

# **ITU Workshop on IPv6**

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## **Impact of IPv6 to an NGN and Migration Strategies**

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# Introduction

- IPv6
  - ➔ IETF has designed IPv6 from 1994
  - ➔ An Internet Layer protocol for packet-switched internetworks
  - ➔ A much larger address space than IPv4
  - ➔ Many features and benefits
- Direction for network evolution
  - ➔ PSTN to NGN in Telco's perspective
  - ➔ **Adopt IPv6 technologies to an NGN**

# IPv6 and NGN

## ■ Why IPv6?

- One of the useful delivery protocols for the future fixed and wireless/mobile network environments

## ■ Why NGN?

- Packet-based converged network
  - Multiple broadband, QoS-enabled transport, Separation services with transport

IPv6 + NGN = IPv6-based NGN

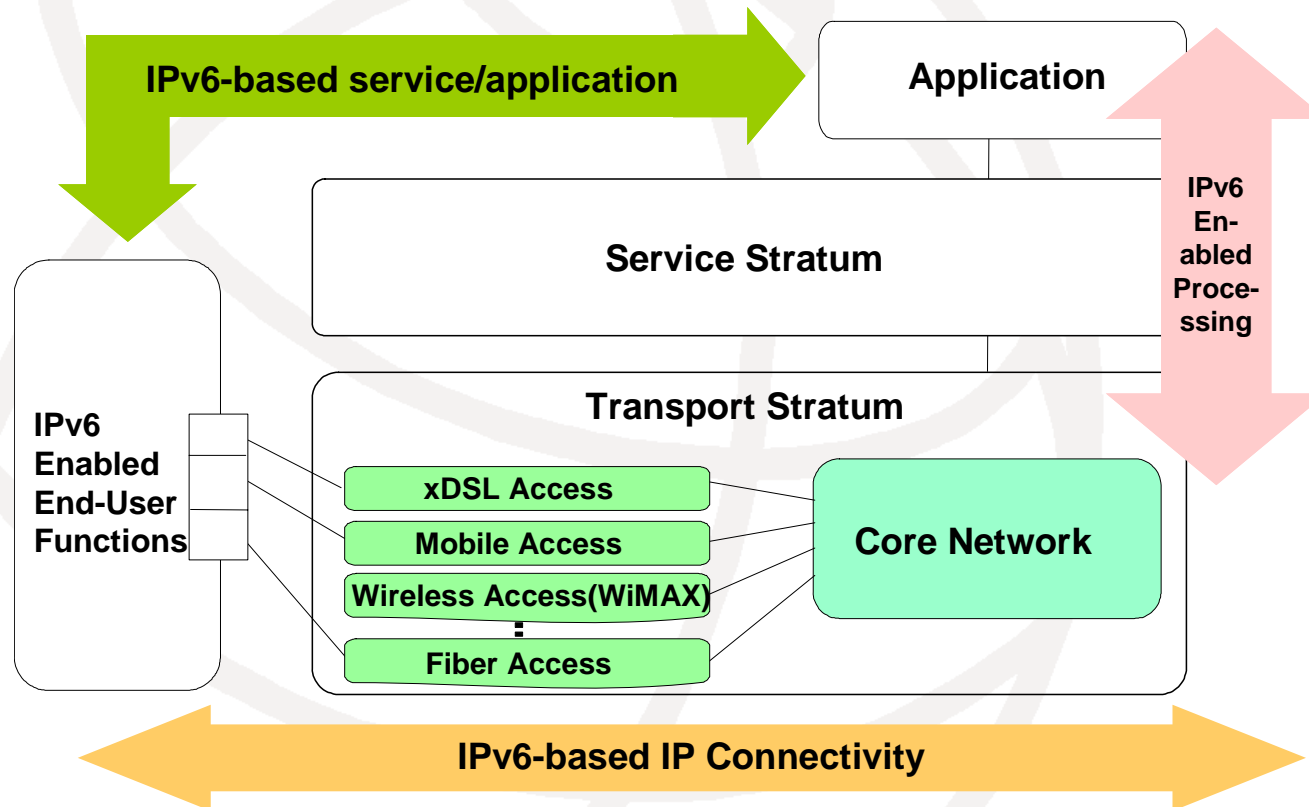
# ITU-T Q.9/13

- Impact of IPv6 to an NGN
  - IPv6 protocol and its mechanisms in alignment with the functional architecture and reference model of NGN
  - IPv6 protocol architectures and functional blocks in NGN
  - Impact of possible use of IPV4 and IPV6 in transitional phases of NGN.
- 4 Recommendations (Jan. 2008)

