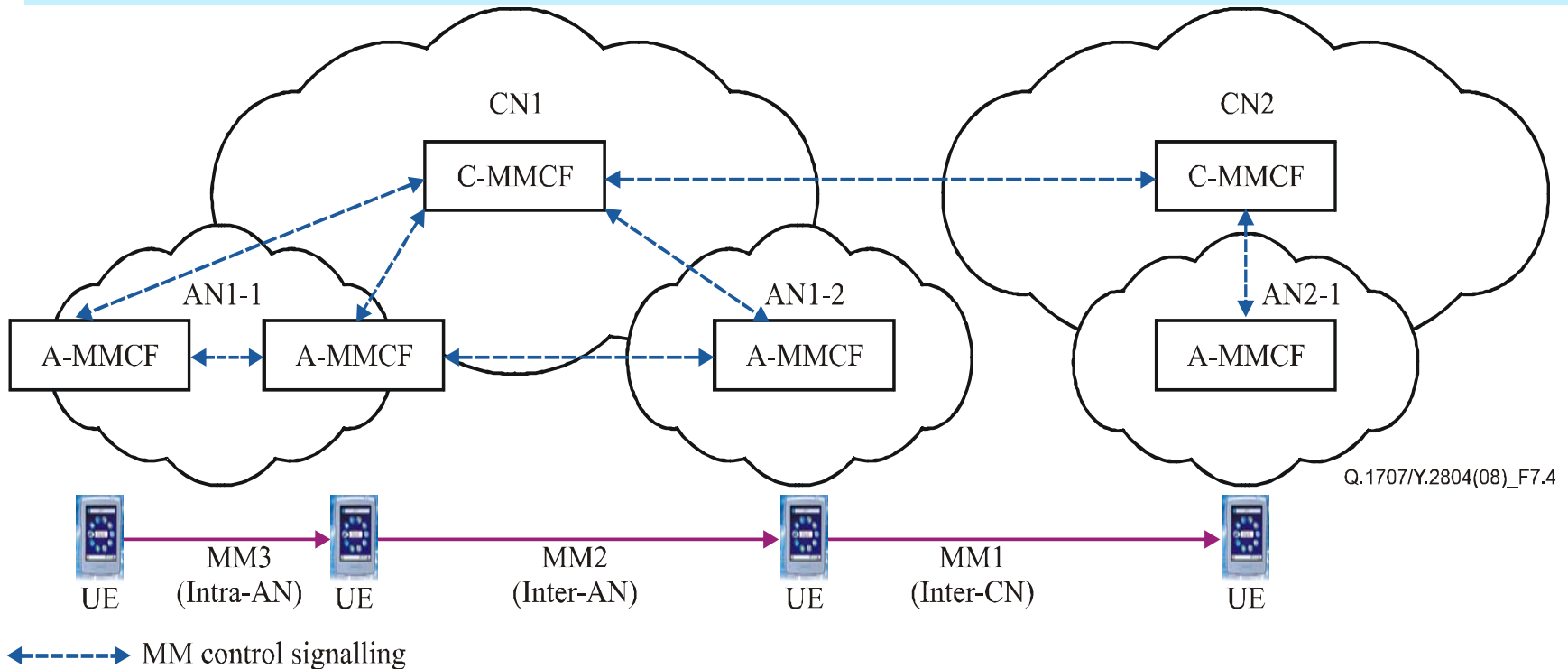


o Mobility management control function (MMCF) model



o Functional architecture-level view of MMCF in NGN

MMCF network configuration example – Q.1707/Y.2804



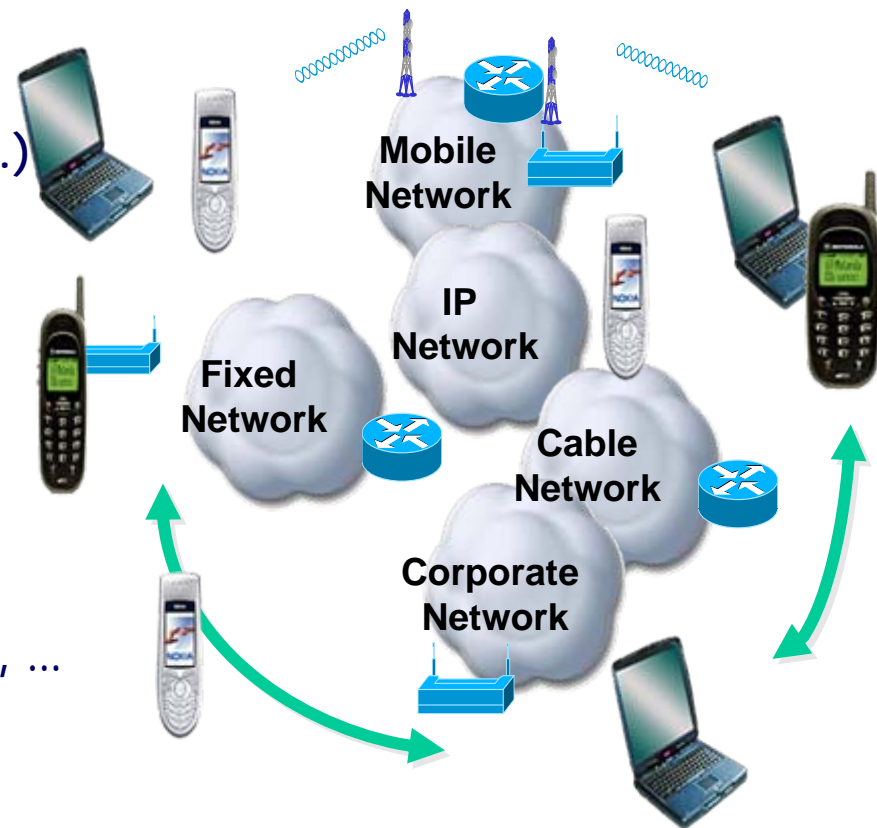
The detailed functional mapping in the NGN architecture is in progress

- o Y.2018 “Architecture and functional requirements for management of logical location