IPv6 Deployment Update from Korea

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IPv6 Strategy in KOREA

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Infra	Service	Users
IX IPv6 interconnection	IPv6 web hosting	IPv6 consulting
IPv6 on Mobile Network	'Korea IPv6 Day'	IPv6 educations
Operating IPv6 based Internet exchange node and subscriber network	IPv6 Tech. Research	IPv6 survey and Index Development
	IPv6 promotion council operation	IPv6 P.R.

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IPv6 Internet eXchange

- Operating IPv6 based Internet exchange node(6NGIX) and subscriber network (6KANET)
  - ✓59 Organizations has been peered(by Dec. 2012)
    - * 6NGIX(IPv6 Next Generation Internet Exchange)
    - * 6KANET(IPv6 Korea Advanced Network)
- Providing IPv6 traffic exchange and connection service between domestic/oversees ISPs and subscibers

Wired Network

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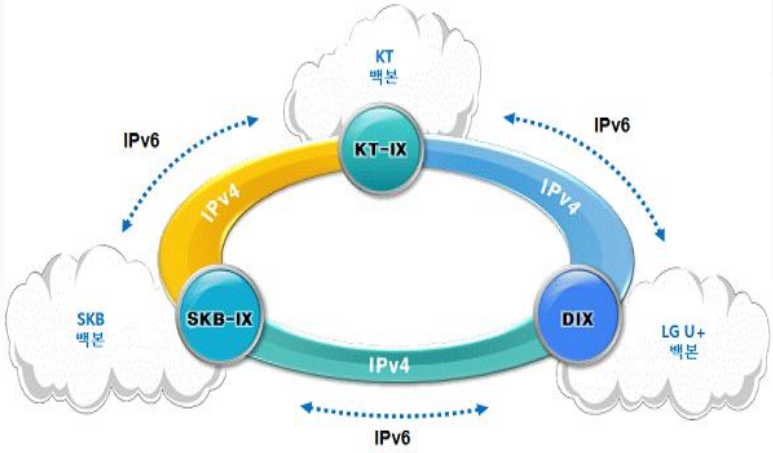
IPv6 Interconnection Agreement among ISPs

- 3 major ISPs(KT, SKB, LGU+) reached the agreement on adopting IPv6 at their backbones and IXs(2012.12.18)

- Commercial environment are ready now(from Feb. 2013)



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Project Overview

1. Partner : SKT(Mobile Telecommunication Company, ISP)
   - SKT Subscriber Occupancy Rate : 50.4%(26Million)
   - No. 1 Mobile Telecom Company in KOREA

   * Total subscribers in Korea : 53Million
2. Background : IPv4 shortage, Difficulties in IPv4 administration(Double NAT…)
3. Period : 2012. JUN. ~ DEC.
4. Goals :
   - Deploying IPv6 in the LTE & WiFi Infra, and Providing services with IPv6 Portal
   - Suggesting best scenarios for deploying IPv6 in Content, Network, Device(C-N-D) at Wireless Environment
   - Drawing Problems and Solutions for deploying IPv6 at Wireless Environment

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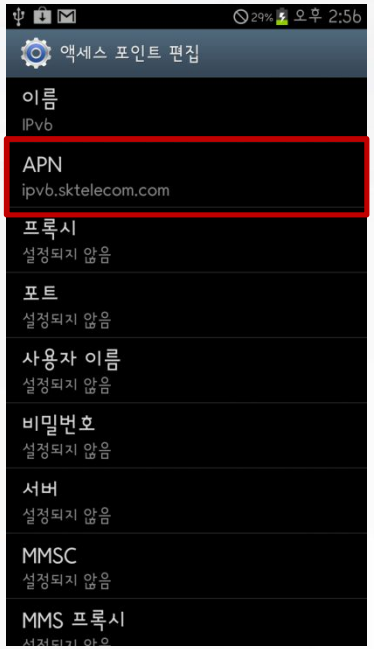
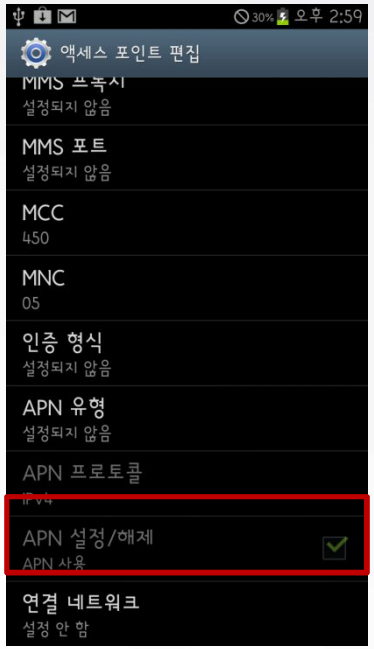
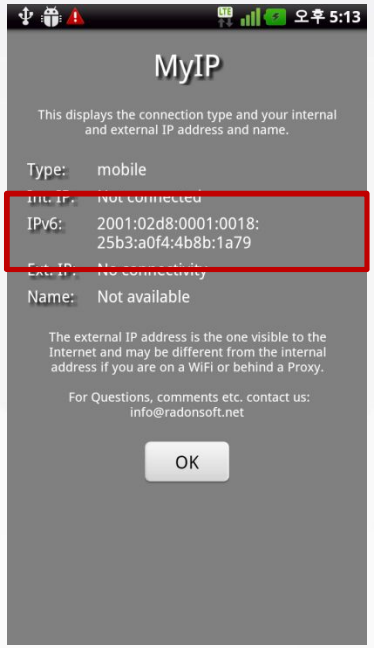
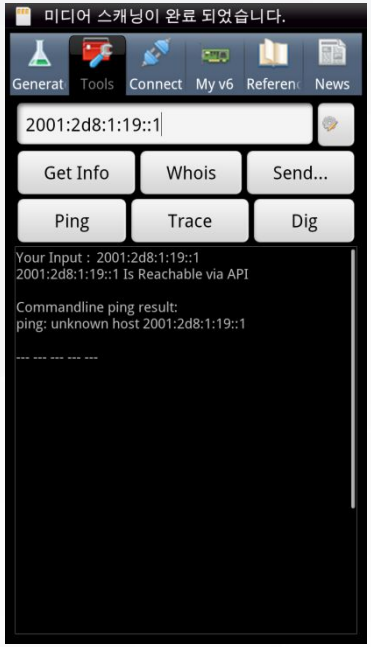
Demo Clip

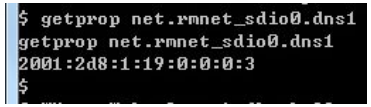
http://www.youtube.com/watch?v=wYzN0c7go4M