# IPv6-based NGN

## ■ General overview

Y.2051, General overview of IPv6-based NGN



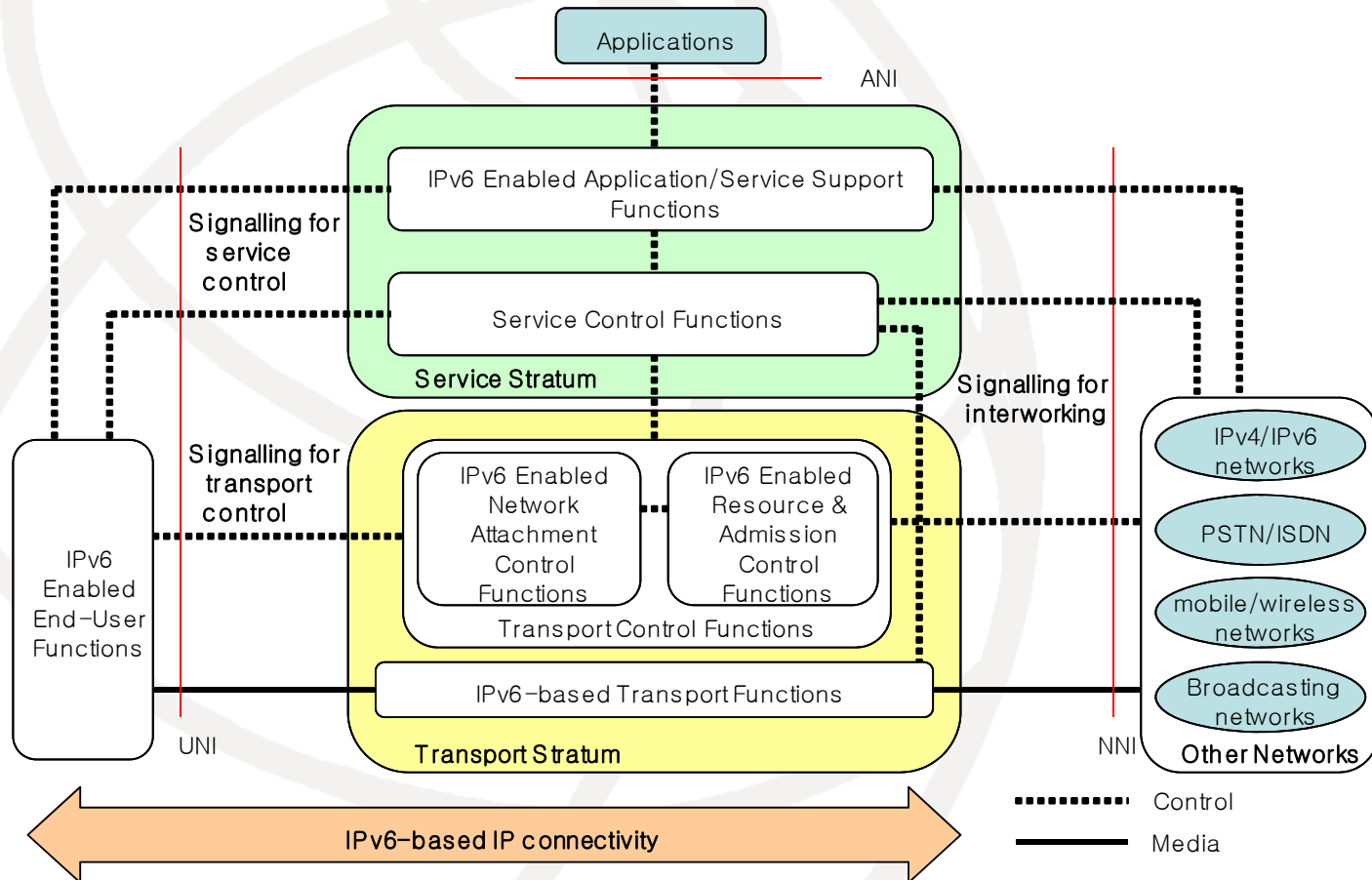
# Impact of IPv6

- Enhanced service capabilities
- Any-to-any IP connectivity
- Self organization and service discovery using auto-configuration
- Multi-homing using IPv6 addressing

