

ITU-D Regional Development Forum for the Asia Pacific Region

**“NGN and Broadband, Opportunities and Challenges”
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What is Next after Next Generation Networks

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Outline

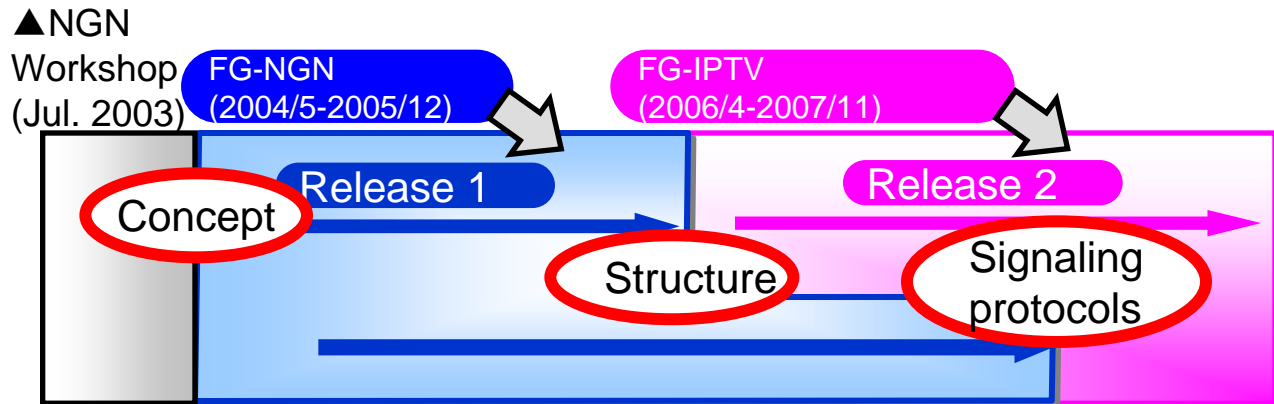
- o NGN standardization status
- o Future directions in NGN standardization
 - Vision and goals
 - Evolving the NGN: some challenges and requirements
- o Towards the networks of the future
 - Worldwide initiatives
 - ITU-T Focus Group on Future Networks

NOTE: The focus of this presentation is on ongoing and planned activities within ITU-T

