IPv6 Metrics Project:
What is current penetration rate in Japan?

produced by IPv6 metric WG in IAjapan

Intec NetCore Inc.

IPv6 R&D Group

Yoshiaki KITAGUCHI

Contents

*i*NetCore

- Goals of project
  - The background and purpose our project
- IPv6 deployment metrics set
  - The 4 categories of measurement
  - The measurement item in each category
- Measurement example
  - Some charts (Address allocation, DNS deployment…)
- Conclusion
  - Summary and future plan

Feb. 26   2007 Asia Pacific IPv6 Summit   2

Goals of project

- Measure the degree of IPv6 deployment
    - Measure the IPv6 specific since the beginning of IPv6 deployment
    - Useful for the market strategy and operation of IPv6

- Contents of process
    1. Define the IPv6 metrics set as the measure the IPv6 readiness
    2. Establish the method of analyzing data using continuous measurement
    3. Share the methods and our tools
    4. Do measurement in each country (ex. in AP region)
    5. Compile and publish the result of the measurement
        - make a chart and update web site automatically

- Handling of the measurement data
    - We should be careful to deal with the compiled data
    - It might be sensitive

IPv6 deployment metrics set

- We defined the 4 categories of measurement
- Scale of IPv6 Internet
  - How much IPv6 Internet is actually used
- IPv6 deployment ratio
  - How much IPv6 application and network are ready
- Characteristics and tendency of IPv6 traffic
  - How about the state of using IPv6
- Stability and reliability of IPv6 Internet
  - Now in preparation…

Next: explain the detail of each category

Scale of IPv6 Internet

- Address allocation
  - The number of IPv6 address blocks by country or RIR
  - The scale of IPv6 address block allocated directly from RIR to LIR (number of /32 prefixes)
  - The scale of allocated IPv6 address block recorded on Whois database of RIR (number of /48 prefixes)
- Routing Information
  - Total number of IPv6 BGP4+ routing entries
  - Total number of ASes using IPv6 BGP4+
  - The average of AS path length in each IPv6 BGP4+ routing entries
- Traffic
  - IPv6 traffic amount of backbone network

IPv6 deployment ratio

- Routing information
  - Ratio of the number of IPv6 prefixes and the number of IPv4 ones in each AS
- Traffic
  - Ratio of IPv6 traffic amount and IPv4 one on dual-stak IX
- DNS deployment rate
  - Statistics of DNS on .JP domain
  - Target applications: DNS, Mail, Web
- Analysis of application access
  - Ratio of IPv6 http accesses and IPv4 ones on the IAJapan web site
- IPv6 enabled products
  - The number of products certificated by IPv6 Ready Logo Program
 - Analyze the program's data

Characteristics and tendency of IPv6 traffic

iNetCore

- Traffic
  - Analysis of the contents of IPv6 traffic on ISP
    - Using the data of a day which is expected to be a averaged traffic condition
    - Surveys the ratio of each data classified by transport protocol and port number
  - Target protocols: TCP, UDP, ICMPv6

