Broadband Business Forum – Expo Comm Italia

"ITU Session: ITU studies on NGN, wireless and interoperability"

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NGN studies in ITU-T
(a brief and not exhaustive overview)

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Outline

ITU-T NGN standardization activities

- Some basic elements, including NGN Functional Reference Architecture and NGN Capabilities
- NGN open service platform (Telco SDP)
- NGN services and IPTV
- What next after NGN

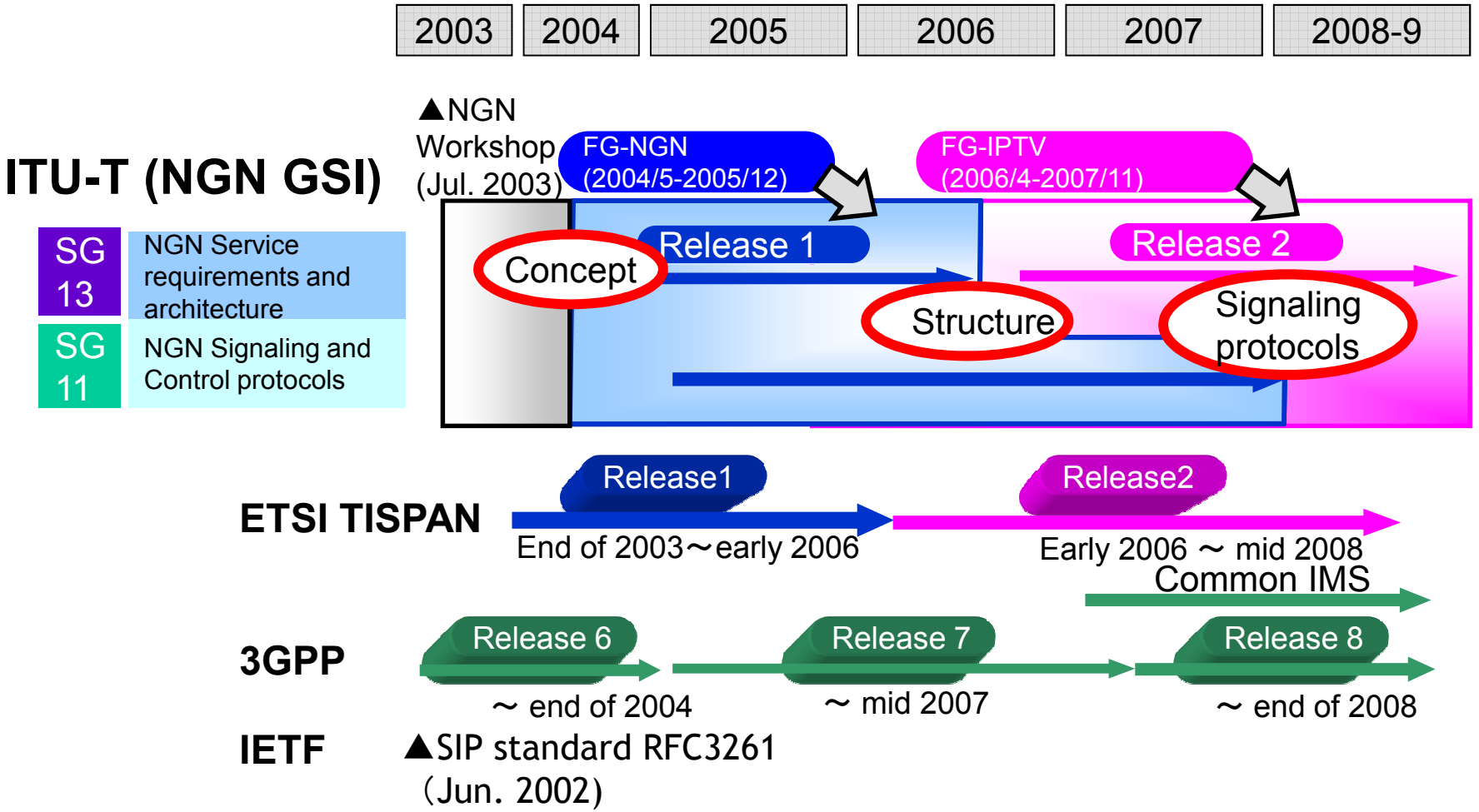
Some basic elements including NGN Functional Reference Architecture and NGN Capabilities

Chronology of NGN standardization in ITU-T

- First workshop on NGN in ITU-T convened in Geneva, 9-10 July 2003
  - Meeting convened with cooperation from SGs 11, 13, 16 and SSG (predecessor to SG 19)
  - Presentations from different interest groups
  - SG 13 was tasked to lead the study team on NGN
- First JRG-NGN meeting, 29 Sept to 2 Oct 2003
  - Four draft Recommendations were generated
- NGN Focus Group was formed in May 2004
- Study Group 13 (NGN SG) established by WTSA-04 as the lead SG for NGN studies
- NGN GSI (Global Standards Initiative) started in 2006 and is continuing

ITU-T NGN standardization timeline

- 13 ITU-T Recommendations on NGN basic concepts published at July 2006
- ITU-T NGN Release 1 practically completed in January 2008
- More advanced services/features (IPTV, FMC etc.) under discussion (Rel. 2)



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

Dec 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
  - ["Release" concept under replacement with "Capability Set" for the Release 2 developments]

March 2006 (FG NGN Management->SG4):

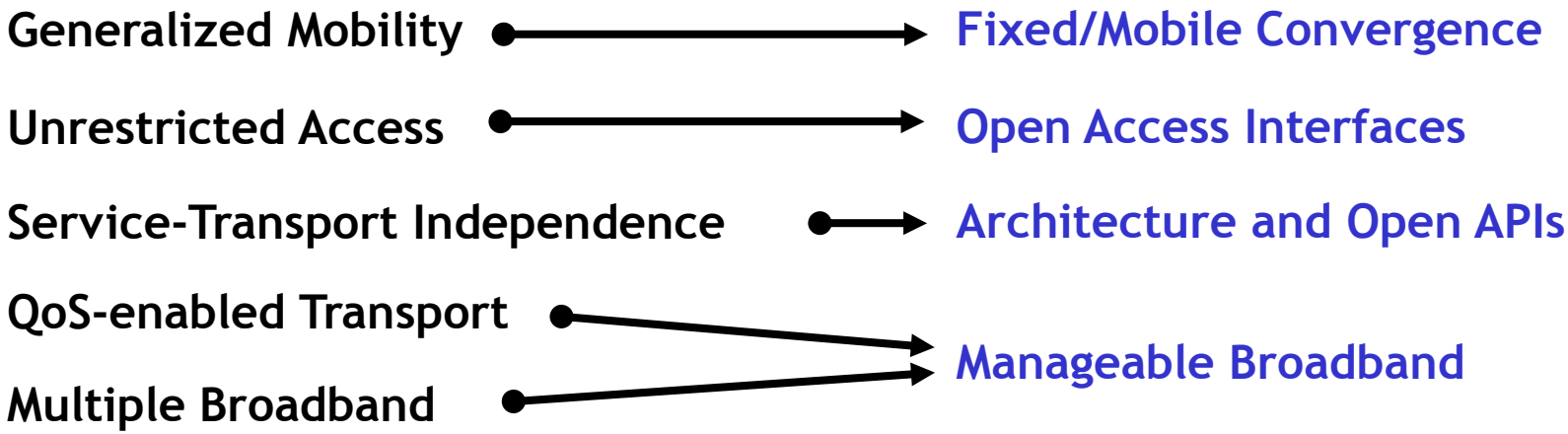
- **Y.2401/M.3060: Principles for the Management of NGN**