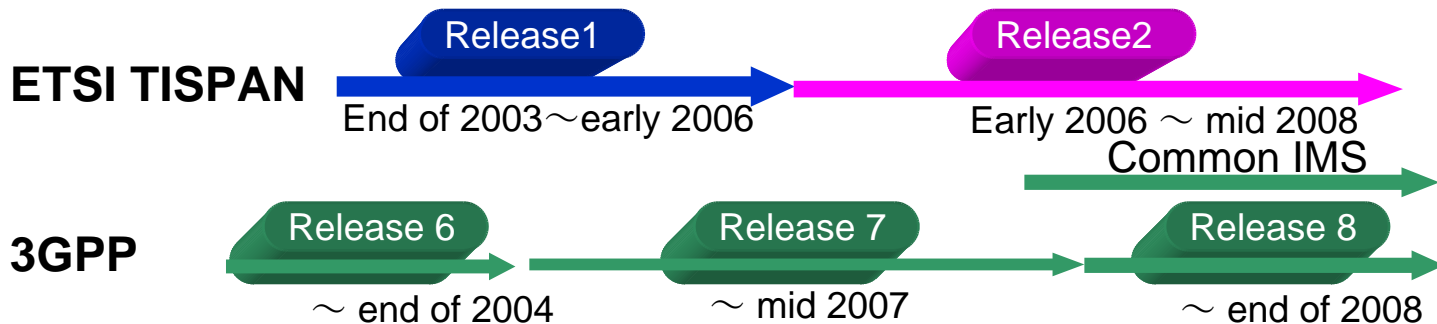
NGN standardization status

ITU-T NGN standardization timeline

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



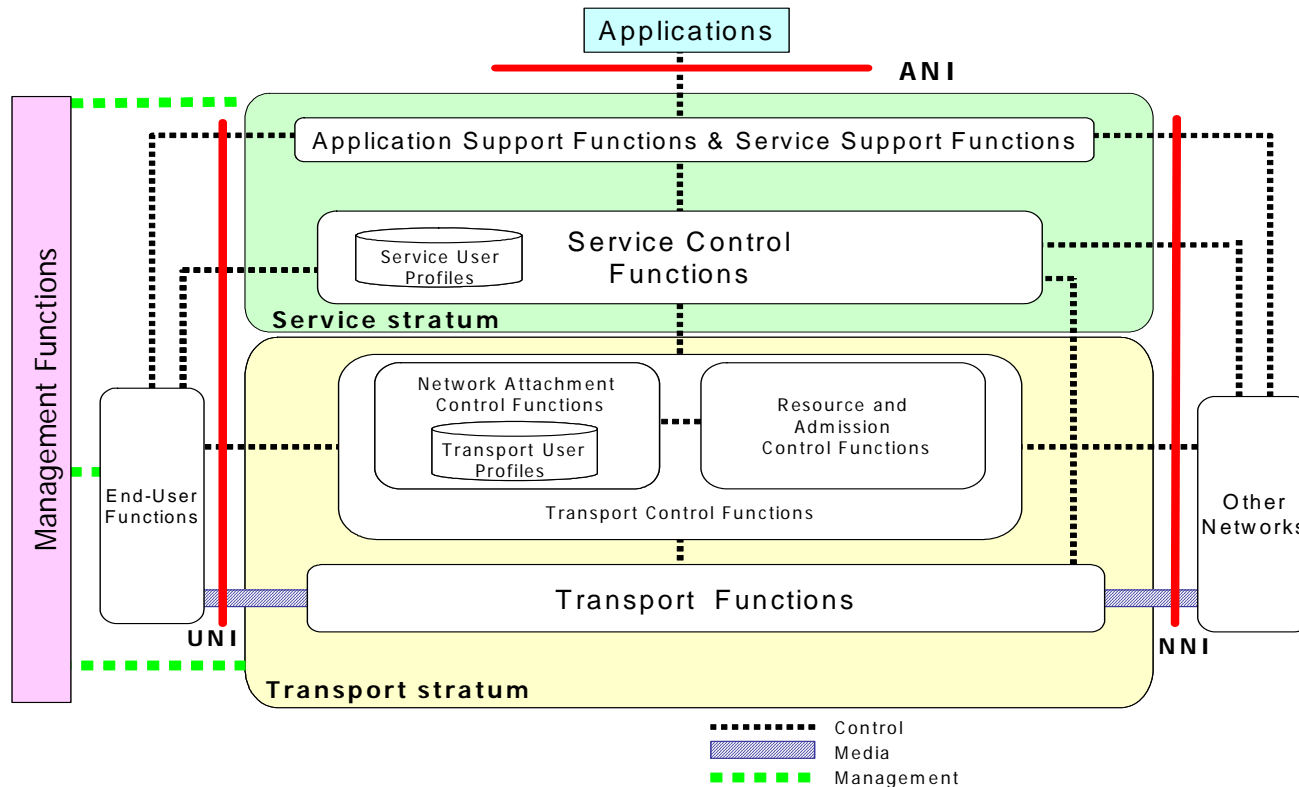
- ITU-T (NGN GSI)**
- SG 13 NGN Service requirements and architecture
 - SG 11 NGN Signaling protocols