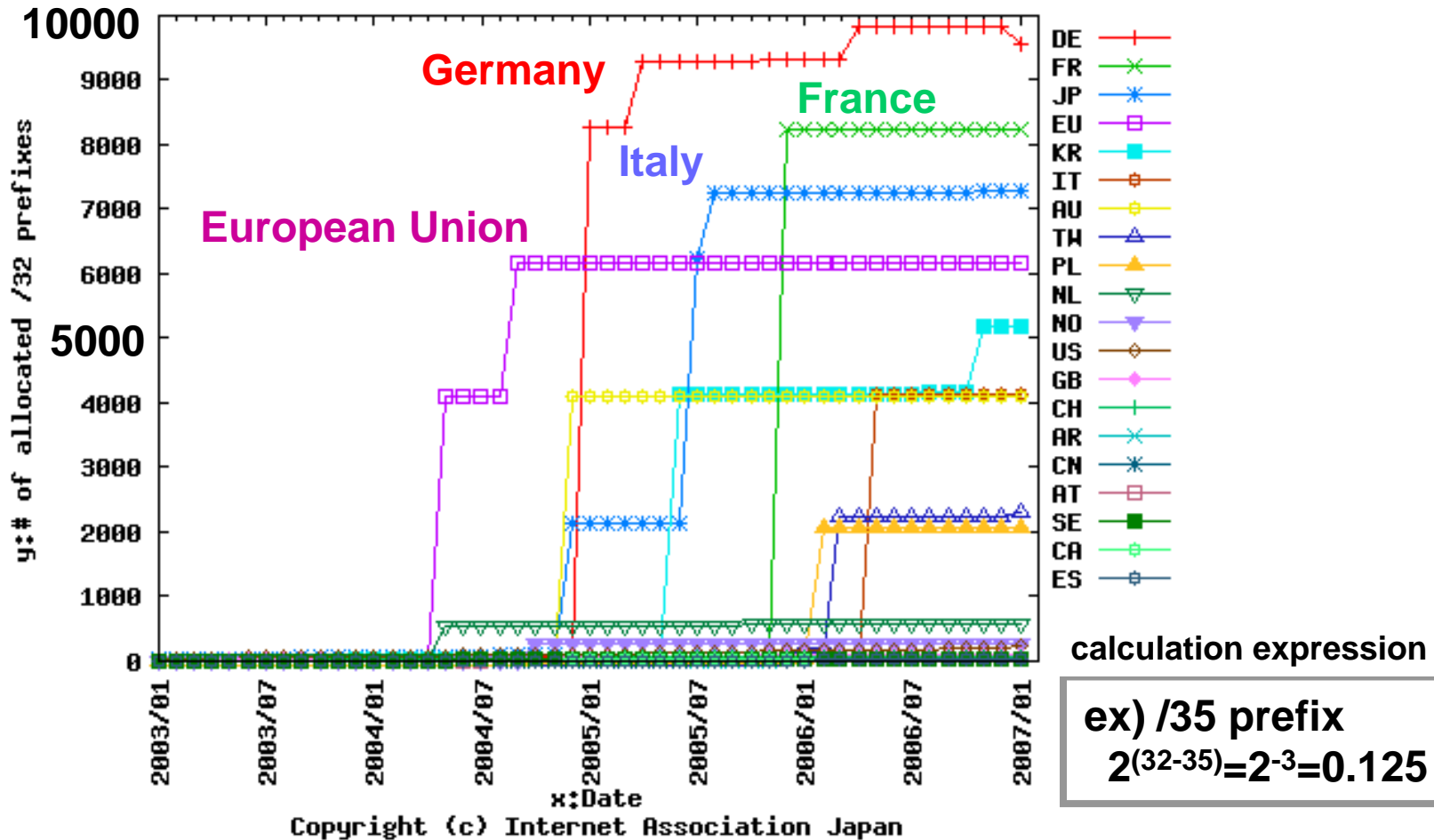Next: explain about each measurement

Address allocation (1)