information and control of mobility in NGN transport stratum” (consent in May 09)
 - Limited to transport stratum (Q.1707 considers both service and transport)
 - Provides mechanisms for seamless mobility if network conditions permit, but doesn't deal with service adaptation if post-handover QoS degradation

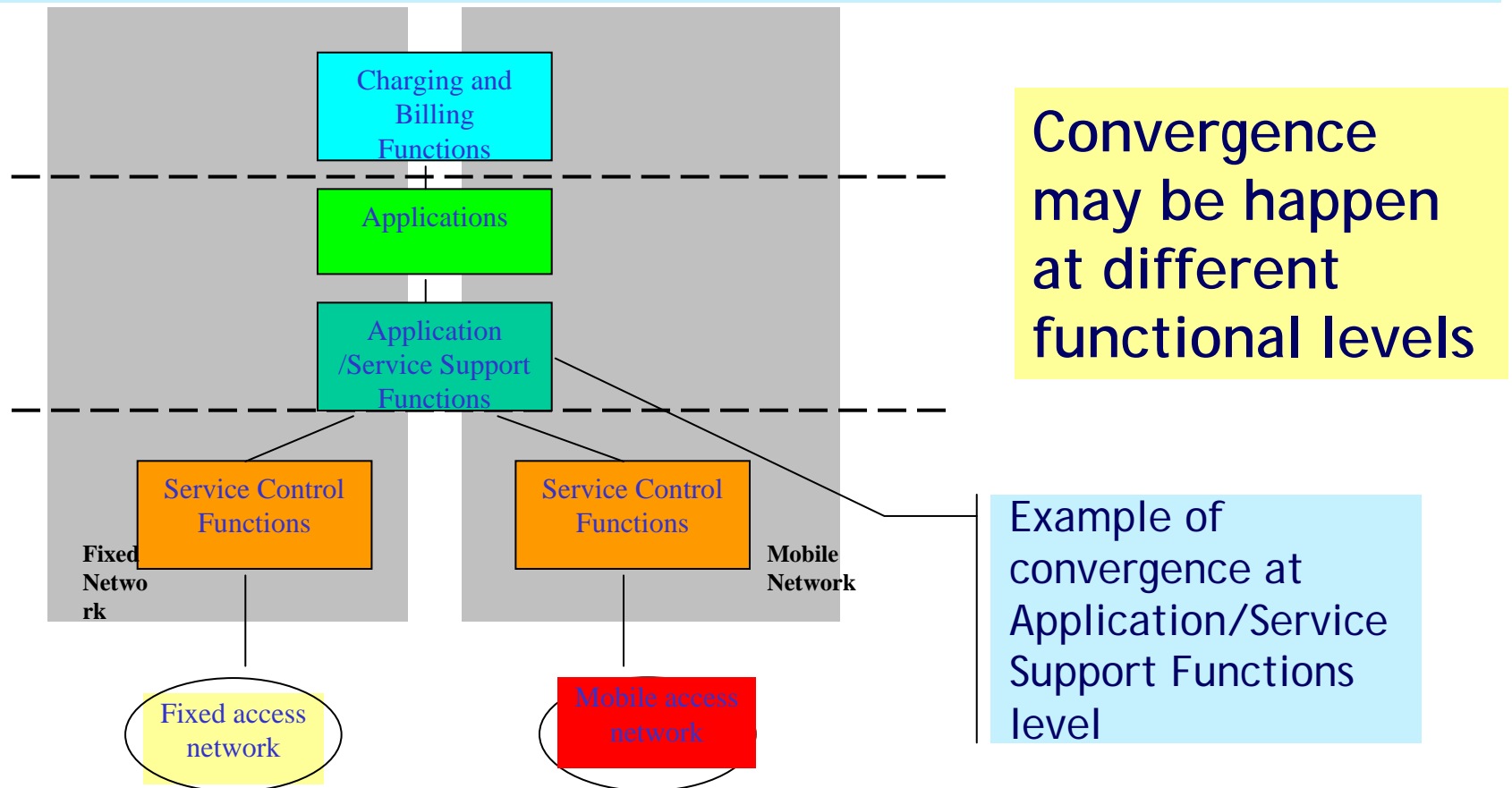
Towards Fixed Mobile Convergence: but which convergence ?

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



- Y.2802: FMC characteristics, requirements, capabilities, scenarios
- Y.2803: FMC service using legacy PSTN/ISDN as fixed AN for mobile users
- Y.2808: FMC with a common IMS session control domain

Progress in NGN security

Key Security objectives

- o To address security dimensions
- o To address security features required for secure domain interconnection

Security Requirements for NGN Release 1 (Y.2701)

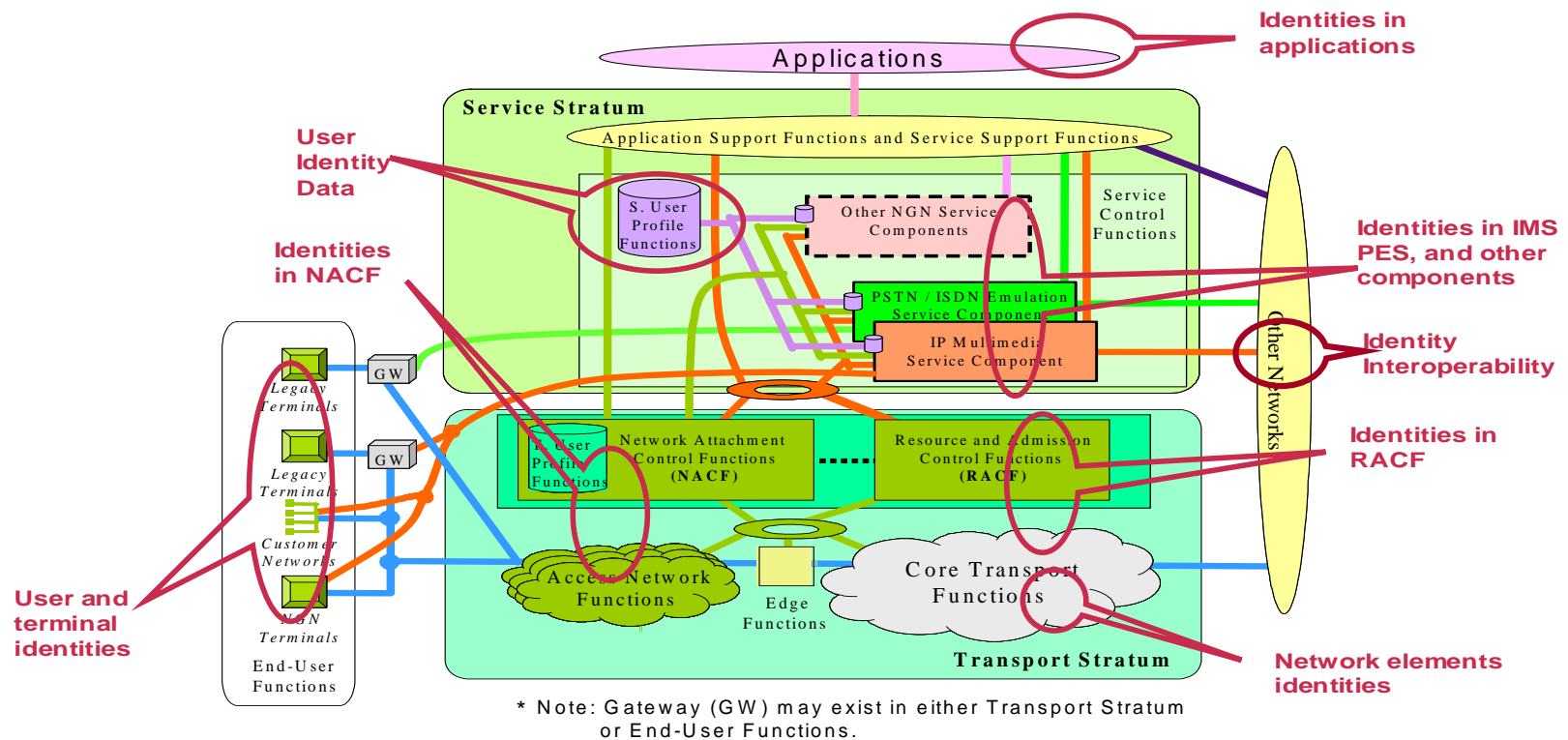
- o Security dimensions and countered threats (ITU-T X.805 principles)
- o Security threats and risks in NGN
- o Security trust models
- o Security architecture
- o Security objectives
- o **Requirements of NGN network elements**
 - Common requirements
 - In Trusted Zone
 - Network border elements
 - CPE border elements
- o Objectives and reqts for Emergency Telecom. Services

Other security topics:

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

Identities in NGN : needed not only for "Users" !

- o Multiple identity domains within the NGN architecture
 - Identities for devices, network elements, network components, applications, service providers etc.



Identity Management (IdM): a key ongoing NGN standardization activity

- “IdM” working definition
 - “Management by NGN providers of trusted attributes of an entity such as a subscriber, a device or a provider”
NOTE: it’s not intended to indicate positive validation of a person
- Identity information assurance, security and management are challenging
 - 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

Current progress on NGN Identity Management

Y.2720 “NGN IdM framework”

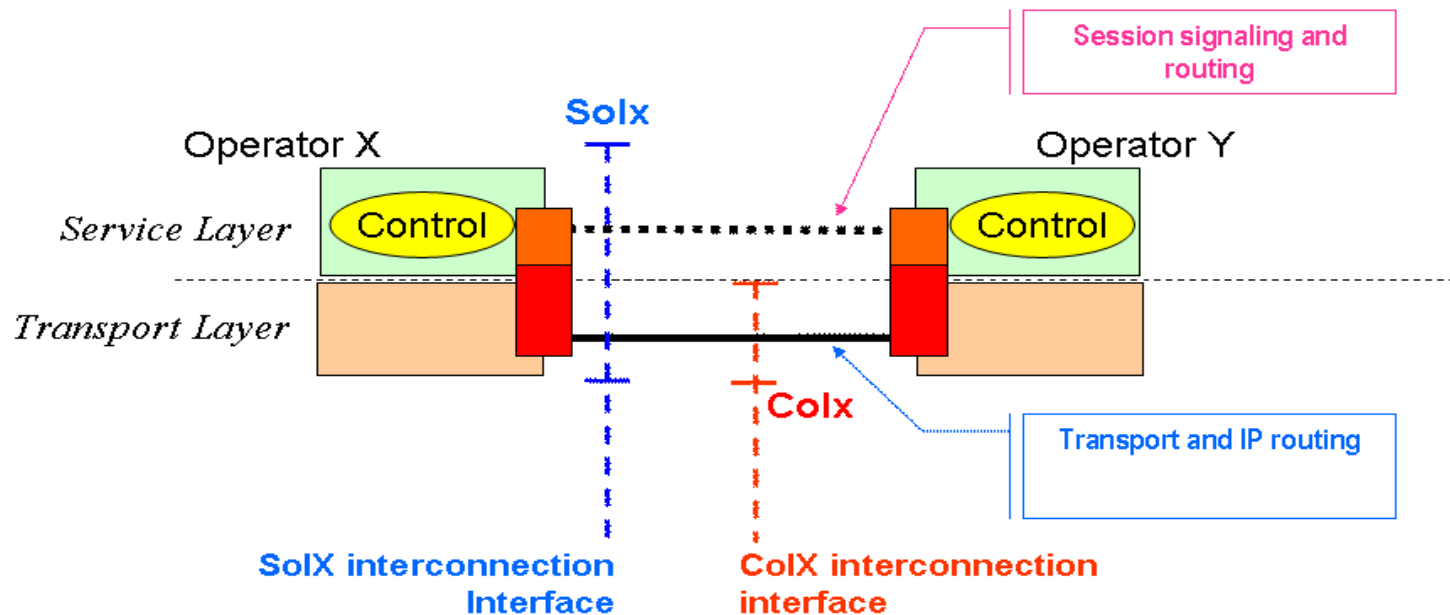
- o A structured approach for designing, defining, and implementing *interoperable* Identity Management (IdM) solutions for NGN
- o Identifies a set of capabilities
 - e.g., administration, discovery, communication exchanges, correlation and binding, policy enforcement, authentication and authorization
- o 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