NGN definition & basic features

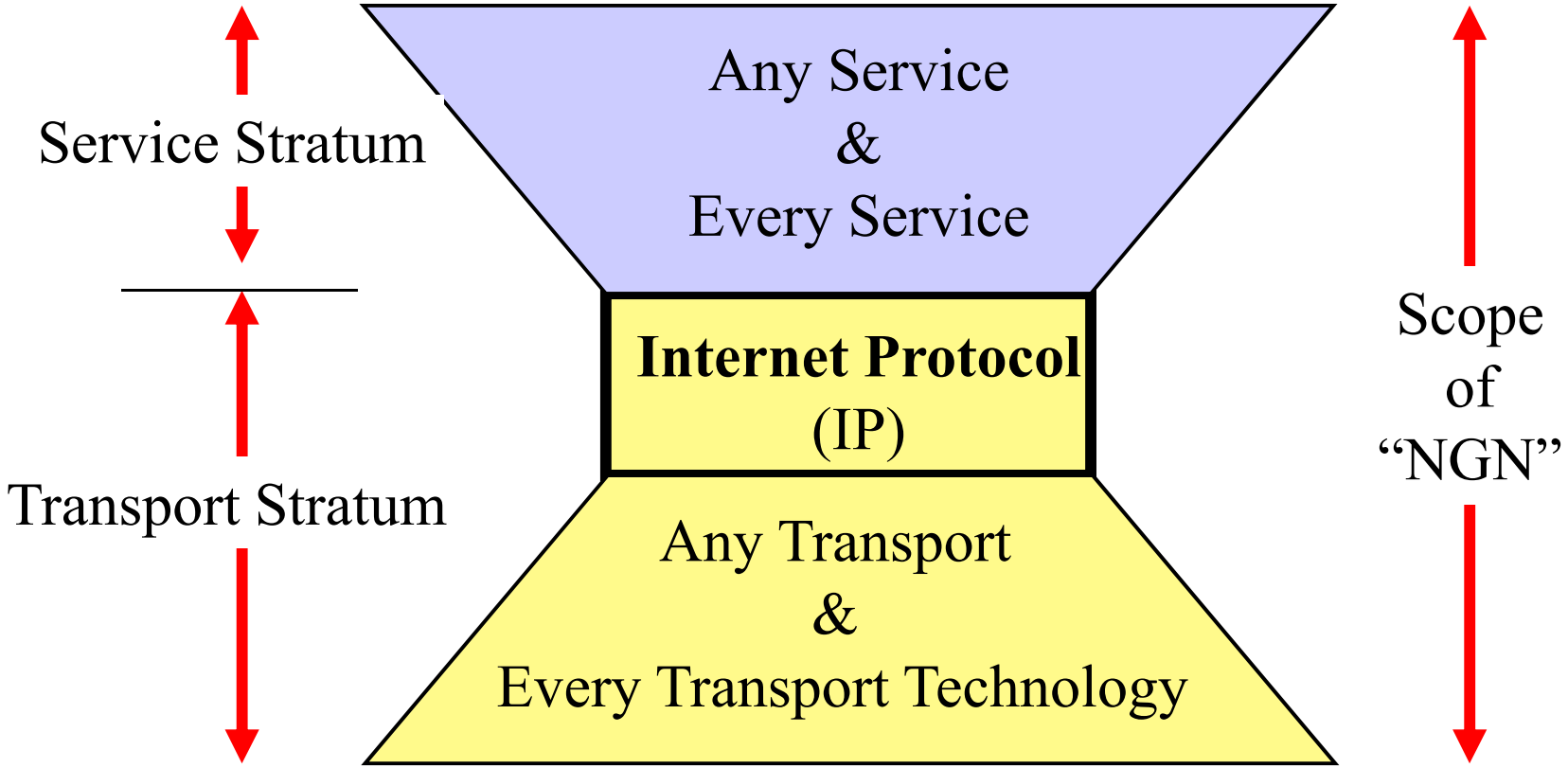
Definition of NGN (Rec. Y.2001)

A NGN is a packet-based network able to provide telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It enables unfettered access for users to networks and to competing service providers and/or services of their choice. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.

Target Standards areas

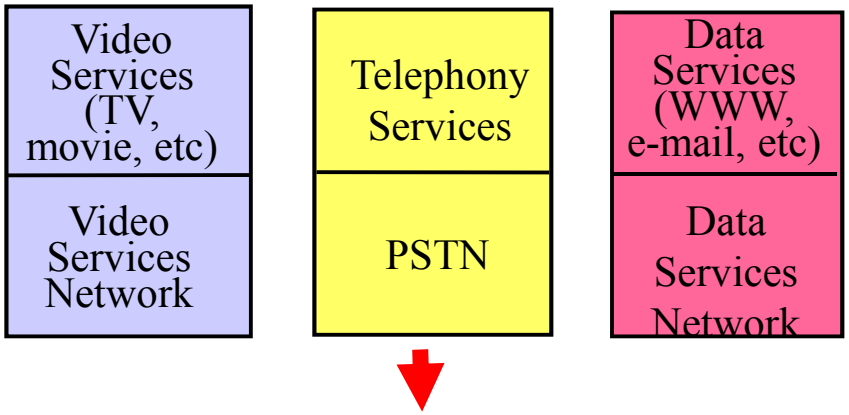


The unifying IP convergence layer

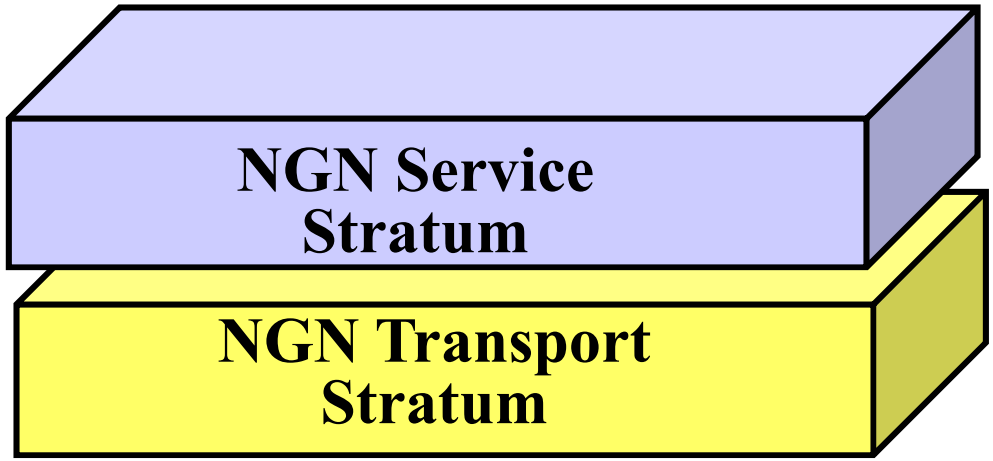


Separation of services from transport in NGN (Y.2011)

Pre-NGN: Vertically Integrated Networks



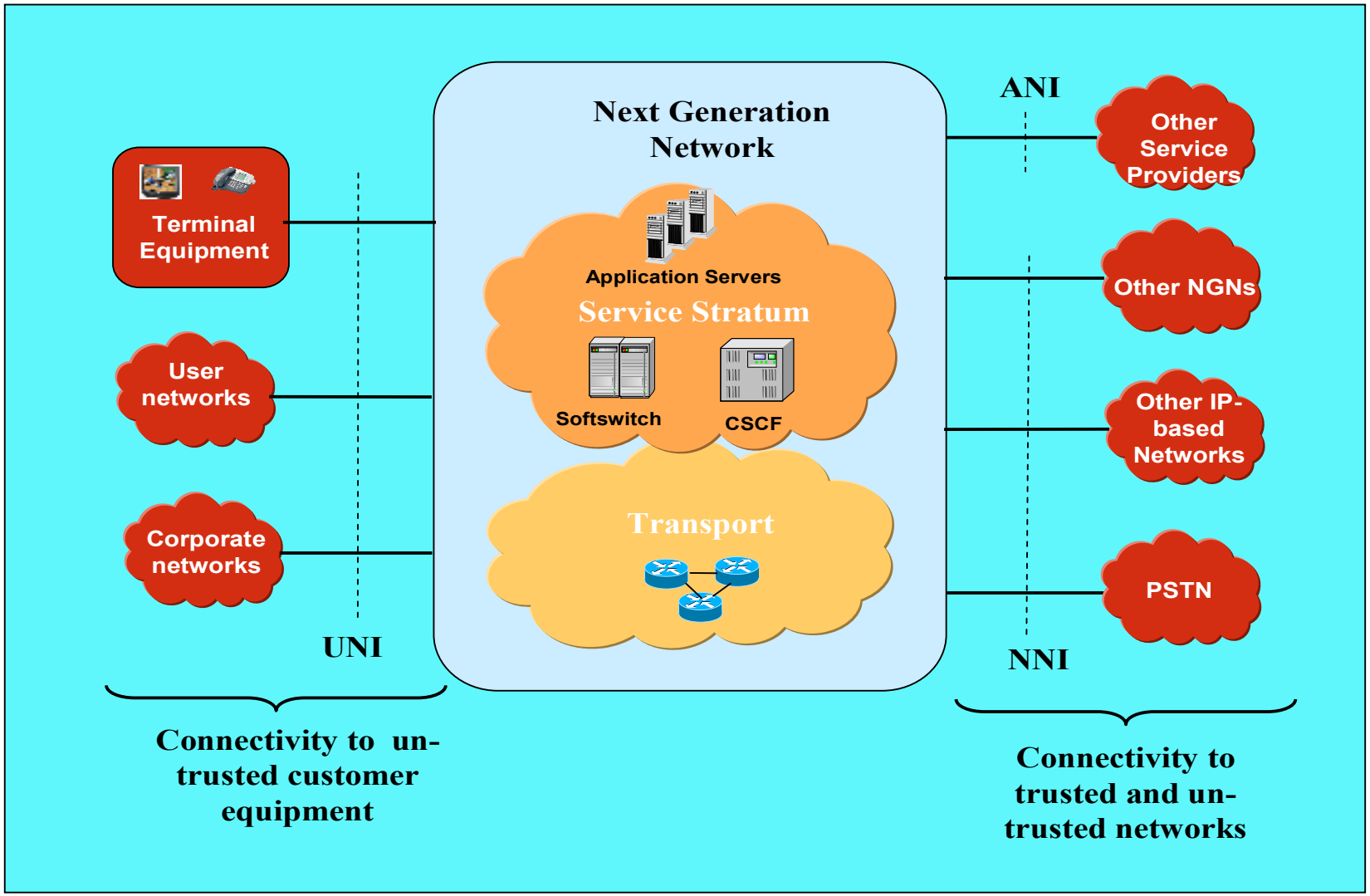
NGN: Horizontally Integrated Networks



"**NGN Service Stratum**" versus "**NGN Transport Stratum**"

- Each stratum comprises one or more layers, where each layer is conceptually composed of a **data (or user) plane**, a **control plane**, and a **management plane**

