ITU-T NGN GSI: requirements and main achievements in ITU-T NGN Release 1 standardization

Marco Carugi

ITU-T Q.2/13 Rapporteur
Senior Advisor, Nortel Networks
marco.carugi@nortel.com

Outline

- Mature deliverables in ITU-T NGN standardization
- Requirements and results in some key areas of NGN Release 1

Mature deliverables in ITU-T NGN standardization

Foundational NGN achievements

Oct-Dec 2004 (JRG NGN->SG13)

- **Y.2001: General overview of NGN**
  - NGN Definition, Characteristics and Subject Areas
- **Y.2011: General principles and reference model for NGN**
  - High level paradigms, separation of concerns
  - Architectural principles, OSI and G.805 model relevance

2005 (FG NGN->NGN GSI)

- **Adoption of a Release-based approach for the production of NGN recommendations (scope and completion deadlines defined for each release)**

March 2006 (FG NGN Management->SG4):

- **Y.2401/M.3060: Principles for the Management of NGN**

Latest ITU-T NGN achievements (1)

Rec. N.	SG	Status	Title
Y.2000-SerSup1	13	**Approved**	**NGN Release 1 Scope**
Y.2012 (Y.NGN-FRA)	13	**Approved**	**Functional requirements and architecture of the NGN**
Y.2091	13	**Approved**	**Terms and definitions for Next Generation Networks**
Y.2111	13	**Approved**	**Resource and admission control functions in NGN**
Y.2171	13	**Approved**	**Admission control priority levels in Next Generation Networks**
Y.2021 (Y.NGN-IFN)	**13**	**Approved**	**IMS for Next Generation Networks**
Y.2261 (Y.piev)	**13**	**Approved**	**PSTN/ISDN evolution to NGN**
Y.2031 (Y.piea)	13	**Approved**	**PSTN/ISDN emulation architecture**
Y.2271	13	**Approved**	**Call server based PSTN/ISDN emulation**
Y.2013 (Y.csf)	13	**Approved**	**Converged services framework functional requirements and architecture**

Latest ITU-T NGN achievements (2)

Rec. N.	SG	Status	Title
Y.2601 (Y.FPBN-req)	**13**	**Approved**	**Fundamental characteristics and requirements of future packet based networks**
Y.2611 (Y.FPBN-arch)	13	**Approved**	**High level architecture of future packet based networks**
Y.2901 (Y.cgoe)	13	**Approved**	**The carrier grade open environment reference model**
Y.2902 (Y.cgoe-cmpts)	13	**Approved**	**Carrier grade open environment components**
Y.2262(Y.emsim)	13	**Approved**	**PSTN/ISDN emulation and simulation**
Y.2211(Y.NGN-RTCONV)	**13**	**Consented**	**IMS-based real time conversational multimedia services over NGN**
Y.2201	**13**	**Decided**	**NGN release 1 requirements**
Y.2701	**13**	**Decided**	**Security requirements for NGN release 1**
Q.1706/Y.2801	**19**	**Approved**	**Mobility management requirements for NGN**
Q.1762/Y.2802	**19**	**Consented**	**Fixed Mobile Convergence general requirements**

ITU-T NGN GSI : current status in summary

Basic achievements for NGN Release 1

- **NGN principles, Release 1 Scope**
- **High level requirements and capabilities (stage 1)**
- **High level architecture, some components in detail (stage 2)**
- **Some capabilities in detail (stages 1, 2) - QoS, Security, Mobility**

Pieces in progress or still missing for Release 1

- Service-specific scenarios, requirements and capabilities (stage 1) – e.g. id-based services, open service environment
- Other components in detail (stage 2) – e.g. NACF
- Other capabilities in detail (stages 1, 2) – e.g. Accounting and Charging
- **Stage 3 (Protocols, implementation aspects): limited progress initially, but increasing activity since October 2006 meeting**

Release 2

- High level requirements and capabilities – start (stage 1)
- High level/component architecture– start (stage 2) – e.g. RACF, Multicast
- Service-specific scenarios, requirements and capabilities (stage 1) – FMC, IPTV, Corporate Networks support

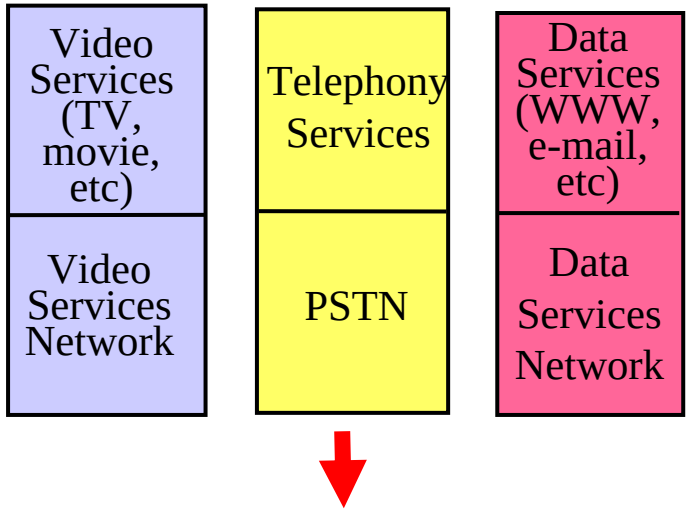
Other ITU-T initiatives in relation with NGN

- IPTV
  - IPTV Focus Group established in April 2006
- Network aspects of Identification systems
  - Joint Coordination Activity (JCA N-ID) established in July 2006
  - Extended in 2007 to include sensor networking
- Identity Management (IdM)
  - IdM Focus Group established in Dec 2006
- **Home Networking**
  - JCA HN established in March 2005

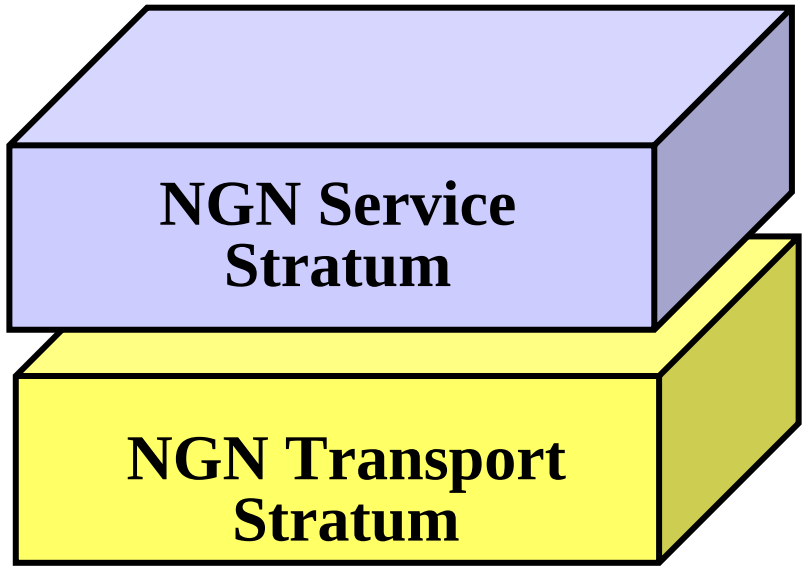
NGN Release 1 services and capabilities

NGN Convergence model
(Y.2011 NGN general reference model)