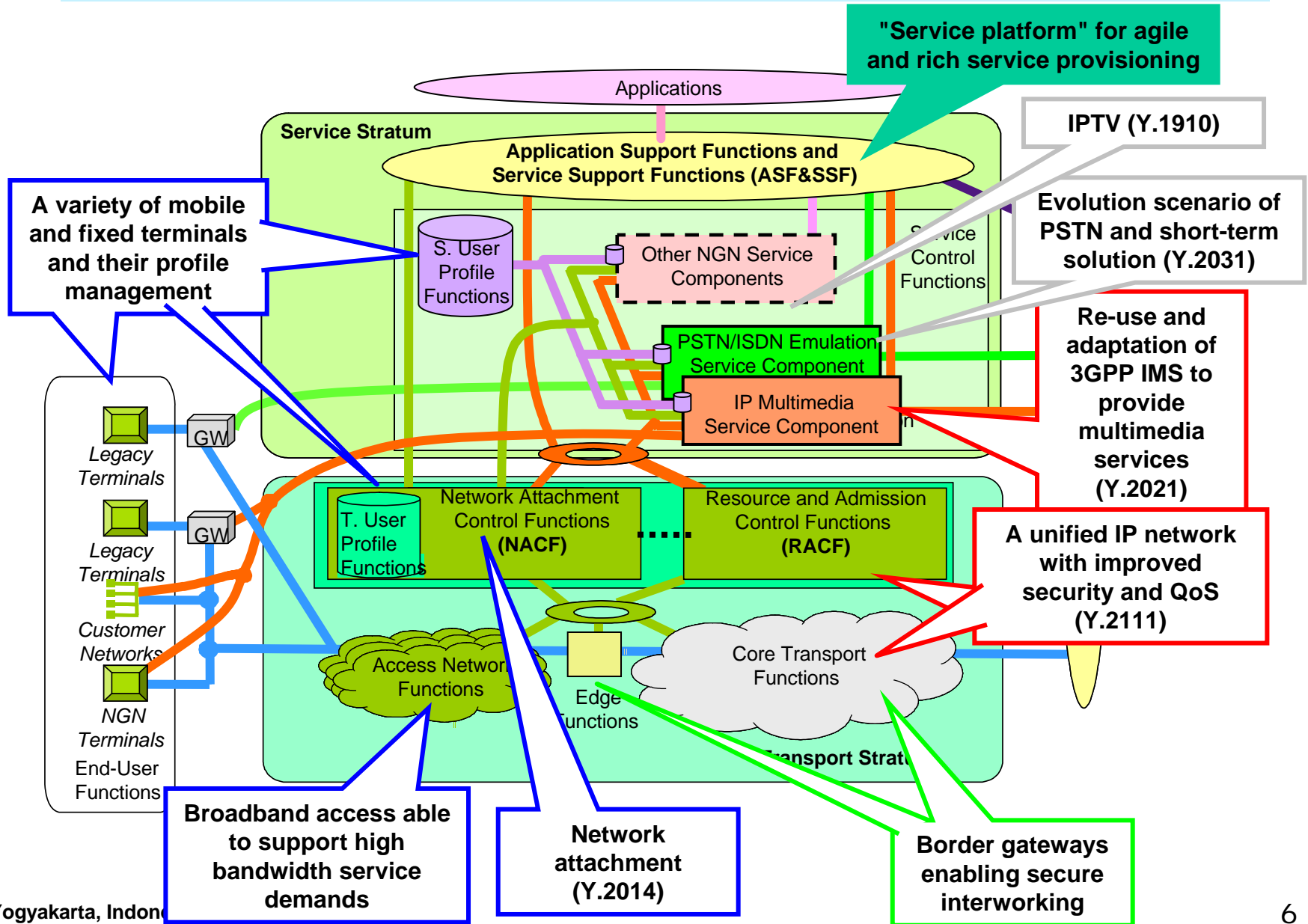
IETF ▲ SIP standard RFC3261 (Jun. 2002)

Status of NGN standards development

- Fundamental functions of NGN Ref. Arch. [Y.2012] almost completed
- Basic specifications for “Managed” IP delivery (QoS, security) and mobility support