# Key technical solutions (1)

## ■ IPv6 signalling **Y.2054**, Framework to support signalling for IPv6-based NGN

### ➔ Traffic class, flow label, extension header



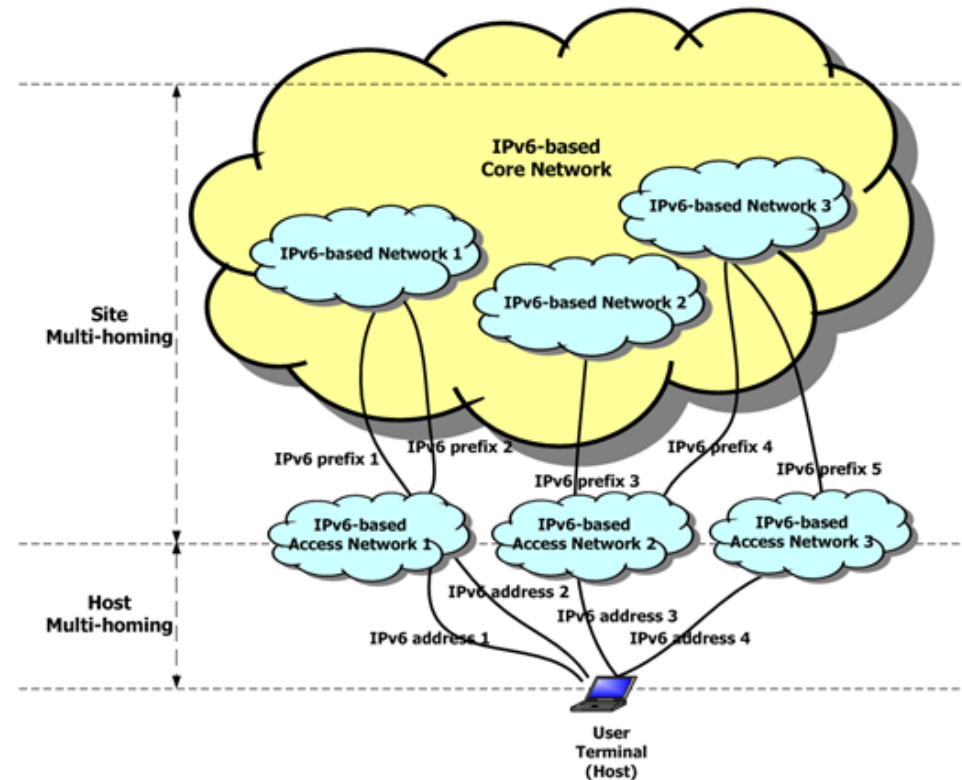


# Key technical solutions (2)

## ■ IPv6 multi-homing

Y.2052, Framework of multi-homing in IPv6-based NGN

- Always-on connectivity
- Load sharing
- Traffic engineering
- Fault tolerance with redundancy
- Session continuity across access networks

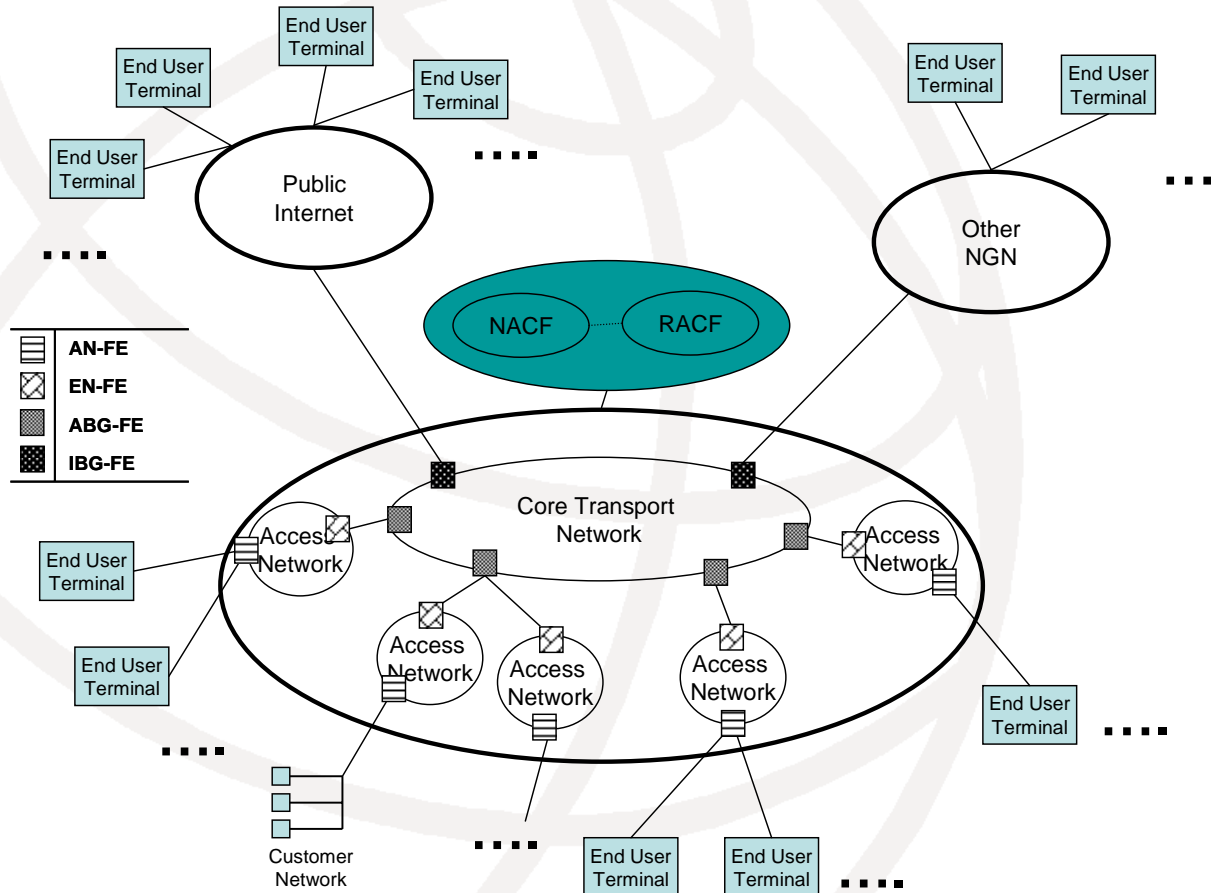


# Key technical solutions (3)

## ■ IPv4-to-IPv6 transition

**Y.2053**, Functional requirements for IPv6 migration in NGN

- ➔ Dual stack, Configured tunnel, NAT-PT



# Roadmap for future standardization(1)

## ■ Proposed roadmap items based on NGN

Draft	Title	Target Date
Y.ipv6-Transport	Transport Stratum Extension in IPv6-based NGN	End of 2009 (with Q.3/13)
Y.ipv6-Service	Service Stratum Extension in IPv6-based NGN	End of 2009 (with Q.3/13)
Y.ipv6-ID	Framework of identity processing in IPv6-based NGN	End of 2010
Y.ipv6-amf	IPv6 address mapping functions for ID/LOC separation in IPv6-based NGN	End of 2010
Y.ipv6-interworking	Interworking with heterogeneous networks in IPv6-based NGN	Mid of 2011

# Roadmap for future standardization(2)

- Additional roadmap items based on NGN (under consideration)

Draft	Title	Target Date
Y.ipv6-vcmh	Vertical Cognitive Multi-homing in IPv6-based NGN	TBD
Y.ipv6-adhoc	Framework of ad-hoc network in IPv6-based NGN	TBD
Y.ipv6-deploy	Deployment scenarios of IPv6-based NGN	TBD

# Migration Strategies (1)

- Basic assumption for migration
  - ➔ IPv6 is expected to gradually replace IPv4
    - IPv4 and IPv6 will need to coexist during the transition
  - ➔ NGN can run both IPv4 and IPv6 concurrently throughout the migration

