

KT's Vision for IPv6 Business

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KT

Agenda

- I. Overview**
- II. Current State**
- III. Issues**
- IV. Development Strategy**

I. Overview

1. IPv6 Everywhere

I. Overview

All-IP trend in Internet-booming world, connecting various networks and terminals through the Internet, is regarded as a big wave in future industry

IP over Every Network

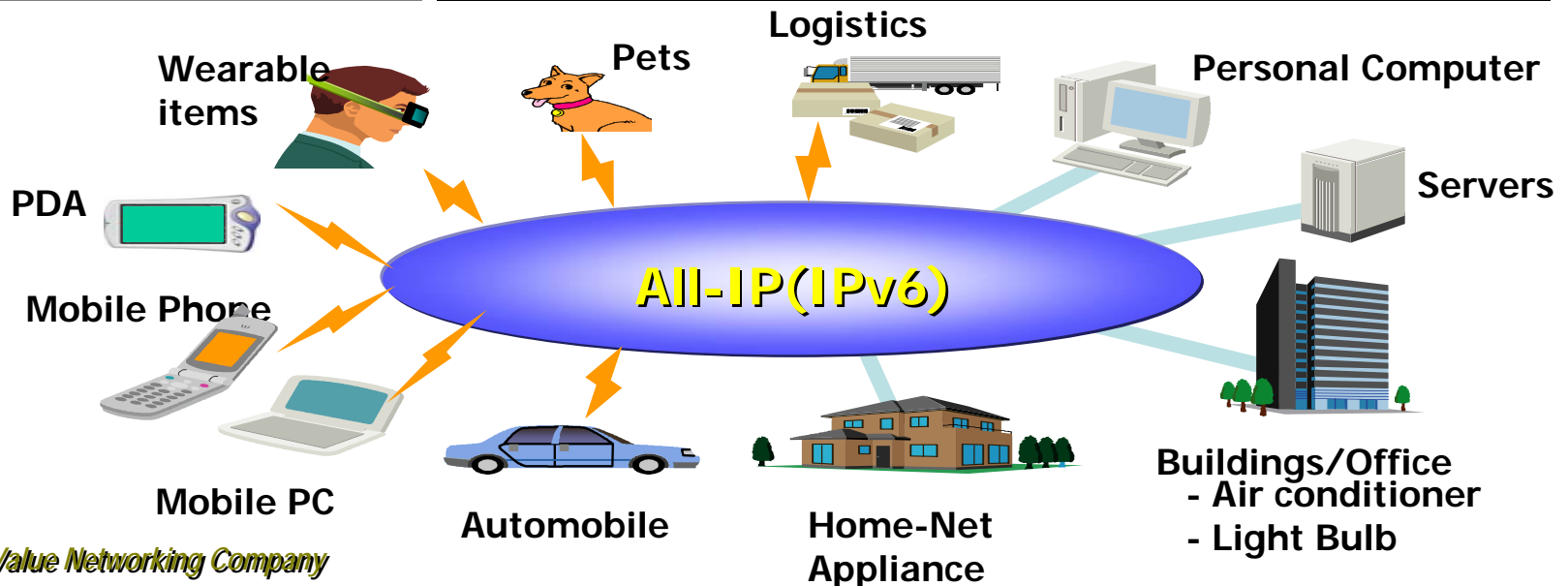
- Every network basically supports IP
- IP network develops as transfer network for every IT service

IP over Every Device

- Every terminal device is IP-enabled to access network

Everything over IP

- Every service is provided through IP-based network



2. Internet Requirements and IPv6 Capability

I. Overview

As demands for 5A-based various services from users grow, service providers are urged to pursue high quality and capability.

Internet Requirements

- Direct access from hosts to Internet
- Flexible/Scalable
- Network Stabilization by route information reduction
- Simple & Effective operation and maintenance
- Real-time security
- Meeting various user demands
- Networking beyond best effort
- Mobilizing Internet Application



IPv6

Highly-Capable network

Address auto-config
(Plug & Play)

Security (IPsec)

QoS Control

Mobile Comm.

Address Expansion

Address space
Expansion
(32bit → 128bit)

Hierarchical Address
(Layer 1 → Layer 3)

* 5A : Anytime, Anywhere, Any content, Any device, Any network

3. IPv6 Service

I. Overview

Relations between major IPv6 services and features are as follows :