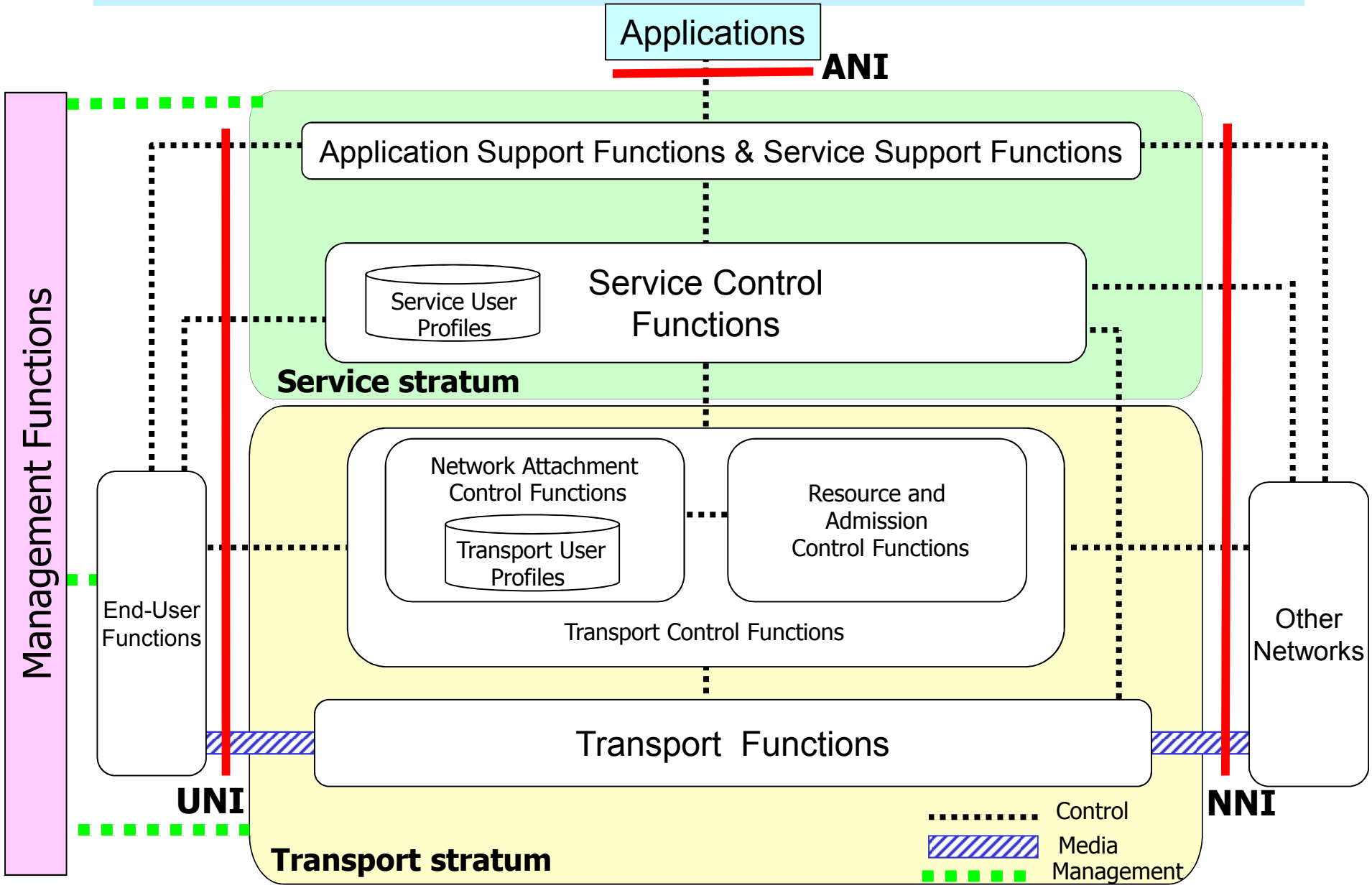
Connectivity to the NGN



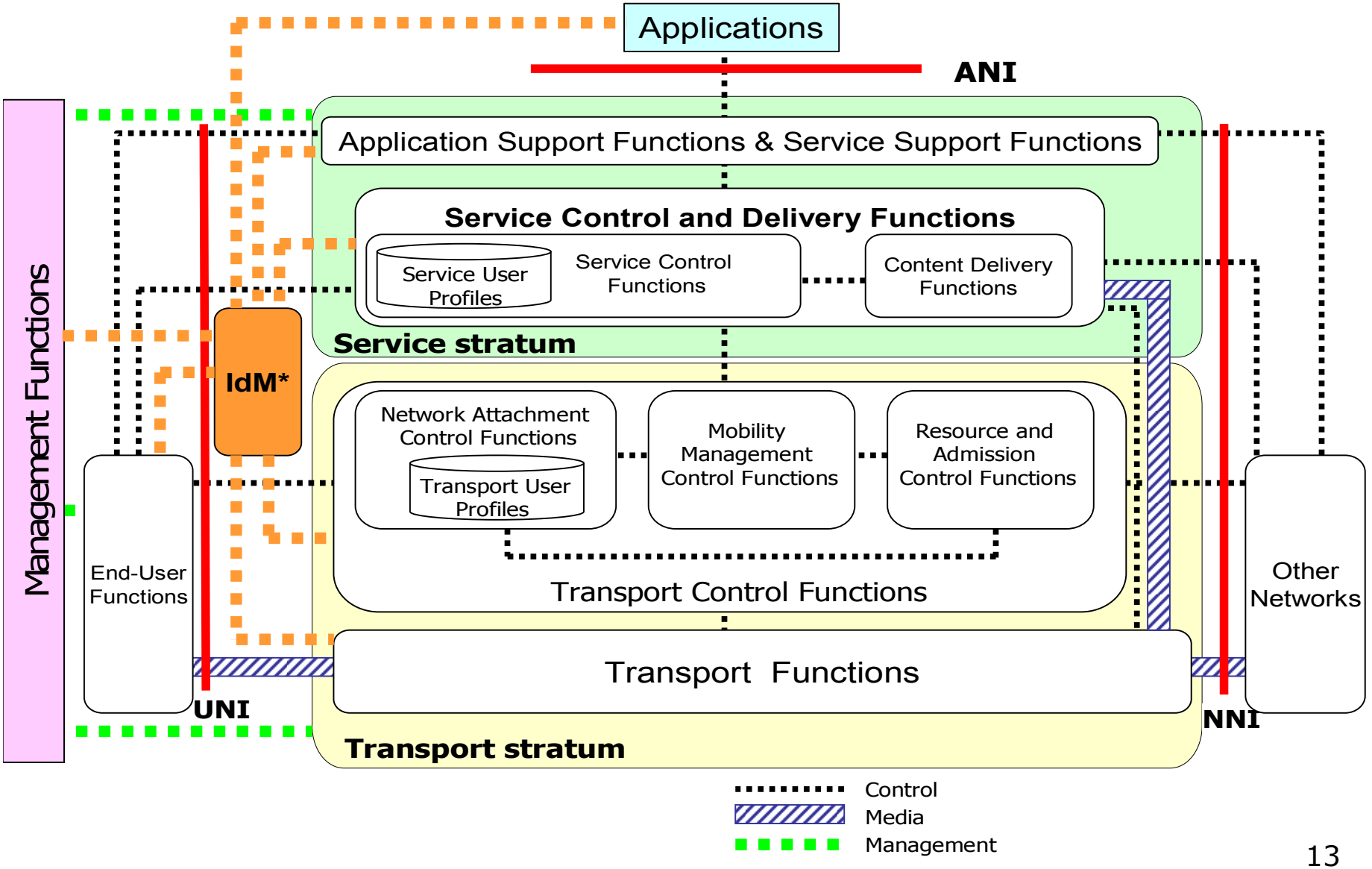
NGN Architecture: objectives and core component

- **The advanced objectives of the NGN Architecture**
  - Support of a comprehensive set of services over a unifying IP layer network (converged network)
  - Transport stratum support of a multiplicity of access networks and a variety of mobile and fixed terminal types
  - Independent service provisioning (separable from transport stratum)
  - Services not limited to those provided by the "home network"
  - Services able to traverse multiple providers' networks
  - Distributed and open control with enhanced security and protection
- **IMS agreed as 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 functionalities
  - Y.2012 "NGN Rel.1 functional requirements and architecture"
  - Y.2021 "IMS for NGNs" – NGN Rel.1 deliverable

Y.2012 : the basic functional view of NGN (NGN Rel.1)



Y.2012 Rev.1 :
the updated functional view of NGN (work in progress)

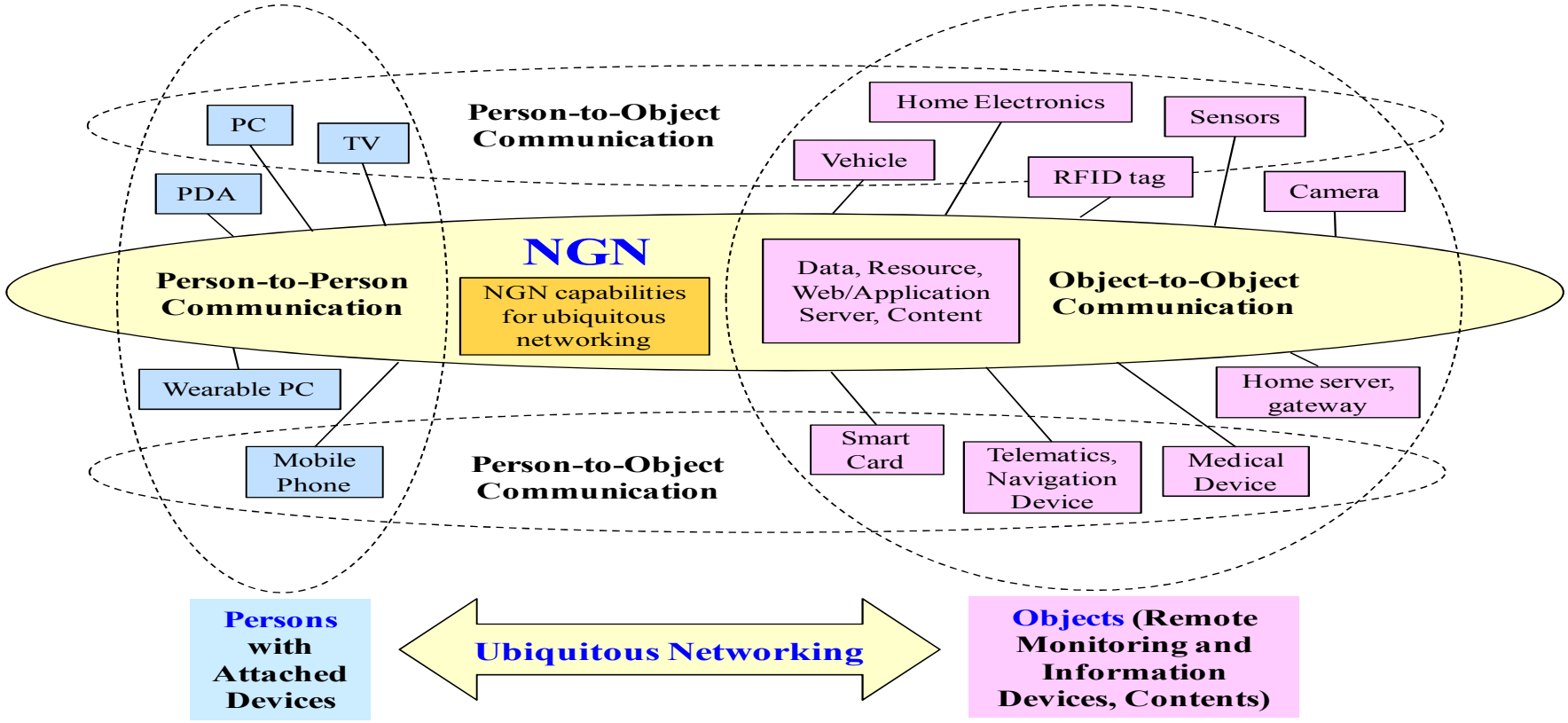


Some key NGN architectural challenges

- 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

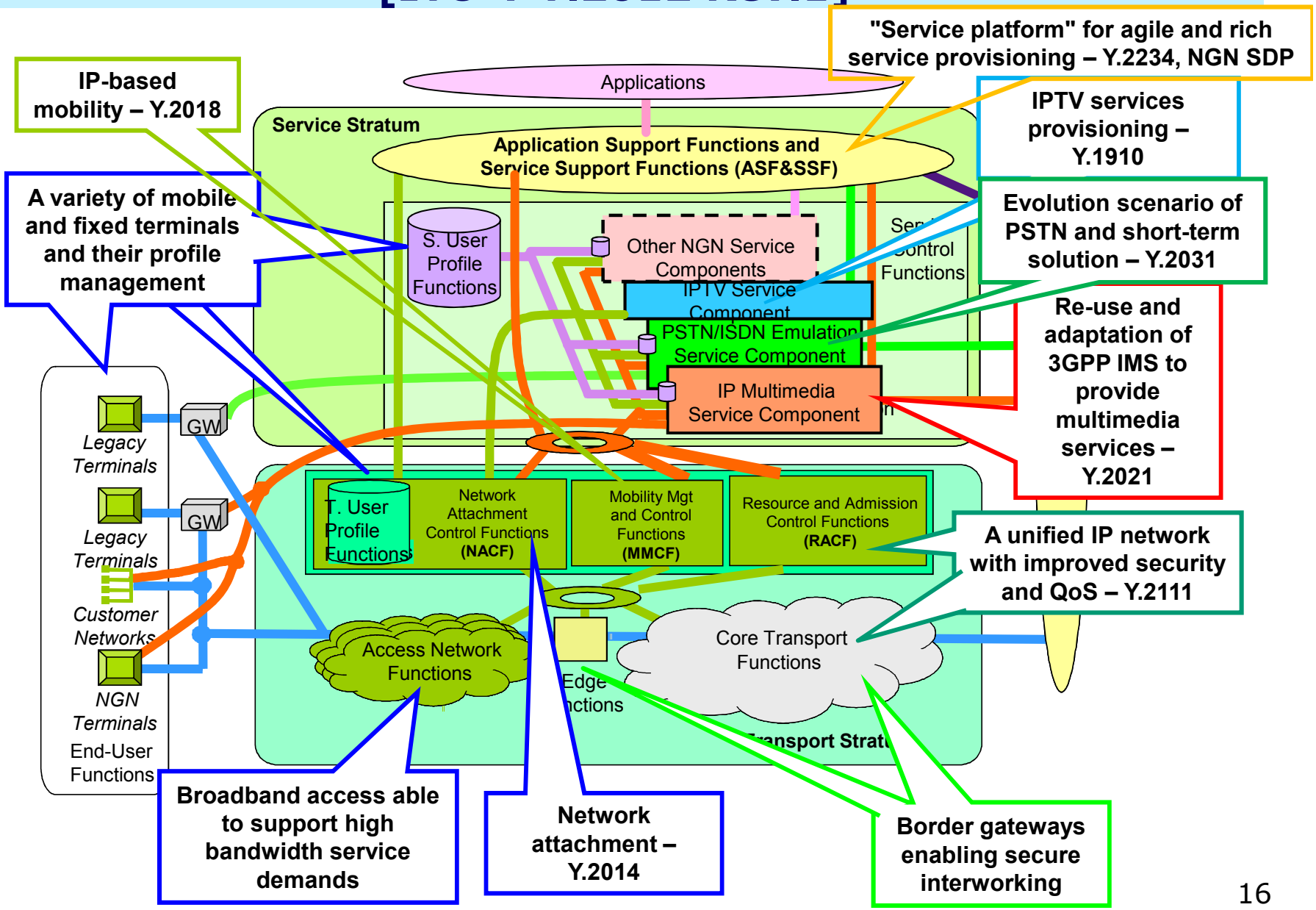
"Ubiquitous networking" as a future target

- 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 communication types

A "functional components" view [ITU-T Y.2012 Rev.1]



Next Generation Services

- From vertical sylos
  - Services require specific infrastructure components for their delivery
- to NGN
  - Horizontal Convergence: services no more vertically integrated
  - Network functions are componentised
  - Standard “capabilities” as service enabling toolkit

- NGN services standardization
  - Services specified in terms of required “capabilities”
  - Service definitions not anymore a requirement

Requirements and Capabilities of NGN

High level requirements

- **Y.2201 "High level requirements and capabilities to support NGN Release 1 service objectives" - approved in April 07**
  - Only network related capabilities

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

Detailed requirements

- **A number of specific Recommendations have been developed covering the various capabilities (e.g. Security and IdM, QoS, Mobility and FMC, Accounting & Charging, Interconnection etc.)**

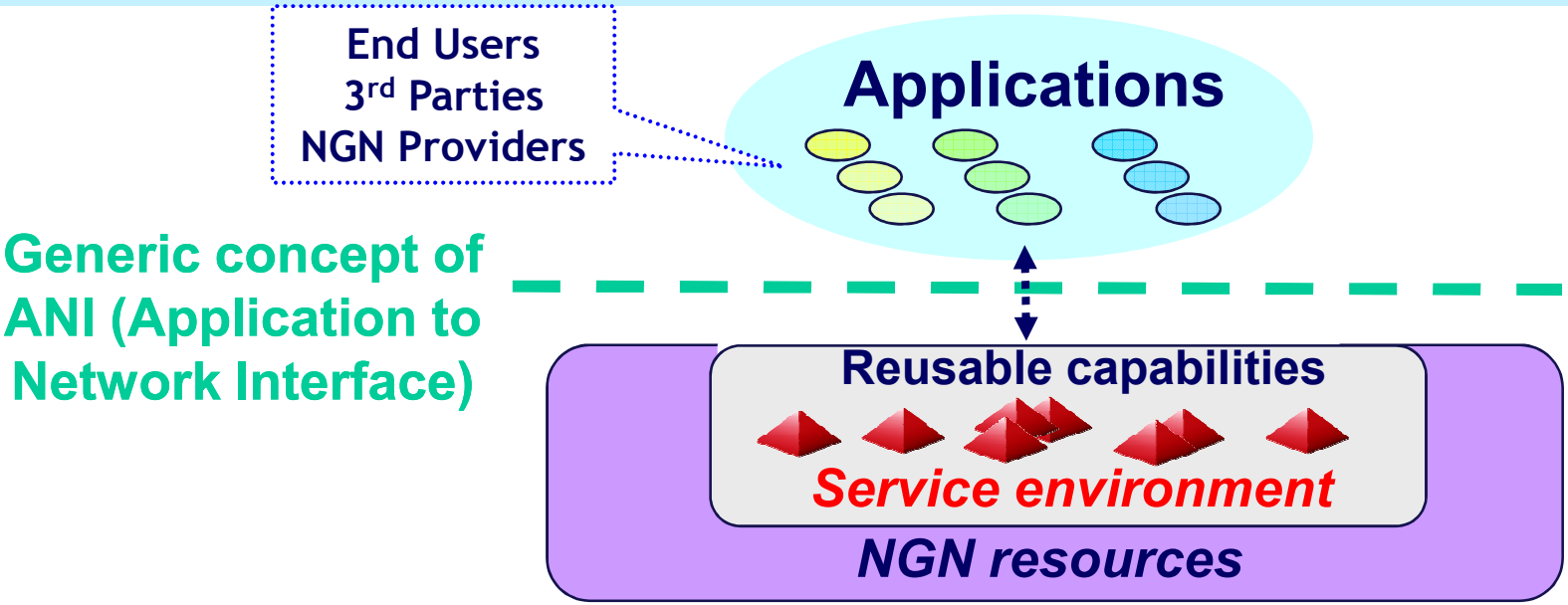
Each specific NGN realisation may support an arbitrary set of services, thus requiring the implementation of an arbitrary set of capabilities