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Details

1. Structure Map
2. LTE Network
3. WiFi Network
4. Tests for Wireless Devices
5. M6 Portal Service
6. NAT64/DNS64

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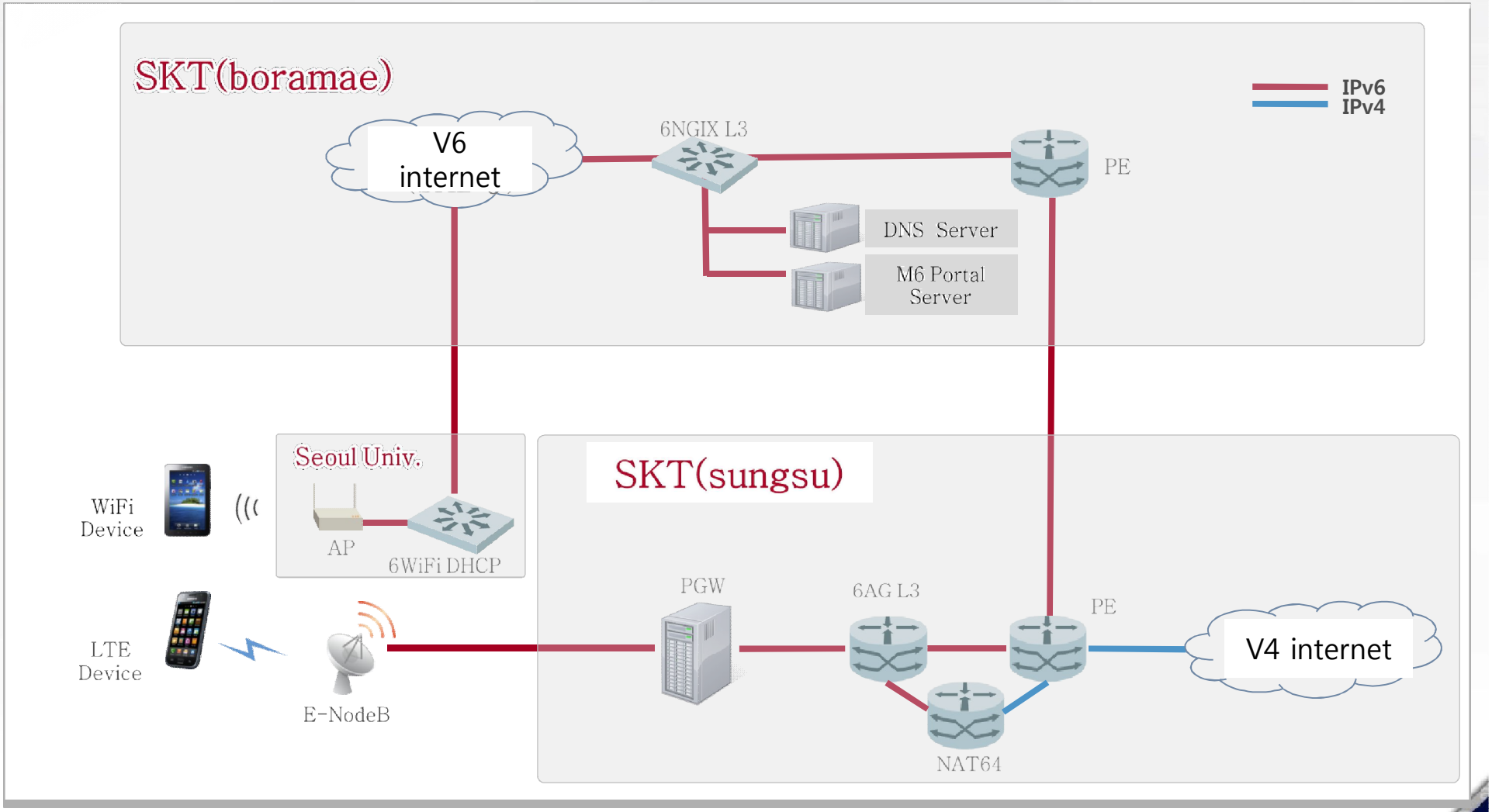
Structure Map



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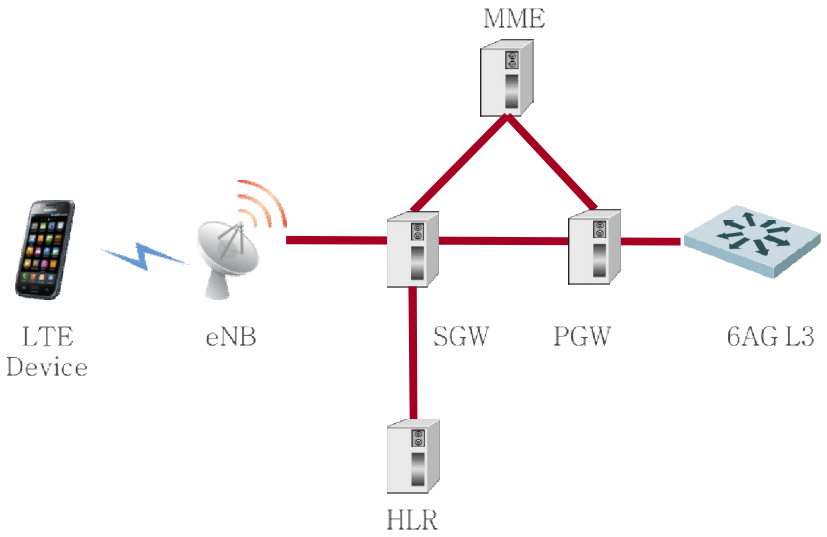
Constructing EPC

EPC Structure map

Metropolitan Area



Performance Details

1) HLR((Home Location Register)
- IPv6 APN(APNCID#40) Allocation
- Verification Device number registration(manual)