The number of operator allocated IPv6 address by RIRs
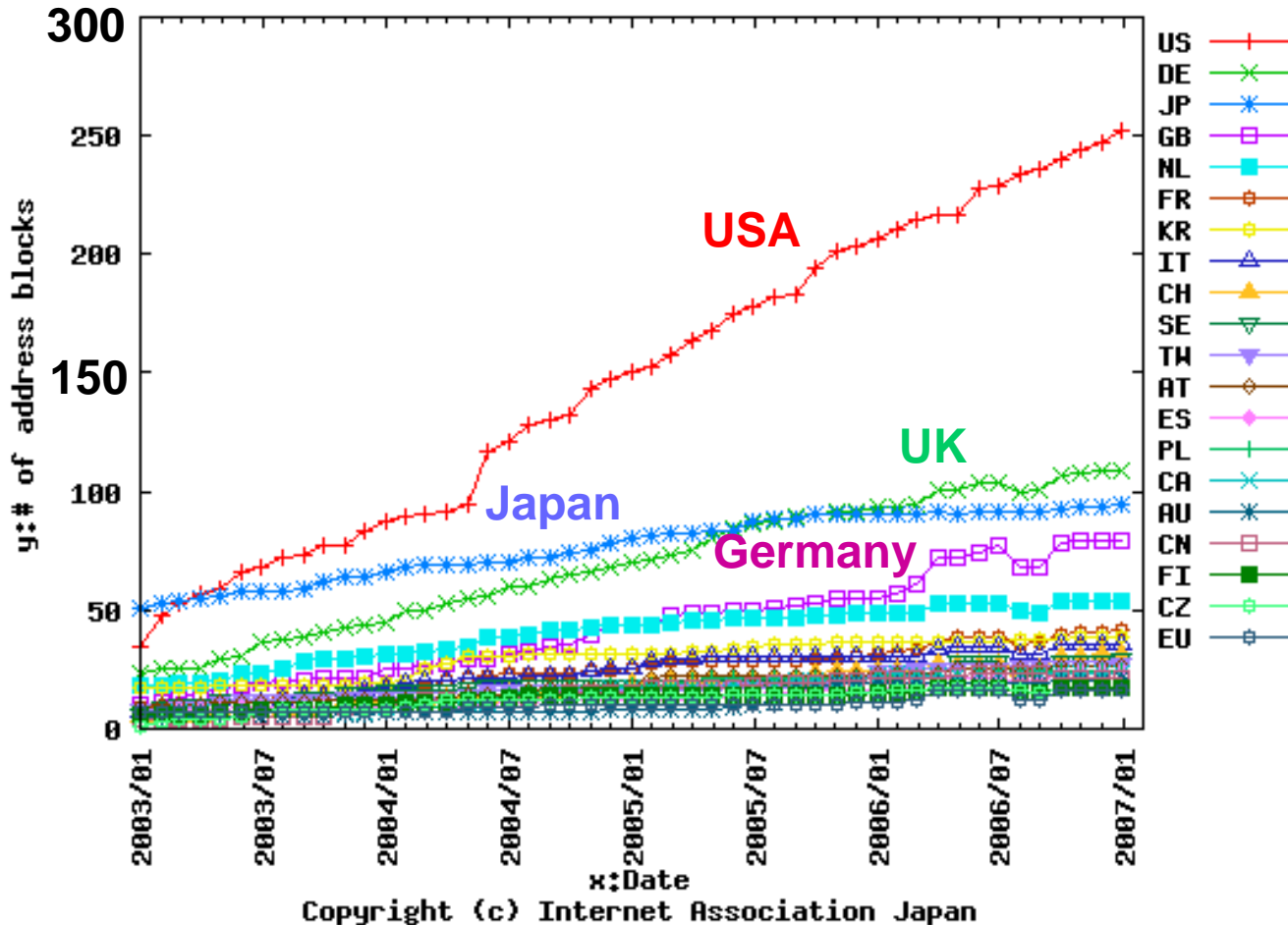
- The first rank USA has twice number of the second rank UK today
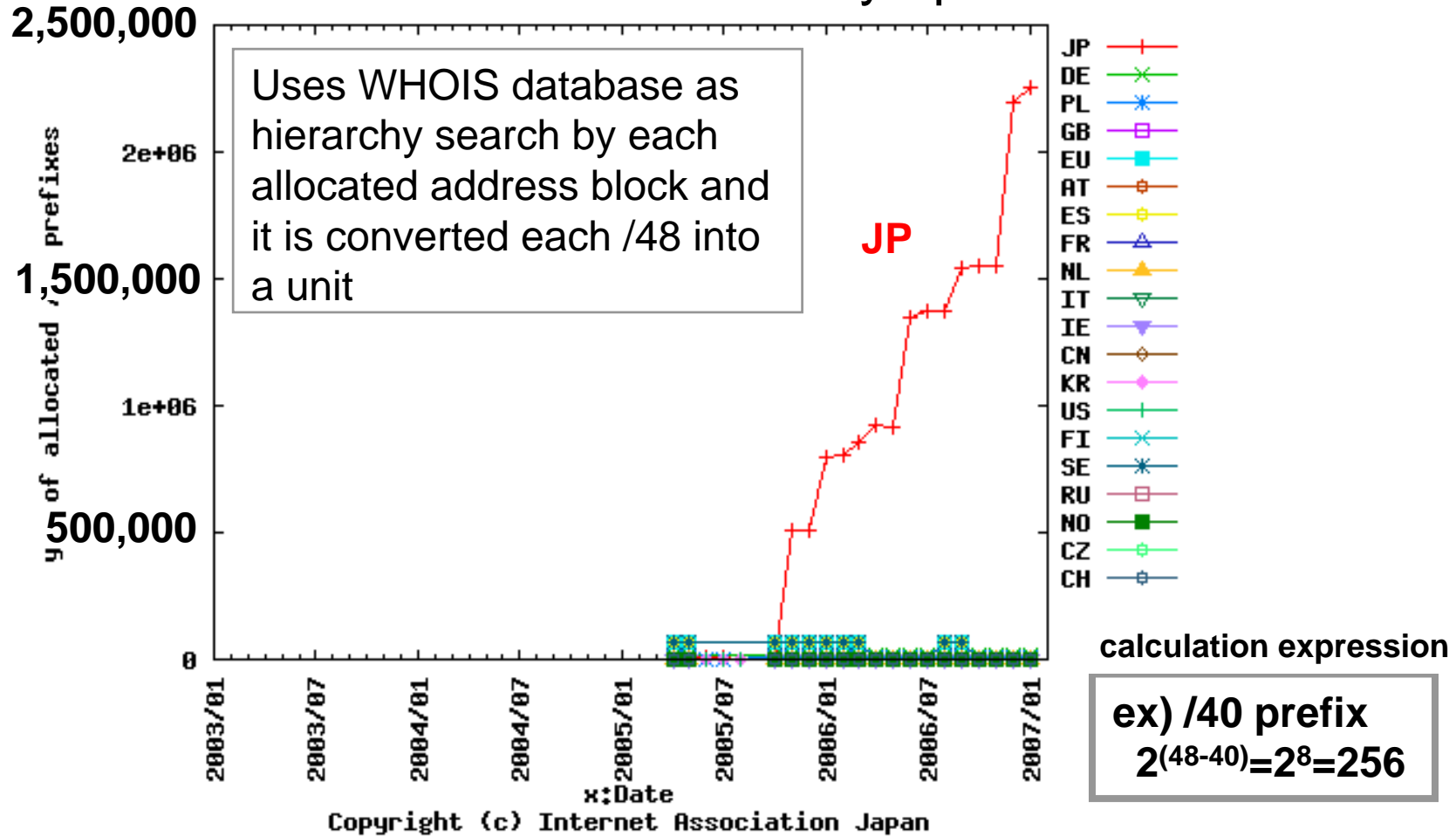- Japan was the former leader acquiring IPv6 address block

2007 Asia Pacific IPv6 Summit   Copyright ©2007, Intec NetCore, Inc., All rights reserved.

Address allocation (2)

The number of prospective end-user estimated by operator

Germany

France

Italy

European Union

calculation expression

ex) /35 prefix
$2^{(32-35)}=2^{-3}=0.125$

Copyright (c) Internet Association Japan

- European countries have large space
- Germany, France and Italy has been assigned /19 address block

# Address allocation (3)

The number of actual use by operator

Uses WHOIS database as hierarchy search by each allocated address block and it is converted each /48 into a unit

JP

Copyright (c) Internet Association Japan

calculation expression

ex) /40 prefix
$2^{(48-40)} = 2^8 = 256$

- Indicates the scale of assigned IPv6 address to end-user
- Japan is the most using IPv6

DNS servers readiness (1)

