

DNS in an IPv6 world

The system

- empirical server data from JPRS
- IMR considerations

DNS Operational Experiences in JPRS/.JP - ... IPv6 ... -

February 22, 2005
APRICOT 2005 Tutorial

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Targets / Objectives

- Targets
 - DNS operators/engineers/administrators
 - Especially, TLD DNS operators/engineers
- Objectives
 - By telling our operational experiences, for helping the DNS server operation
 - Discussions about them for our past, current and future works

Today's topics

Technical overview of the following topics
and operational experiences in JPRS/.JP

{elided}

– IPv6

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IPv6

Review: What's IPv6?

- The primary purpose: to solve the problem of the shortage of IP addresses
- IPv6 has 128 bits length address
 - IPv4 has only 32 bits

What we need for IPv6 – in the DNS and Registry side

- Two independent DNS issues
 - Capability of processing IPv6 related DNS resource records
 - Capability of processing IPv6 DNS packets (aka IPv6 “transport”)
- Registry/Registrar issue
 - The Internet Registries and Registrars can process registrant’s IPv6 related requests

Capability of processing IPv6 related DNS resource records

- IPv6 related DNS resources records (RRs)
 - AAAA record for mapping
 - IP6.ARPA domain for inverse mapping
 - IP6.INT also should support for compatibility
- Current almost of all DNS server implementations support them
 - BIND 9 and 8
 - NSD
 - djbdns
 - original version supports AAAA itself, and unofficial patch supports writing AAAA easier
 - Nominum's ANS

Capability of processing IPv6 DNS packets (aka IPv6 “transport”)

- For supporting this, both DNS “authoritative” server and “cache” server have capability for IPv6
- DNS “authoritative” server
 - Prepare for “IPv6 capable DNS server box”
 - Both “a separated server” and “dual-stack” are acceptable
 - It is an operational issue
- DNS “cache” server
 - Prepare for “IPv4 and IPv6 capable DNS server box”
 - DNS “cache” server needs iterative query for each DNS “authoritative” servers
 - DNS “authoritative” servers may support “IPv4 only” or “IPv6 only”
 - And currently, there are no servers in root zone cache
 - Therefore, it must support “dual stack” connectivity
- Current almost of all DNS server implementations support IPv6 transport
 - BIND 9 and 8
 - NSD
 - djbdns with unofficial patch
 - Nominum’s ANS/CNS

Our experiences – IPv6 related work

- In 1999, I sent BIND 8 bug fix to ISC for AAAA glue treatment on zone transfer

```
(In ns_xfr.c of current BIND 8.4.6)
```

```
/* for IPv6 glue AAAA record transfer */
/* patched by yasuihiro@nic.ad.jp, 1999/5/23 */
foreach_rr(gdp, gnp, T_AAAA, class, DB_Z_CACHE)
    if (sx_addr(qsp, fname, gdp) < 0) {
        /*
         * Rats. We already sent the NS RR, too.
         * Note that SXL_GLUING is being left on.
         */
        return (-1);
    }
```

- In 2000, .JP supported IPv6 AAAA registration for DNS server address (aka “glue”)

Our experiences – IPv6 related work (cont.)

- In 2002, JPRS requested to IANA for registering IPv6 address for .JP DNS servers
- In 2004, IANA registered IPv6 address for .JP DNS servers (this is the first in the world)
- Currently, there are 4 IPv6 ready DNS servers in .JP
 - {A, D, E, F}.dns.jp

IPv6 and DNS packet size issue

- IPv6 provides large address space
- But this increases DNS packet size, too
- Original DNS supports 512 octets as maximum size for UDP transport, and it exceeds, packet is truncated and fallback to TCP
 - It increases the DNS load
- EDNS0 (RFC 2671) can increase UDP payload
- In IPv6 environment, DNS server should support EDNS0 function
 - It is similar to DNSSEC issue

IMR considerations

- dual stack
 - the platform or the service?
 - for many, dual-stacking the service is the easier migration path.
<http://www.nanog.org/mtg-0405/augmentation.html> - particularly Ed Lewis's presentation

thinking locally

- Hardcoded IPv4 assumptions in:
 - firewalls
 - proxies
 - load balancers
 - layer2 fabrics (MAC/ARP tables)
 - buffering
- DNS “tree” consistency
- Mapped Addresses / ULA’s

Conclusions and Future works

- The role of DNS in the Internet is more important
 - Therefore, DNS operators have more responsibility for stable Internet operation
- The demand about “cost” is also important
 - Not only money and server resources but also the human resources
- More usable and stable DNS services are needed
 - For example, updating more frequently the DNS data
- More technical experiences are needed
 - IP Anycast deployment
 - DNS Dynamic Update
 - DNSSEC

Acknowledgements

- This presentation is included the research activities funded by the Japanese National Institute of Information and Communications Technology (NICT).
- This presentation also includes research activities funded by the US Defense Information Systems Department (DISA)