2) MME(Mobility Management Entity)
- Device Authentication, Status Monitoring
- ipv6.sktelecom.com APN registration

3) SGW(Serving GateWay)
- E-NB scope management(Handover, Traffic interrupt)
- Routing from Device to PGW

4) PGW(Packet data network GateWay)
- IPv6 Package applied at Sungsu PGW#8
- IPv6 APN, IP Pool, DNS infos & routing are added

*EPC : Evolved Packet Core
*eNB : evolved NodeB

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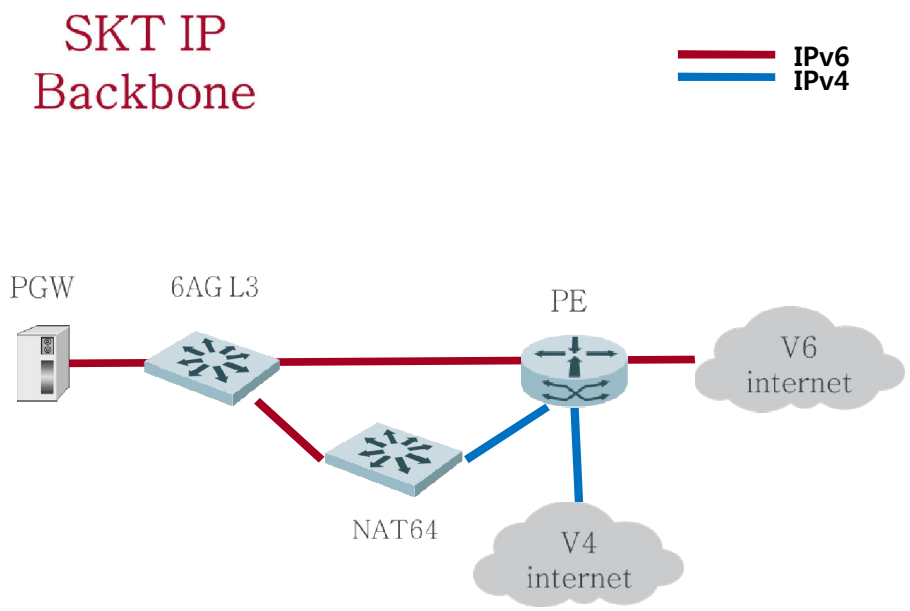
Constructing Wired Network

Structure Map of Wired Network



Performance Details

1) 6AG L3
- Sungsu PGW#8 Interface linkage and NAT64 Scope IP Routing
- Native IPv6 scope IP Routing

2) NAT64
- v4 internet connection via IPv6 to IPv4 NAT(Network Address Translation)

3) PE
- v6 internet Connection by implementing MPLS 6PE

* 6AGL3 : IPv6 Aggregation Gateway Level 3
* PE : Provider Edge
* 6PE : IPv6 Provider Edge
* MPLS : Multi-Protocol Label Switching

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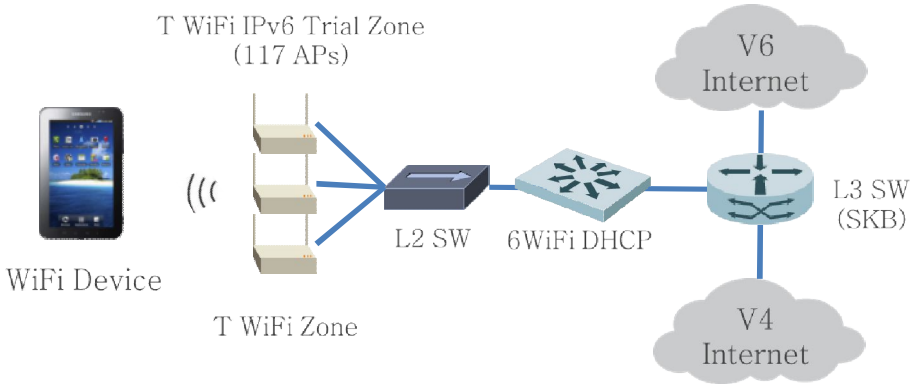
Constructing WiFi Network