○: Essential feature

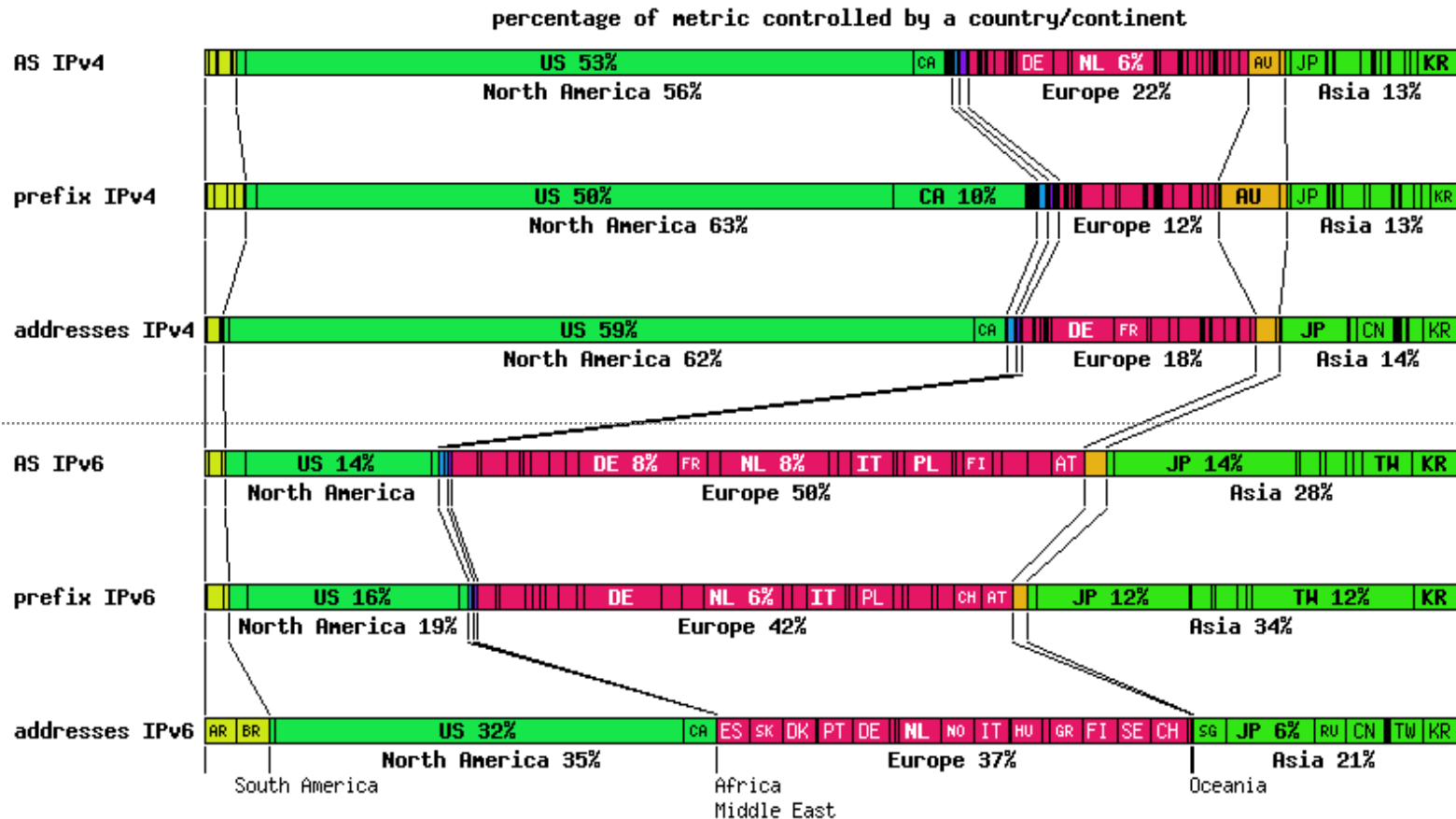
| Category | Service | Relationship with IPv6 features | | | | |
|---------------------------|---------------------------------|---------------------------------|-----|----------|--------|-----|
| | | Address | P&P | Security | Mobile | QoS |
| Network Transport Service | Native IPv6 Service | ○ | ○ | ○ | | |
| | IPv4 to IPv6 Transition Service | ○ | | ○ | | |
| | Mobile IPv6 Service | ○ | ○ | ○ | ○ | |
| | IPv6 Multicast Service | ○ | ○ | | | |
| Basic Network Service | IPv6 VPN Service | ○ | | ○ | | |
| | IM Service | ○ | ○ | ○ | | |
| | VoIP Service | ○ | ○ | | | ○ |
| Application Service | VOD Service | ○ | ○ | | | ○ |
| | Broadcasting Service | ○ | ○ | | | ○ |
| | Duplex Video Service | ○ | ○ | | | ○ |

* P&P(Plug and Play), IM(Instant Message), VoD(Video on Demand)

4. Current World IP Address Allocation Status

I. Overview

Currently, 93% of IPv6 addresses are allocated to EU, North America, and Asia.
– Europe 37%, North America 35%, and Asia 21%.



II. Current State

1. IPv6 Activities Worldwide

II. Current State

Japanese government pursues IPv6 most aggressively to combine consumer devices, its top strength, with the Internet, thus forming a new industry.

Japan

- Japan expects to develop domestic IT industry and become No.1 in world Internet market by combining consumer devices with the Internet
- Consumer devices require a lot of IP address space, thus pursuing IPv6 desperately
- World's first IPv6 commercial service to personal and business customers
- Tax cut plan for businesses buying IPv6 products

| Category | Related Companies |
|-----------------------|---|
| Internet (Enterprise) | NTT Communication, KDDI, Japan Telecom, Powered-com, IIJ, JENS, AboveNet Japan, etc |
| Internet (Private) | . ADSL : e-Access, ACCA Networks . CATV : Chita Media Network . Wireless LAN : Miyago Net |
| IPv6 Product | . Network Devices : Hitachi, NEC, Yamaha, Fujitsu, etc . Terminal Devices : SONY, Panasonic, Sharp, Canon, etc |

1. IPv6 Activities Worldwide

II. Current State

US and Europe are trying to adopt and expand IPv6.

