



IPv6 Training

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Agenda

1. Basic Introduction to IPv6
2. Header Formats & Packet Size Issues
3. Addressing
4. ICMPv6, Neighbor Discovery & DHCPv6
- 5. Applications**
- 6. IPv6 DNS**
7. Security/firewalling
8. Transition and Coexistence
9. Mobility
10. Routing



IPv6 Tutorial

5. Applications



IPv6 Applications (1)

- Client-Server model implies that it is possible to have Client/Server applications working:
- IPv4 Only
- IPv6 Only
- IPv4 + IPv6
- