

International Telecommunication Union

Basic NGN Architecture Principles & Issues Keith Knightson Rapporteur Q3/13 (Architecture) Industry Canada



NGN Definition

Next Generation Network (NGN): a <u>packet-based</u> network able to provide telecommunication services and able to make use of multiple broadband, <u>QoS-enabled</u> transport technologies and in which <u>service-related</u> <u>functions</u> are <u>independent</u> from underlying <u>transport-related technologies.</u>

It enables unfettered access for users to networks and to competing service providers and/or services of their choice. It supports <u>generalized</u> <u>mobility</u> which will allow consistent and ubiquitous provision of services to users. ITU-T Recommendation Y.2001

↔ IETF



What's Old: Vertically-Integrated Networks







What's New: Horizontally-integrated Network





ITU-T Recommendation Y.2011 ITU-T Workshop on NGN (jointly organized with IETF) Geneva, 1-2 May 2005



Effects of Separation: the good, the bad and the ugly

o Good:

• Any service over a single IP transport network

o Bad:

• Two different levels of control, authentication, admission, charging, etc.

o Ugly:

• QoS selection, QoS control, transport resource allocation, monitoring, accounting for usage.









Geneva, 1-2 May 2005



End-User Services in NGN R1

- All 3GPP IMS Services delivered to fixed line systems
- PSTN replacement and legacy services
- IMS extensions to accommodate regulatory requirements (emergency, disaster relief, etc.)
- o QoS-enabled transport
- o Secure IP network
- Mobility (continuous where available, global requirement limited to nomadism for R1)
- Global Interconnect (other NGNs, PSTN/ISDN, Public Internet, etc.)



Release 1 Service & Capabilities

- Service Types
- PSTN/ISDN Emulation services
- PSTN/ISDN Simulation services
- Multimedia services
- Internet access
- Other services (data services etc.)
- Public service aspects (LI, ETS/TDR, etc.)

Service Capabilities

- Basic network capabilities
- Service support capabilities
 - Open Service Environment
 - Service Enablers
 - PSTN/ISDN Emulation support
- Public service support capabilities





Multimedia Services

- Real-time Conversational Voice services
- Instant messaging (IM)
- Push to talk over NGN (PoN)
- Point to Point interactive multimedia services, including interactive realtime voice, video and other media (videotelephony, whiteboarding, etc.)
- Collaborative interactive communication services: support of multimedia conferencing with file sharing and application sharing, e-learning, gaming.
- Group Messaging
- Content delivery services
- Push-based services
- Broadcast/Multicast Services
- Hosted and transit services for enterprises (IP Centrex, etc.)
- Information services, such as cinema ticket information, motorway traffic status, advanced push services, etc.
- Presence and general notification services
- 3GPP Release 6 and 3GPP2 Release A OSA-based services





Other Services

- Data retrieval applications, such as tele-software.
- Data communication services, such as data file transfer, electronic mailbox and web browsing
- Online applications (online sales for consumers, e-commerce, online procurement for commercials)
- Sensor Network services
- Remote control/tele-action services, such as home applications control, telemetry, alarms etc.
- Over-the-Network Device Management

Public Service Aspects

- Lawful Intercept.
- Malicious call trace
- User identity presentation and privacy
- Emergency Communications (ETS/TDR)
- Users with disabilities
- Carrier selection
- Number portability





Component/subsystem viewpoints







Changing Environment (1)

Original Requirements	New Requirements
E2E transparency	Packet inspection/NATs
Peer-to-peer	NATs/Firewalls/servers
Connectionless	MPLS
Best Effort	Real-time demands
	Bandwidth demands
User back-off	QoS "guarantee"
Network empowerment	User Empowerment
No flow state	Flow state
Trust	Hackers everywhere
Static Addresses	DHCP, Mobility





Changing Environment (2)

Original Requirements	New Requirements
Fairness	QoS (implies deliberate unfairness)
Terminal-to-host, BE	Mass public residential services, multi-terminal multi- QoS
Flat network	Access & Core Domains
Layer Independence	Inter-layer coupling?
Simple protocol layering	Protocol maze
Research/Defense use	Commercialization, competition, consumer choice





Next Generation Internet: Papers of Interest

- Developing a Next Generation Internet Architecture, Bob Braden, David Clark, et al.
- Role-based Architecture, Bob Braden, Ted Faber.
- A new architecture for an Internet, David Clark, Steve Bellovin, Bob Braden, Noel Chiappa, Ted Faber. Scott Schenker, John Wroclawski, et al.
- RFC 2775, Internet Transparency. Brian Carpenter.
- RFC 3439, Some Internet Architectural Guidelines and Philosophy, R.Bush, <u>D</u> <u>Meyer.</u>
- IAB Concerns Regarding Congestion Control for Voice Traffic in the Internet, Sally Floyd, James Kempf
- Making the world (of communications) a different place, Report of a working session of the End-to-End Research Group, Version 4 3/24/05, David D. Clark, Craig Partridge, Robert T. Braden (chair), et al.
- Rethinking the design of the Internet: The end to end arguments vs. the brave new world, Marjory S. Blumenthal & David D. Clark.



Just a small sample ITU-T Workshop on NGN (jointly organized with IETF) Geneva, 1-2 May 2005



A Golden Opportunity for Collaboration

o A recognition in both organizations that some new approaches may be required?

o What kind of changes are required and/or foreseen?

 Could/should the expertise of the ITU-T and the IETF be jointly applied to create the principles and architectural framework for next generation networks?





Obtain Respective Views on Architectural Issues such as: 1

• Role of Edge-based Servers:

- E2E violation
- Packet inspection
- Admission control

• Application selectable QoS:

- Lack of adequate classes
- Lack of standardized protocol mappings
- Explicit bandwidth selection





Obtain Respective Views on Architectural Issues such as: 2

- QoS in Access:
- Multiple terminals, multiple QoS
- End-user Application selection of QoS
- Role of Home Gateway (shaping, limiting)
- Home gateway control
- Distributed network control of/for QoS path:
 - Horizontal means
 - Vertical means
 - Monitoring, dynamic allocations, accounting
- o Network Control and Management
 - Protect from attack
 - Separation from payload paths
 - Inter-domain co-ordination





No conclusions, only Questions

- Do the ITU-T and IETF have different views on the architecture of next generation networks?
- Can a number of differences (if any) be identified and catalogued for study?
- Can ITU-T and IETF collaborate with a view to eliminating or (at least minimizing) any differences wherever possible?





Thank you for your attention





Background & Back-up slides











Generic Functional Architecture



IMS Architectural Component









Fixed to Mobile convergence (1)



How to integrate with fixed VoIP service? Cross Architectural impacts?





Fixed to Mobile convergence (2)









Summary of Work in SG13

- Y.2001: NGN Overview
 - NGN Definition, Characteristics & Subject Areas
- Y.2011: General Reference Model
 - Identify high-level paradigms
 - Separation of concerns, services from networks
 - Identify emerging NGN-generic issues •
 - Architectural principles
 - OSI model relevance
 - G.805 relevance
- Y.FRA: Functional Requirements & Architecture
 - Service control functions
 - Transport control functions •
 - Mobility management functions
 Wireless and Fixed access

 - IMS positioning
 - Multi-terminal/multi-QoS Home Gateway •