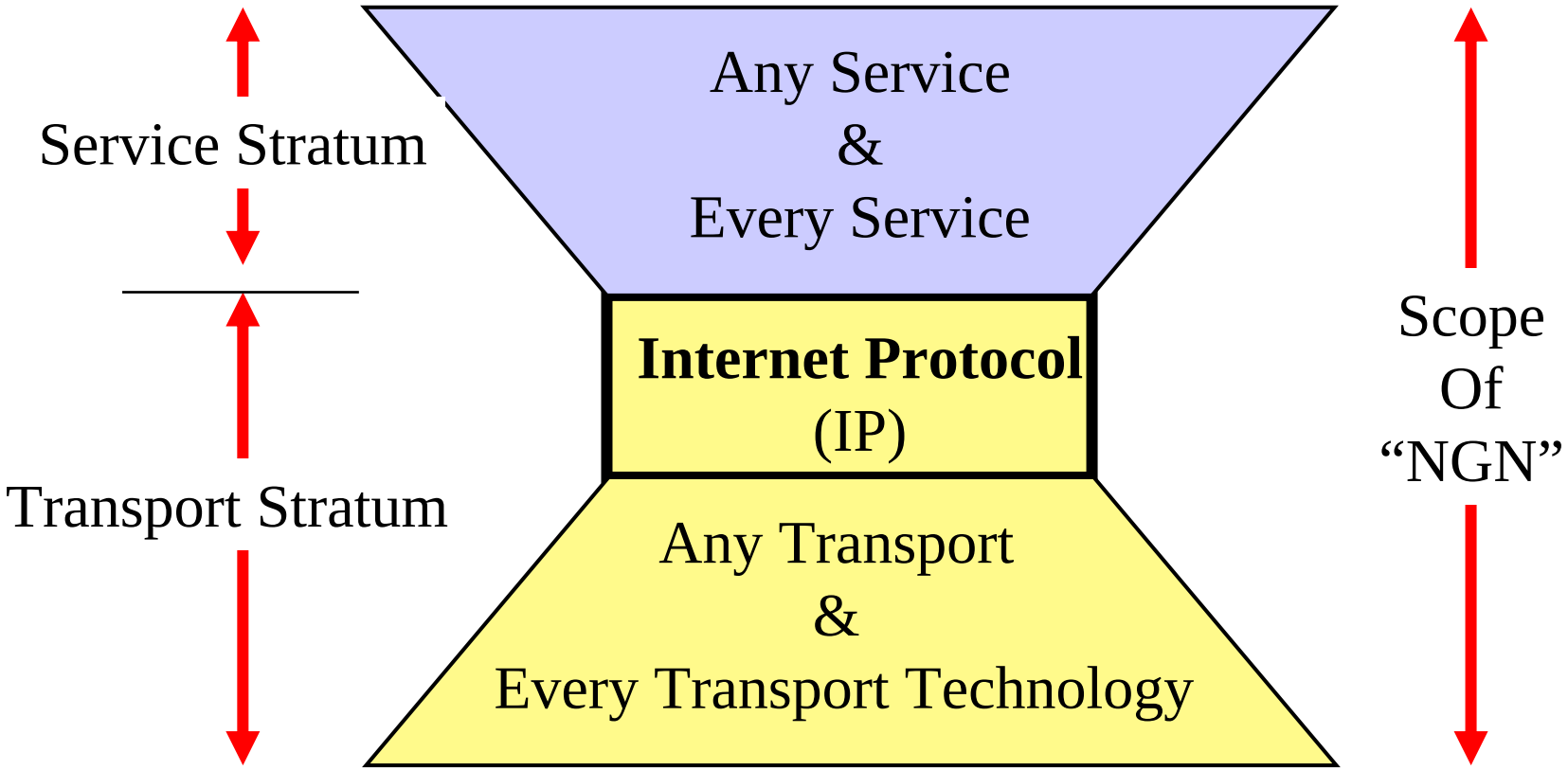
Pre-NGN: Vertically Integrated Networks



NGN: Horizontally Integrated Networks



Unifying IP convergence layer



Service standardisation

Key objectives in NGN service standardisation

- Not just a new voice network
- *"Service level equal or better than in circuit-switched networks"*
- Services specified in terms of required "capabilities"
- Precise service definitions are not an objective like in legacy world
  - **Public Interest Services are a special case**

Services expected to be supported in NGN Release 1

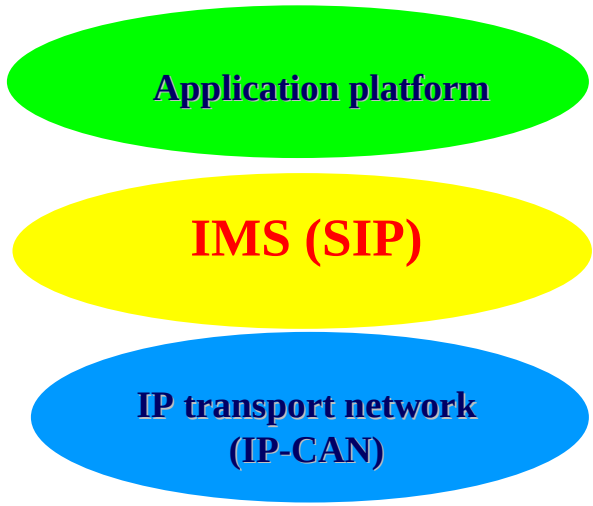
- **Multimedia services**
- **Data communication services**
- **PSTN/ISDN Simulation services**
- **PSTN/ISDN Emulation services**
- **Public Interest Services**
- **NGN is not intended to preclude access to the Internet**

It's a Provider decision which services will be actually deployed

Requirements and results in key areas of NGN Release 1 environment

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

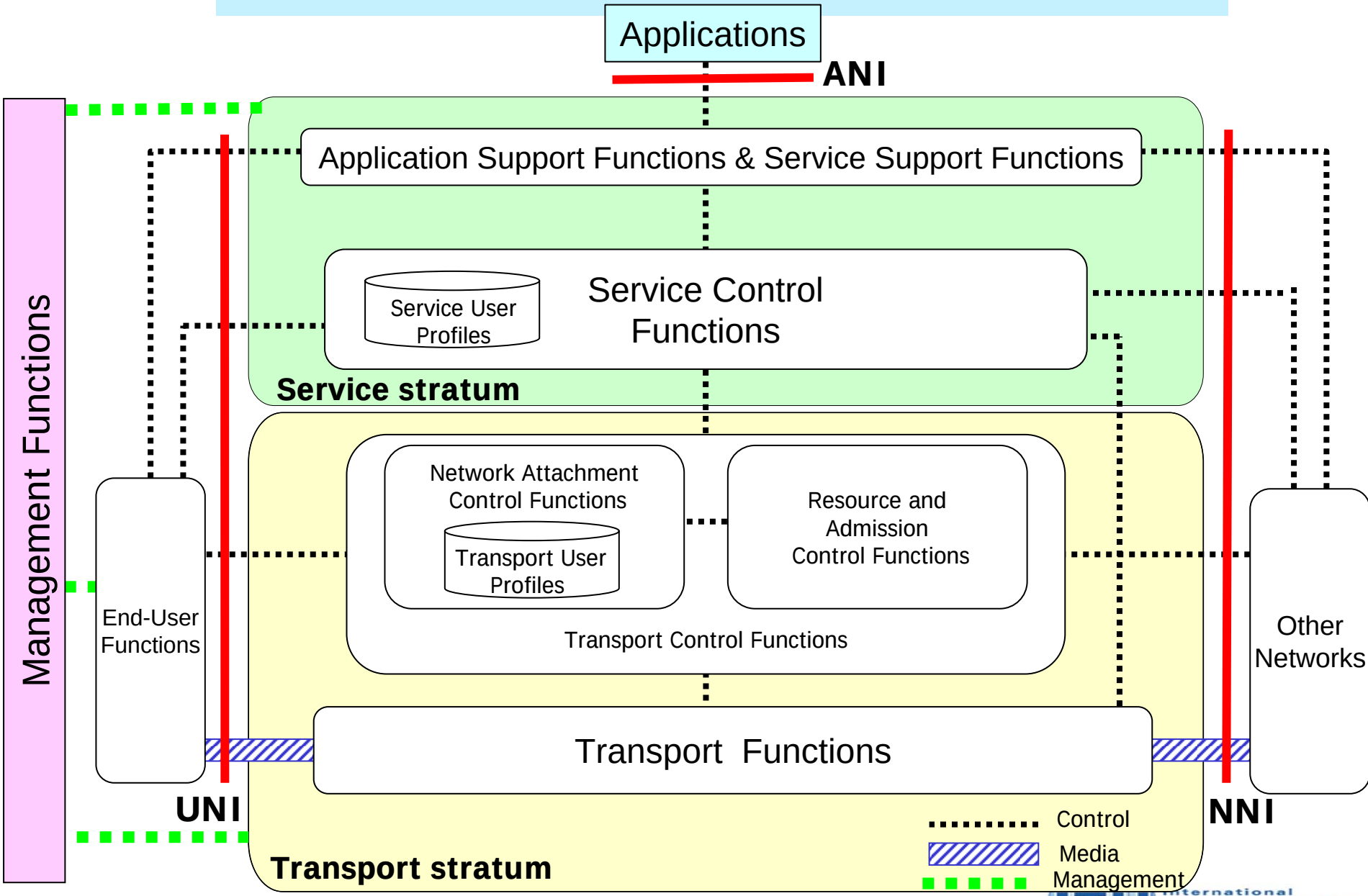


The central role of 3GPP IMS in NGN Release 1 Architecture

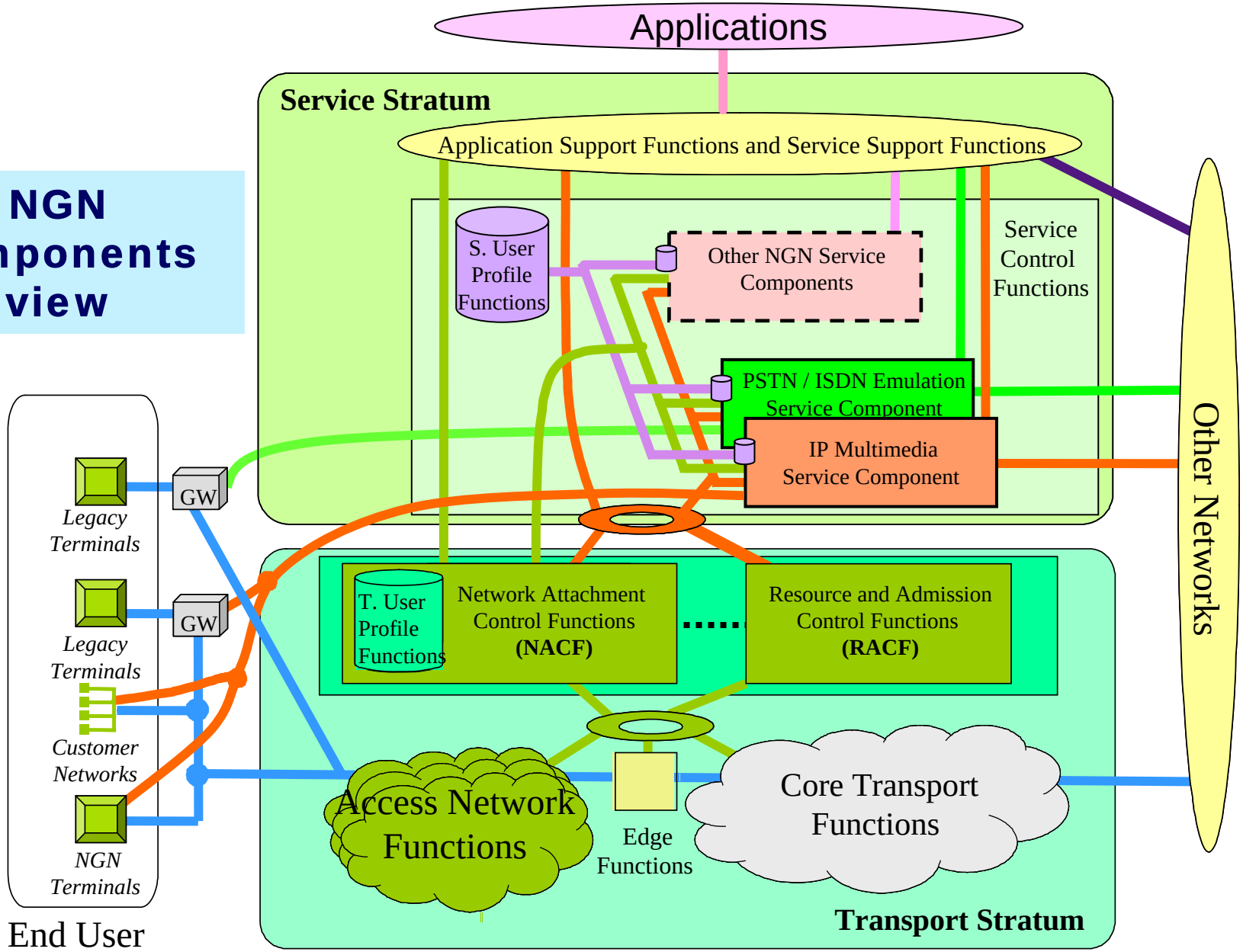
- **Advanced Architecture objectives**
  - Comprehensive set of services over a unifying IP layer network
  - Services separable from transport stratum into service stratum
  - Transport stratum support of a multiplicity of access networks and a variety of mobile and fixed terminal types
  - Services 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 Rel.1
  - Leveraging the 3GPP IMS capabilities, but they need some extensions
  - Y.2012 (Y.NGN-FRA) and Y.2021 (Y.NGN-IFN)

Y.2012: basic functional view



NGN components view



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 -> any device*

Release 1 environment – Quality of Service (QoS)

High level objectives

- 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 and guidelines
- Performance objectives
  - Network performance classes and allocation
- Performance measurement, management and prediction

