IPv6 DNS Service Deployment in Korea

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KRDNS V6

KRNIC Korea Network Information Center

NIDA National Internet Development Agency of Korea

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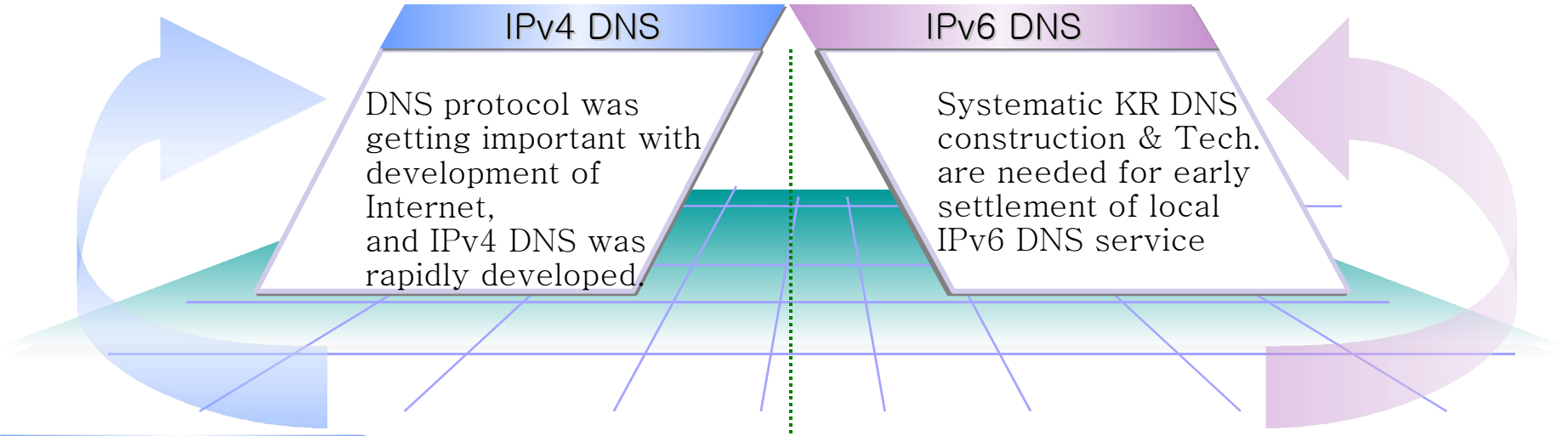
Background



Advent of IPv4 (Early 1980s)

- Early stage of Internet
- Name-IP mapping table (hosts.txt file)
- Needs for DNS

Brisk IPv4 era (1990s)

- Increased Network&Host
- Development of various IPv4 application services

Depletion of IPv4 (1994)

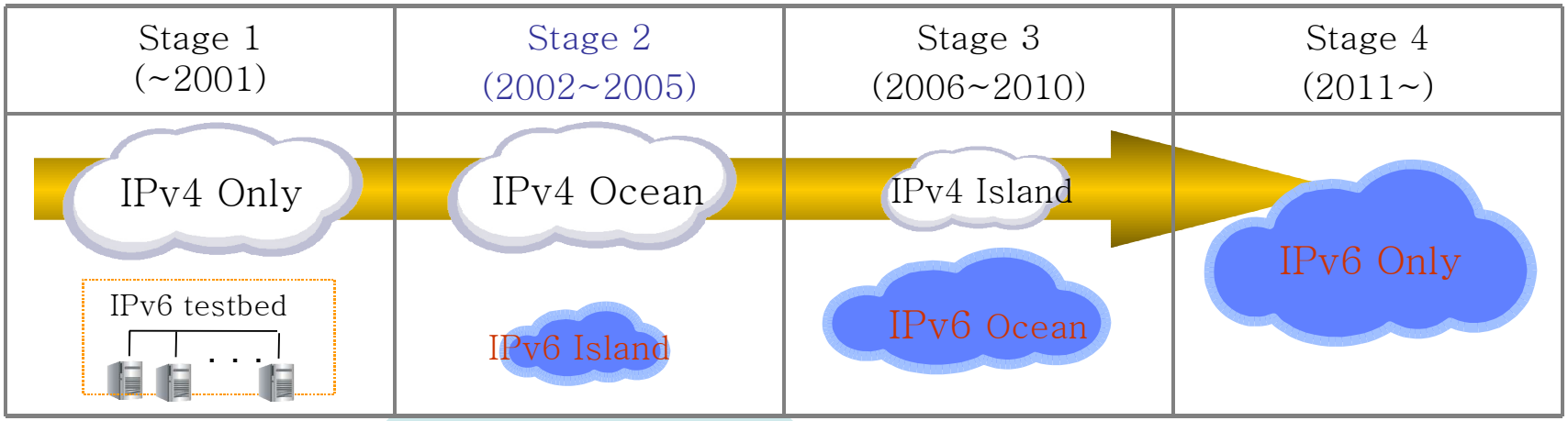
- Growing needs for hi-speed Internet service
- Development of wireless/mobile tech.
- Appearance of various new services