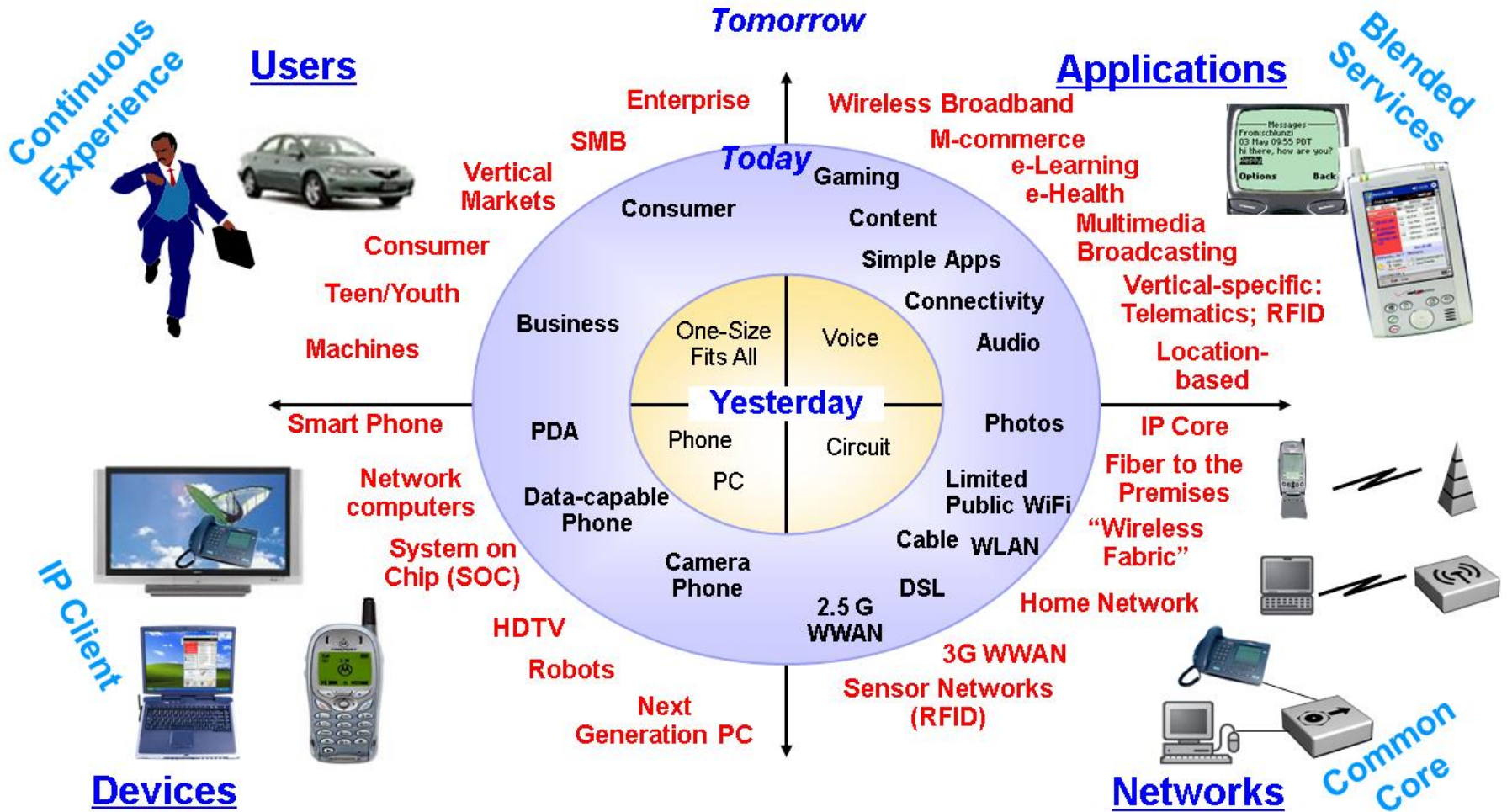


NGN components



Future directions in NGN standardization

Overall future directions



“Convergence” is a key goal of the future

Future should direct to “Convergence”

- Vision is “Any Time, Any Where, Any Services and Any Devices”