Structure Map of IPv6 WiFi Network



Performance Details

1) Making Service AP in T WiFi Zone support IPv6
   - IPv6 SSID : T WiFi IPv6 Trial Zone
   - Developing of IPv6-supporting AP(Dual-Stack)
   - Verifying connectivity in AP network
   - Selecting Construction Site – Seoul National University(117 APs installed)

2) IPv6 WiFi Zone configurations
   - AP is developed for Dual-Stack and ipv4 traffic translated via NAT in AP.
   - case of IPv6 internet, obtain ipv6 address and dns information from 6WiFi DHCP and then being interlocked with IPv6 internet
   - v4 and v6 internet are been linked via SKB L3 switch.

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LTE Wireless Device Test

- Test Devices are limited to products released in Korea(domestic) market.
- Some of that, IPv6 packages/functions are all embedded but disabled

Terminal Device	Vendor	OS	chipset	Test result		
				APN set-up	IPv6 address acquisition	IPv6 comm.
Optimus LTE	**LG**	**Android 2.3.5**	**MDM-9200**	**O**	**O**	**O**
Optimus LTE	LG	Android 4.0.4	MDM-9200	O	X	X
Optimus LTE Tag	LG	Android 2.3.5	MDM-9200	O	X	X
Optimus LTE2	LG	Android 4.0.3	MSM-8960	O	X	X
Optimus Vu	LG	Android 4.0.4	MDM-9200	O	X	X
Vega S5	Pantech	Android 4.0.4	MSM-8960	O	X	X
VegaRacer 2	Pantech	Android 4.0.4	MSM-8960	O	X	X
Galaxy S3	Samsung	Android 4.0.4	CMC221S	X	X	X
Galaxy S2 LTE	Samsung	Android 2.3	MDM-9200	X	X	X
Galaxy Note	Samsung	Android 4.0.4	MDM-9200	X	X	X
Galaxytab 7.7	Samsung	Android 4.0.4	MDM-9200	X	X	X
Raider	HTC	Android 2.3.4	MSM-8260	X	X	X

❖ Verizon or T-Mobile IPv6 Devices : Galaxy S3, Galaxy Nexus, Optimus LTE, Optimus Vu, I-Phone 5

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WiFi Wireless Device Test

Terminal Device	OS	Test result		
		IPv6 address acquisition	DNS info acquisition	IPv6 comm.
Optimus LTE	Android 2.3.5	O	X	O
Optimus LTE2	Android 4.0.3	O	X	O
Galaxy S3	Android 4.1.1	O	X	O
i-Pad mini	**iOS 6.0**	**O**	**O**	**O**
PC	Windows 7	O	O	O

Issues

- Insufficient Supports for IPv6 Only Network
  - In case of Android OS, when IPv4 address couldn't be acquired, WiFi connection was lost.
  - To solve this problem, we should set a fake IPv4 address in AP.
- IPv6 DNS info acquisition failure
  - In case of Android OS, neither RDNSS Option nor DHCPv6 is supported
  - We should configure DNS infos inside the device compulsarily.(rooting)

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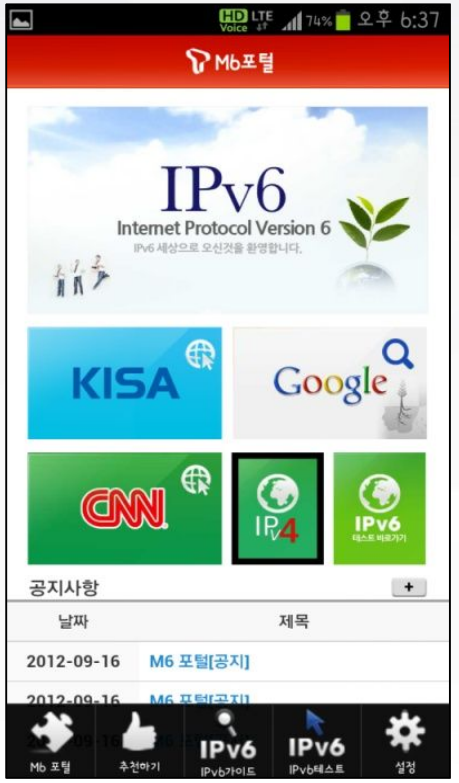
M6 Portal Service