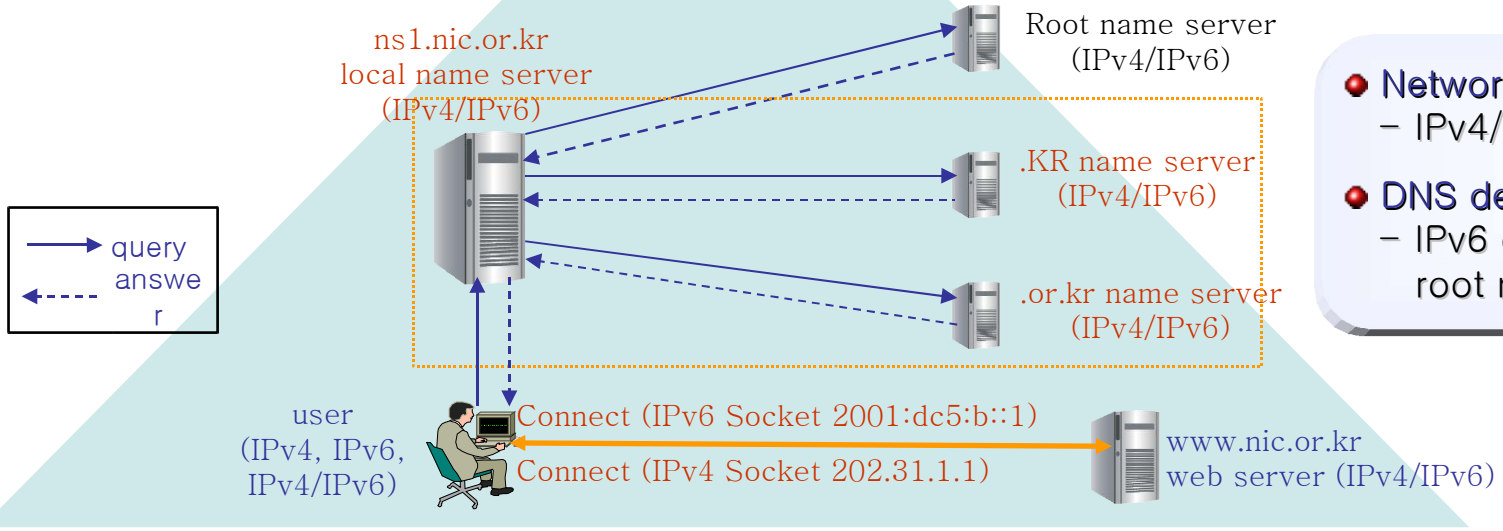
Advent of IPv6 (1999)

- ubiquitous era
- Preparation of hi-performance IPv6 application test basis
- Needs for stable IPv6 DNS tech.

Goals in IPv6 DNS Deployment

Developing DNS system to provide stability toward IPv6





- **Network side**
  - IPv4/IPv6 dual-stack
- **DNS delegation side**
  - IPv6 delegation under root name server

I Background

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III International Trend

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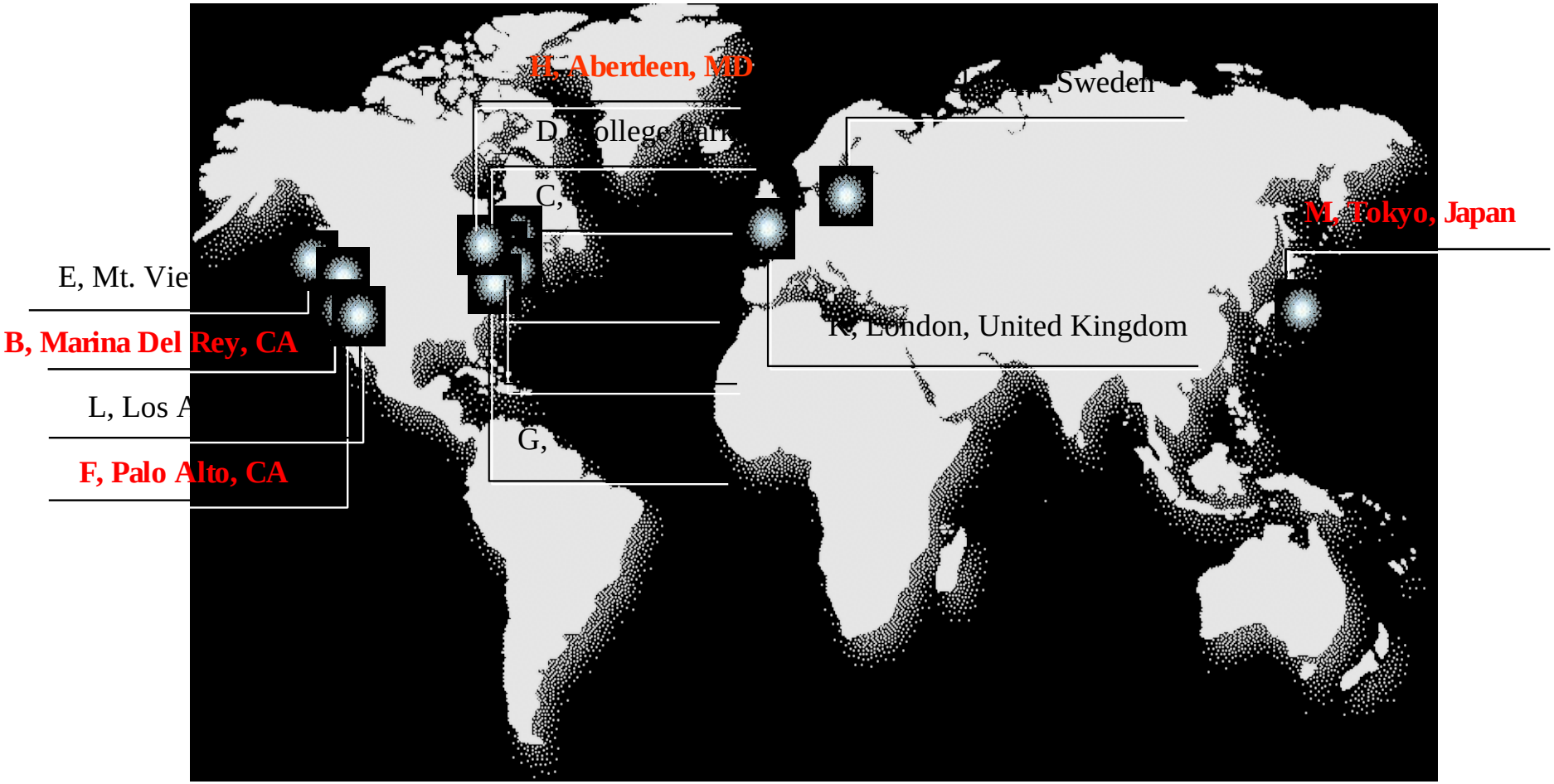
International Trend (1/6)