- IPv6 deployment of DNS
  - Measures the current registration of IPv6 from DNS servers
  - Takes the updated list from JPRS twice a month
    - There are about 900,000 records on .JP domain now
  - Target applications are DNS, Mail, Web
  - Use a result of DIG command
- DNS and Mail service
  - Resolve NS/MX record of target domain
    - 2 queries (NS, MX)
 - Check the address type (A or AAAA)
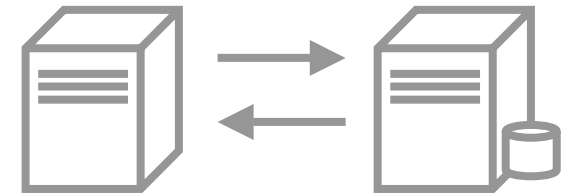
6 queries per domain

- Web service
  - Resolve AAAA/A record of www.<domain> and <domain>
    - 4 queries (www A, www AAAA, domain A, domain AAAA)
  - Can not search all web services, but can calculate the ratio
- Judgment method
  - If AAAA record is exist, the target domain is defined as IPv6 ready

2007 Asia Pacific IPv6 Summit

DNS servers readiness (2)

The IPv6 deployment each service
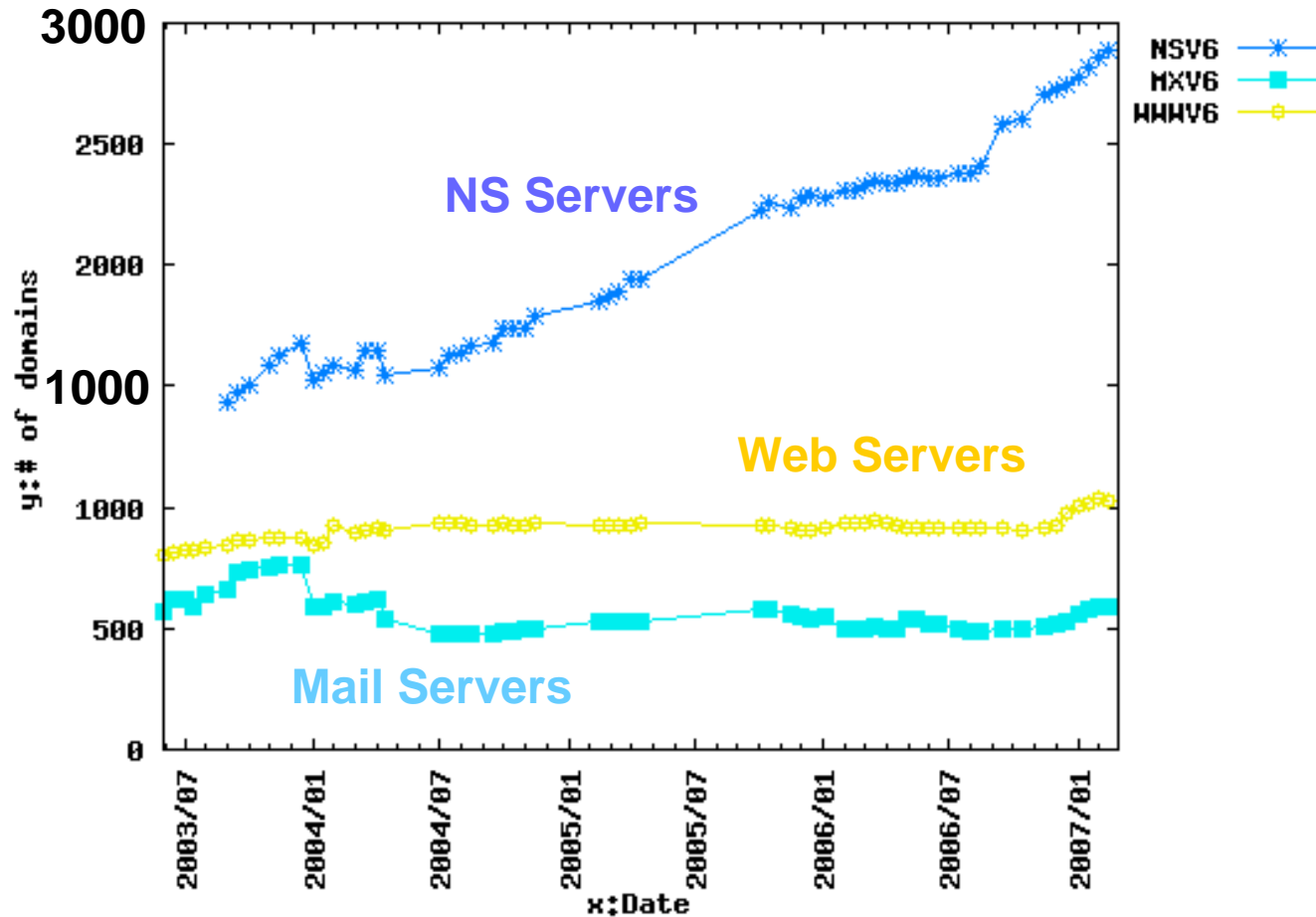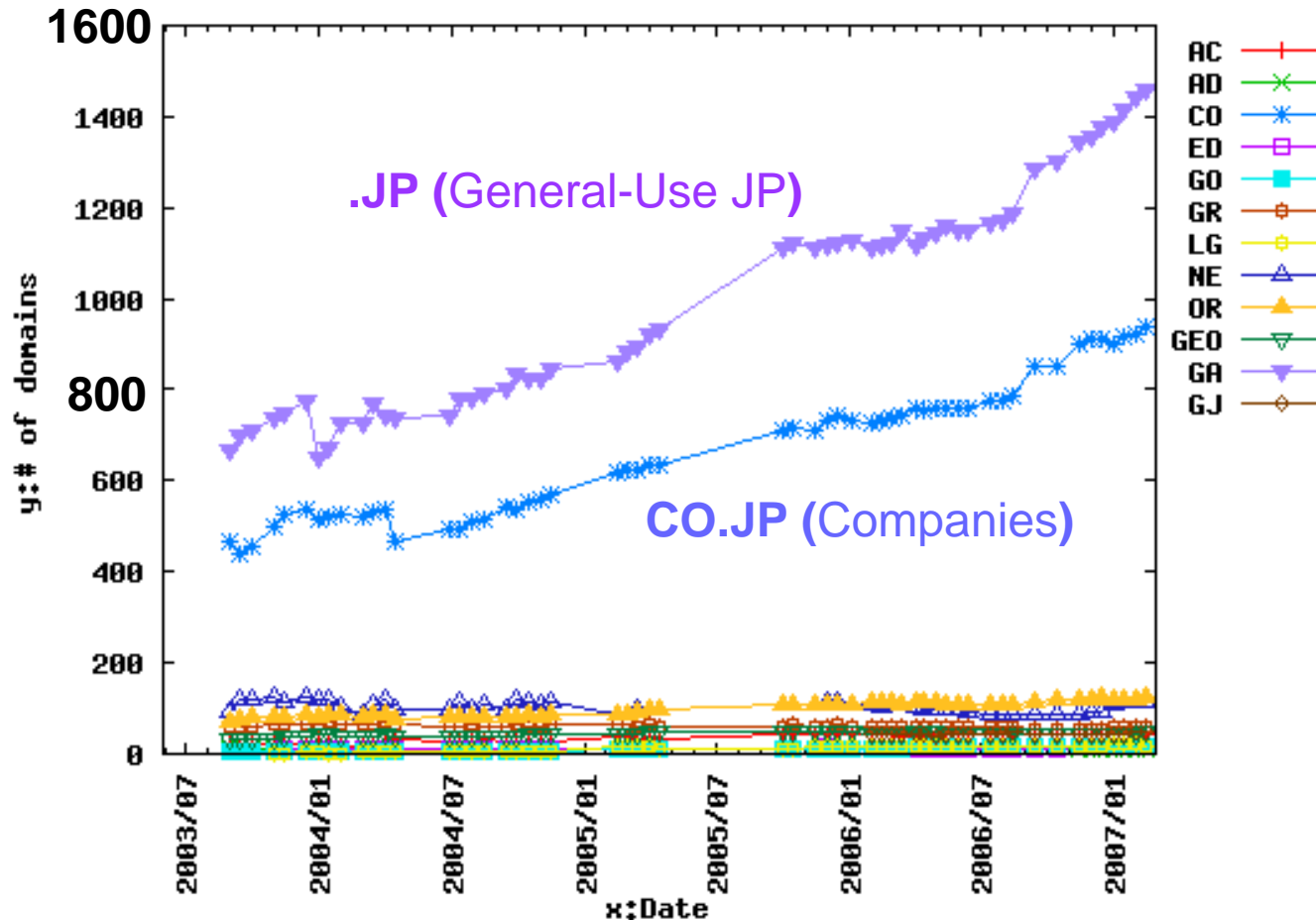

- IPv6 ready DNS service is smooth increasing
- IPv6 mail and web service turned to increase in the last 3 months

DNS servers readiness (3)

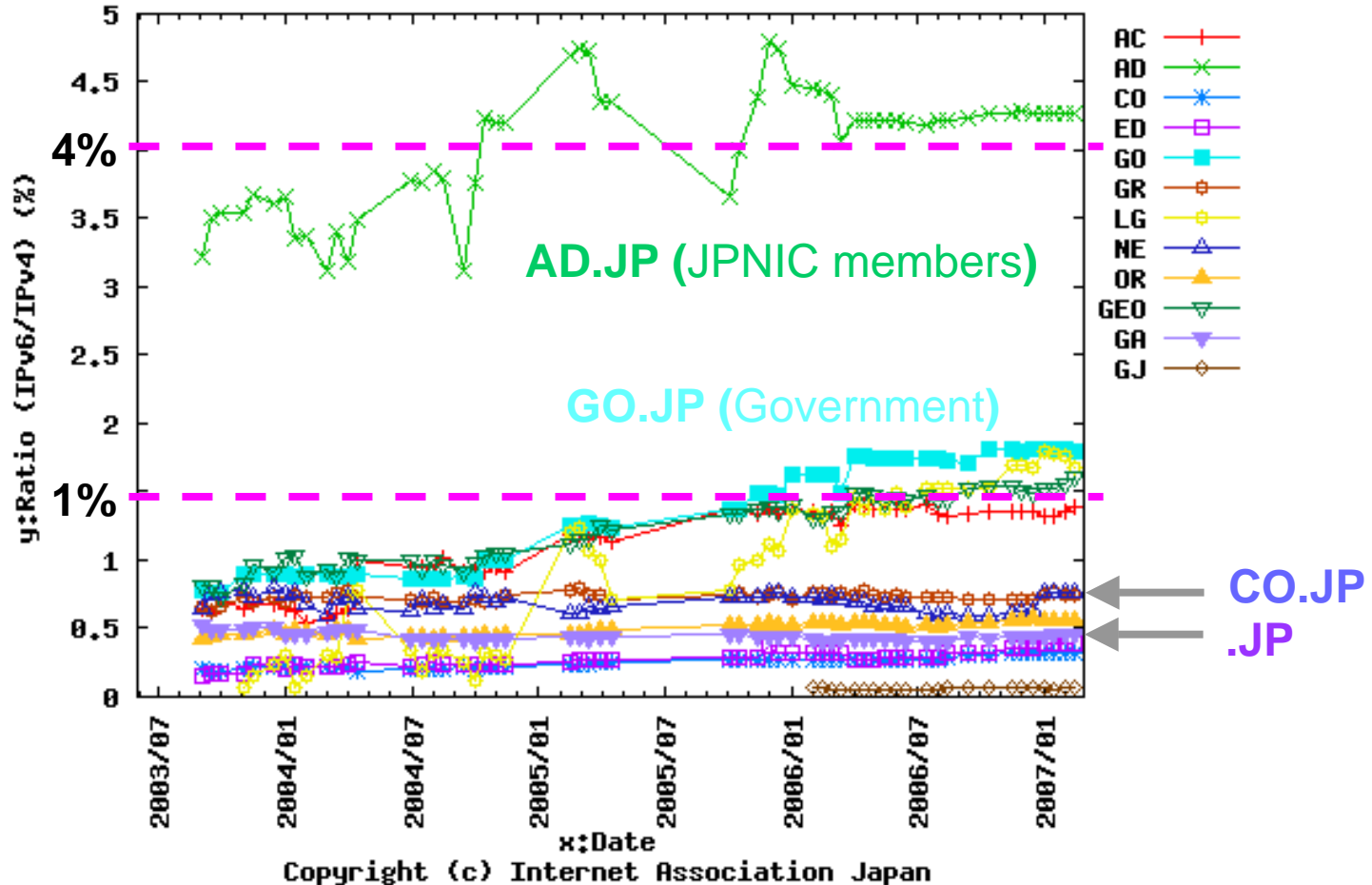The IPv6 deployment of name server each second domain