- Towards Any services over Any transport infrastructures

Convergence

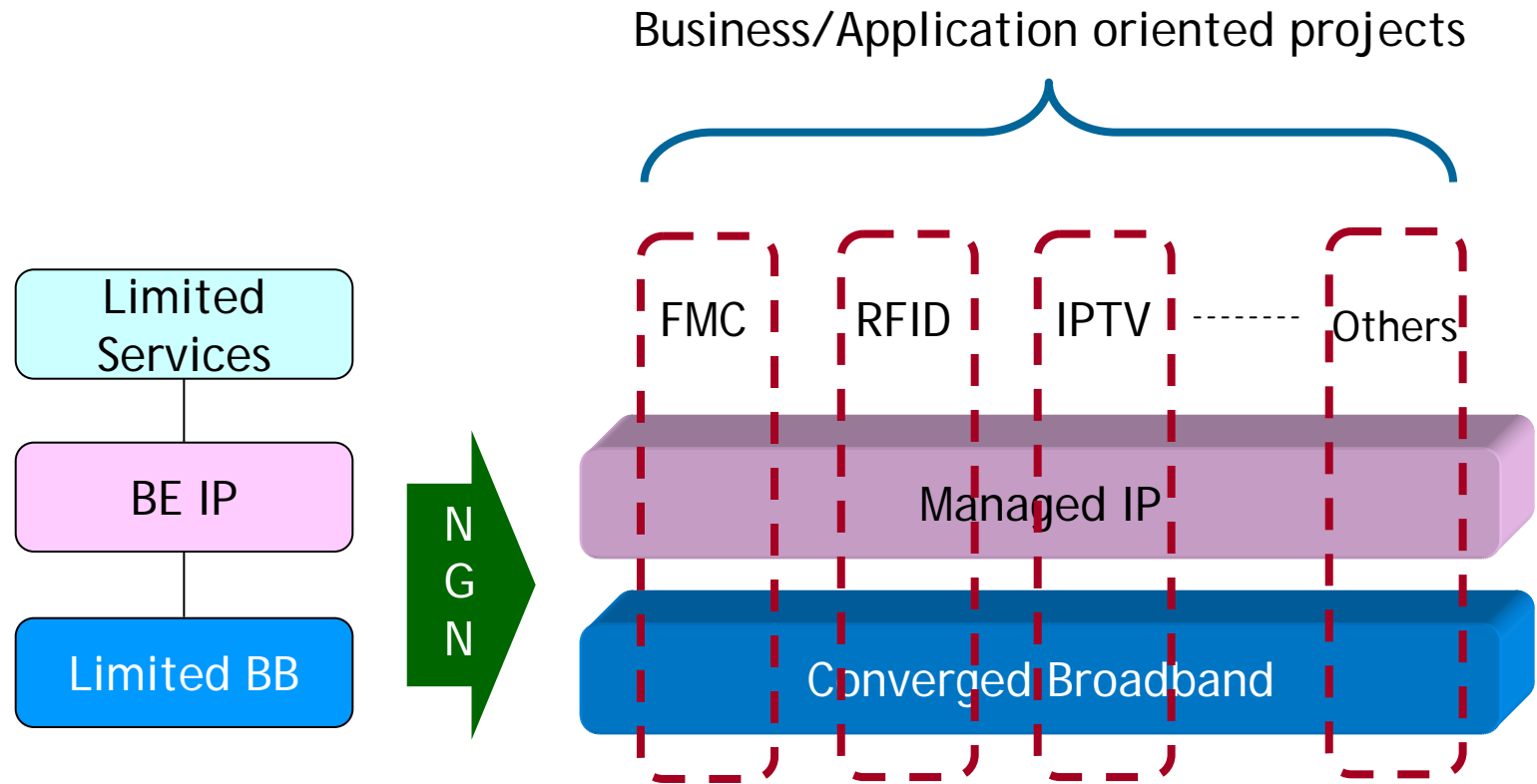
- Internal to an industry (e.g. FMC, IPTV)
- Among different industries (e.g. Telematics/ITS, USN, e-Health, etc.)