Worldwide Root DNS Servers : Total 13



International Trend (2/6)

IPv6 Compatibility with Root DNS Server

IPv4/IPv6 dual-interface on 4 root servers from perspective of IP layer

- IPv6 based DNS query acceptable

- so, local servers need to be built up as dual network

Name server	Organization	Location	IP address
B	Information Sciences Institute	Marina Del Rey CA	IPv4: 128.9.0.107 IPv6: 2001:478:65::53
F	Internet Software Consortium	Palo Alto	IPv4: 192.5.5.241 IPv6: 2001:500::1035
H	U.S. Army Research Lab	Aberdeen MD	IPv4: 128.63.2.53 IPv6: 2001:500:1::803f:235
M	WIDE Project	Tokyo	IPv4: 202.12.27.33 IPv6: 2001:dc3::35

IPv6 delegation to name servers under root name servers

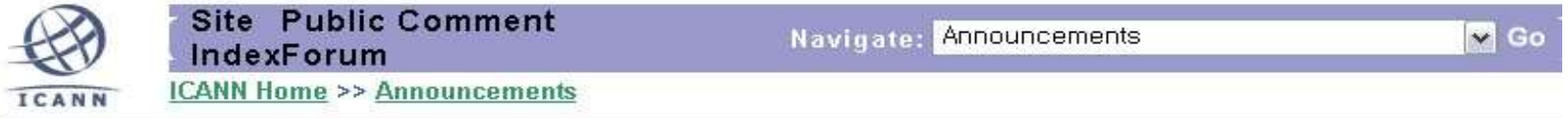
- IPv6 AAAA delegation to ccTLD level name servers (July 20, 2004)

- Needs for IPv6 delegation to gTLD level name servers

- Technical limit of DNS packet size 512 bytes

International Trend (3/6)

IPv6 Address Added to the Internet's Root DNS Zone



Next-generation IPv6 Address Added to the Internet's Root DNS Zone

20 July 2004

Kuala Lumpur, Malaysia (20 July 2004) – ICANN announced today that for the first time, an IPv6 nameserver address has been added to the Internet's root DNS zone. This next generation version of the Internet Protocol provides trillions more addresses than the IPv4 system that is in use by most networks today.

By taking this significant step forward in the transition to IPv6, ICANN is supporting the innovations through which the Internet evolves to meet the growing needs of a global economy.

On 20 July 2004 at 18:33 UTC the IPv6 AAAA records for the Japan (.jp) and Korea (.kr) country code Top Level Domain (ccTLD) nameservers became visible in the root zone file with serial number 2004072000. It is expected that the IPv6 records for France (.fr) will be added shortly. Other requests are pending and will be added in accordance with documented procedure, which was developed through ICANN's unique multi-stakeholder consensus-based approach. <http://www.iana.org/procedures/delegation-data.html>.

Recognizing the importance of IPv6 to the Internet community, ICANN has coordinated with its Root Server System Advisory Committee, Top Level Domain managers, Security and Stability Advisory Committee, and other interested parties in careful analysis of this issue. After a period of thorough examination, the decision was made to move forward with deployment of the IPv6 address records in the manner prescribed by the community.