Copyright (c) Internet Association Japan

- The number of AAAA DNS servers is increase at GA and CO
- The latest increase of GA is 43 per month

2007 Asia Pacific IPv6 Summit Copyright ©2007, Intec NetCore, Inc., All rights reserved.

DNS servers readiness (4)

iNetCore

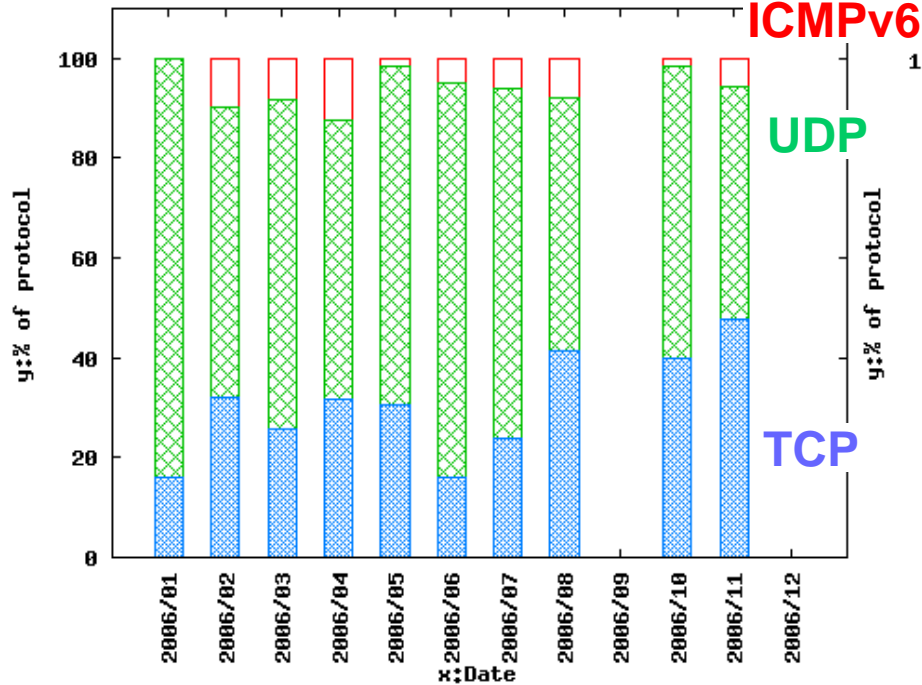Compared with the number of IPv4 DNS servers