Services at "Convergence" time



- Always on with Any devices
- Anytime, anywhere and in Any form
- Voice and multimedia
- Self service, intuitive
- Simple for the end user
- Secure, trusted and reliable

NGN as enabler for Convergence

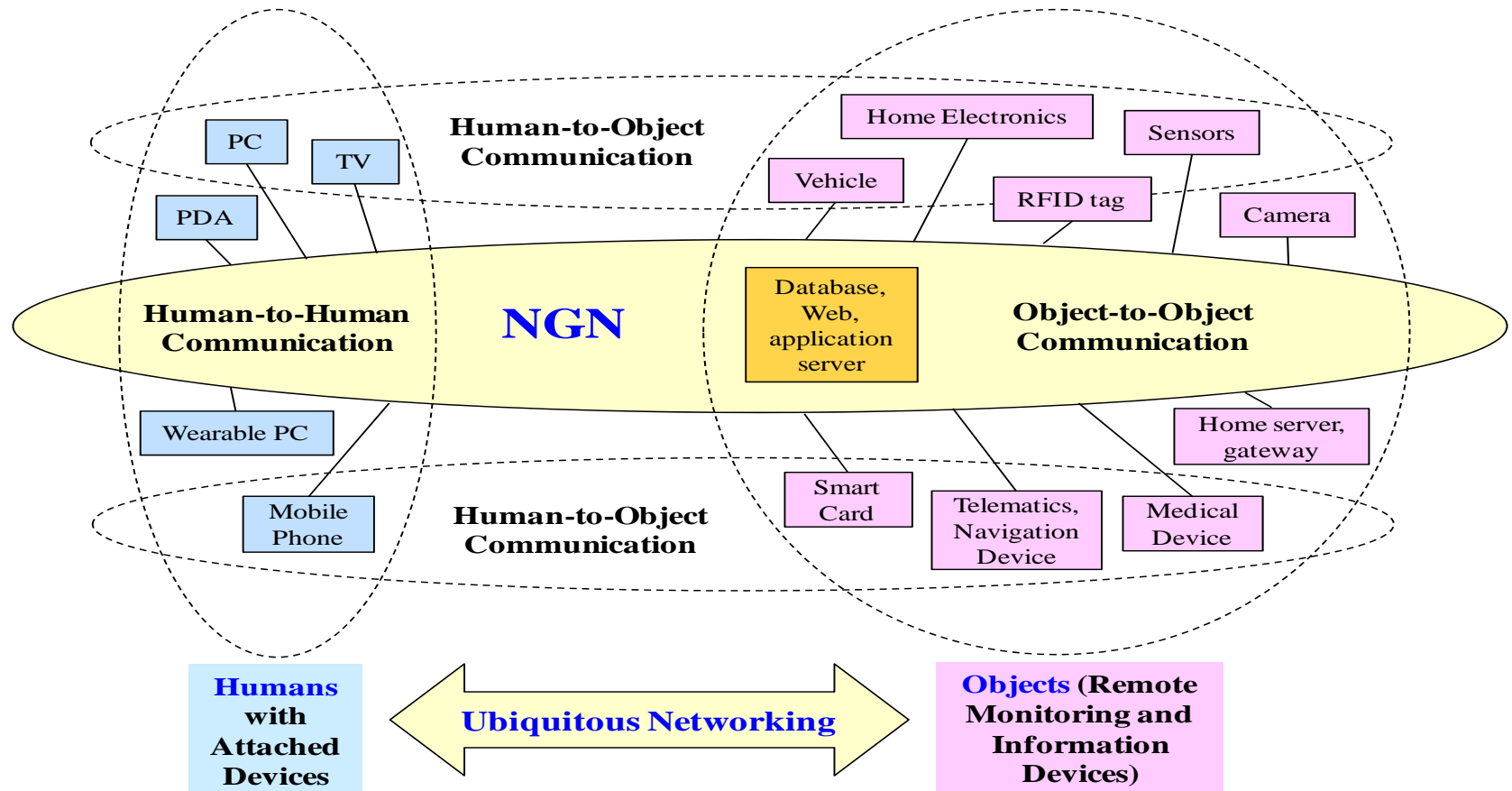


- Simple business relationships
- Simple players

- Diverse business models and flexible business relationships
- Diverse players

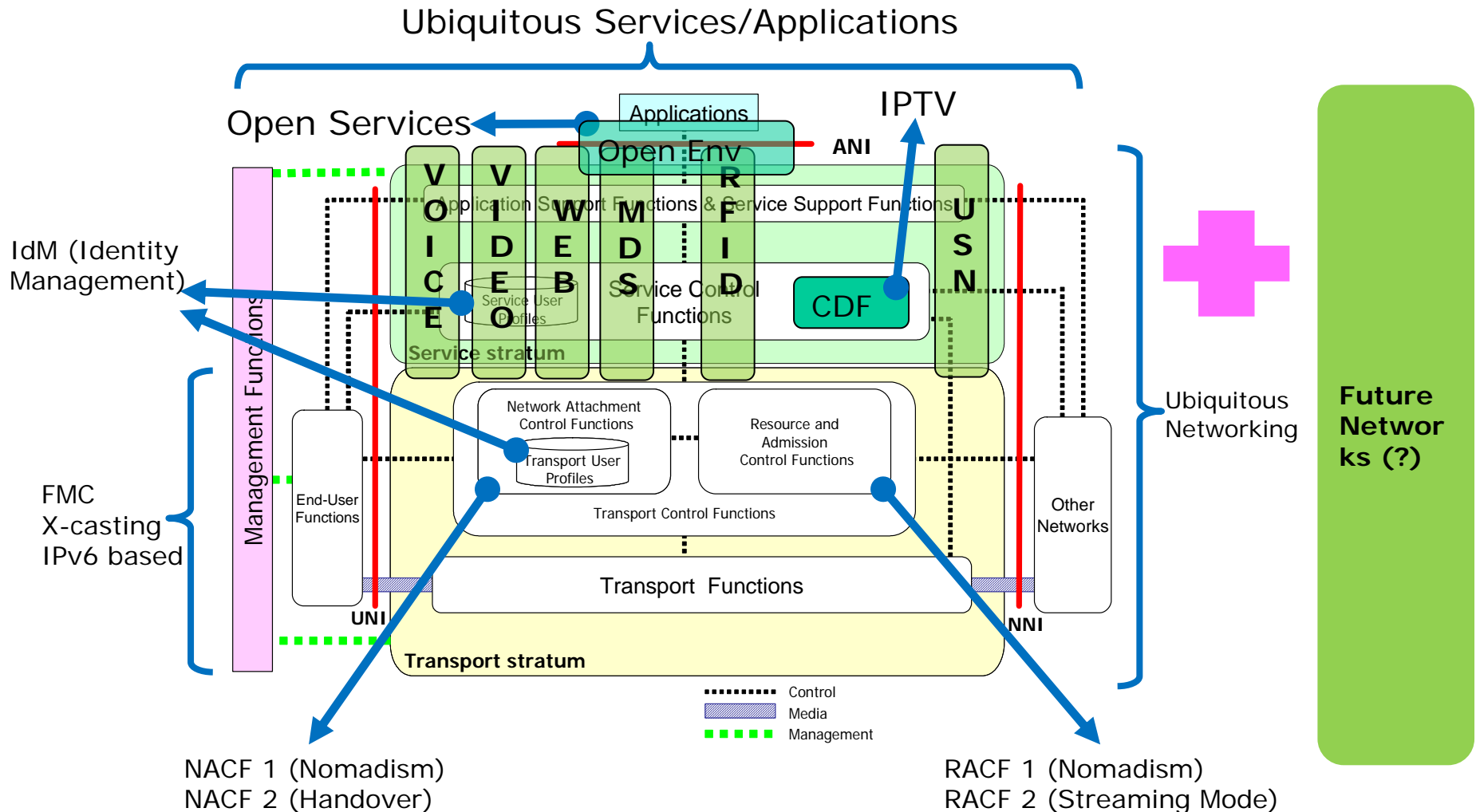
“Ubiquitous Networking”