NGN Capabilities: Rel.1 (Y.2201) and Rel.2 (Y.2201 Rev.1)

- Transport connectivity and network components
- Communication modes
- Multicast
- Media handling (resource management and codecs)
- Access networks and network attachments
- User networks including enterprise networks
- Interconnection, Interoperability and Interworking
- Numbering, naming, addressing
- Identific., authentic., authoriz.
- Identity management
- Security
- Critical infrastructure protection
- Routing
- Quality of Service
- OAM and Survivability
- Accounting and Charging
- Management
- Mobility handling
- Service enablers
- Context awareness
- Open service environment
- Profile management
- Policy management
- Content management
- IPV6 support
- Non disclosure of info across NNI and ANI
- Inter-provider exchange of user-related information
- Public Interest Services support capabilities
- *Capabilities for service specific requirements*

NGN and Telco SDP

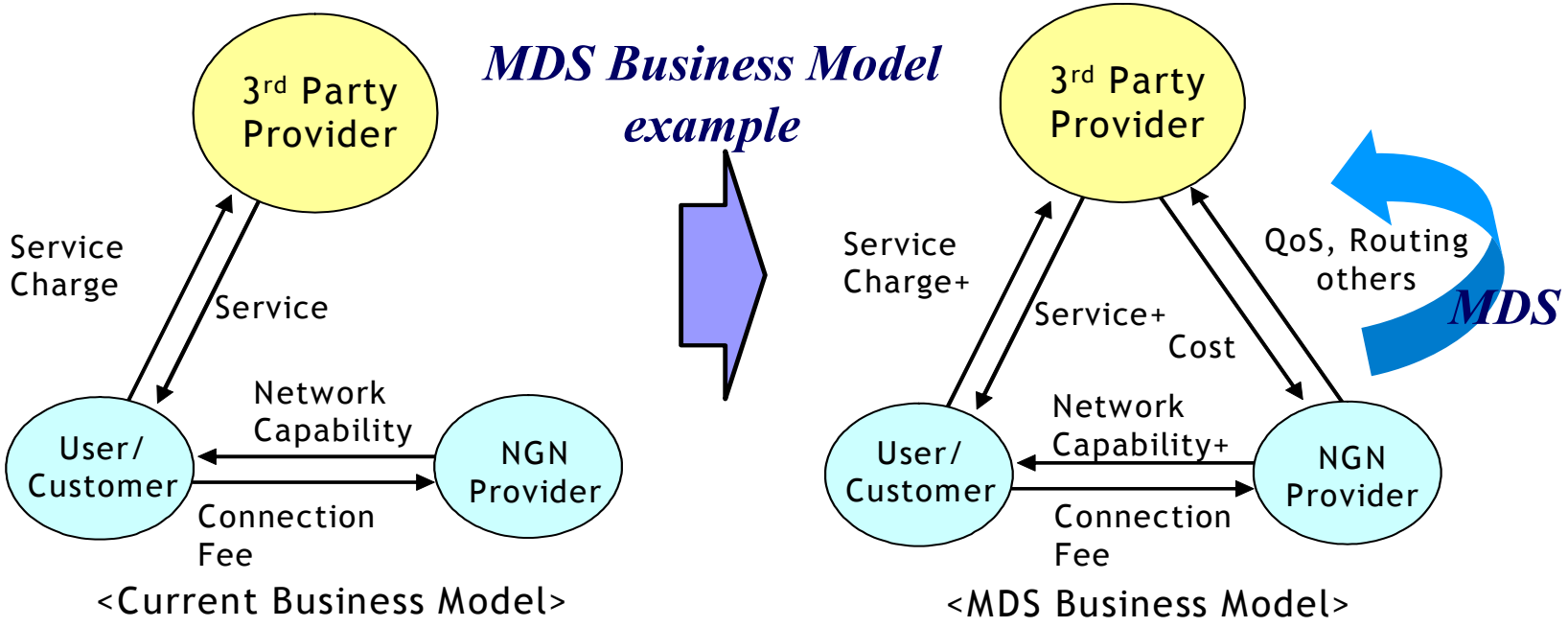
Reusable "Capabilities" for an (open) service environment



- **Reusable common set of "Capabilities" for reduced service development costs**
  - Applying the development approach from IT industry to Telecoms
- **(Open) service environment** for flexible and agile service creation, execution and management
  - **Service platform (NGN SDP (Telco SDP))**
  - Rapid changes for satisfying the changing customer needs
  - New business opportunities via an environment integrating applications and telecom infrastructure
  - Competing with Web companies' service offerings

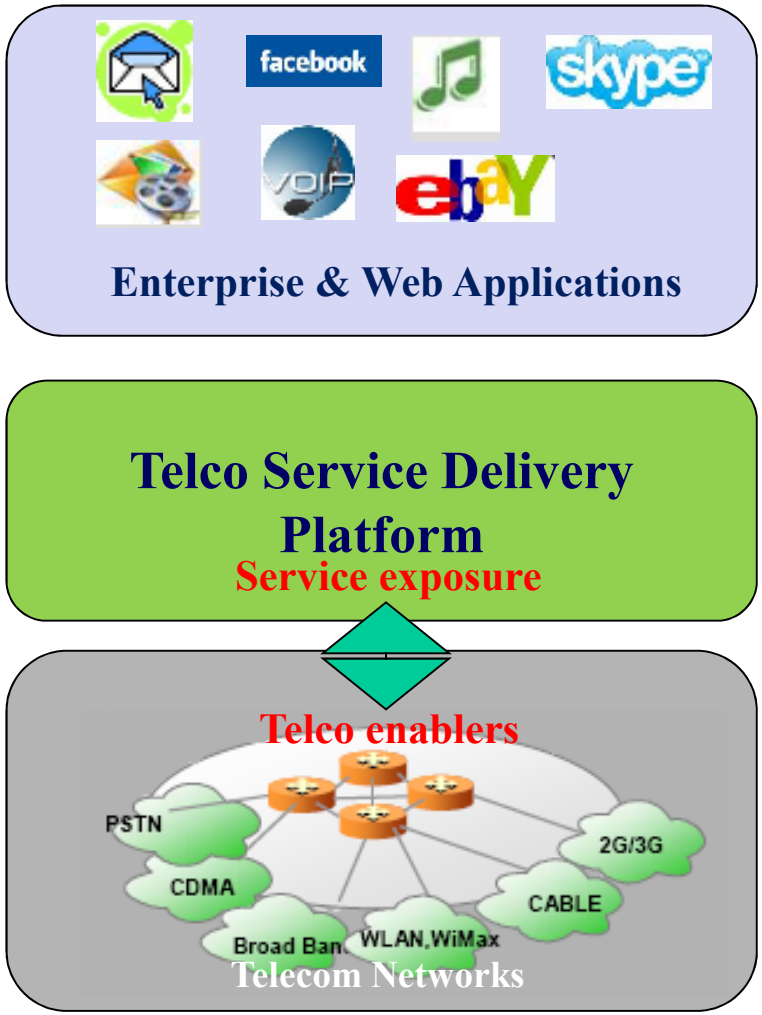
New business models:
« multi-sided model » example scenario

- NGN dynamic features and comprehensive service delivery control capabilities are made available **via MDS through ANI** by the NGN Provider to 3rd Party Providers and their customers
- 3rd Party Providers can offer enhanced services to their customers



A win-win situation for both 3rd Party Provider and NGN Provider

Telco SDP to compete with Web Companies



- Telco world versus Internet world with its huge offer of applications
- Telcos may become just 'bit pipe' providers (services Over The TOP)
- New services become a strategic differentiator and a way to face with decreasing voice revenues
- But legacy service delivery is inefficient and expensive

SDP (*) as framework for a new service deployment model

(*) IMS may been seen as separate or complementary framework

Towards an open service environment in NGN

- "Open service environment" key attributes (ITU-T Y.2234)
  - Exposure of capabilities via standard application network interfaces
  - Leveraging capabilities from different network domains (Internet/Web 2.0, Broadcast Networks, Mobile Networks etc.)
  - Portability and re-usability of capabilities across network domains (e.g. from the Internet to NGN, and from NGN to the Internet)
  - Flexible development of applications and capabilities by NGN Providers as well as by Application Providers *and End Users*
  - *Support of all types of service provision*
  - *Support of different business models & service delivery approaches*
- Enabling interworking with other service creation environments
  - IN-based service creation environment (INAP, CAMEL, WIN, …)
  - IMS-based service creation environment
  - Open service creation environment (OSA/Parlay, OMA, …)

Approaches for an open service environment in NGN

- How to open
  - Adopting a Service Oriented Architectures (SOA) framework from the Information Technology world, and enhance it as appropriate ⇒ **Telecom SOA**
  - Using **enhanced Web Services** as implementation tool set of the Telecom SOA framework (SOAP versus REST approach)
- What to open (exposing via standard interfaces)
  - NGN capabilities to Applications

    ⇒ Telecom APIs

    To a common basic set of Telecom APIs reusable across different service platform implementations
  - NGN capabilities to other NGN capabilities

Telecom SOA and enhanced Web Services: new challenges for the development of standards