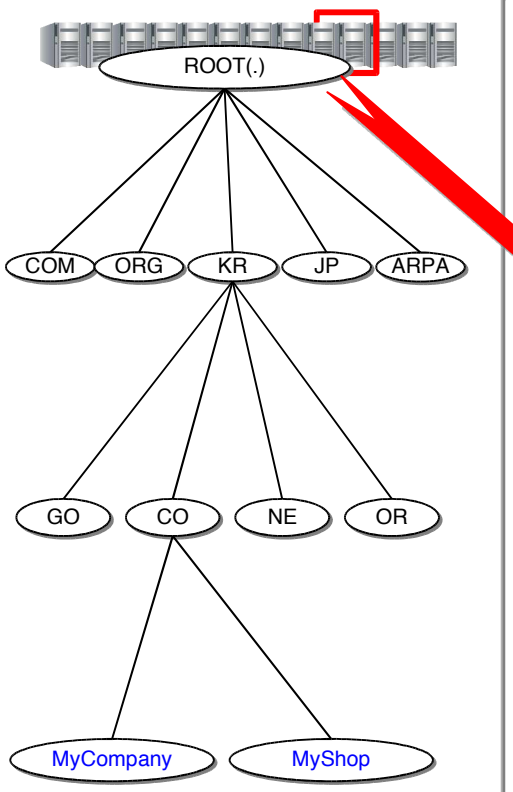
ICANN is the global public-benefit non-profit organisation responsible for coordinating the Internet's naming and numbering systems. For more information please visit: <www.icann.org>.

International Trend (4/6)

13 Root DNS ccTLD Delegation Services

As of Aug. 2004

Domain Name Space



ROOT Zone

```
KR.              NS   a.dns.kr.
:
KR.              NS   g.dns.kr.
a.dns.kr.   A     202.30.50.51
:
g.dns.kr.   A     211.216.50.130
g.dns.kr.   AAAA  2001:dc5:a10::51
:
```

Requests for Adding IPv6 Glue Record

g.dns.kr. AAAA 2001:dc5:a10::51

IPv6 delegation to ccTLD (Since July 20, 2004)

Delegation Policy

IPv4/IPv6

IPv6 Enabled Name Servers

B.ROOT-SERVERS.NET
F.ROOT-SERVERS.NET
H.ROOT-SERVERS.NET
M.ROOT-SERVERS.NET

IPv6 packet with DNS
DNS Query:
www.myshop.co.kr AAAA ?

IPv6 packet with DNS
DNS Response:
Refer to
KR.NS A.DNS.KR.
:
KR.NS G.DNS.KR.
A.DNS.KR. A 202.30.50.51
:
G.DNS.KR. A 211.216.50.130
G.DNS.KR. AAAA 2001:dc5:a10::51

IPv6 user

International Trend (5/6)

Dual-stack Status of ccTLD Countries

Country Name	No. of DNS Server	No. of IPv4/IPv6 dual DNS Server	Name of DNS Server	IP Address
Japan	6	4	a.dns.jp	IPv4: 203.119.1.1
				IPv6: 2001:dc4::1
			b.dns.jp	IPv4: 202.12.30.13
			c.dns.jp	IPv4: 165.76.0.98
			d.dns.jp	IPv4: 210.138.175.244
				IPv6: 2001:240::53
			e.dns.jp	IPv4: 192.50.43.53
				IPv6: 2001:200:0:1::4
			f.dns.jp	IPv4: 150.100.2.3
				IPv6: 2001:2f8:0:100::153
France	8	1	ns1.nic.fr	IPv4: 192.93.0.1
			ns2.nic.fr	IPv4: 192.93.0.4
			c.nic.fr	IPv4: 192.134.0.49
				IPv6: 2001:660:3006:1::1:1
			ns3.domain-registry.nl	IPv4: 193.176.144.6
			ns-ext.vix.com	IPv4: 204.152.184.64
			dns.cs.wisc.edu	IPv4: 128.105.2.10
			dns.inria.fr	IPv4: 193.51.208.13
			dns.princeton.edu	IPv4: 128.112.129.15

International Trend (6/6)

DNS Name Simplification of ccTLD Countries

Minimizing DNS response message size through consistent domain name
- Systemized domain name can be processed in compressed type
- This allows DNS response message size that is limited to 512 bytes
- This is also very sensitive factor in construction of dual-stack network and IPv6 delegation to root domain name server in the future

JP	• **Readjustment, Jul. of 2003 through Aug. of 2003** • **6 .JP domain names changed : [a-f].dns.jp**
FR	• **Aug. of 2004, under systemizing domain names**