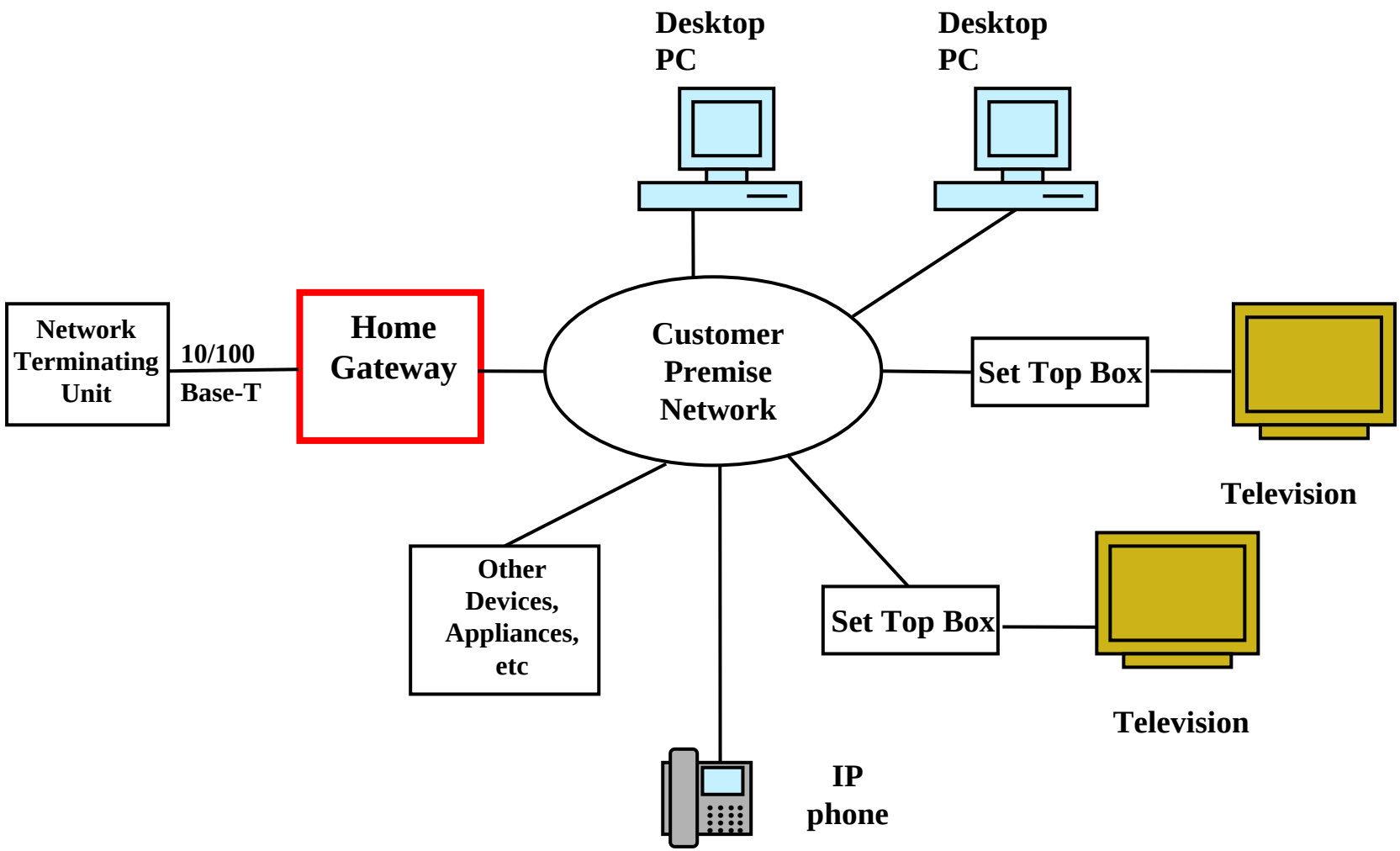
A major goal is the development of a comprehensive QoS solution allowing incremental deployment

Release 1 environment – Quality of Service (2)

- **RACF (Resource and Admission Control Functions) - Y.2111**

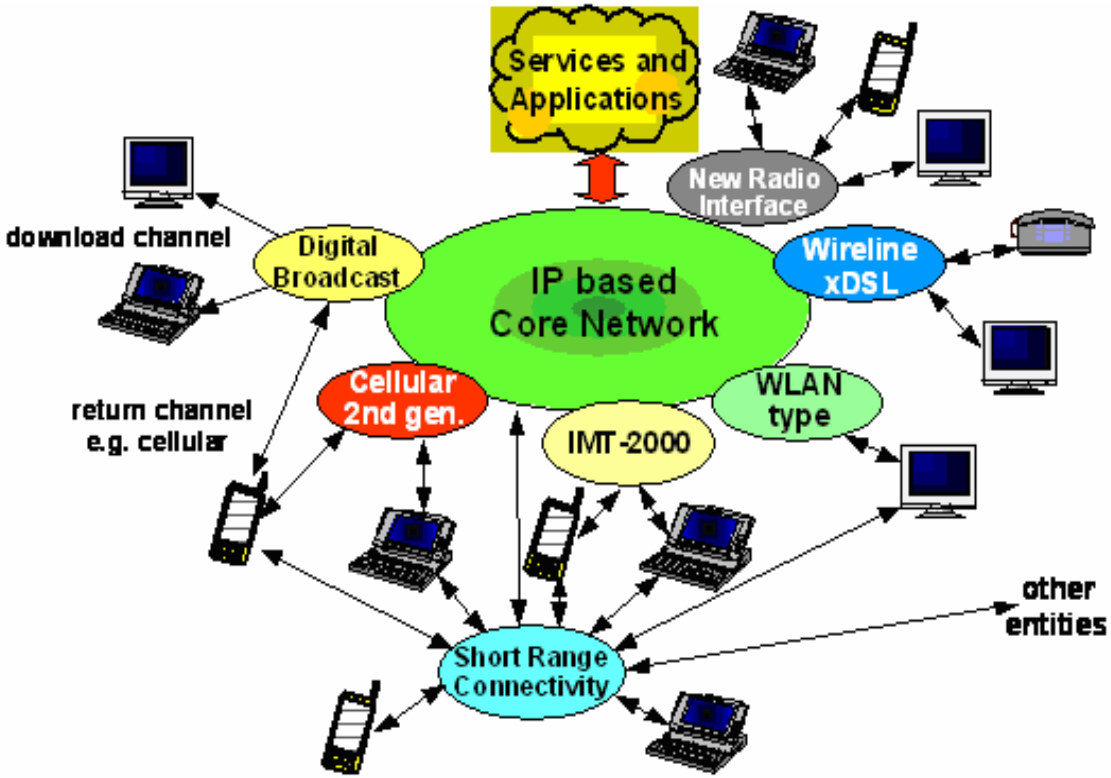
  - Application-driven, policy-based resource management
  - Bridging service control and packet transport to dynamically guarantee QoS and enforce certain network security measures
    - QoS coordination in transport stratum through Access Network, Core Network and other NGNs
    - Different modes for 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

QoS challenges in Customer Networks



Home Gateway issues and QoS per device/terminal

Mobility: a fundamental enabler of NGN

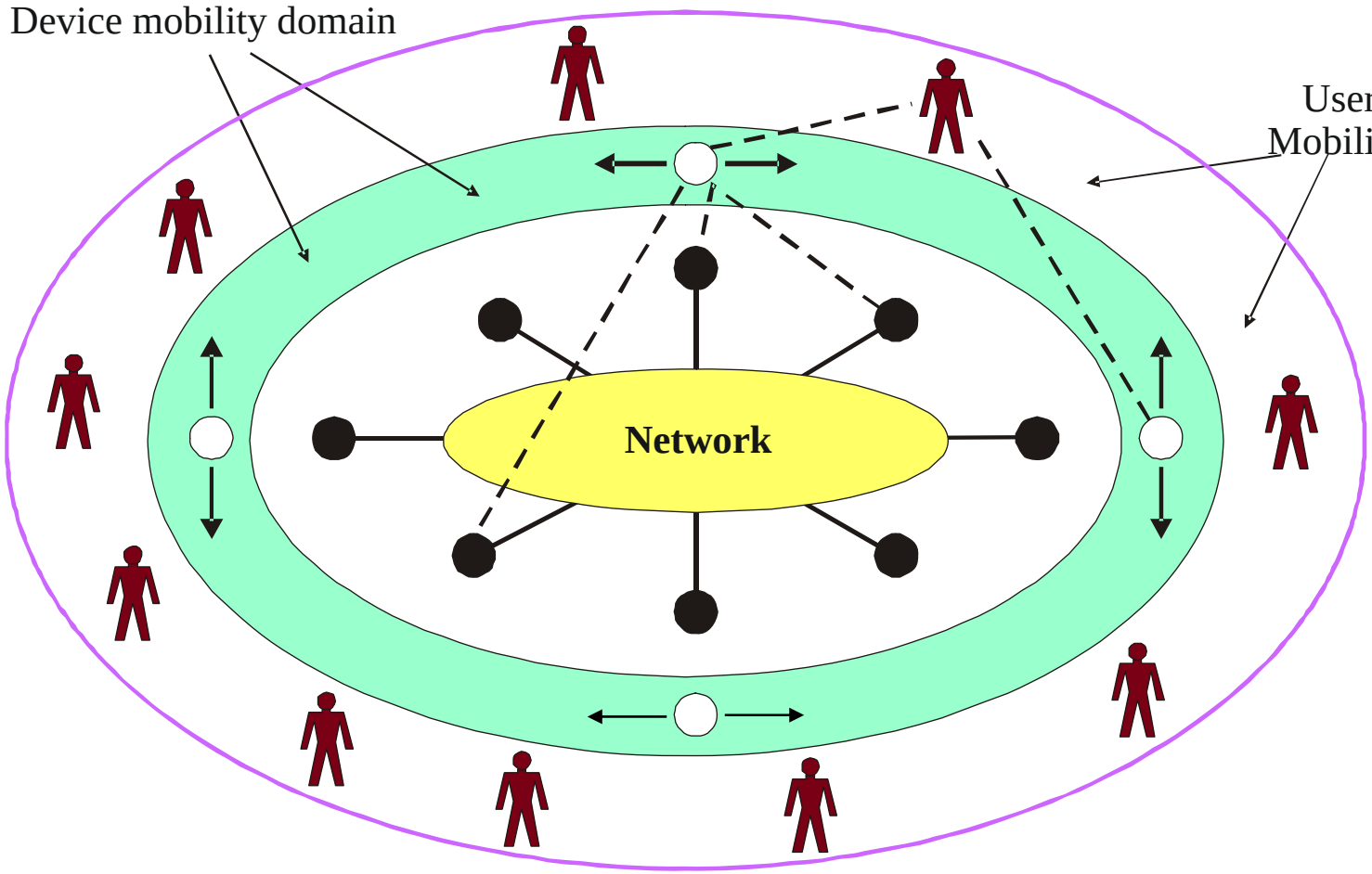


Complex and heterogeneous environment

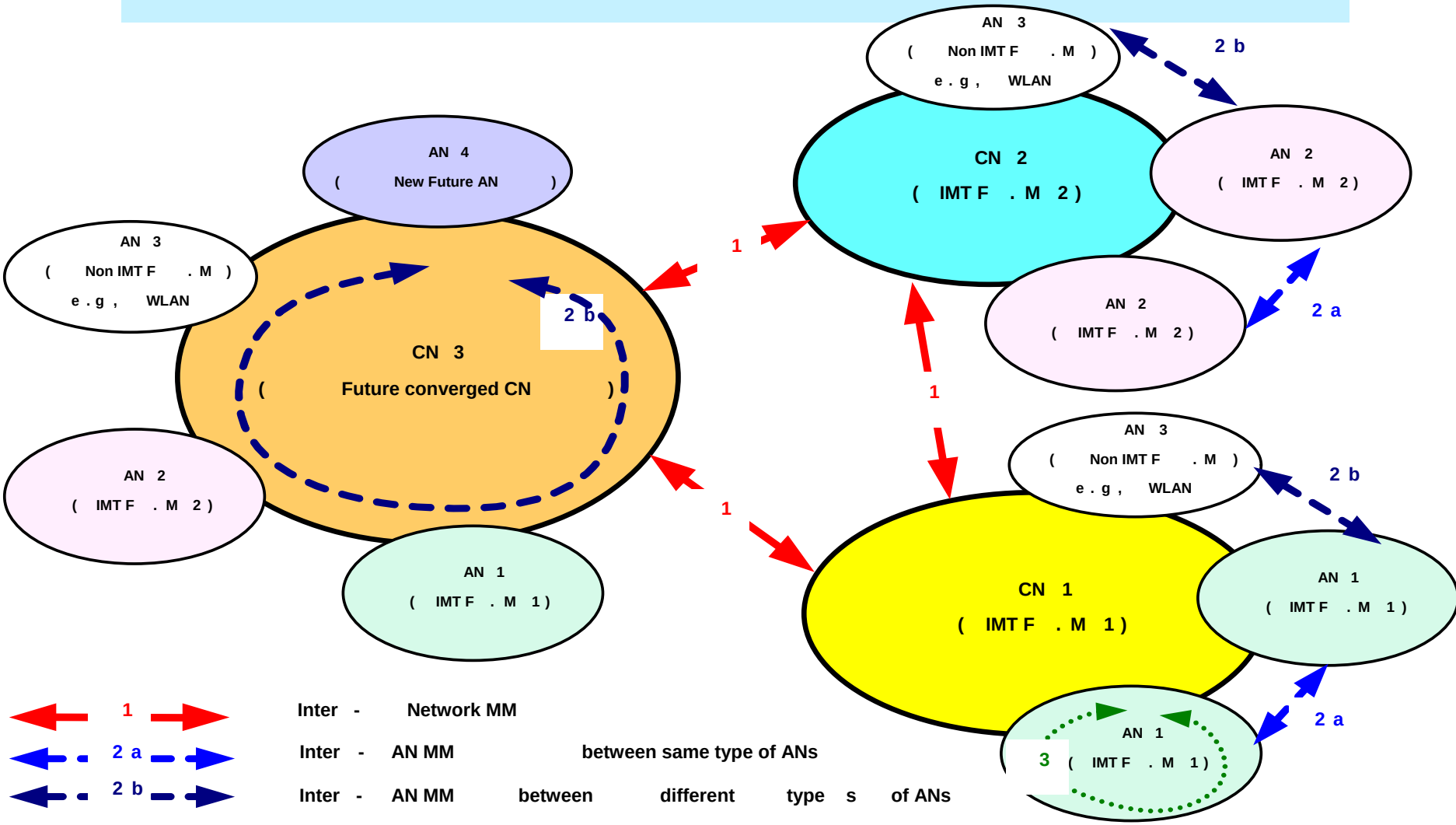
Basic User Requirements

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

Mobility in NGN (Y.2011)



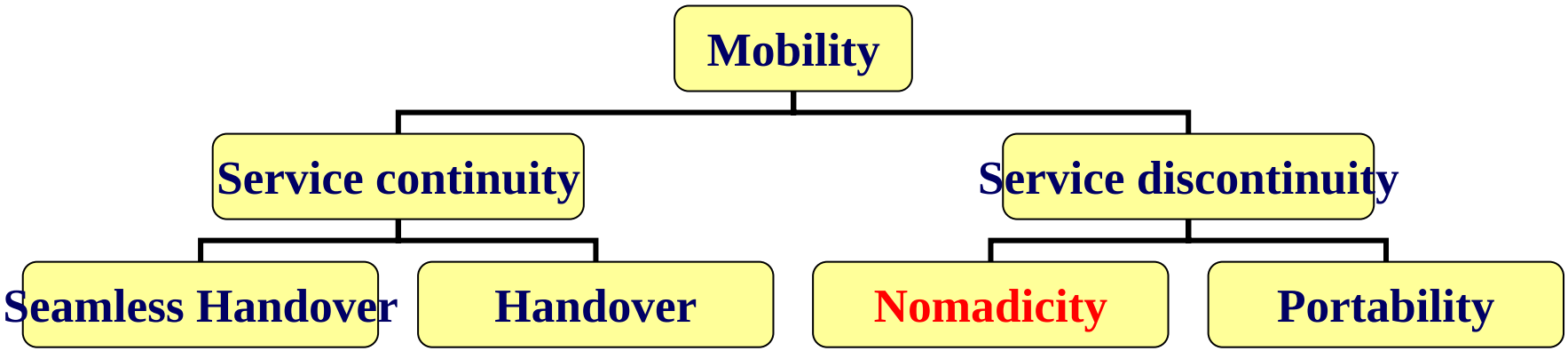
Mobility flavours (Q.1706) (1)



MM Mobility Management
AN Access Network
CN Core Network
IMT F . M IMT - 2000 Family Memeber

Scenarios

Mobility flavours (Q.1706) (2)



Service Quality

The limited Mobility objectives of NGN Release 1

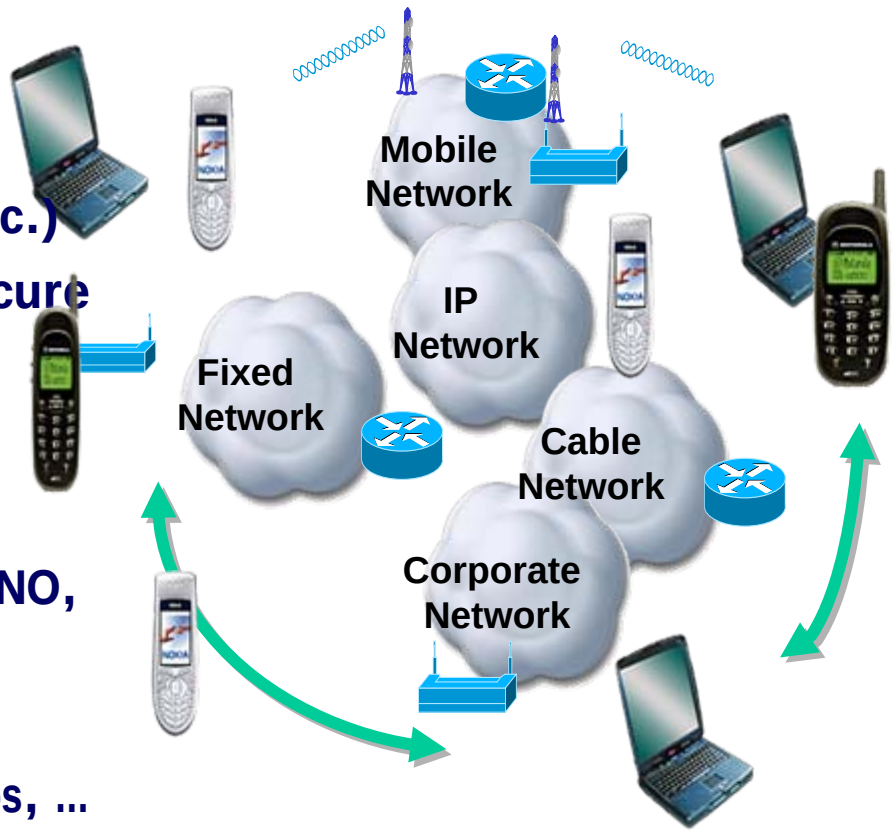
- **Release 1 shall support "Nomadism"**
  - **"The ability to change network access point on moving, without maintaining service continuity"**
  - To be supported between networks and within a network
  - But support for service continuity is not excluded

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

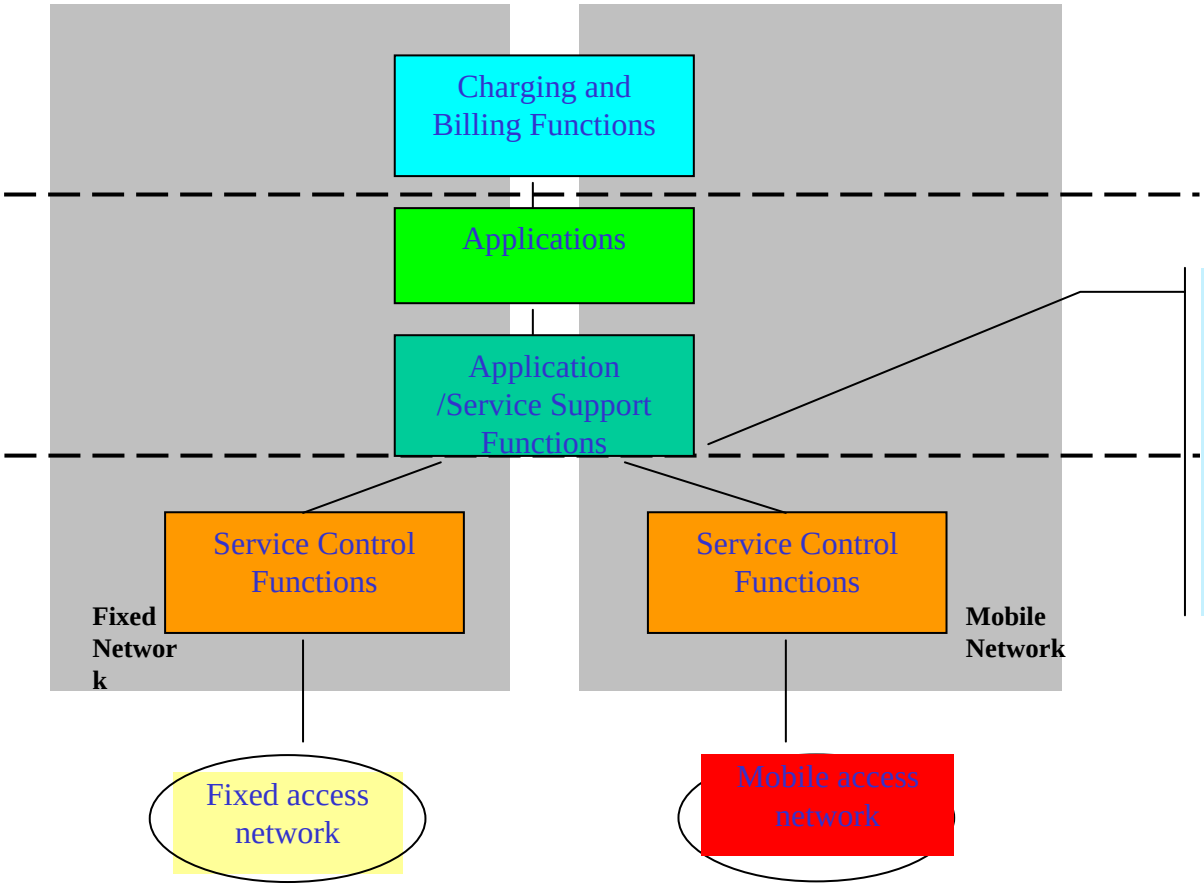
Release 1 is just an initial step towards Generalized Mobility and Fixed Mobile Convergence

The multiple dimensions of convergence

- Converged services
  - Service integration (voice and multimedia, messaging, presence etc.)
  - Always on, self service, simple, secure
- 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 (Y.2801)



Example of convergence at Application/Service Support Functions

Convergence may be happen at different functional levels

Y.2801: FMC characteristics, requirements, capabilities and scenarios

User Identifiers

- **User Identifier**
  - Means for User to access telecommunication services at any terminal on the basis of a personal identifier
  - Means for Network/Service Provider to identify, authenticate and possibly authorize the user (but other direction is also true)
  - To enable Network/Service Provider to provide those services delineated in user's profile
  - Use and type of User Identifier may be tied to specific set of services
- **NGN User identifiable by one or both of User Identifier types**
  - **public user identifier**: information used by a NGN user to contact or communicate with another NGN user (**identity visible to other users**)
  - **private user identifier**: information used to identify a NGN user to his network/service provider (**identity not visible to other users**)
- **Identifiers are needed not only for "user" entities**
  - **Identifiers for devices, network and application providers, applis etc.**
- **Distinct identification, authentication and authorization capabilities for NGN service and transport strata**

Identity Management (IdM)

- **Y.IdMsec NGN Identity Management Security (Release 2)**
  - Fundamental NGN concepts and framework for NGN
  - Threats and risks within NGN
  - Trust models within NGN
  - Security objectives and requirements
- **Identity Management Focus Group (launched in Dec 2006)**
  - Generic IdM framework (including data models/schemas)
  - Solutions for discovery of autonomous distributed identities and identity federations
  - IdM interoperability

Release 1 environment - Security

Security objectives

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

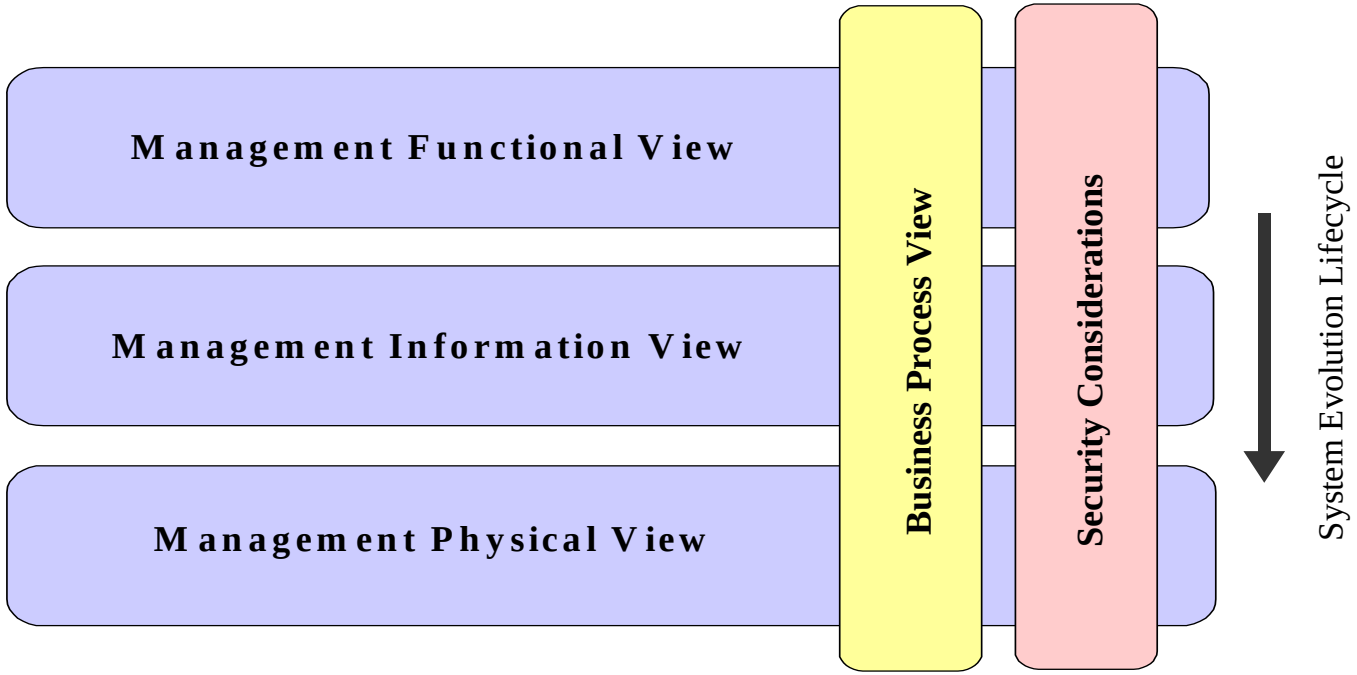
Security Requirements for NGN Release 1 (Y.2701)

- 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 requirements for Emergency Telecommunications Services

Ongoing work: NGN Authentication, NGN Certificate Management, Security mechanisms and procedures

NGN Management Architecture (M.3060)



- Integration of the Business dimension
  - Business Process View (M.3050 series = TMF eTOM)
- Concept of NGN Management Logical Layered Architecture

Release 1 environment – Management Interface Capabilities

- **Management objectives**
  - Following principles of M.3060
  - Monitoring and control of NGN services and components

- **Release 1 work items focus**
  - **Management requirements and architecture**
  - **Protocol-neutral/protocol-specific interface specifications**

- **Collaboration among ITU-T NGN Management Focus Group/SG4 and partner organizations**
  - **SG15, SG13, TISPAN WG8, ATIS TMOC, TMF, 3GPP SA5, OASIS, IETF O&M**
  - Emphasis on reuse of partner specifications

- **NGN Management Specification Roadmap**
  - **Gaps and best organization to fill the gaps**
  - **Overlaps and stimulating harmonization among partners**

Basic components:
Release 1 Requirements for Access Networks (AN)

- **NGN shall support Access Networks of diverse technologies and capabilities**
  - **All AN types are required to provide IP connectivity**
  - **Release 1 Scope provides a "proposed list" of technologies**
    - No mandatory list
    - Other emerging technologies may be ready for deployment (e.g. WiMAX)
    - Stage 3 (protocol work) will identify respective ability to support R1 requirements
- **Requirements for network attachment capabilities**

Basic components : Release 1 Requirements for User Networks

- A variety of network configurations inside User Networks may be deployed
- Access solutions to NGN shall have minimal impact on existing user network deployments
- No preclusion of firewalls and private IP addresses in combination with NAT/NAPT inside user networks

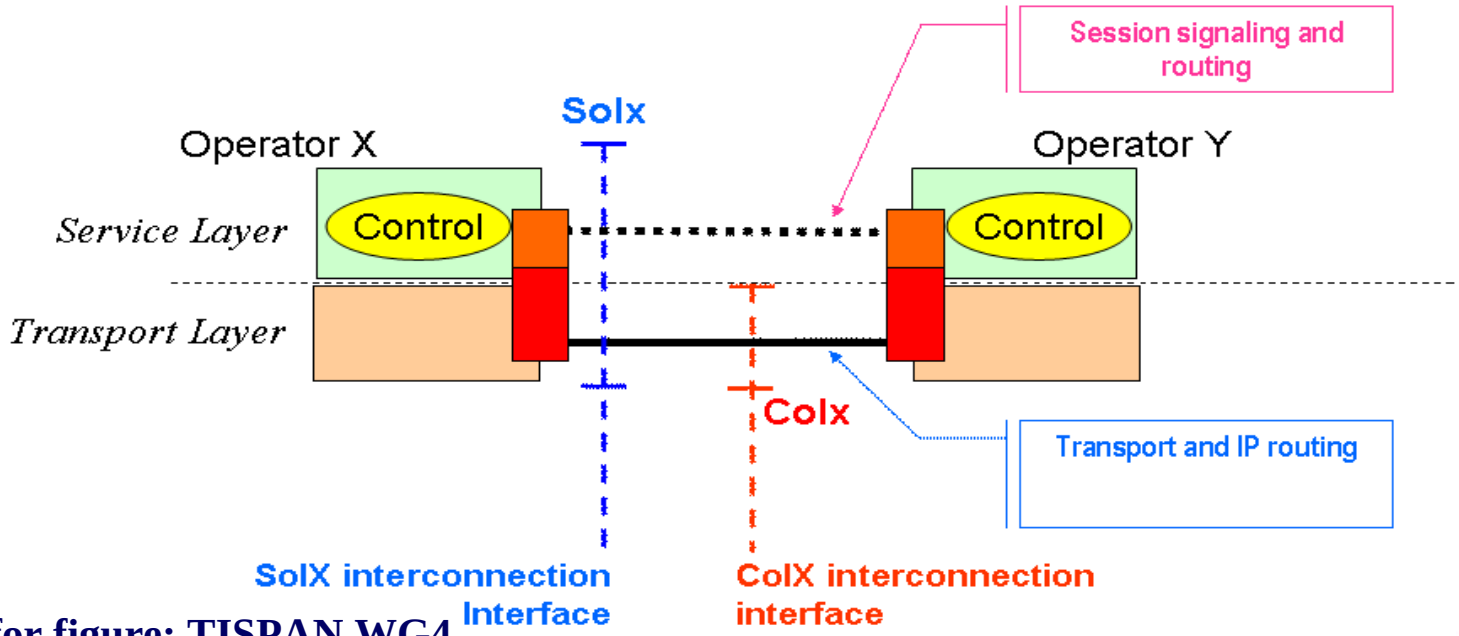
- Serious limitations in Release 1
  - Management of user networks is out of scope
  - Implications of complex configurations (e.g. Home Networking) are out of scope

