

Consideration on DNS Service Level

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- What is a service level of DNS operation?
- How to measure a service level?
- How to maintain a service level?
- How to cooperate with users to maintain a service level?

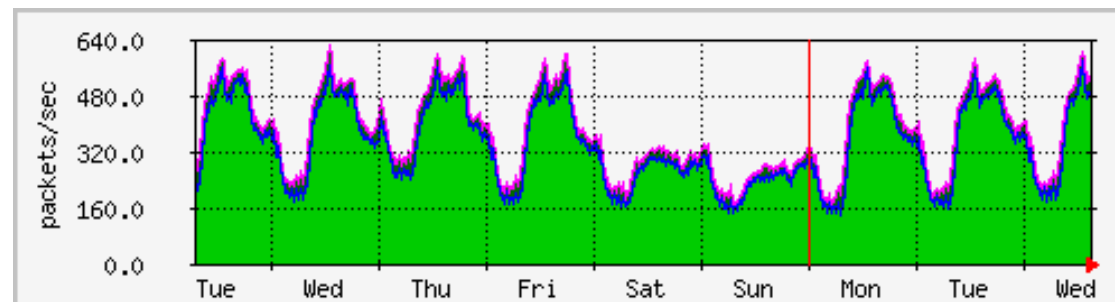
Background

- DNS service level is a common interest among (ccTLD) DNS operators
 - DNS is one of the most important services that all ccTLDs provide
 - name servers seems to be easily set up and maintained, but reality is...
 - Are they really working stable enough?

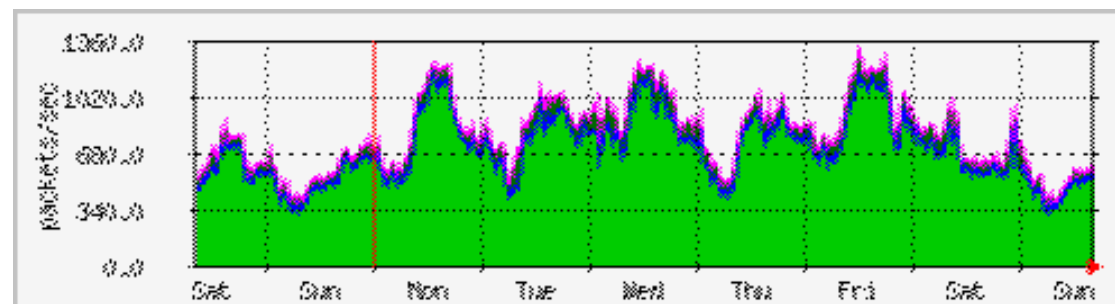
In the Case of JP DNS Operation

- From observation in query rate monitoring
 - Remarkable increase of queries was found
 - Caused by continuous queries from a few servers

Dec. 2001
(ave. 350qps)



Oct. 2002
(ave. 700qps)



Service Level

- Service Level can be a guideline to know how well the DNS is operated
- Benefits for the service providers
 - A guiding principle of management and control of the services
 - Stability of service quality
 - Reliance of their customers
- Benefits for the customers
 - Guarantee of stable service quality

What is Service Level of DNS

- Need to define SLO (Service Level Objectives)
 - Availability
 - Name servers are online and answering the queries
 - Performance
 - Name servers give an answer to the clients in a response time short enough
 - Zone file
 - How frequently the zone files are created
 - How long it takes to make them appear in name servers
 - and so on

Approaches to Service Level: gTLD Case

- SLA of DNS service on .com / .info / .pro agreement
 - SLA is made between registry and registrar
 - SLA on other services than DNS also made (depends on gTLDs)
 - WHOIS, RRP and so on
 - Service Level Objectives (vary among gTLDs)
 - Availability, Performance and so on
 - Standard of measurement (vary among gTLDs)

Approaches to the Service Level: .jp Case

- DNS service level aspects
 - Service availability
 - Performance

How to Measure a Service Level?

- Availability measurement
- Performance measurement

Availability Measurement Done by JPRS

- Query to all name servers to see if it is working
 - Availability checks for the name server hosts can be done by “ping” command
 - Availability checks for the DNS service can be done by “dig” command
- Check continuously and keep them recorded
 - Check every 5 minutes
 - Various monitoring tools available

Performance measurement on .jp

- CNNP (Cross Network Name server Performance) Test:
 - measuring the response time of the TLD servers from specified points of the Internet
 - Development of measuring tools
 - Development of data correction tools
- Measuring procedure:
 - Contact to an access point (dial-up or other methods)
 - DNS queries to the target name servers
 - Apply some data correction method

How to Maintain a Service Level?