I Background & Need

II Goals

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IV Deployment Strategy

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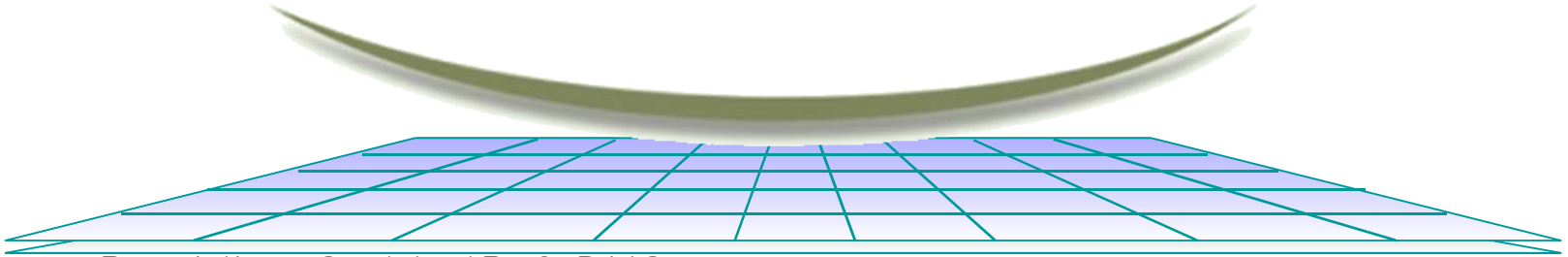
VI Future Plan

KR Strategy in IPv6 DNS



Providing Stable IPv6 DNS Service

- In IPv6 deployment, keeping stability of existing IPv4 based six .KR DNS services are the most important!
  - Additional construction of IPv6 .KR Secondary DNS (g.dns.kr)
  - Applying IPv6 to existing DNS step by step

Sharing Tech. & information

- After deployment, trial service will be commenced and DNS operational tech. & information Will be shared
  - cooperation with other organization in .KR DNS trial service
  - Sharing DNS tech. by launching web site

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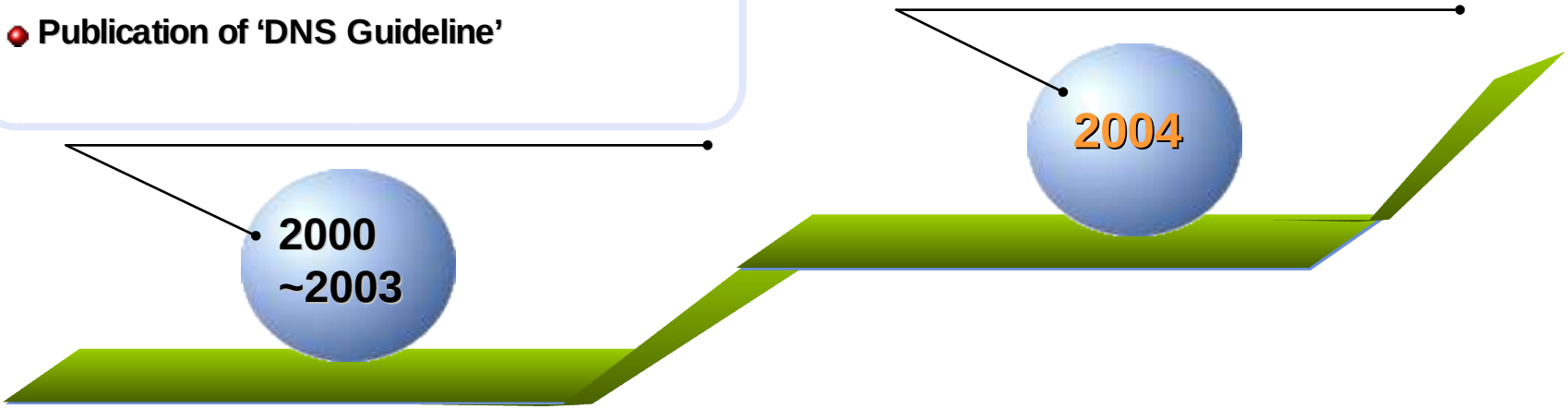
IPv6 DNS Deployment Milestone

- Construction of tunneling IPv6 network & IPv4/IPv6 interoperability test
- Construction of Native-IPv6 network
- Construction of IPv6 DNS trial system & IPv4/IPv6 interoperability test
- Education(NGI2 & IPv6 DNS workshop)
- Publication of 'DNS Guideline'

- Construction of 7th .KR dual-stack server & network [KRDNSv6 test network]
- Delegation of IPv6 AAAA of .kr name server to root DNS zone
- Registration of IPv6 reverse of .kr name server to APNIC
- Launching DNS web page (http://www.krdnsv6.or.kr)

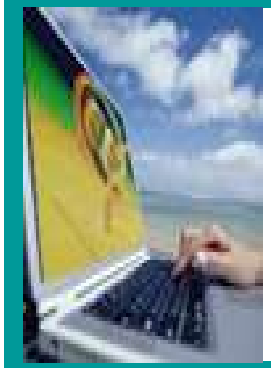


Trial KRDNSv6 Service (1/3)

Trial IPv6 DNS Service through KRDNSv6

What is KRDNSv6 ?