US

- DoD(Department of Defense) plans to convert its network to IPv6 by 2008 using DoD's IT budget(USD 30 bil/yr)
- Cisco and MS implement IPv6 in their products
- In collaboration with private industry, DoD formed NAv6TF(North America IPv6 Task Force)

EU

- Since 98, conduct various research projects for IPv6 adoption : 40 plus projects such as 6INIT, 6WINIT, Euro6IX, and 6NET running with investments over USD 100 mil/yr for research purpose
- Mobile technology and service development notably from Ericsson and Nokia
- Sweden's Skanova launched commercial IPv6 services in 2001
- EC formed 『IPv6 Task Force』 in 2001 to prepare for the IPv6 adoption and expansion

KT is preparing to implement IPv6 and roll out application services.

KT

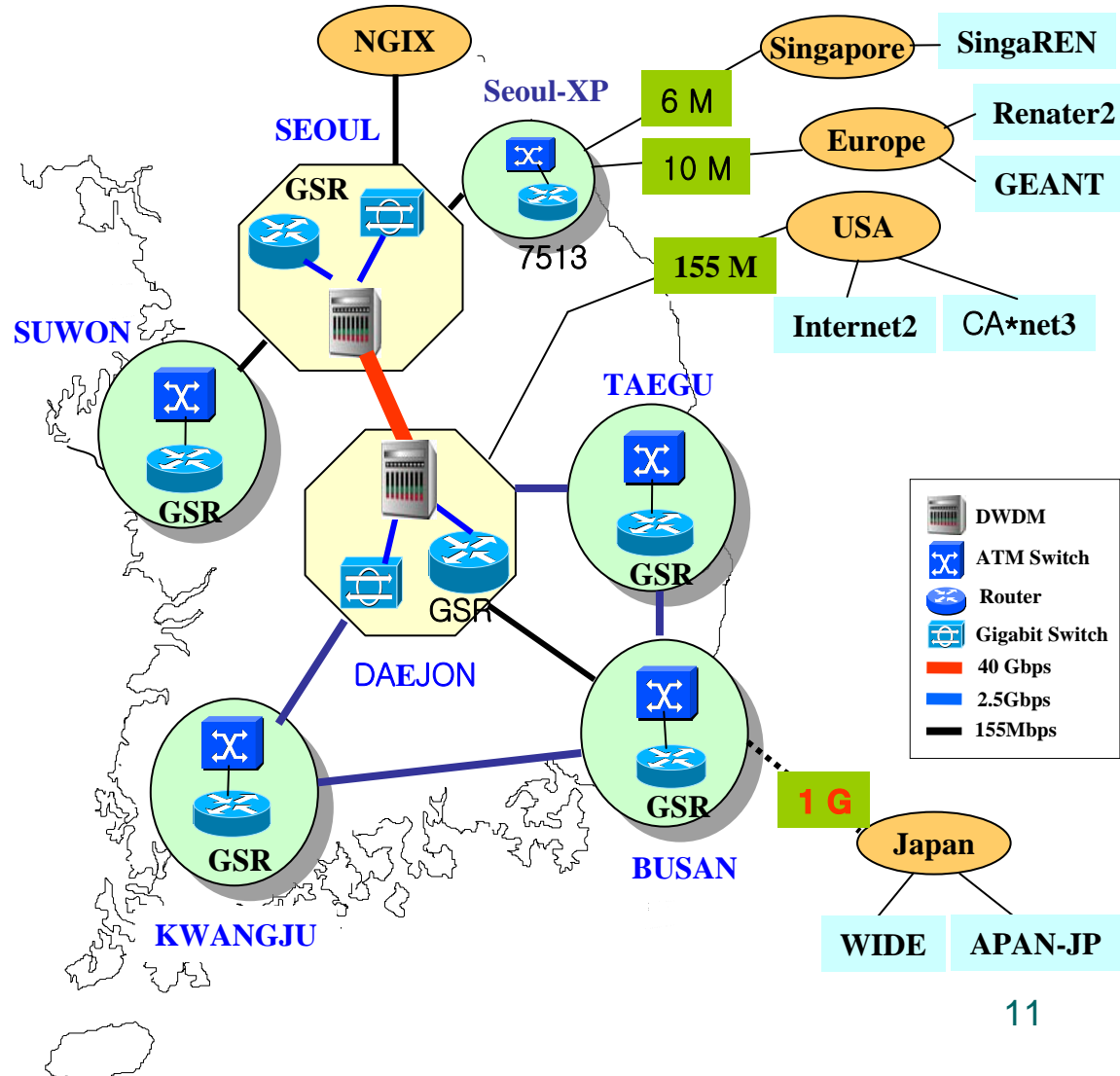
- Received public IPv6 address from the APNIC, first time in Korea (1999)
- Deployed IPv6 KOREN network and obtained network building & operating skills (since 1999)
- IPv6 field experiment with BT (2001)
- Optimum IPv6 transport method test (2002)
 - Tested the IPv6 packet transport methods for best performance
- IPv6 Interoperability test (2003)
 - IPv6 IX, PE(Provider Edge), RR(Route Reflector), DNS
- IPv6 adoption test in the KT-BcN backbone test-bed (2003)
- Develop IPv6 firewall (2003~)
- Develop IPv6-based, high-quality video conferencing S/W (2003~)