Y.NGN IdM Requirements “NGN IdM requirements”

- o Includes former Y.NGN IdM Use Cases as an appendix
- o Planned for consent in Sept 09

Interconnection

- Interconnection at Network to Network Interface
 - Between multiple NGN domains, between NGN and other networks
- Two types of Interconnection have been identified
 - **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



NGN capabilities and specifications for Interconnection

Interconnection capabilities (objectives)

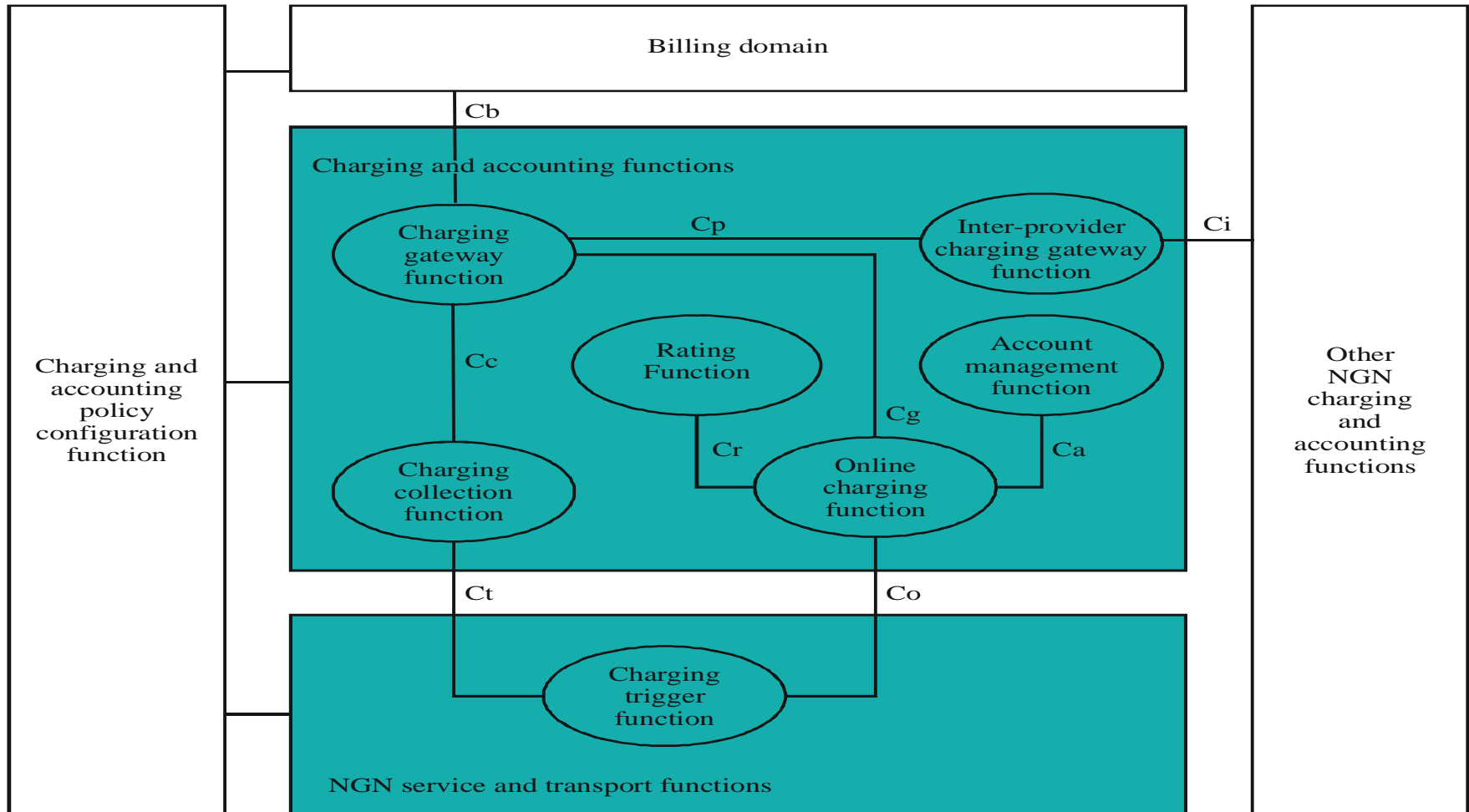
- o routing;
- o signalling interworking;
- o numbering, naming and/or addressing interworking;
- o accounting and charging related information exchange;
- o security interworking;
- o QoS interworking;
- o user and terminal profile information exchange;
- o media interworking;
- o management interworking;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