- IPv4/IPv6 based local DNS network for IPv6 network
- Construction of trial IPv6 service network through trial IPv6 deployment to .kr domain in 2004



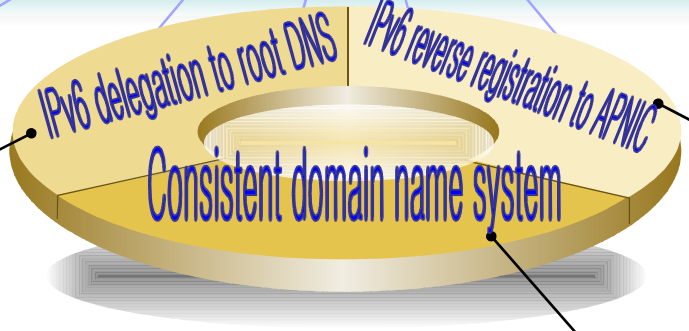
Structure of KRDNSv6

- Construction of IPv4/IPv6 interoperable network under cooperation with KOREAv6
- Construction of 'IPv6 DNS preliminary test network' for IPv6 DNS related technical analysis
- Fully equipped environment for technical analysis in depth

Trial KRDNSv6 Service (2/3)

.KR DNS IPv6 System Construction Status

Stabilized IPv6 DNS Service System




```
KR.     NS      a.dns.kr.
    :
KR.     NS      g.dns.kr.

a.dns.kr.       A   202.30.50.51
          :
g.dns.kr.       A  211.216.50.130
g.dns.kr.AAAA  2001:dc5:a10::51
```

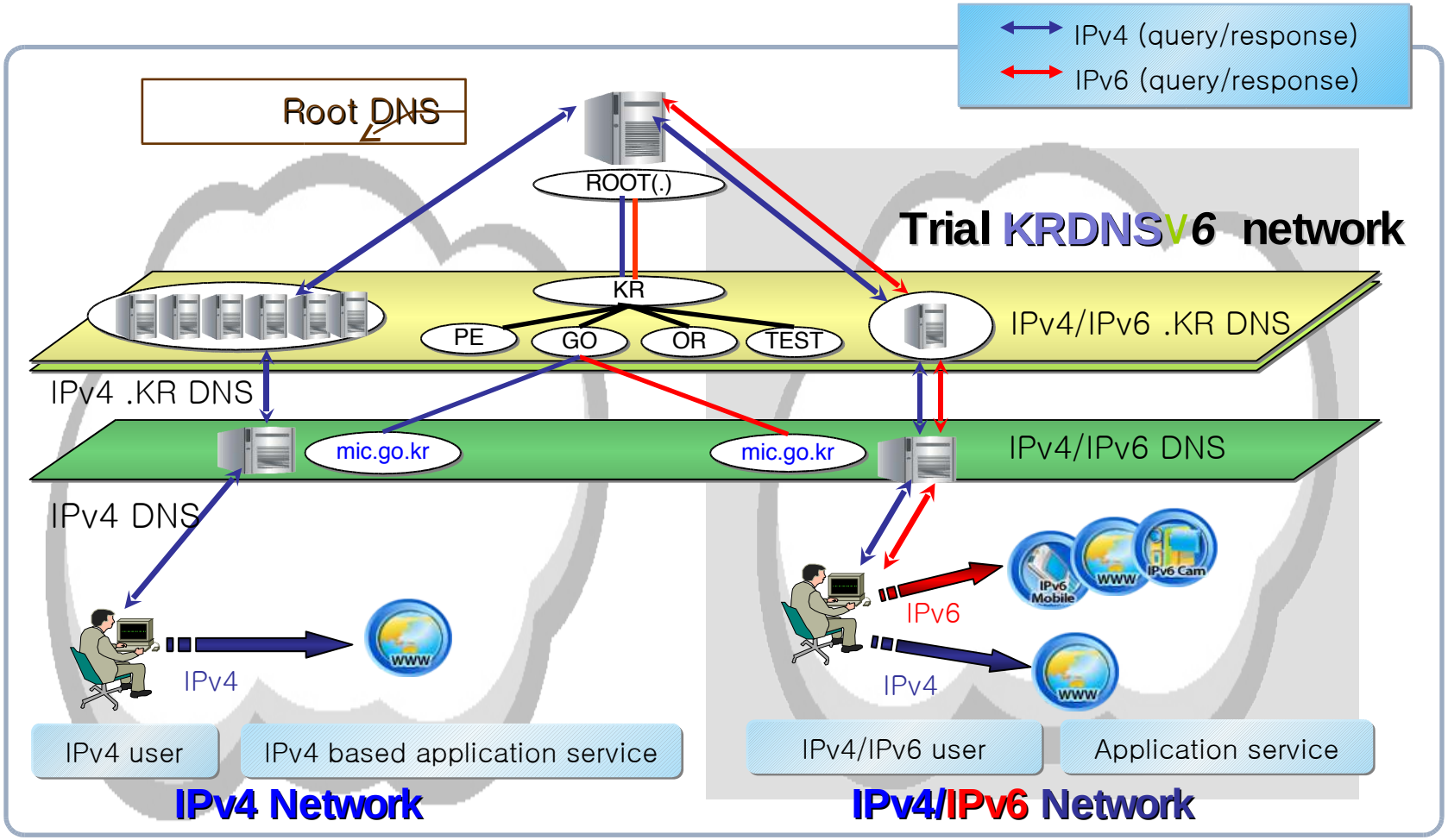
a.dns.kr
b.dns.kr
c.dns.kr
d.dns.kr
e.dns.kr
f.dns.kr
IPv4 [6]

g.dns.kr – IPv4/IPv6 [1]