2. IPv6 Activities in KT

II. Current State

KOREN IPv6 Topology

- ◆ KOREN(KOrea advanced Research and Education Network)
- ◆ 36 customers (Major customers are universities and research institutions)
- ◆ Non-commercial but **production-level network** since it was deployed (funded by MIC & KT)
- ◆ IPv4/IPv6 dual stack (including tunnel service)



2. IPv6 Activities in KT

II. Current State

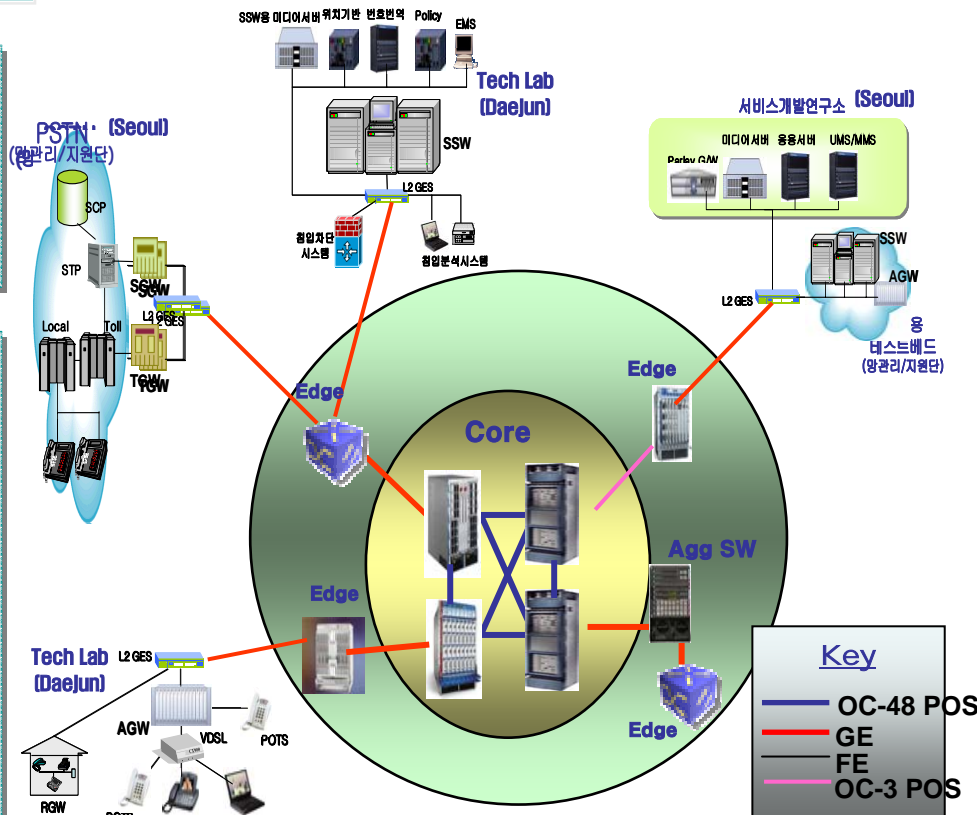
KT-BcN Backbone Network Test-bed

Network Architecture

- Full mesh structured core network
- Equipment : 4 Core Devices, 4 Edge Devices, 1 Line Aggregation Switch
- Line : 2.5G & Gigabit Ethernet

Test Items

- Routing Protocols
 - IS-IS
 - OSPFv3
 - BGP4+
- Router Performance
 - IPv6 only
 - Dual Stack
- Tunneling Mechanism
 - 6to4 Tunneling
 - IPv6 over MPLS (6PE) : LDP, RSVP-TE
 - IPv6 over Martini Circuit



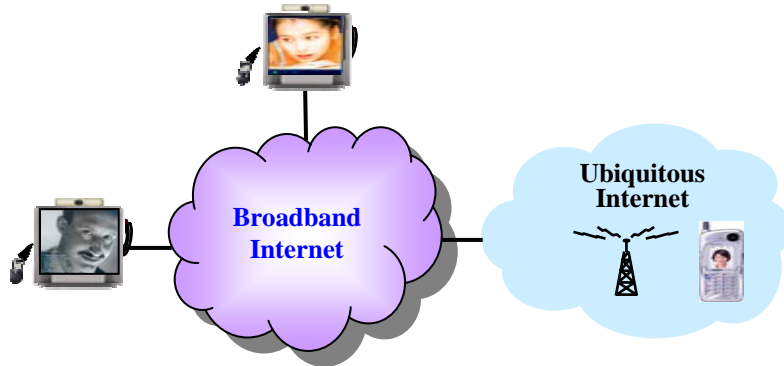
KT-BcN Backbone Network Test-bed Configuration