- Key values of a SOA framework
  - Cross-platform and highly reusable
- **But new requirements have to supported for a Telecom SOA** for such as for carrier grade reliability, performance, security

- Most SOA implementations identify Web Services as the means for realizing a SOA
- **But Web Services enhancements are required**
  - Security, policy management, addressing, service traceability
  - Current WS standards are incomplete (proprietary implementations, low interoperability)

Telco SDPs status

Service platforms today

- Platforms using Web Services with interfaces developed between proprietary implementations
- Controlled platforms (Walled Garden approach)
  - Usage of proprietary control mechanisms (e.g. for security, policy mgt)
  - SDK (creation and launch)

No openness, no interoperability

Moving to “open” platforms

- Open: Growth of service market
- Closed: market restricted to those using your proprietary system
- Providers begin their move to open platforms
  - Initiatives in terms of SDP interworking (Verizon, Qwest)
  - Joint Labs (www.jil.org)
  - Leadership in standardization (e.g. APIs in OMA)
  - IMS platforms: Rich Communication Suite trials among 3 French IMS Providers

Service platforms related standardization activities

- Numerous (closed) ecosystems in the market

- A number of SDOs/Forums/Consortia are involved in this area, including
  - ITU-T: SG13 (NGN/future networks), SG16 (IPTV)
  - OMA : OMA Service (Provider) Environment, enablers, APIs
    - APIs: Parlay Service Access (22 APIs), Parlay REST, PXPROF (OneAPI profile of Parlay X SOAP WS (SM, MMS, Payment, Terminal location)), NGSI (Next Gen Service Interfaces)
  - GSMA: OneAPI (work now brought into OMA)
  - 3GPP (SCIM, brokering)
  - TeleManagement Forum: Service Delivery Framework
  - OASIS: Telecommunications Services Member Section, others
  - IEEE: NGSON (Next Generation Service Overlay Network)
  - ATIS: Service Oriented Networks (SON)
  - Others, including OMG (service description), Service Broker Forum

- It is required to fill gaps and converge/harmonize existing standards

Initial ITU-T work items in NGN service platform area

ITU-T SG13 is increasing its activities in this area

- **Y.2234: Open service environment capabilities for NGN (Sep08)**
- Y.OSE-arch "OSE functional architecture for NGN" (launch in Jan09)
- **Y.NGN-SIDE-Req: Requirements for NGN SDP** (launched in May09)
- Y.2212: Requirements of Managed Delivery Services (Jan08)
- Y.2232: NGN convergence service model and scenario using WS (Feb08)
- Deliverables based on past OCAF Focus Group activities (Dec06)
  - Y.2901/Y.2902 - Carrier grade open environment model/components

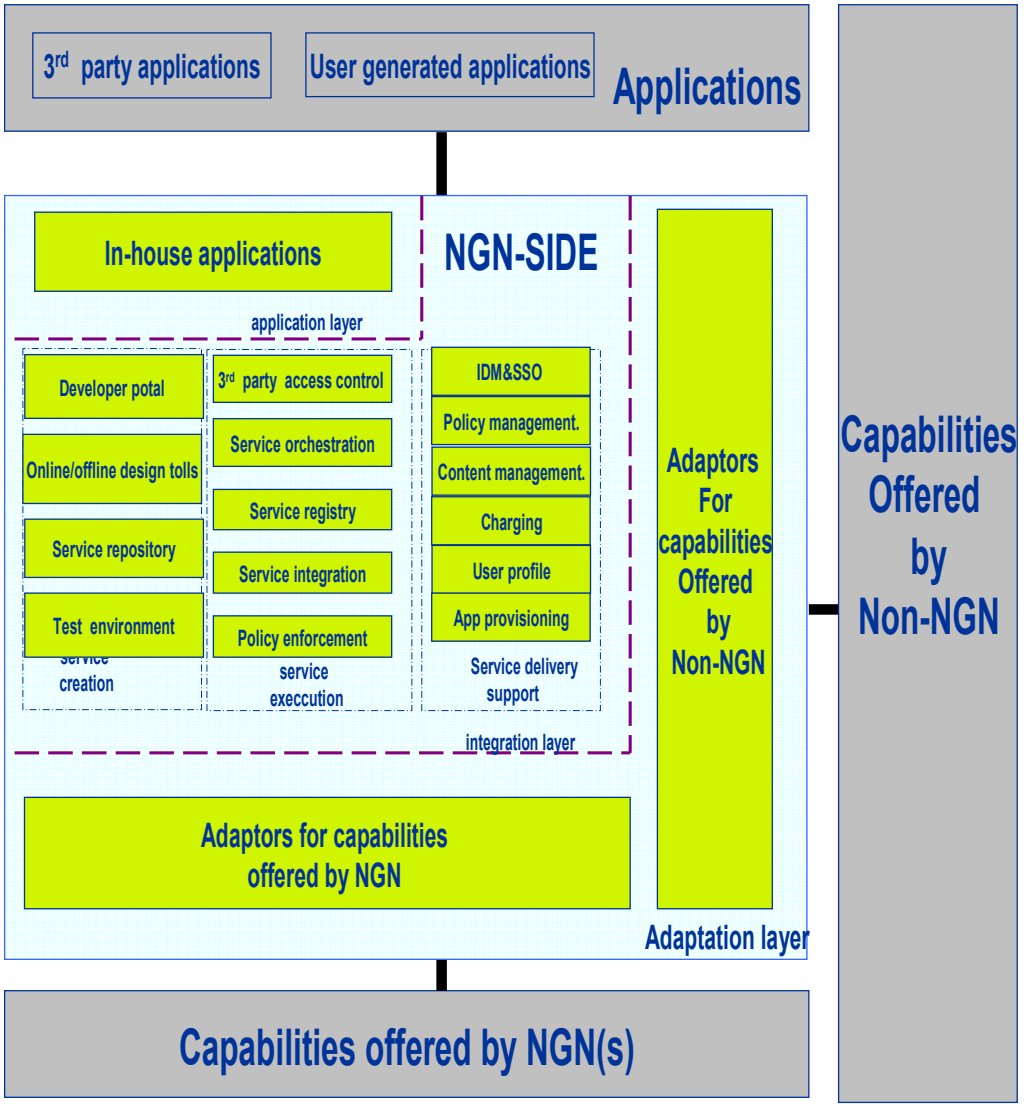
Other ITU-T activities in Telecom SOA and WS include

- M.3060: Principles for NGN management (March06) (ex- ITU-T SG4)
- SOA/WS related security aspects (ITU-T SG17)
- Middleware aspects for IPTV and USN (ITU-T SG16)

NGN SDP requirements

Y.NGN-SIDE-Req - draft

- NGN SDP capabilities
  - Generic capability set
  - Application-specific capability sets
  - Functional positioning (NGN architecture, NGN OSE)
- Requirements of NGN SDP capabilities
  - General requirements
  - Service interface reqts across ANI, NNI and UNI
  - Open service interface reqts within NGN SDP
- Appendixes
  - Application scenarios
  - Survey of API standardisation
  - Capabilities and APIs of relevant market SDPs



NGN SDP functional framework - Nov 09 draft

NGN services and IPTV

NGN Release 1 service objectives (Y.2000-series Sup.1 "NGN Rel.1 scope")

Services expected to be supported in NGN Release 1

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

It's always a Provider decision which services will be actually deployed (applies in all Releases)

PSTN/ISDN and the evolution (migration) to NGN: preserving the existing services

In evolution path to NGN, NGN shall support:

- legacy terminal equipment (e.g. PSTN/ISDN phones)
- PSTN/ISDN-like capabilities

PSTN/ISDN Emulation

- From the end user perspective, the NGN "appears" supporting the same types of services offered by the existing PSTN/ISDN
- Legacy terminals are enabled to continue to use existing telecommunication services while connected to NGN
- Implemented via adaptation to an IP infrastructure

PSTN/ISDN Simulation

- NGN terminals in an NGN network are enabled to use PSTN/ISDN-like service capabilities
- But legacy terminals with terminal adaptations may be used too
- Implemented over IP-based control infrastructure (e.g. using SIP)

Standardization activity on evolution aspects

Generalities: Scenarios for PSTN/ISDN evolution to NGN: Y.2261

- Aspects to consider for migration
- Call Server (SoftSwitch) based core network evolution : three scenarios (start from Local Exchanges, start from Transit Exchanges, One-step)
- IMS-based core network evolution: One-step scenario
- Access network evolution: xDSL access network scenario

Generalities on PSTN/ISDN Emulation and Simulation: Y.2262

- Adaptation Functions for legacy access equipment at UNI user or network side

On PSTN/ISDN Emulation

- Two approaches for emulation support: Call Server based (Y.2271) and IMS based
- PSTN/ISDN Emulation architecture (Y.2031) – the Emulation component in NGN

On PSTN/ISDN Simulation

- PSTN/ISDN simulation services rely on IMS capabilities (3GPP MMedia Telephony)
- Requirements in Y.2211, protocol aspects in SG11 (or 3GPP)

Other work is expected for concrete field scenarios (ITU-D)