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



Enhancing/Evolving the NGN components

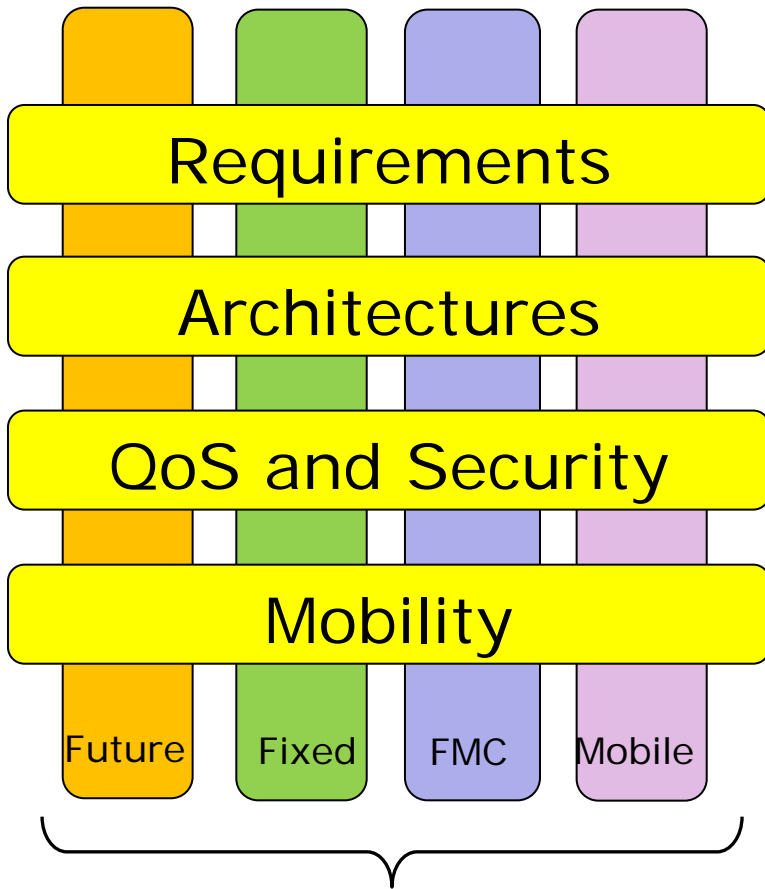
- Based on ongoing and future working directions of new ITU-T SG13 "Future networks including mobile and NGN"



Another high level representation of ongoing and future SG13 study areas

Technical areas

- NGN
- IPTV
- Open Environment
- Web based
- USN/RFID
- Ubiquitous Networking
- Climate Change
- Others



Infrastructural Frameworks

The evolved NGN will have to support a larger set of applications and business scenarios

- The NGN infrastructure needs enhancements in order to support a larger set of applications and business scenarios
 - Telco oriented services (such as Voice, Data and Video streaming), as well as dynamic Information services (e.g. WS, P2P, USN)
 - Customized/personalized services using advanced capabilities in service delivery and control (e.g. context awareness)
 - 3rd Party Providers' apps/scenarios, User created apps, Interconnect scenarios with Home Networks & Enterprise Networks
 - Composite applications "mashing-up" capabilities from different domains (Telecom/IMS, Internet/Web 2.0, Content) -> NGN service platform
 - Applications over NGN integrated with other industries such as Transport Systems, Robotics, Health, Education etc.
- Also, current standards generally lack of clear indication on how these should be used for support of specific application scenarios
 - E.g. more study required on service delivery and control (IPTV etc.)

Standardization of NGN capabilities: some challenges

- Support of Convergence
 - FMC capabilities don't provide full service level support
 - More detailed developments are necessary (e.g. support of seamless handover with what service and what level)
- Support of Composite services
 - Mechanisms are required for service delivery across different domains, including for Service Quality Mgt and Policy Mgt
 - Accessibility of enablers to third parties
 - Orchestration of common service functions
- Identity Management features completeness
 - Integrated Identity Processing (across identity domains), standards for interoperability and User control of Personal Ident. Info (PII)
- Policy management consistency
 - Required across access technologies, across Service and Transport
- Support of Multi-domain/multi-network services
 - More work required on Security, QoS, User profiles, Content Mgt, Interconnection etc.