- Registration of reverse delegation to APNIC in /32

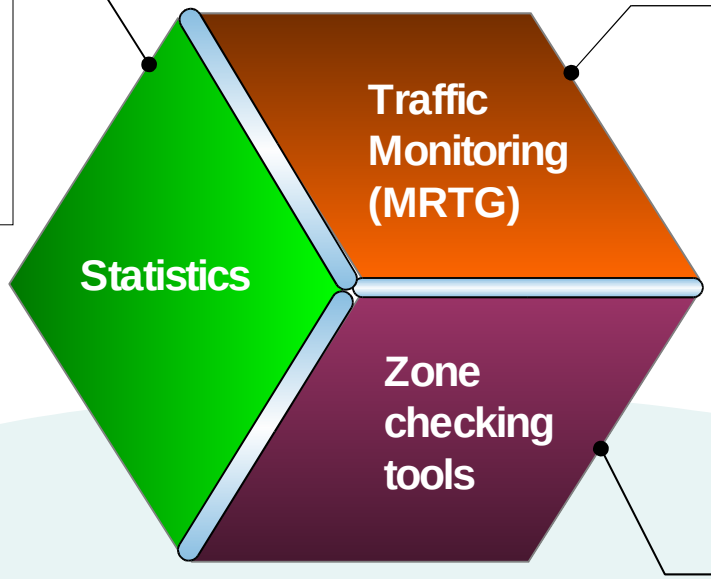
Trial KRDNSv6 Service (3/3)

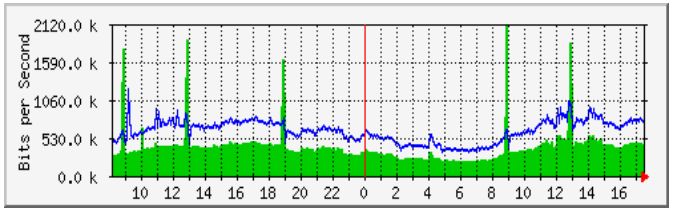
Trial KRDNSv6 Service Topology as of Aug. 2004



Trial KRDNSv6 Operation Status (1/5)

Launching KRDNSv6 Web Site





- Providing upgraded services as of Aug. 1
  - IPv4/IPv6 DNS statistics
  - Monitoring 7th .KR DNS(g.dns.kr) name server traffic
  - Providing zone checking tools for users
  - and so on

Trial KRDNSv6 Operation Status (2/5)

Statistics

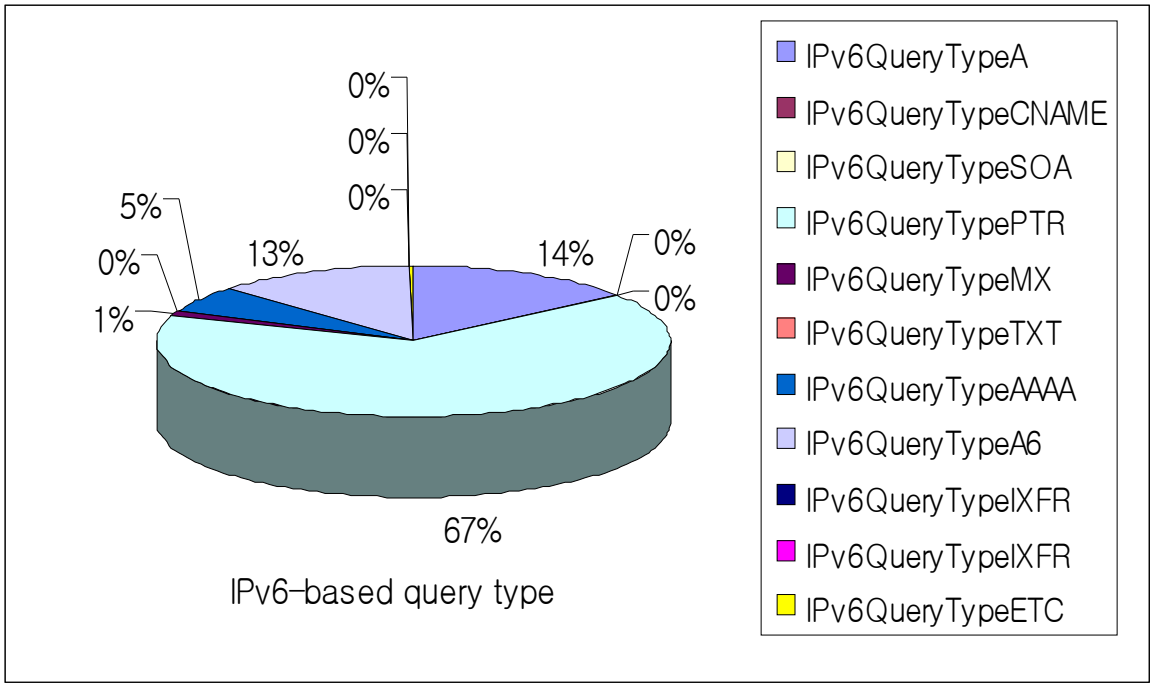
- .KR DNS (g.dns.kr) IPv6 delegation to root DNS zone
- World first delegation to ccTLD (July 20, 2004)
- IPv6-based DNS query/response increased as of July 21 (45,000 → 100,000)