- The most advanced IPv6 deployment domain is AD next one is GO
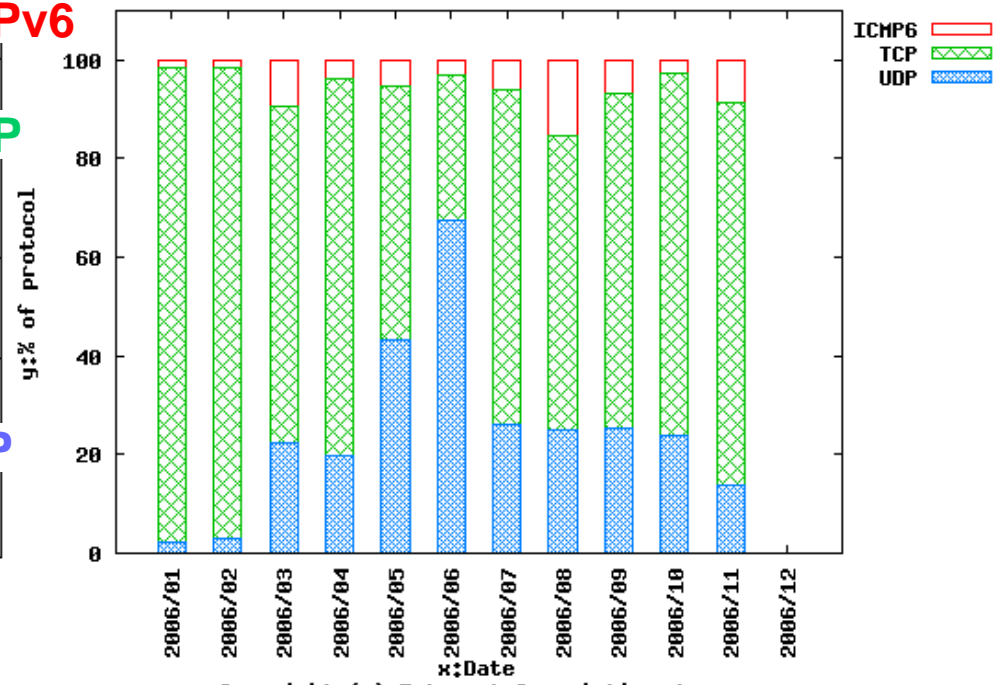- Only the AD domain's ratio is over 4 percent ➡ company is not large

