IPv6 on the ccTLD-PT (country code Top Level Domain - Portugal)

Agenda

•Status of DNS IPv6 connectivity

•IPv6 domain registration process

•Issues to consider

•Summary

Status of DNS IPv6 connectivity

- ICANN now allows IPv6 addresses on the root DNS zone [1]
    - "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 "
- The root-servers themselves don't yet have IPv6 official addresses; but
    - There's an unofficial list at www.root-servers.org. Servers B,F,H,K and M have IPv6 addresses. There are 13 official root-servers, so, unofficially, about 40% of root-servers have IPv6 connectivity
    - It's possible to manually feed the DNS resolvers with those IPv6 addresses

Status of DNS IPv6 connectivity (2)

- There are 64 name servers on the root zone with "AAAA" resource-records
  - There are 867 name servers on the root zone, so
  - about 7% (64/867) of name-servers have "AAAA" resource-records
- ccTLD-PT's name servers: ns-ext.isc.org; ns.dns.br; ns.dns.pt (primary); ns.uu.net; ns2.dns.pt; ns2.nic.fr; and sunic.sunet.se
- ns-ext.isc.org and ns2.dns.pt have official (present on the root-zone) IPv6 addresses: 2001:4f8:0:2::13 and 2001:690:a80:4001::100

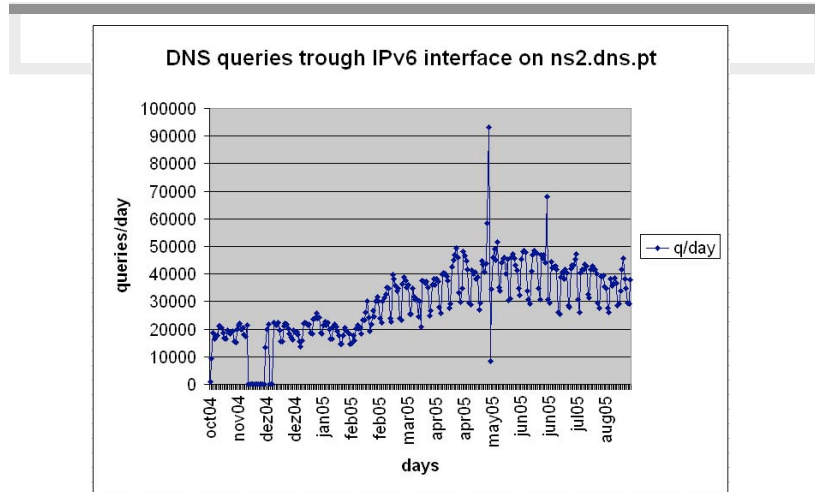# Status of DNS IPv6 connectivity (3)

- There are 6 name servers on the .PT DNS zone with "AAAA" resource-records
  - There are 10,644 name servers on the .PT zone, so
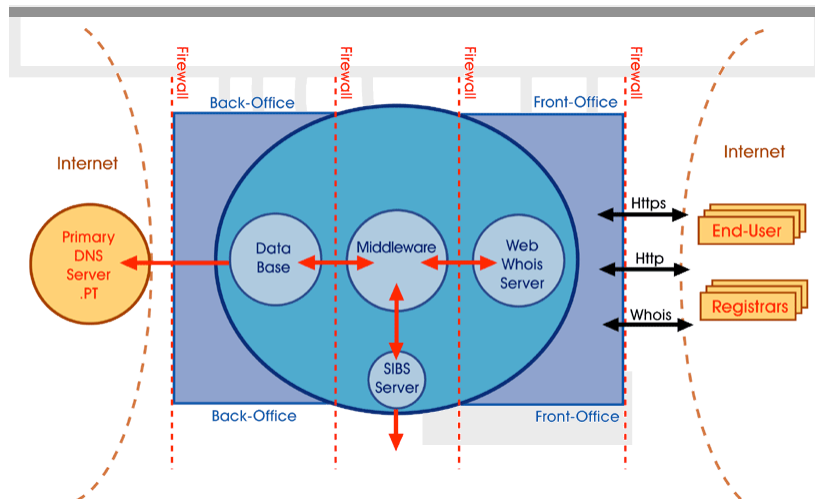 - about 0,5% (6/10644) of name-servers have "AAAA" resource-records