— : IPv6 DNS Query Counter

— : IPv6 DNS Response Counter

Trial KRDNSv6 Operation Status (3/5)

Statistics

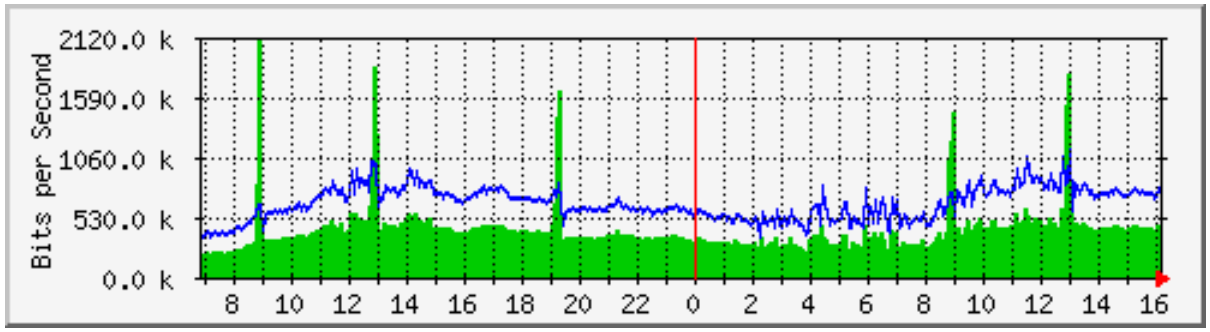


<IPv6-based RR Query Type>

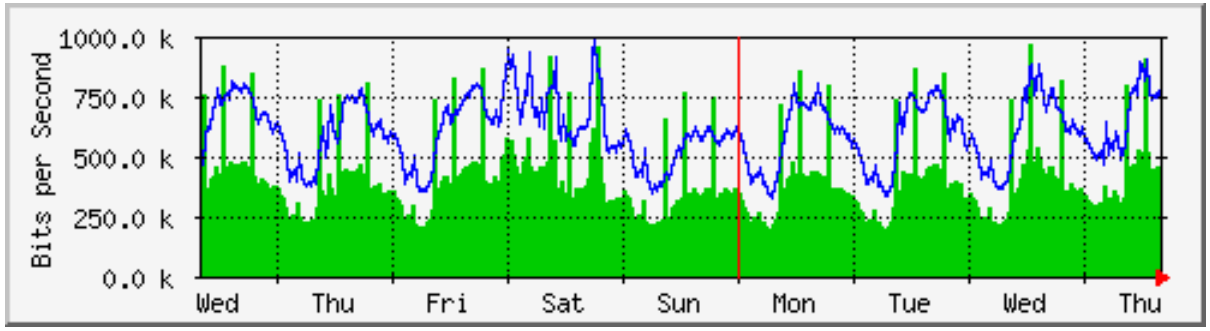
- **Target server : g.dns.kr**
- **Statistics on IPv6 based query by query type**
  - **PTR(67%)**
  - **A(14%)**
  - **A6(13%)**
  - **AAAA(5%)**
  - **and so on**

Trial KRDNSv6 Operation Status (4/5)

Traffic Monitoring (MRTG)



Daily graph (Average in every 5 min.)



Weekly graph (Average in every 30 min.)

- **Target server : g.dns.kr**
- **2004. 8. 5, PM 4:20 updated**
- **IPv4/IPv6 DNS (daily)**
  - **Average reception: 431.3kbps**
  - **Average transmission: 665.6kbps**
- **IPv4/IPv6 DNS (weekly)**
  - **Average reception: 396.3kbps**
  - **Average transmission: 613.3kbps**

Trial KRDNSv6 Operation Status (5/5)

Zone Checking Tools

- Providing checking tools for domain config.
- Problems in DNS operation
  - DNS config. error
  - etc.
- Constructing stabilized DNS by providing web based zone checking tools for DNS operators

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Future Service Plan in IPv6 DNS

DNS for Next Generation Internet

2005

- IPv6 DNS service expansion
  - .KR name server distribution
  - .KR IPv6 DNS commercial service
- IP Anycast study
  - IP Anycast(IPv4/IPv6) study and trial deployment
- Study UDP packet size limit
- Sharing IPv6 DNS technology

2006 ~

- Settlement of IPv6 DNS
  - stable IPv4/IPv6 .KR DNS service
- Transference current IPv4 based .KR DNS name server to IPv4/IPv6
- IP Anycast commercial service
- Study on EDNS0 deployment

CONTACT

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National Internet Development Agency
of Korea

Thanks !!