III. Issues

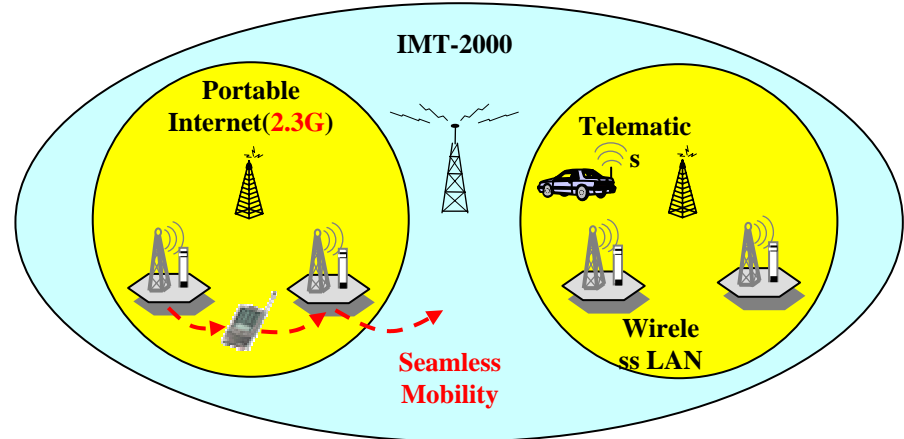
1. IPv6 Applications

III. Issues

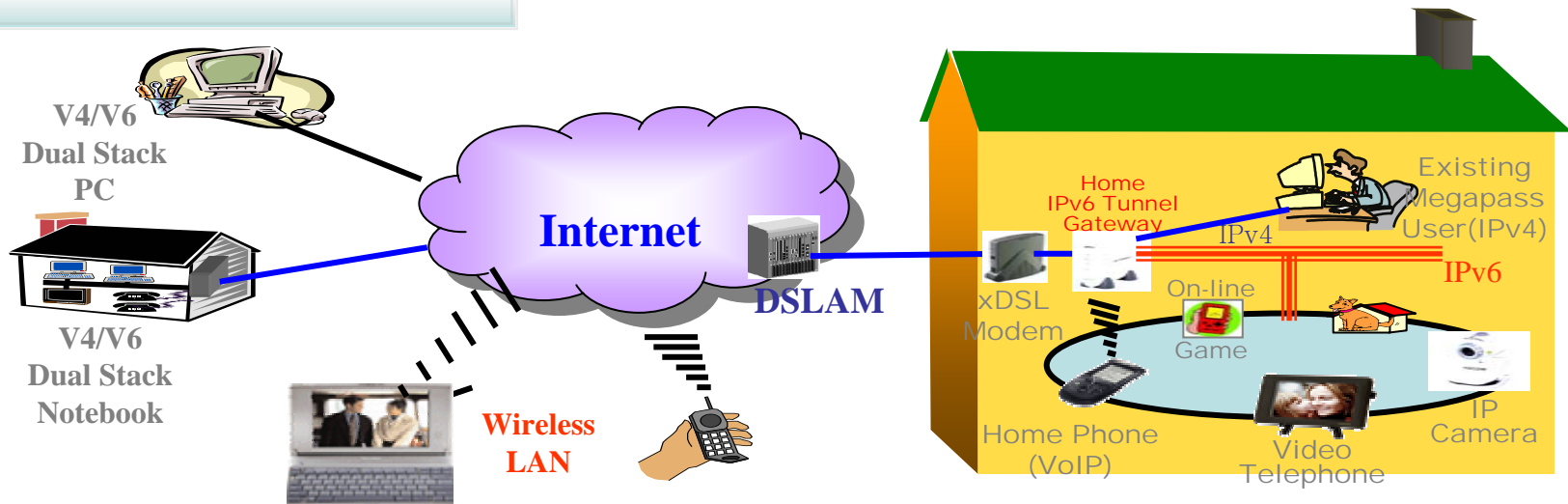
Peer-to-Peer communications



Mobile IPv6



Home Network



2. Exhaustion of IPv4 address

III. Issues

The depletion of IPv4 address space, meaning no more new subscribers and services, is predicted to be around 2006 to 2007.

Major Forecasts

- **ASO** : Predicts IPv4 address space to be depleted in 2007, considering 1.3 increase rate of IPv4 address allocation from RIR to LIR
(ASO Paul Mylotte & Tony Holmes, ASO, April 2001)
- **BT** : Predicts IPv4 address space to be depleted in 2006
- **HITACHI** : Predicts IPv4 address space to be depleted in 2006
- **MIC** predicts IPv4 address space to be depleted around 2006
 - 29.20 million IPv4 addresses (about 2 A-class space) in July 2003
 - 200 million IP addresses will be needed by 2010 with the development of Portable Internet and Internet-connected home devices (MIC 『IPv6 Deployment Plan』 Sept, 2003)
- **KT** : Predicts IPv4 address to be depleted around 2006~7, considering IANA's address reserve, other organizations' predictions, and new IP address demands

3. IPv6 Packet Transport Method

III. Issues

MPLS for tunneling and Dual-stack basis are recommended.

| Implementation Technology | | Adoption Point | | | | Complexity | Timing | | Consideration |
|---------------------------|---------------|----------------|-----|----------|-----------|------------|------------|----------|--|
| | | IX | ISP | Intranet | Host/Apps | | Short term | M-L term | |
| Tunnel | Manual Tunnel | | | ○ | | Low | ○ | | Scalability |
| | 6to4 | | | ○ | ○ | Low | ○ | | |
| | DSTM | | | ○ | ○ | High | | ○ | Consider application solution according to network configuration |
| | Terado | | ○ | | ○ | High | ○ | | |
| | ISATAP | | | ○ | ○ | Low | ○ | | |
| | Tunnel Broker | | ○ | | ○ | Low | ○ | | |
| | MPLS | ○ | ○ | | | High | | ○ | Performance |
| Translation | NAT-PT/SIIT | | | ○ | | High | ○ | | Scalability, Stability |
| | BIS,BIA | | | | ○ | High | ○ | | Stability, Performance |
| | ALG | | | ○ | | High | ○ | | Scalability, Stability |
| | Dual Stack | ○ | ○ | ○ | ○ | High | | ○ | Performance, Complexity |

ISATAP :Intra-Site Automatic Tunneling Addressing Protocol
 SIIT : Stateless IP/ICMP Translation Algorithm
 DSTM : Dual Stack Tunneling Protocol

: Carrier solution

: Enterprise solution

Source : CST

IV. Development Strategy

Definition

- Project aiming at creating new revenues from application services for personal/home users
 - Single-player[Access service] → multiple-player[Access+Application service]
 - Octave terminal devices and services to high-speed private Internet users
- Octave: Collective name for “Beyond Broadband” Strategy

Goal

- Increase the broadband revenue by “one octave”
- Revenue generation comparable to that of current “broadband access business”
- Octave services will be provided upon IPv6-based Infrastructure

2. Octave Service

IV. Development Strategy

- Application services for personal/home users, thus leveling up legacy access service
- Four color services