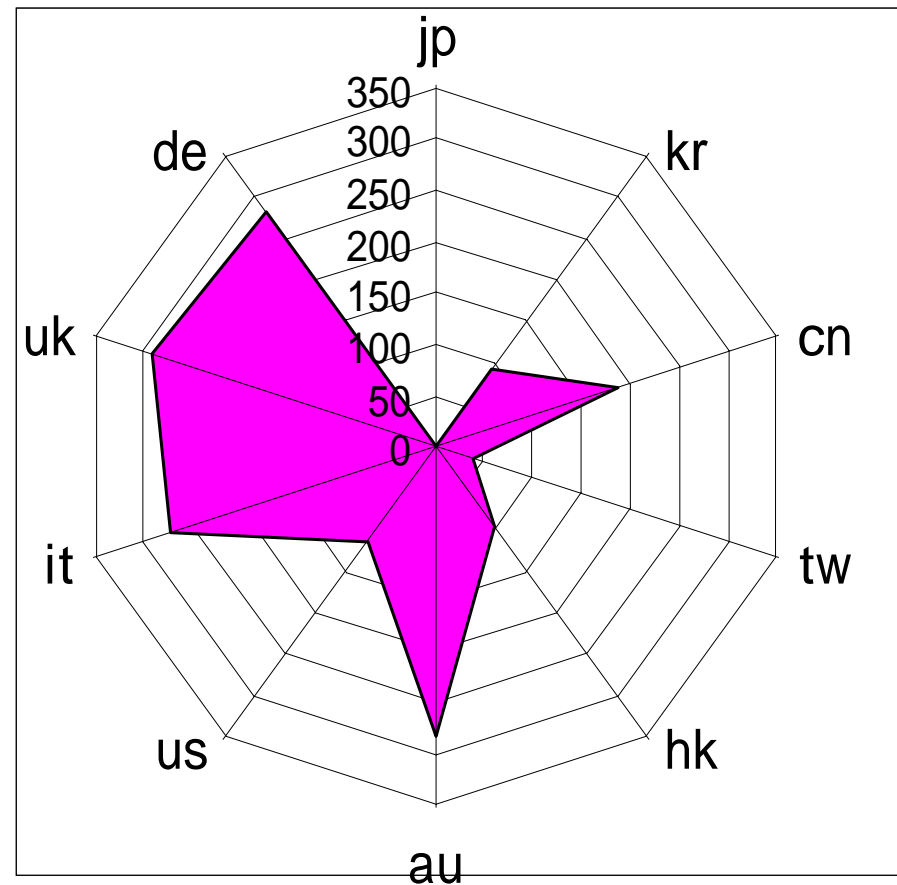
- Understanding the current status
- Estimation
- Action

Measurement Done by JPRS

- Purpose: To collect the information of the current DNS service level on .jp and some TLDs (gTLDs and ccTLDs)
- Target: Primary and secondary DNS servers of those TLDs
 - the servers described in root zone file
- Measuring point:
 - Access points covering 10 countries
 - jp, kr, cn, tw, hk, au, us, it, uk, de
 - Roaming access provided by GRIC / UUNET / Nifty
- Procedure:
 - At each measuring point, response times for all name servers of a target TLD are measured
 - Make some data corrections
 - Overhead time by dial-up access, ...
 - Find the fastest answer