- google Play store registration
- Android App was developed



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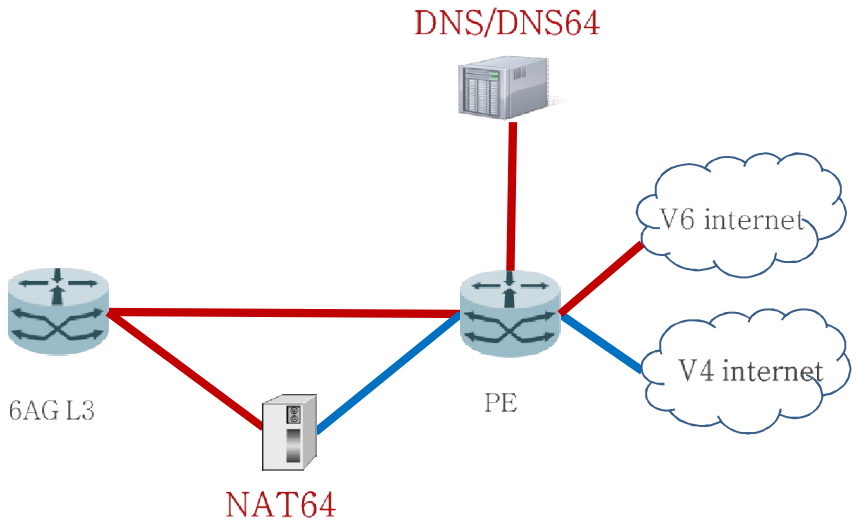
NAT64/DNS64

Structure Map



Details

○ **IPv4 Contents Interconnection**

1) NAT64 Deployment : To connect to IPv4 only contents with IPv6 device
   - Source-NAT-Prefix Set-up at NAT64(2001:2d8:0:19::)
   - V4 IP and 1:1 NAT Pool assignment(223.33.190.0/24)
   - 6 To 4 NAT implement

2) DNS64 function enable at DNS
   - AAAA allocation for IPv6 address
   - Source-NAT-Prefix allocation for IPv4 address

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Android APP Operation Test with NAT64

Normal operation APPs

❖ web service and HTTP based communication APPs are mostly work well.

Mobile App	Service Type
Web browser	Internet service
T map	Navigation
Smart Wallet	Mobile membership wallet
Naver portal	Internet portal
cyworld	SNS
twitter	SNS
Tabzin	Mobile magazine
anipang	game

Abnormal operation APPs

❖ Abnormality caused by ALG(Application Level Gateway) performance constraints with NAT64.

symptoms	Mobile App	Service Type
Authentication failure	T store	App store
	T cloud	Cloud service
	Tictalk plus	chatting
	nateon-UC	Chatting
	Skype	VoIP
Network abnormality	Mobile T money	Online payment
	Cakao talk	Chatting
	Seoul bus	Living info.
	YTN	Broadcast
Streaming malfunction	Hoppin	streaming/VoD
	Melon	streaming/Music

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Accomplishment

- Suggesting best scenarios for deploying IPv6 in Content, Network, Device (C-N-D) at Wireless Environment
- Drawing Problems and Solutions of Deploying IPv6 at Wireless Service Environment

Challenge

- To commercialize IPv6 LTE network, IPv6 traffic monitoring & calculation system, and charging system(H/W & S/W) should be ready to support IPv6 first.

  * Existing systems are all based on IPv4

Vision

- SKT is going to adopt IPv6 for the commercial service independently.

  * SKT is predicting IPv4 address is short for their future business.

IPv6 Plan in 2013

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- ✓Planning IPv6 deployment roadmap including both private/public sector
- ✓ Analyzing vulnerabilities in Security Equipment and BMT
- ✓ IPv6 IX(6NGIX, 6KANet)' service
- ✓Supporting vendors to spread IPv6 devices

- ✓IPv6 deployment in education network & university
- ✓'Korea IPv6 Day'
- ✓ IPv6 survey, policy development, researches

- ✓ IPv6 consulting, education
- ✓ IPv6 conference, workshop
- ✓ IPv6 P.R., website operations

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THANK YOU