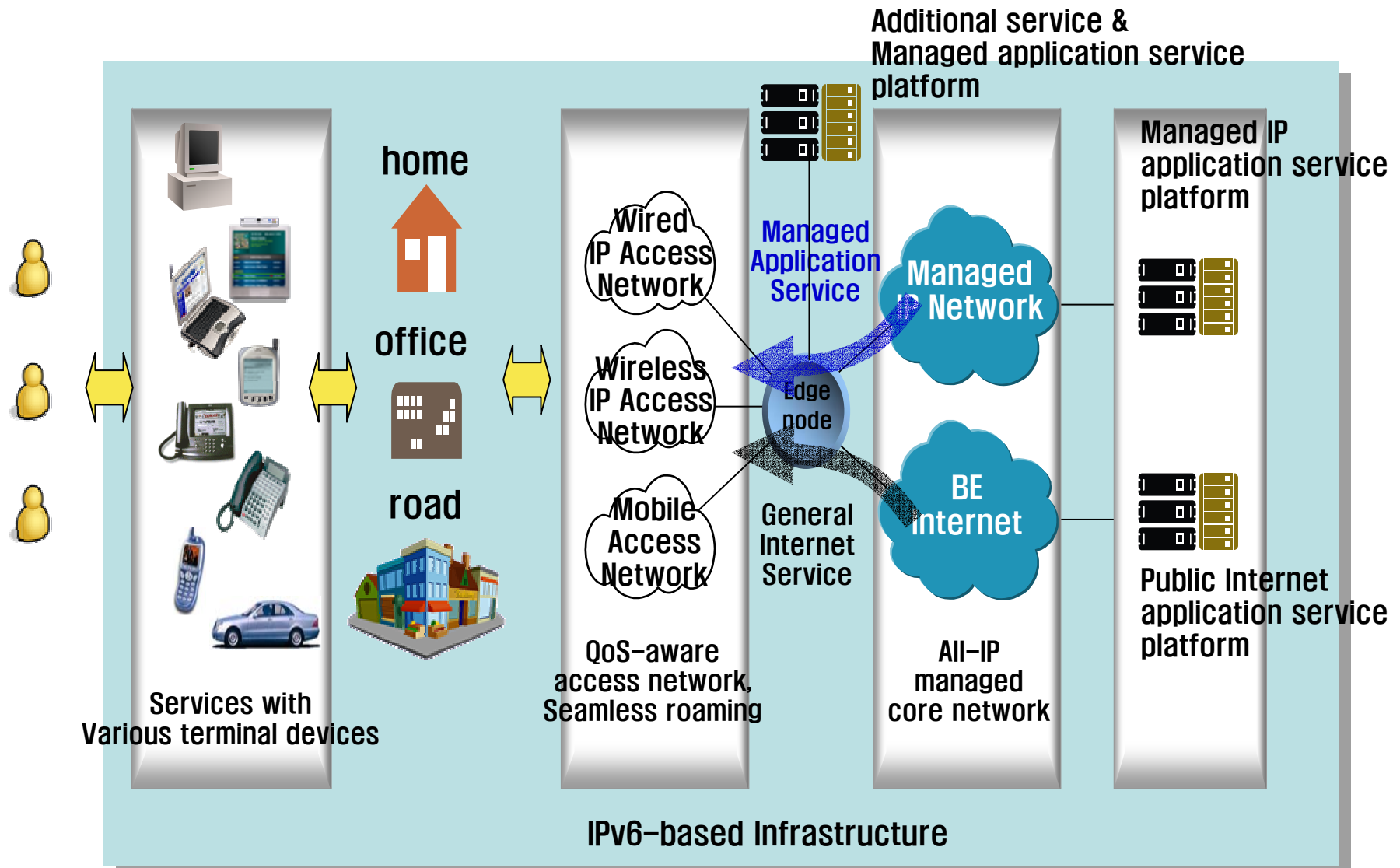


KT Octave Device (TV, PC, Wireless device, Home appliance)

IPv6-supported Managed Broadband Network

3. Octave Infrastructure

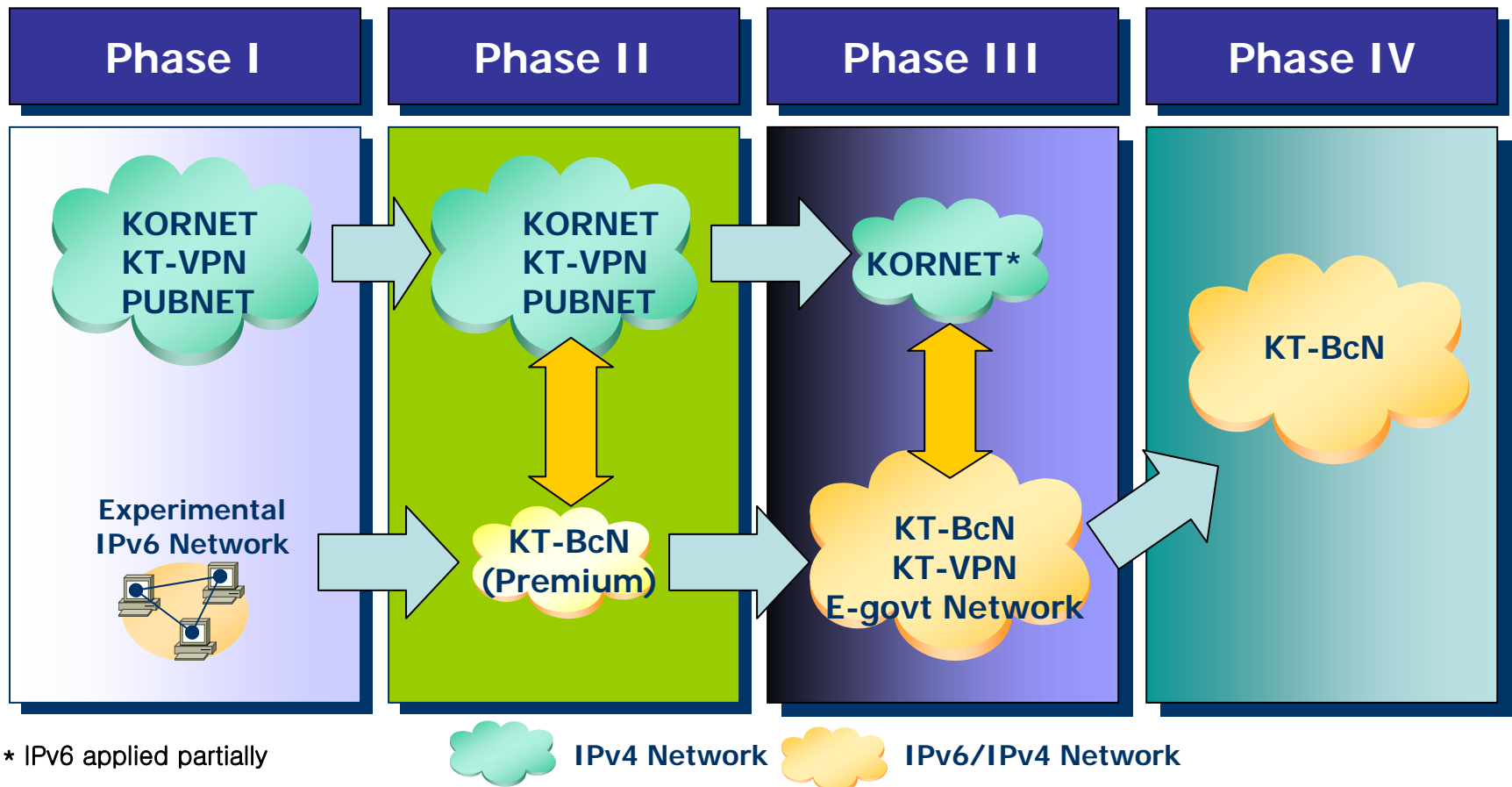
IV. Development Strategy



4. IPv4 to IPv6 Migration Strategy

IV. Development Strategy

Implement IPv6 in KT-BcN (IP Premium network) first, then expand to e-Government, VPN, KORNET depending on IPv6 service demand