.jp DNS Performance

- .jp DNS servers
- Response time

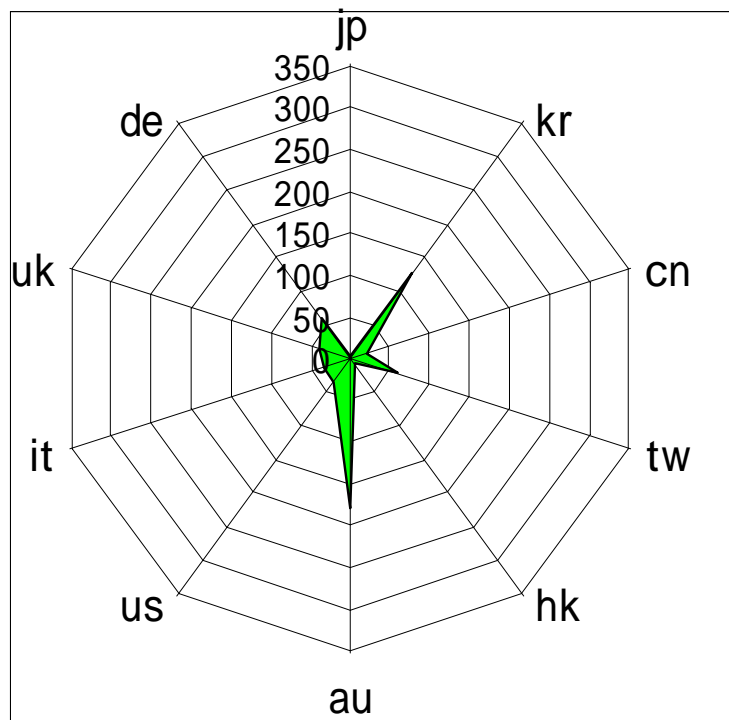


Observation of .jp DNS

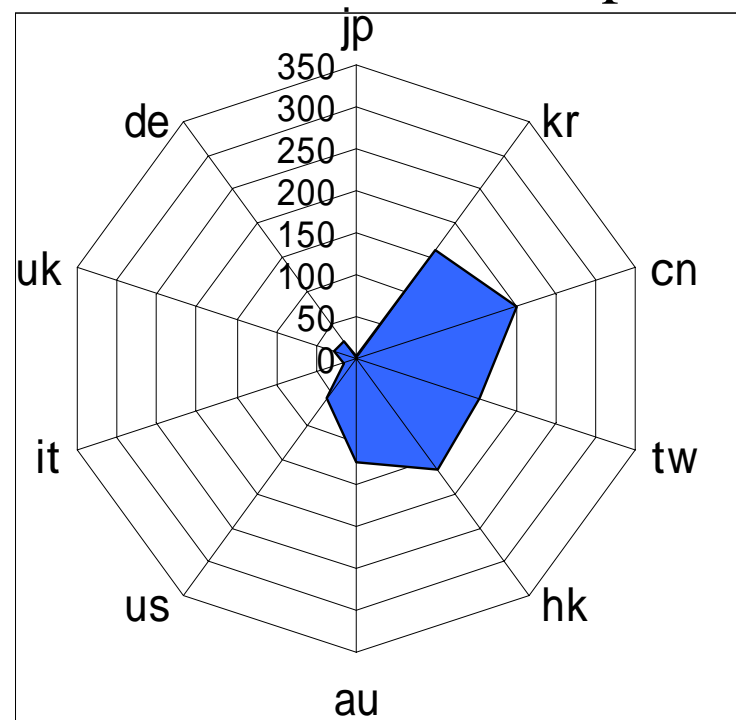
- From the figure
 - Response time of the queries is long from European countries
 - AP region has shorter response time
- Where to place name servers
 - Distribution of JP DNS query should be considered together with response time
 - Distribution by
 - Geographic regions?
 - Network regions? (for example AS)

Results of other TLDs

- gTLDs (com / org / net)



- a ccTLD in Europe



Future Works

- Determine DNS service levels
 - Index? (availability & performance?)
 - Criteria?
- Build up a management process for service level maintenance
- Infrastructure planning based on service policies
 - Number of DNS servers
 - Machine power of DNS servers
 - Where DNS servers should be placed
 - Level of enforcement on DNS server operators

Standard for Evaluations

- Need to define requirements of Service Level
 - Goals
 - Response time 100ms?
 - 99.99% for each name servers availability?
 - Permissible level
 - Response time 300ms?
 - 99.99% for total availability of authoritative name servers?
 - Minimum level
 - Response time 500ms?

How to Cooperate with Users to Maintain a Service Level

- DNSQC-TF (JPNIC/JPRS/WIDE)
 - DNS Quality Checking project
 - Check for the lame delegations and misconfigured name servers under JP domains
- Performance investigations (WIDE Project)
 - Target: Root servers and ccTLD servers

Proposal from JPRS

- Cooperation among ccTLDs
 - Determination of measuring method and tools
 - Widely distributed / long range measuring activities
 - Collocation of name servers with each other

Joint Effort of ccTLDs: why needed?

- The internet is a huge and widely distributed network and is a set of many autonomous systems.
- Thus, measuring from few specific points will not be enough for estimation of DNS service level.
- More measuring points desirable.
- Joint effort of ccTLDs can be a good solution for this
- We can have so many measuring points covering various countries / AS's around the world

Joint Effort of ccTLDs: What and How

- Set up a working group
- Issues
 - On performance measuring
 - Development of the tools
 - Standardize the method (CNNP test?)
 - Share the measuring points on each countries
 - Information exchange
 - Sharing secondary servers of the other ccTLDs
- <specific proposal today>
 - Making a team to see whether such Working Group is useful or not for ccTLDs