Basic components : Release 1 Requirements for User Equipment

- NGN is expected to support a large variety of user equipment
- NGN Release 1 does not mandate specific requirements for user equipment, except for
  - Access arrangements
  - Protocol compatibility with NGN authentication, control, transport
  - No preclusion for user equipment enabling interface adaptation to varying user requirements (including accessibility needs)
  - Both direct and indirect (e.g. via IP PBX) connectivity between terminals and NGN shall be supported
- User equipment requirements in Release 2 ?
  - Ongoing studies in SG13 (Y.CMTP), SG16 (Next Gen MultiMedia terminal) etc.

Interconnection with other networks

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



Source for figure: TISPAN WG4

Capabilities for interconnection

Which 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

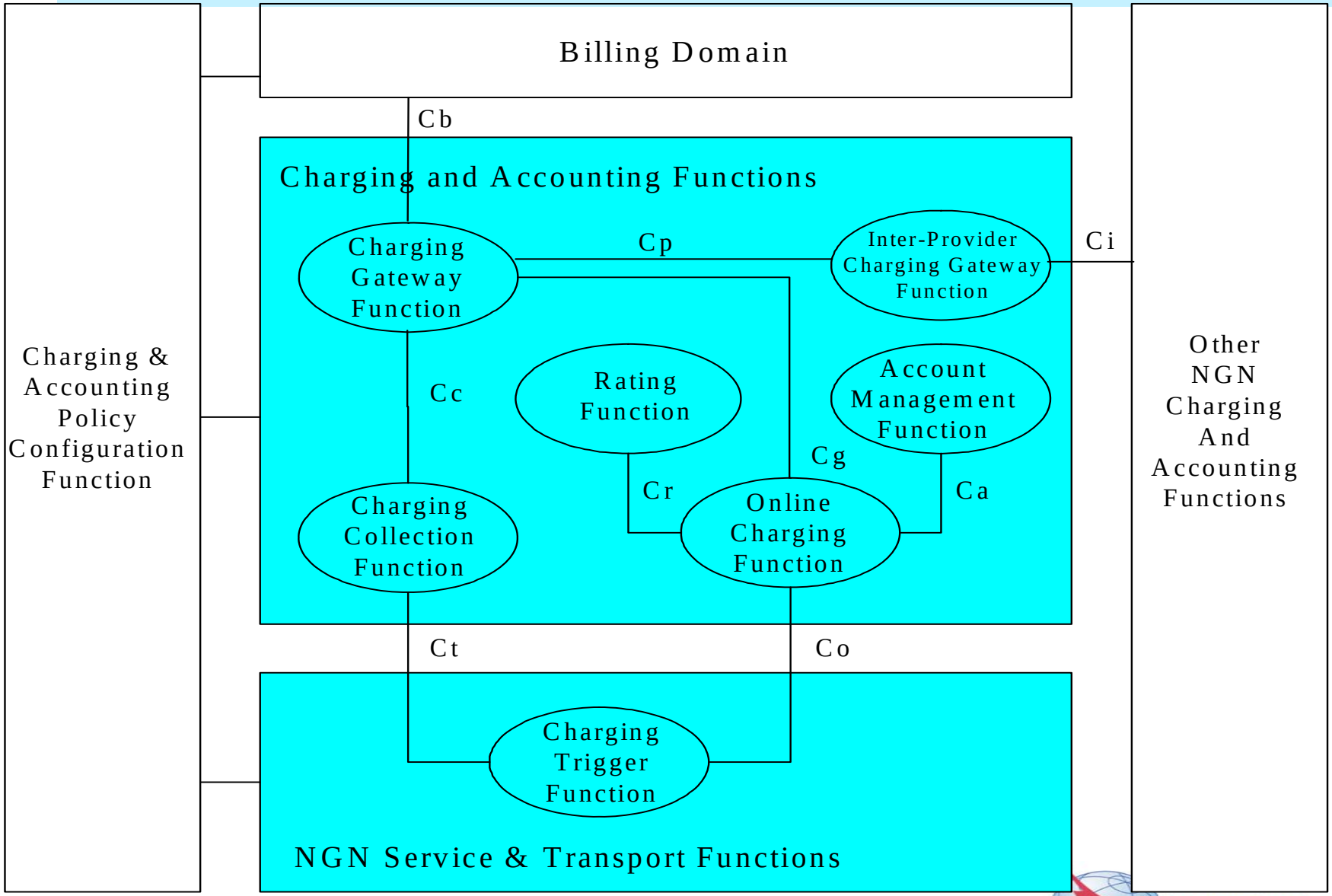
R1 requirements of Interconnection with non-NGN networks

- Interworking is required (not implied all services can be interworked)
- Supported network types
  - PSTN/ISDN
  - Circuit-based networks: same requirements than PSTN/ISDN
    - PLMN, Cable networks, Broadcast networks
    - Circuit-based Enterprise networks via PSTN/ISDN or PIE gateway
- IP-based networks : interconnection is not excluded

Interconnection between NGNs: critical topic requiring further technical work … and more

- Practicable Interconnection arrangements for seamless service operations are critical for NGN success
- Significant business implications exist in this area and progress is not only a matter of standards
- Interconnection in NGN is a new world for policy makers and regulators
- Standardisation advances require cooperation inside ITU-T and with other SDOs (regional bodies, IETF, 3GPP etc.)

NGN Accounting and Charging (Y.ngn-account)



High-level Requirements for Accounting and Charging (A&C) Capabilities within NGN R1

- NGN is required to support:
  - A&C functionality for unicast and multicast
  - various charging policies (e.g. fixed rate and usage based charging)
  - appropriate charging arrangement models for NGN R1 services
  - architecture with open-standard interfaces
  - interfaces and protocols
    - between network elements and accounting elements
    - between A&C elements
  - management functionalities for of A&C seamless operation
- NGN may support
  - flow-based A&C functionalities for various NGN R1 services (accurate, reliable, and scalable functionalities)

Benefits of NGN Release 1

NGN Release 1 Scope

- Re-use and adaptation of 3GPP IMS to provide multimedia services
- Unified IP network with improved security and QoS
- Broadband access
- Variety of mobile and fixed terminals targeting FMC
- Media processing for content delivery
- Service delivery platform for easy service creation and execution
- Border gateways for secure interworking
- Evolution scenarios of PSTN and short-term solutions

Benefits

- Reduction of installation and operating costs
- Expansion of service features
- Creation of new business opportunities
- Preservation of existing services

Driving the ITU-T NGN Global Standards: the NGN standardization roadmap

- **NGN GSI works on the NGN standardisation roadmap**
  - Completion of Release 1 and future releases
  - Coordination inside ITU-T, cooperation with other SDOs
  - Leverage of near term detailed and well-focused technical work of relevant SDOs into a consistent global framework

- **Consideration of regional requirements is essential**
  - ETSI (Europe), ATIS (N-America), ASTAP (Asia-Pac)
  - **Arab region is welcomed to contribute !**