What is Next after Next Generation Networks

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Outline

- NGN standardization status
- Future directions in NGN standardization
  - Vision and goals
  - Evolving the NGN: some challenges and requirements
- 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

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<th>Year</th>
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<th>ITU-T NGN Release 2</th>
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ITU-T (NGN GSI)

- NGN Workshop (Jul. 2003)
- FG-NGN (2004/5-2005/12)
- FG-IPTV (2006/4-2007/11)

ITU-T NGN standardization timeline

- ITU-T NGN standardization timeline
- ITU-T NGN Release 1
- ITU-T NGN Release 2
- ETSI TISPAN Release
- 3GPP Release
- IETF SIP standard RFC3261 (Jun. 2002)
Fundamental functions of NGN Ref. Arch.[Y.2012] almost completed

Basic specifications for “Managed” IP delivery (QoS, security) and mobility support
NGN components

Legacy Terminals

Service Stratum

Application Support Functions and Service Support Functions (ASF&SSF)

Transport Stratum

End-User Functions

Application Functions

Core transport Functions

NGN Terminals

Customer Networks

Other Networks

Other NGN Service Components

PSTN/ISDN Emulation Service Component

IP Multimedia Service Component

T. User Profile Functions

S. User Profile Functions

Network Attachment Control Functions (NACF)

Resource and Admission Control Functions (RACF)

Access Network Functions

Edge Functions

Core Transport Functions

Border gateways enabling secure interworking

Network attachment (Y.2014)

Broadband access able to support high bandwidth service demands

"Service platform" for agile and rich service provisioning

IPTV (Y.1910)

Evolution scenario of PSTN and short-term solution (Y.2031)

Re-use and adaptation of 3GPP IMS to provide multimedia services (Y.2021)

A unified IP network with improved security and QoS (Y.2111)

A variety of mobile and fixed terminals and their profile management

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A variety of mobile and fixed terminals and their profile management
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”

- Enabling “Any Service, Any Time, Any Where, Any Device” operations via enhanced NGN capabilities
- Support of human-to-human, but also human-to-machine and machine-to-machine communications
Yogyakarta, Indonesia, 27-29 July 2009

Enhancing/Evolving the NGN components

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

Ubiquitous Services/Applications

Open Services

IdM (Identity Management)

FMC X-casting IPv6 based

Ubiquitous Networking

Future Networks (?)

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 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**
- 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, programmable.
- Aimed at a large scale facility development’s budget in NSF, with international cooperation also included as a target.

### Europe

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

**GEANT**
- EC’s research network.
- Upgrading and greater capacity in its third term (GEANT3).

### 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.
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
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
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

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

- 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)?
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!
FN attributes and some initial discussion items

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