Status of DNS IPv6 connectivity (4)

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IPv**6DISS**emination and Exploitation

ccTLD .PT internal structure

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3

IPv6 domain registration process

- For IPv4 the ccTLD-PT has an automatic mechanism do discover what DNS delegation to install on the .PT zone
  - The client only has to provide a domain name and an IPv4 address
  - The "delegation extraction tool" goes to that IP address and gets the necessary "NS", and possibly, "A" and "AAAA" resource-records, needed to install a valid DNS delegation
- For IPv6 the process is different
  - The client has to fill out a form that completely describes the DNS delegation to install on the .PT zone (error prone!).
    - That form must provide information for the "NS", and possibly, "A" and "AAAA" resource-records, needed to install a valid DNS delegation
  - Of course, it is possible to write down IPv6 addresses on the manual form

Issues to consider

- On the support system (database, forms, control logic, etc.)
  - Wherever an IPv4 address is present, it should be possible to use also an IPv6 address
    - This can be costly in man-hours needed to find all situations, change, test, etc.
  - More complex address parsing
- Possible technical pitfall:
  - IPv6 addresses are larger than IPv4
  - DNS queries and responses are UDP based
  - One should study "response size (from root servers) and name compression for TLDs while taking IPv6 into account " [2]

Issues to consider (2)

- "More and more TLDs are choosing a naming scheme that allows for more compression (e.g. .mil, .jp, .se, …). This scheme enables TLD Hostmasters (TLDH) to save more space in the DNS response. "
  - Example: .FR domain: "Proposal for Name Compression for FR Name Servers" (renaming of servers):
    - ns1.nic.fr.   ==>   a.nic.fr.
    - ns2.nic.fr.   ==>   b.nic.fr.
    - ns3.nic.fr.   ==>   c.nic.fr.
    - dns.inria.fr.   ==>   a.ext.nic.fr.
    - dns.cs.wisc.edu. ==>   b.ext.nic.fr.
    - dns.princeton.edu.   ==>   c.ext.nic.fr.
    - ns-ext.vix.com.   ==>   d.ext.nic.fr.
    - ns3.domain-registry.nl.   ==>   e.ext.nic.fr.
  - Update: .FR actually did rename the servers on the root-zone

Issues to consider (3)

- For .PT, considering the existing name servers and glue-records, the maximum size of a name that can be queried to the root-servers without loosing data on the response is 161 characters
  - Since the biggest domain is only 50 characteres wide, the ccTLD-PT isn't pressured to take action (possibly compressing name servers) over this potential problem
  - "loosing data on the response" means that some IP addresses of the "additional section" aren't presented to the entity that made the query
    - Those dropped IP addresses wouldn't be contacted on subsequent queries (Note that the resolving process can have several interactions. Contacting the root-servers is only one of them)
- Making this tests is something to do once a while, because:
  - Name servers can change
  - The biggest domain on a TLD can change

Summary

- What did the ccTLD-PT do:
  - Installed an IPv6 address on the ns2.dns.pt server, reflecting that on the root-zone
  - Provided mechanisms to allow IPv6 address on the .PT DNS zona
- Planned activities:
  - New version of the delegation extraction tool will be IPv6 capable
    - Changes will be needed at the Sistems Information level
    - A support server will be made "IPv6 compliant" for the extraction tool to run properly
  - Conduct a more deep study on the dropped-glue problem (condense name server names, etc.)
- ICANN will eventually publish IPv6 official addresses for the root-servers

Bibliography

[1] - "Next-generation IPv6 Address Added to the Internet's Root DNS Zone"; 20 July 2004; http://www.icann.org/announcements/announcement-20jul04.htm

[2] - DNS Response Size and Name Compression; 2004-09-08; http://w6.nic.fr/dnsv6/resp-size.html