- E.g. best “common” practices of migration towards target NGN configurations

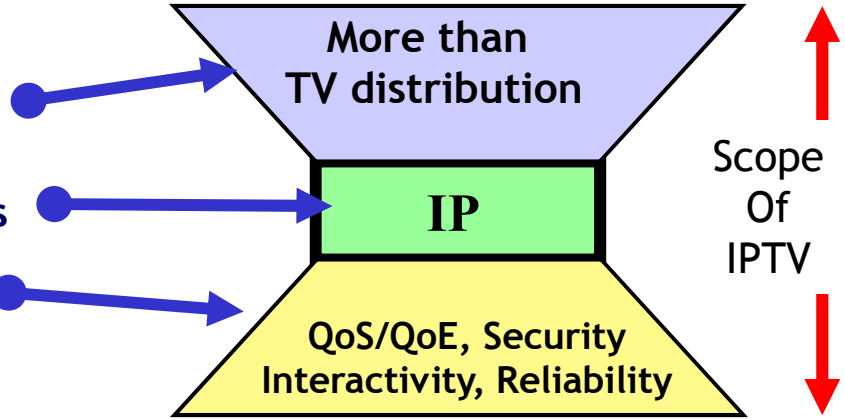
NGN Release 2 service objectives (Y.2000-series Sup.7 "NGN Rel.2 scope")

Services expected to be supported in NGN Release 2

- IPTV services
- Managed Delivery Services
- NID related services
  - Services using tag-based identification
  - Ubiquitous Sensor Network services
- Additional multimedia services
  - Visual surveillance services
  - Multimedia communication centre services
- Enterprise services (support by NGN of services for enterprises)
  - Virtual Leased Line, Business Trunking, Hosted services
- *Converged Web Browsing*
- *Home network services (support of services in home network environments)*

A key differentiator of future service offerings: IPTV

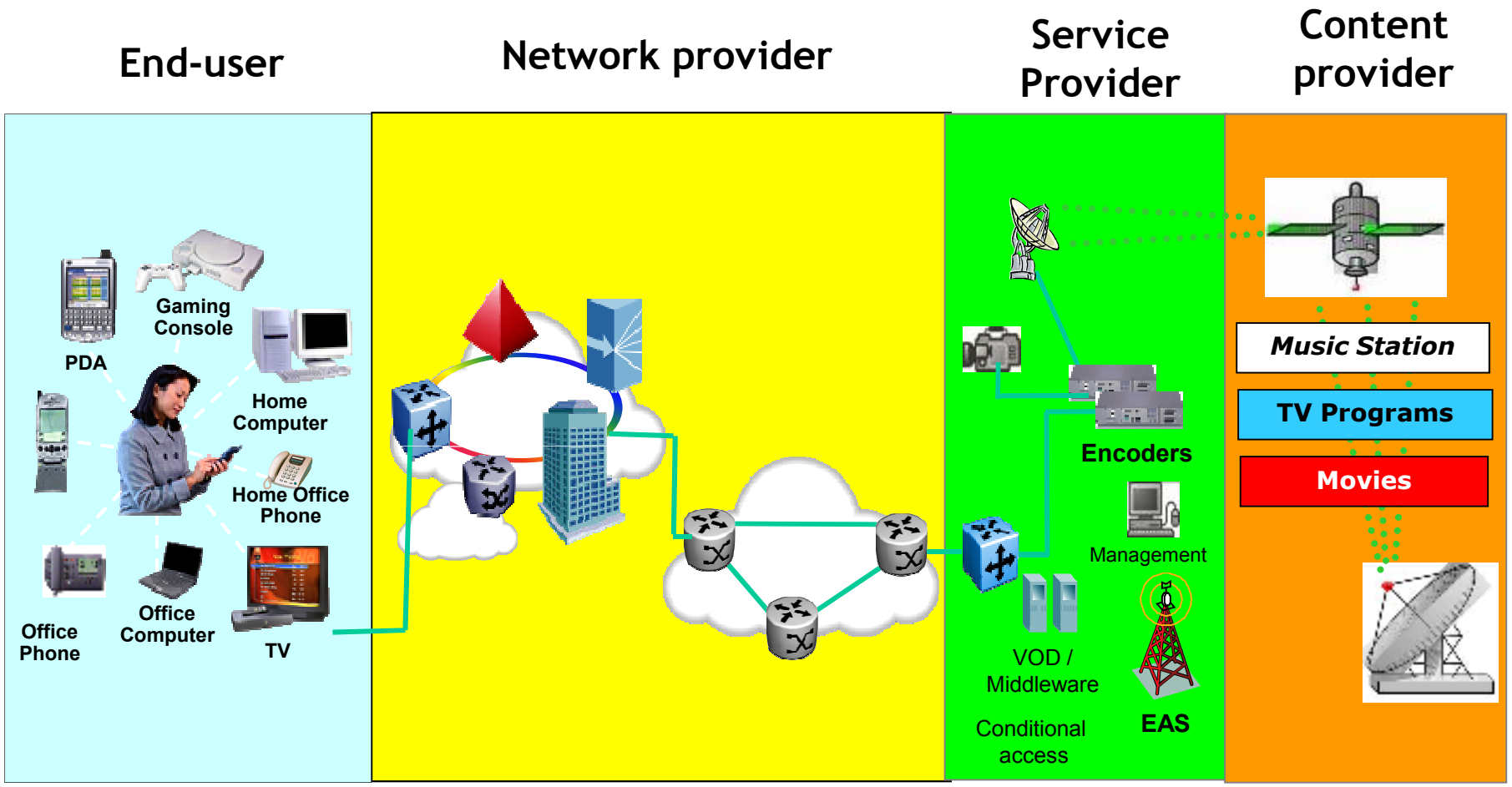
- From user's passive experience with traditional TV to active user control and involvement



- Multimedia Services
- Over IP based networks
- Managed capabilities

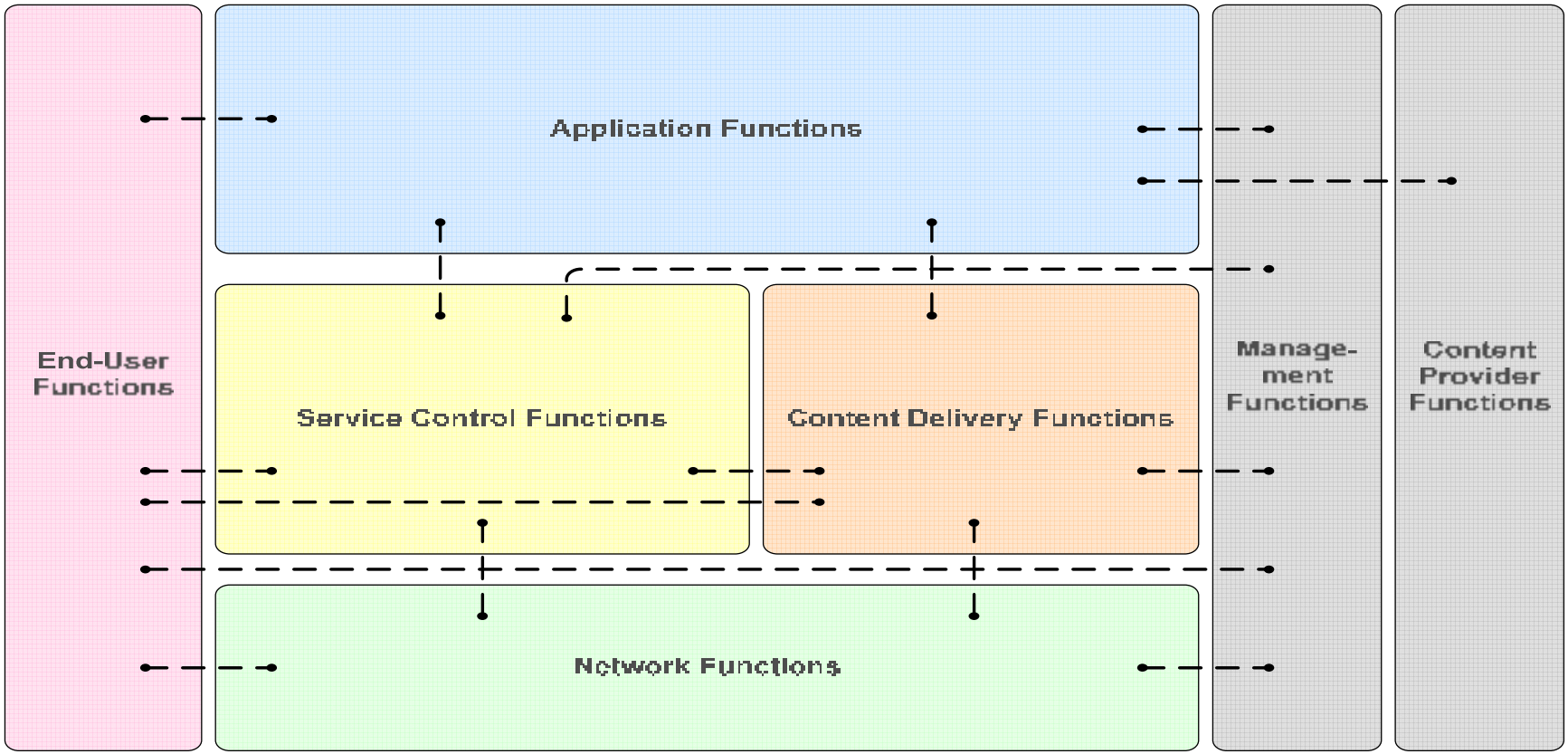
- **IPTV definition**
  - Not just Television over IP
  - "Multimedia services such as television/video/ audio/text/graphics/data delivered over IP-based networks managed to support the required level of QoS/QoE, security, interactivity and reliability"
- **Key features of IPTV**
  - Supportable by NGN
  - Bi-directional networks
  - Real time and non-real time service delivery
- **A large spectrum of IPTV services and business models**
- **Y.1901: High level requirements for IPTV**

IPTV domains as defined in ITU-T Recommendations



These IPTV domains do not define a business model.
In the provision of an actual service, one provider may play in multiple domains and multiple providers may play in the same domain.