Other NGN challenges

- Integration of new technologies with NGN
 - P2P (Q.19/13 DSN), Grid, etc.
- Integration of social requirements
 - Environmental sustainability, accessibility
- Interoperability
 - Promotion of interoperability is required developing mechanisms which facilitate it
- IMS-based NGN
 - It is needed to ensure the value proposition of IMS-based NGN for providers and users (e.g. integrating IMS assets in a NGN service platform)
- Migration to NGN
 - More work is required to identify best “common” practices for migration towards identified target NGN configurations

Towards the networks of the future

Worldwide research initiatives on Future Networks – some relevant examples

United States

FIND

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

GENI

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

European Community

FP7/FIRE

- o FP7 is EC's funding structure for science and technology
- o FIRE: Future Internet Research and Experimentation
- o FIRE's goal is to build a dynamic, sustainable, large scale European Experimental Facility

GEANT

- o EC's research network
- o Upgrading and greater capacity in its third term (GEANT3)

Japan

AKARI/NwGN

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

Korea

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

China

CNGI

- o China's Next Generation Internet project

The ITU-T Focus Group on Future Networks (FG-FN) (established in Jan 09) – 1

Background and rationale of FG-FN creation

- The title of SG13 in the new study period (2009-2012) is “Future Networks including Mobile and NGN” reflecting the importance of “Future Networks”
- A specific new Question on Future Networks has been approved as Q21/13
- Future Networks have become part of the global agenda: national and regional initiatives (US, EU, China, Japan, Korea), as well as international ones (IRTF and, more recently, ISO/IEC JTC1/SC6)
- The academic community expressed strong interest in collaborating with the ITU-T on this subject during the ITU-T Kaleidoscope May 2008 event
- However, all ongoing activities seem to be in an early stage of investigation/development
- Global harmonization among all these 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) collaborating with all relevant worldwide organizations/projects/FN communities
- Initial collaboration items (in progress) include
 - Collection and identification of various visions of future networks from relevant organizations/projects
 - Establishment of a shared roadmap of standardization for Future Networks

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Scope of FG-FN

The Focus Group,

by collaborating with worldwide future network (FN) communities (e.g., research institutes, forums, academia and etc),

aims to

- collect and identify visions of future networks, based on new technologies
- assess the interactions between future networks and new services
- familiarize ITU-T and standardization communities with emerging attributes of future networks
- encourage collaboration between ITU-T and FN communities

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Objectives of FG-FN

The main objective of the Focus Group is to document results that would be helpful for developing Recommendations for Future Networks.

To achieve this objective the Focus Group will:

- gather new ideas relevant to Future Networks and identify potential study areas on Future Networks
- describe visions of Future Networks
- identify a timeframe of Future Networks
- identify potential impacts on standards development
- suggest future ITU-T study items and related actions

Specific FG-FN tasks and deliverables

- o Review related research and standardization activities;
- o Based on this review, produce the following deliverables:
 - Future network benefits
 - Future network vision
 - High-level description of Future Networks attributes
 - Vocabulary

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Initial thinking on Future Networks study

An initial (DRAFT) definition of 'Future Networks' developed by Q.21/13 :

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

- o 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 every participant as much as they contribute. It will be studied based on clean-slate approaches.

Real revolution or evolution (even if more steps forward) of existing networks (NGN, Internet and NGN) ?

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Start of first FG-FN deliverable “Future Networks : Vision, Concept, and Requirements”

May 2009 Q.21/13 meeting+June 29-July 3 first FG-FN meeting

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Multiple different views from parties involved in first FG-FN meeting !

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FN attributes and some initial discussion items

- o Combination of Packet-switching and circuit-switching
- o Separate structure for location and identification
- o New naming and discovery schemes
- o Cross-layered architecture and control
- o Network virtualization, programmability, overlays
- o Autonomic control and self-management solutions
- o Security and reliability for social infrastructure
- o others

Conclusion

- The NGN standardization activity has almost completed the basic initial steps, but much remains to be done
 - Evolution of NGN: ongoing and future working directions in order to support new and varying customer needs, and a larger set of applications and business models
 - Challenges and requirements in numerous (new) areas
- A growing interest (and funding) in Future Networks within the worldwide research community
 - Harmonization of activities is essential for globally interoperable future ICT infrastructures
 - Standardization should start as early as possible when targeting the future social infrastructure
 - The ITU is taking an active role in promoting global and harmonized frameworks and a shared standardization roadmap for Future Networks

**Thank you for your
attention**

Questions ?