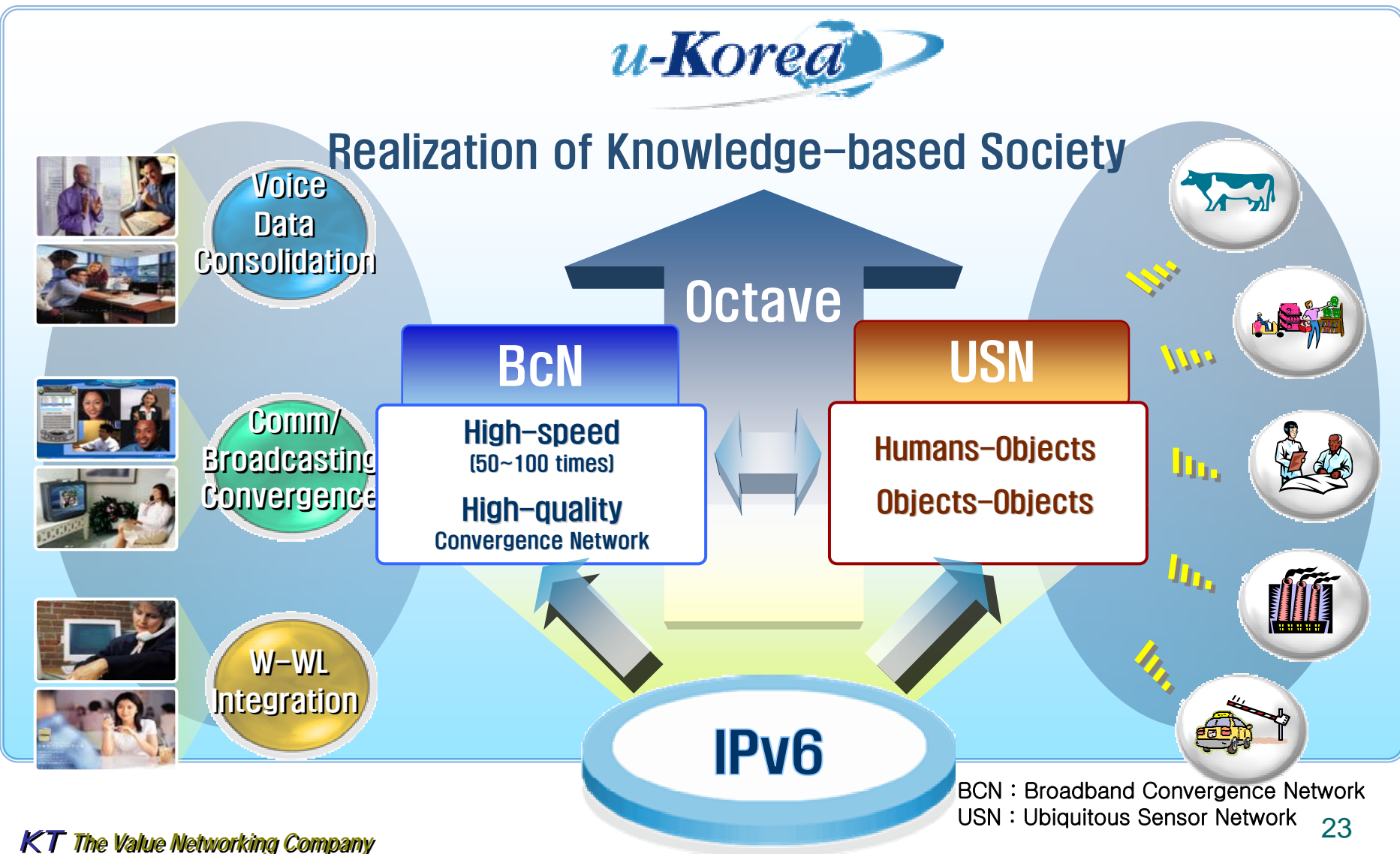
5. Deployment Roadmap

IV. Development Strategy

- **Phase 1 (~ 2004)**
 - ◆ Build IPv6 test-bed and field trial
 - ◆ Develop IPv6 business model
- **Phase 2 (2005 ~ 2006)**
 - ◆ Deploy dual stack from the access network
 - ◆ Launch IPv6 commercial service for the advanced users
 - ◆ Korea Information Infrastructure-Government
 - ◆ Digital Home IPv6 trial service
 - ◆ Mobile IPv6 for the Portable Internet (2.3G)
- **Phase 3 (2007 ~ 2009)**
 - ◆ Diffuse dual stack to the backbone network
 - ◆ Application transition from IPv4 to IPv6
- **Phase 4 (2010 ~)**
 - ◆ Deploy IPv6 only equipments from the backbone network
 - ◆ Evolve to the IPv6 only network/service
 - ◆ Completion of all-IPv6 network

6. KT's Vision for IPv6

IV. Development Strategy





KT

The Value Networking Company

Thank you very much!