IPTV Functional Architecture – Y.1910



Open interfaces to support multiple business models within an unified functional architecture

Focus on the standardisation of interfaces between IPTV components

Three IPTV architectural approaches - Y.1910

- (1) “Non-NGN IPTV functional architecture” (Non-NGN IPTV)
  - Based on existing network components and protocols/interfaces.
  - Technology components, protocols and interfaces already in use => approach of typical existing networks providing IPTV services.
  - Can optionally be used as basis for evolution towards the other IPTV architectures

- (2) “NGN non-IMS IPTV functional architecture” (NGN-Non-IMS IPTV)
  - Uses components (NACF, RACF, SCF) of NGN reference architecture [Y.2012] to support IPTV services, in conjunction with other NGN services if required

- (3) “NGN IMS based IPTV functional architecture” (NGN-IMS-IPTV)
  - Uses components of NGN architecture including IMS component (core IMS and associated functions for SCF) to support IPTV services, in conjunction with other IMS services if required

Progress in ITU-T IPTV standardisation (IPTV-GSI)

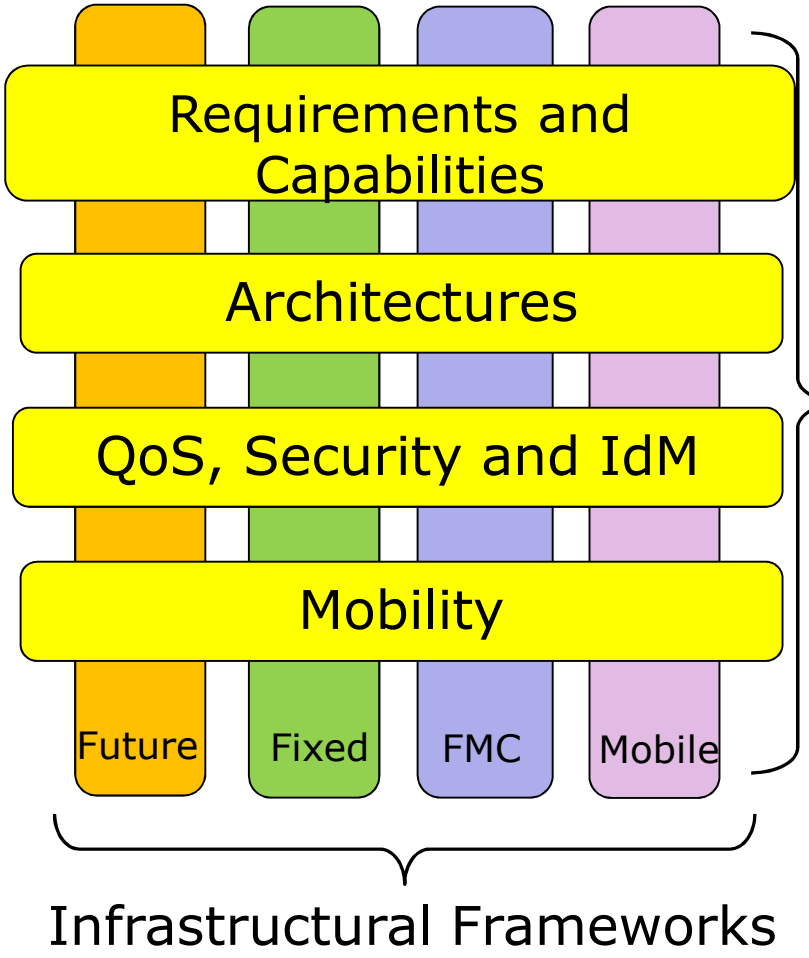
- Global IPTV standards in various technical areas:
  - Services requirements (SG13, SG2)
  - Architecture (SG13, SG9, SG16)
  - QoS/QoE, traffic mgt mechanisms, performance monitoring (SG12, SG9)
  - Security aspects (SG12, SG17)
  - End systems and home networking (SG13, SG9, SG16)
  - Middleware, metadata, applications & content platforms (SG16, SG9)
  - Protocols and control plane aspects (SG 11, SG 13, SG 16)
  - Management aspects (SG 2, SG 13, SG 16, SG 9)
- Ongoing collaboration with international and regional SDOs
  - ATIS IIF, DSL Forum, Home Gateway Initiative
  - DVB, ETSI TISPAN
  - (Open IPTV Forum)

ITU-T IPTV recommendations and future plans

- At this time, around 50 draft Recs have been developed in several SGs and 13 Recommendations have been completed:
  - SG13: Y.Sup5, Y.1901, Y.1910
  - SG12: G.1080, G.1081
  - SG16: H.622.1, 701, 720, 721, 750, 760, 761, 770
  - SG17: X.1191
- *Phased approach to meet market needs – under discussion (Sept 2009 SG13 meeting)*
  - *Phase 1 (IPTV basic services) – Sept 2009*
    - Services already provided commercially in many countries, including linear TV and VoD
  - *Phase 2 (IPTV advanced services) – Sept 2010 as target*
    - Services already provided in some countries, including personal broadcast services.
  - *Phase 3 (IPTV future services) – after 2011*
    - All other services, including services requiring additional functionalities and capabilities
- Standards compliance is key to global interoperability

What is next after NGN

NGN standards evolution : working directions based on ITU-T SG13 programme



Core NGN areas

Emerging NGN areas

- Open Service Environment
- 3rd Party apps and Web based
- Ubiquitous Networking
- NGN in Home and in Vehicles
- Peer-to-Peer approaches
- Others (ICT&Climate Change, …)
- Other emerging services (IPTV, NID & USN, etc.)

Still a lot to do for the evolving NGN: some standardization challenges in important areas

- Support of an increased set of applications and business scenarios (personalized services, 3rd party apps, cross-industry apps etc.)
- Support of composite services (service platform governance, mashups)
- Integration of new technologies (P2P, Grid, Cloud computing etc.)
- Extensions of capabilities, including for multi-domain services
- Social requirements (environmental sustainability, accessibility)
- Interoperability (developing mechanisms which facilitate it)
- Migration to NGN (best “common” practices for migration towards identified target NGN configurations)
- IMS-based NGNs (ensuring the value proposition of IMS-based NGNs for providers and users (e.g. IMS service platform aspects))

Future Networks/Future Internet – some relevant worldwide research initiatives

United States

FIND

- NSF's ambitious program to develop the future Internet architecture through a clean slate approach.
- Small scale, but a large number of projects converge into a fewer number of full scale architectures
- To verify using GENI

GENI

- Aimed at developing a testbed organization to succeed Planet Lab's development.
- Aimed at a large scale facility development's budget in NSF, with international cooperation also included as a target

Europe

FP7/FIRE

- FIRE programme: Future Internet Research and Experimentation
- FIRE's goal is to build a dynamic, sustainable, large scale European Experimental Facility

Other FP7 projects

- Including high-level thinking (Eiffel, Future Internet 2020)

Future Internet Assembly

Japan

AKARI/NwGN

- Architecture development project
- R&D on evaluation and establishment in the structure of NwGN; R&D for dynamic network technology
- NICT's Testbed network for research development

Korea

- **Future Internet Forum (FIF)**
- PG220 (TTA)
- ETRI project for Virtualized Programmable Platform for FN research and experimentation

China

CNGI

- China's Next Generation Internet project

International level

- Including ISOC/IRTF, ISO/IEC JTC1, ITU-T

A lot of international, regional and national initiatives have started to address requirements and technological issues of future global and converged telecommunication infrastructures

The ITU-T Focus Group on Future Networks (FG-FN)

Established in Jan 09 under ITU-T SG13

- SG13 (2009-2012) is "Future Networks including Mobile and NGN"
- A specific new SG13 Question created on Future Networks (Q21/13)

Rationale

- Future Networks have become part of the global agenda
- Academic community expressed strong interest in collaborating with ITU-T
- All ongoing activities seem in an early stage of investigation/development
- Global harmonization among all different activities is important and essential to build up globally interoperable future ICT infrastructures
- ITU-T intends to make all efforts to support the development of global and harmonized frameworks (e.g. requirements, functional architectures and protocols) **looking for collaboration with all relevant worldwide organizations/projects/FN communities**

Initial work items (in progress)

- Collection and identification of various visions of future networks from relevant organizations/projects
- ***Towards a shared roadmap of standardization for Future Networks ?***

FG-FN – an initial draft definition of "Future Network"

Future Network (FN) is a network which is able to provide revolutionary services, capabilities, and facilities that are hard to provide using existing network technologies.

Note: FN provides mechanisms that benefit participants as much as they contribute. It will be studied based on clean-slate approach.

[Note: clean-slate is understood as a design principle, not as deployment one]

Consensus on clean-slate approach as design principle ?

- Much successful work today is evolutionary rather than revolutionary
- Revolution or evolution of existing networks ?

"Successful network architectures can and should change over time. All new systems start small. Once successful, they grow larger. The growth will bring the system to an entirely new environment that the original designers may not have envisioned, together with a new set of requirements that must be met." [Eiffel white paper]

Useful Links

- ITU
  - http://www.itu.int
- NGN Global Standards Initiative (NGN-GSI)
  - http://www.itu.int/ITU-T/ngn/index.html
- SG11 (Signalling & Control Protocols)
  - http://www.itu.int/ITU-T/studygroups/com11/index.asp
- SG 13 (Future Networks including mobile and NGN)
  - http://www.itu.int/ITU-T/studygroups/com13/index.asp

Thank you for your attention

Questions ?