NNI deliverables

- o **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
- o **Q.1912.5**
 - Interworking between SIP and BICC protocol or ISDN User Part
 - Not an “interconnection” spec but useful in defining SIP-I

Accounting and Charging capabilities in NGN

- o Y.2233: A&C functional architecture for NGN Release 1
- o Y.2233 Rev.1 (ongoing): policy-enabled A&C capabilities



Key NGN A&C requirements - Y.2233 Rev.1

- secure, reliable, scalable and seamless A&C operations
 - an A&C architecture with open-standard interfaces
 - interfaces and protocols between
 - Network Elements and Accounting Elements
 - Accounting Elements and Charging Elements
 - Policy control Elements and A&C Elements
 - A&C functionalities for both unicast and multicast based services
 - different charging policies (e.g. fixed rate, usage based)
 - per-user offline charging and online charging
 - service level and transport level charging
 - per-service and per-medium charging
 - per-QoS level charging (incl. network resource usage based)
 - appropriate charging arrangement models (incl. for inter-provider settlements)
 - coordination with Resource Control functions (RACF)
 - flow-based charging
 - 3rd party charging, real-time modification of accounting policies, dynamic rating, customer account hierarchy
- o Y.2233 has been developed in cooperation with ITU-T NGN Management Focus Group/SG4, 3GPP SA5, ATIS TMOC, ETSI TISPAN

A global ITU effort for NGN standards development

- ITU-T ongoing standards developments address NGN capabilities in numerous other technical domains (than those covered here), including
 - Management
 - Migration
 - Performance, measurement, testing
 - IPv6
 - Home networking
 - Enterprise networks connected to NGN
 - Advanced service enablers and service oriented infrastructure
 - Enhanced access and core transport
 - Emergency telecommunications and accessibility

- ITU-T NGN GSI is the ITU focal and harmonization point for NGN standards development
 - Coordinating within ITU (the other two ITU sectors, ITU-T Study Groups, other ITU-T efforts/GSIs (e.g. on IPTV, IdM, HN, NID))
 - Coordinating with external Standards Organizations