IPv4 – IPv6 coexistence

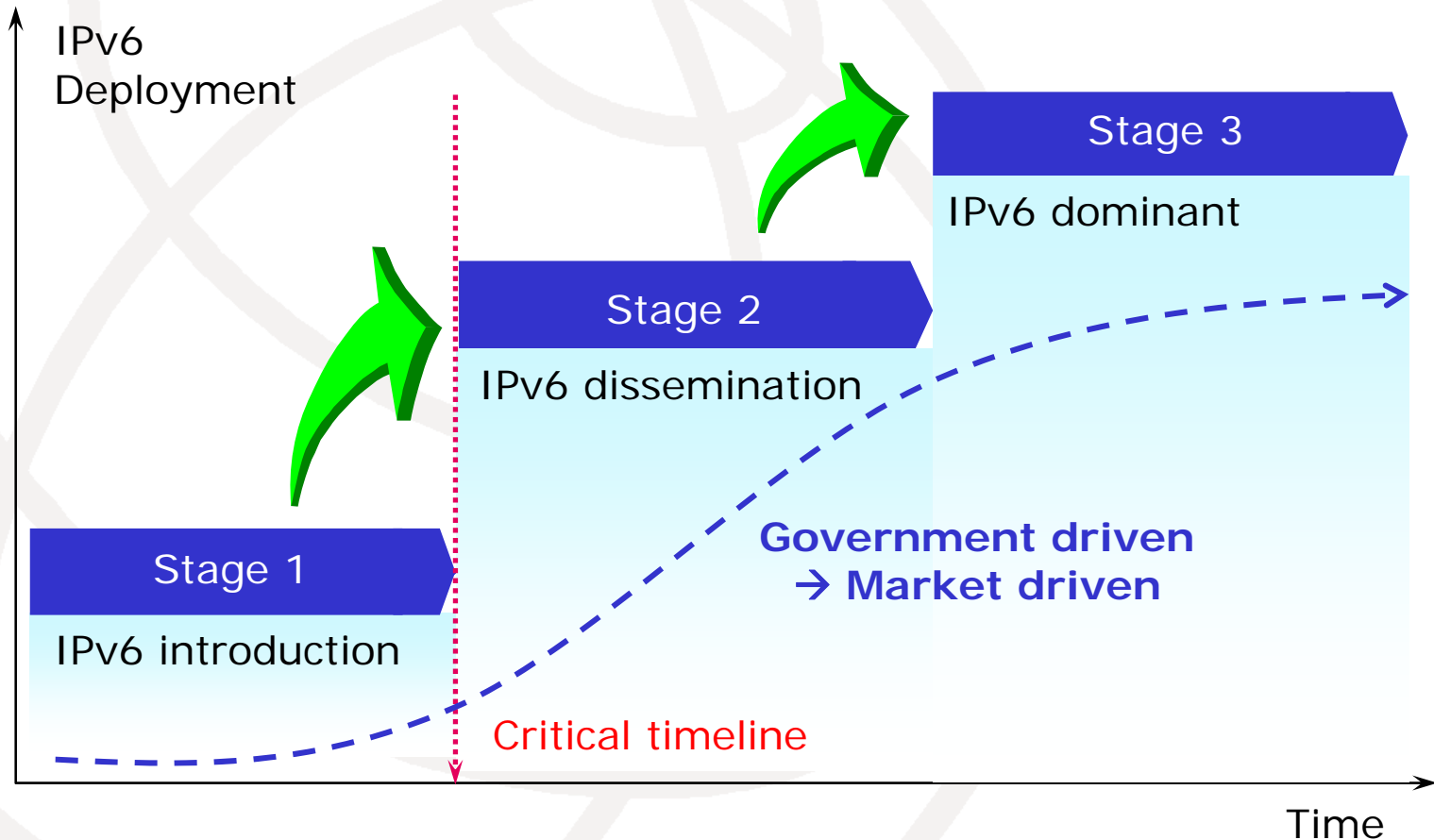
# Migration Strategies (2)

- Governments
  - ➔ Policy
    - Guideline, promotion, address allocation
- Network operators
  - ➔ Deployment and operation
    - Enabling IPv6 on the core transport network
- Vendors
  - ➔ Development of technical solutions
    - Dual-stack, IPv6-enabled end-devices