Analysis of the contents of IPv6 traffic

Ratio of traffic by protocol

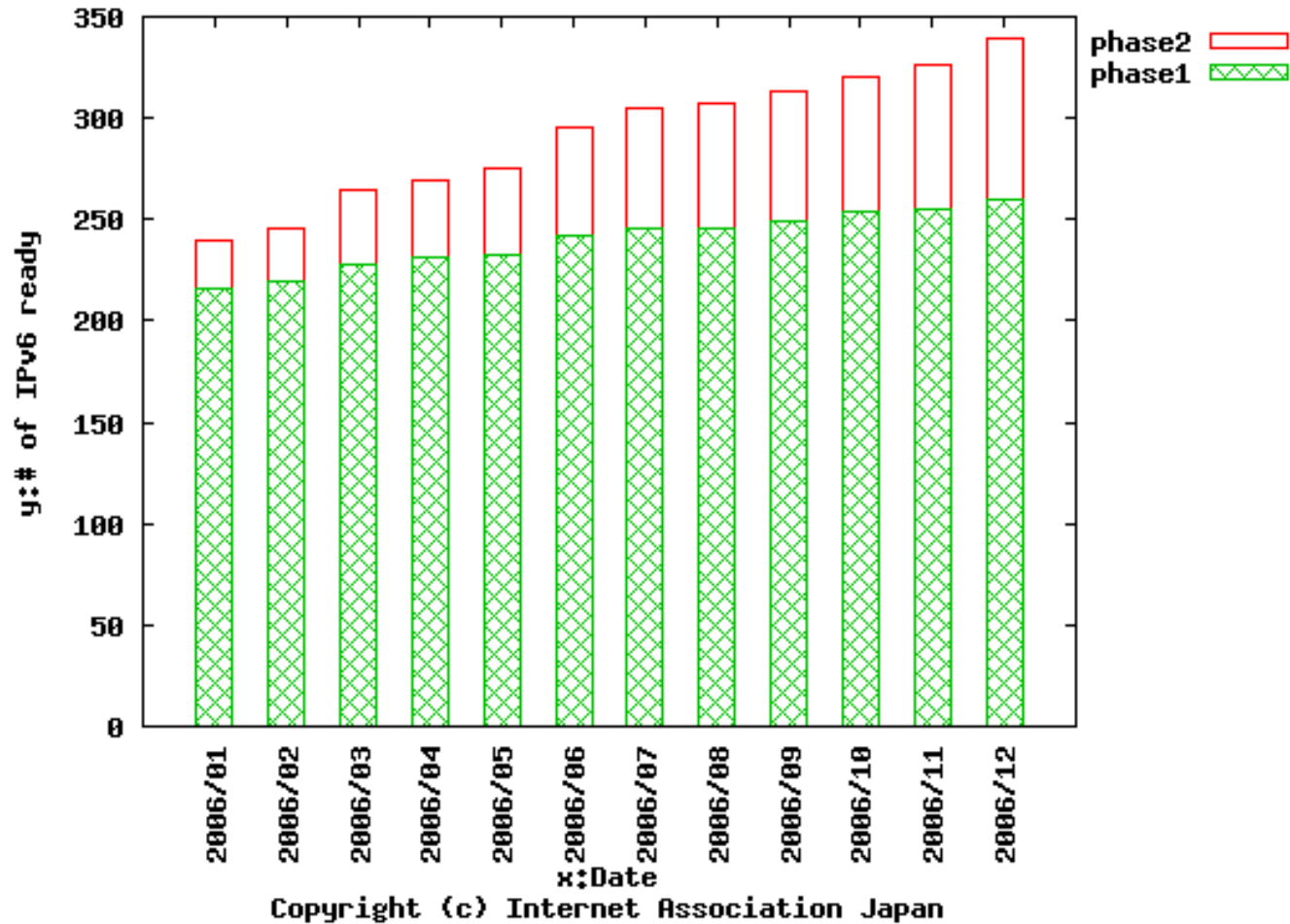### ISP1

ISP2

- Surveys the ratio of each data classified by transport protocol at each ISP's observation points
- use a day data which is expected to be an averaged traffic condition
- The ratio of ICMPv6 is large in comparison IPv4
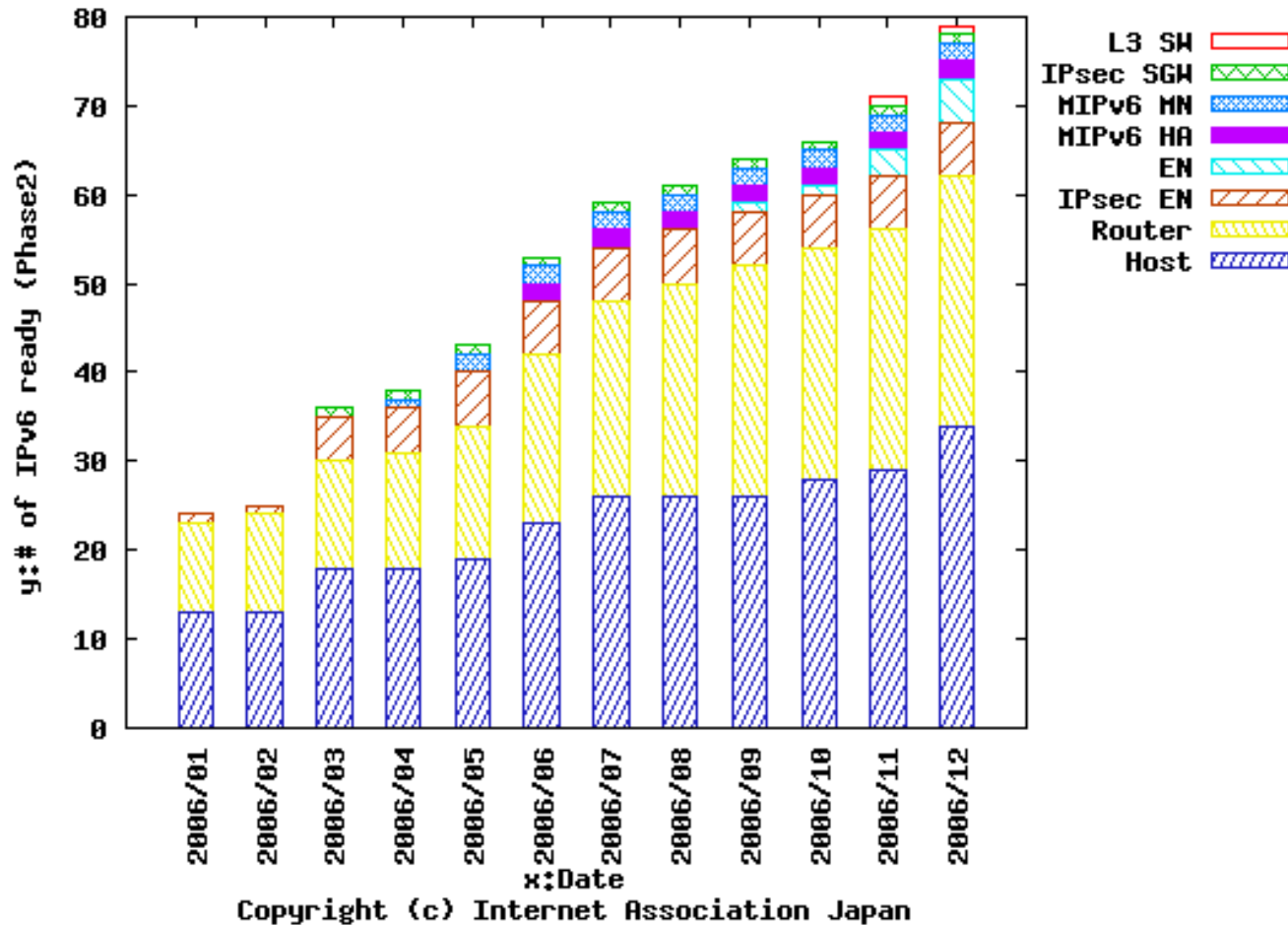
IPv6 enabled products (1)

*i*NetCore

The number of the products certificated by IPv6 ready logo

Copyright (c) Internet Association Japan

- The increase of phase2 products is lager than phase1 in 2006

IPv6 enabled products (2)

The number of IPv6 ready (phase2) by category

- Shows the distribution of the category in pahse2 products
- The records of IPsec products appeared in 2006

2007 Asia Pacific IPv6 Summit   Copyright ©2007, Intec NetCore, Inc., All rights reserved.

Summary

- We defined the IPv6 metrics set
  - 4 categories and measurement method
- We kept continuously observing it
  - Developed the web publishing server
- The tendency of IPv6 Internet was observed
  - Address allocation and IPv6 deployment of DNS are smooth increasing
  - But it's scale is still smaller than IPv4 ones

Future plan

- Distribute of our measurement and analyzing tools
  - Brush up our tool
    - DNS measurement requires a half day now.
- Monthly report
  - Publish our examination on every end of month
- The measurement of amount of IPv6 traffic in Japan
  - Add up the result of two or more IXes
- About the stability of IPv6 Internet
  - Define the index of the stability
- Develop this work with another country or organization

![iNetCore]

Thank you very much!

Our project web page:

http://v6metric.inetcore.com/ (Japanese)

http://v6metric.inetcore.com/en/ (English)