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

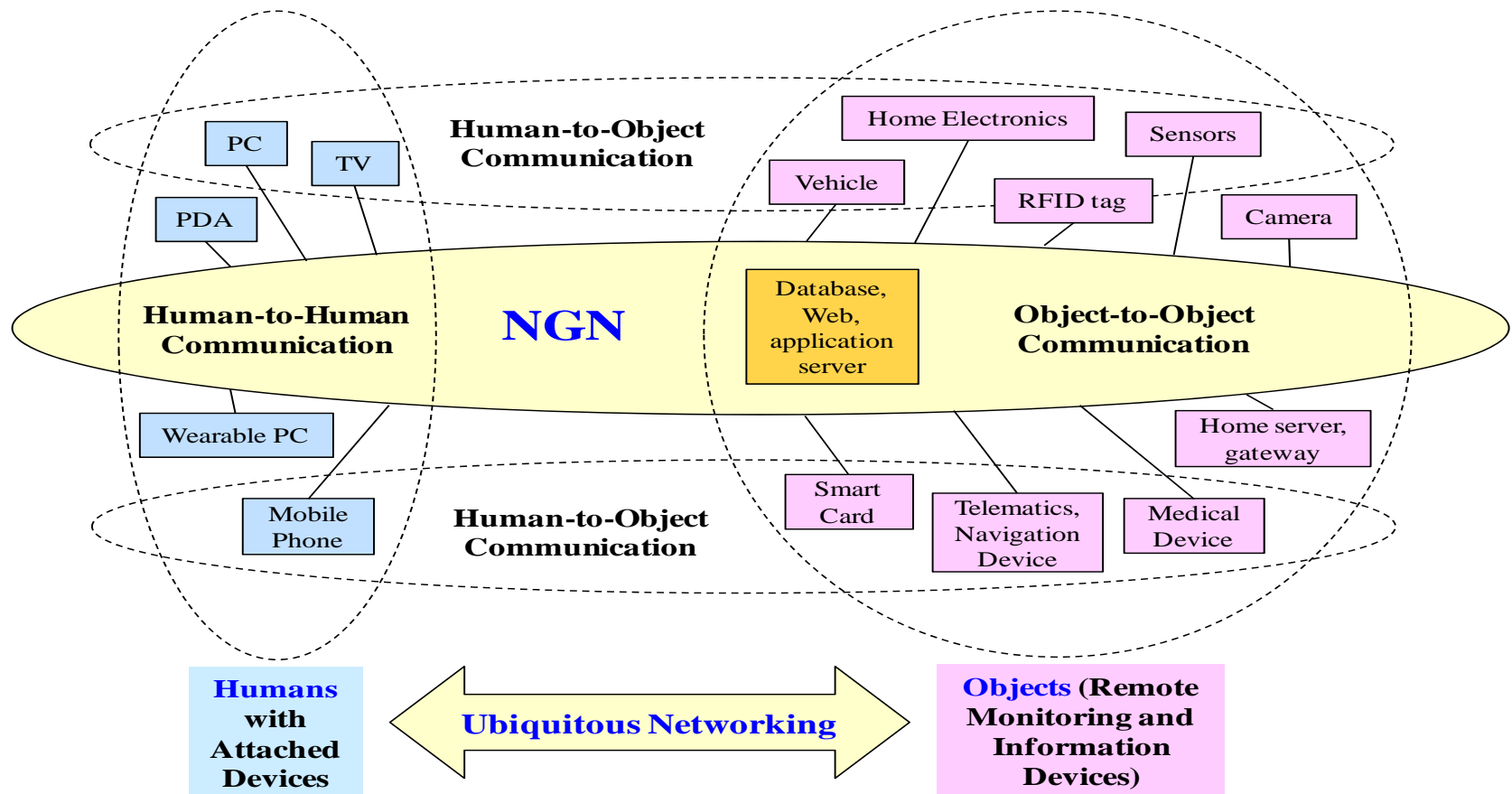
**Thank you for your
attention**

Questions ?

Backup

“Ubiquitous networking” as a future target

- Enabling “Any Service, Any Time, Any Where, Any Device” operations in NGN via enhanced capabilities
- Support of human-to-human, but also human-to-machine and machine-to-machine communications



Ubiquitous networking work items

- “Draft” definition of ubiquitous networking [Y.NGN-UbiNet]
 - The ability for all objects to communicate and access services without any restrictions of services, locations, time, users, etc., in the context (application environment) of the subscribed services
- Y.NGN-UbiNet - Overview and principles for ubiquitous networking in NGN (started in Jan 09)
 - Objectives and basic characteristics of ubiquitous networking in NGN
 - Design principles including architectural model and enhanced capabilities

Specific to sensor device networking:

- Y.USN-reqts - Requirements for support of Ubiquitous Sensor Networking applications and services in NGN environment (planned for consent in Sept 09)
- Draft definition of ubiquitous sensor networking [Y.USN-reqts]
 - A conceptual structured network which delivers sensed information and knowledge services to anyone, anywhere and at anytime where the information and knowledge is developed via context awareness

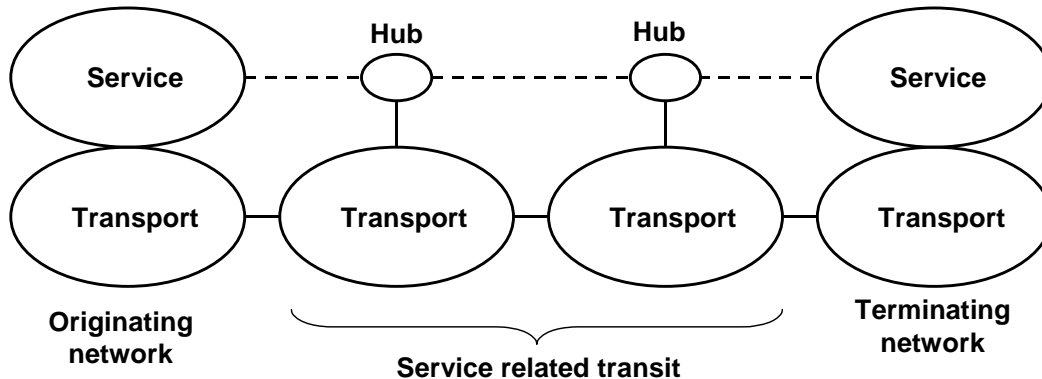
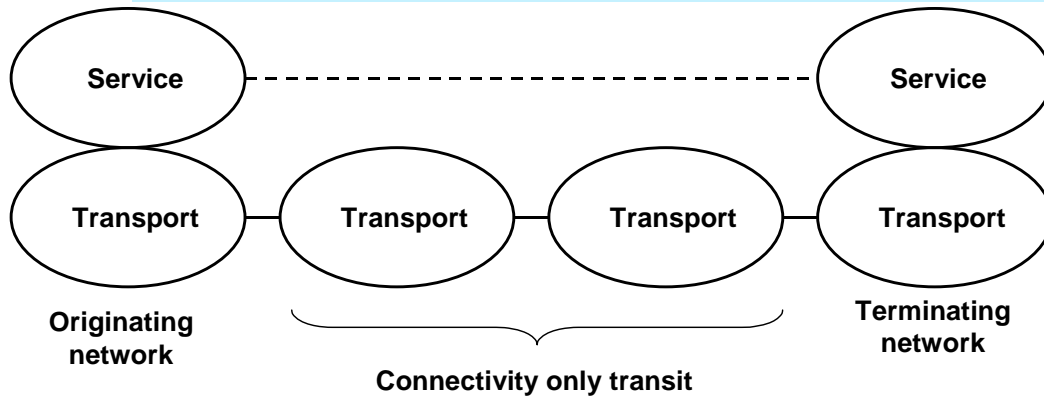
Security of financial transactions – Jan 09 work item

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

Management of context information

- **Context management capability [Y.2201 Rev.1]**
 - Enabling influence or determination of a telecommunication process by referring to the status of relevant entities
 - Individual and aggregated entities' status form a coherent set of information known as "context information"
 - Requirements include security, reliability, standardized format and semantic, real-time and on-demand support of context information
- **Context generator, requestor and distributor**
 - Distributor collects, distributes, processes and optionally stores context information (as broker between provider and consumer)
- **Key enabler of advanced and future services: e.g. Targeted Advertising**
 - benefiting from knowledge of user's context information such as location (e.g. at home, in town, in a shopping mall), activity (e.g. at work, on holidays, on business trip), sociality (e.g. alone, with family, with friends)
- **All possible dimensions of "context" still to be explored**
 - E.g. correlation with past behaviours of the User

SoIX versus CoIX



o 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. That depends on pricing/revenue flow/traffic mix.
- GSMA IPX allows either pure L3 or Application layer peering

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

Ongoing Y.2233 Rev.1: NGN policy-enabled A&C capabilities

- o Multiple attributes are relevant for policy enablement
 - access specific characteristics, bearer QoS, service type, time, user subscription information, etc.