Create new business and market with IPv6

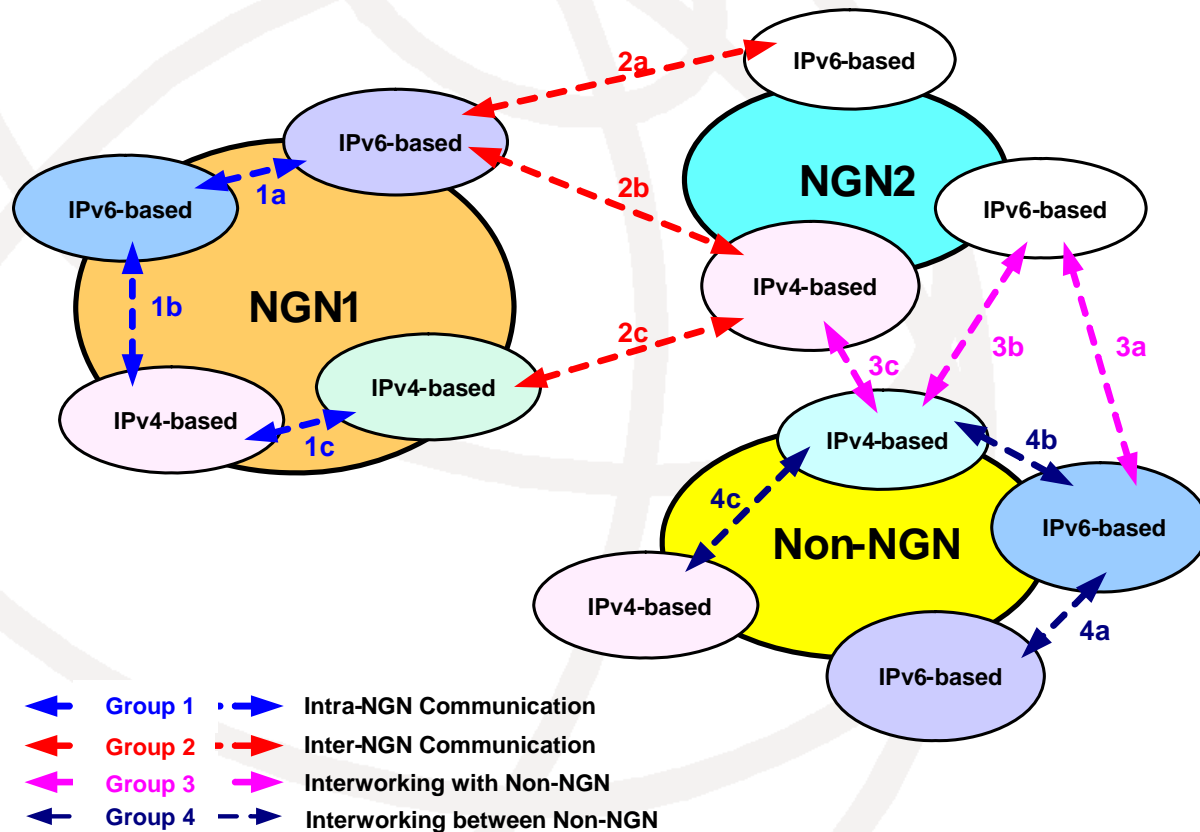
# Migration Strategies (3)

## ■ Stepwise approach



# Migration Strategies (4)

- Backward compatibility for gradual transition
  - ➡ Relationships with heterogeneous networks





# Conclusion

- IPv6-based NGN
  - Key infrastructure for packet-based converged network
- Future work
  - Preparation for increase of devices
  - Standardization (ITU-T, IETF, etc)
    - How to adopt IPv6 technologies to an NGN
  - Focus on realization of NGN with IPv4-IPv6 migration



# Backup Slides

# Key features of IPv4 and IPv6

		IPv4	IPv6
Packet Format	Size of IPv6 header	Variable size	Constant size
	Optional headers	Optional headers	Extension headers and options
Addressing	Addressing spaces	Lack of address spaces	Large address spaces
	End-to-end communications	No	Yes
	Types of addresses	Unicast, multicast and broadcast	Unicast, multicast and anycast
	Scopes of addresses	Local and global	Link-local, local and global
	Address configuration to an interface	A address	Multiple addresses
	Address allocation to an equipment	Multiple interface/addresses	Multiple interfaces/addresses
	Address Autoconfiguration	Using private addresses	Using public addresses
	Hierarchical addressing	-	Yes
	Address Renumbering	-	Yes
	QoS	Management of service conflicts	Type of Service field
Identification of traffic flows		None	Flow label field
Recognition of control/expedite data		None	Hop-by-Hop extension header
Security	AH header	Optional	Mandated
	ESP header	Optional	Mandated
Mobility	Detection of new networks	-	RA messages
	Generation of new addresses	-	Autoconfiguration
	Mobility headers	-	Mandated
	Option header	Optional	Mandated

# Functional architecture of IPv6-based NGN

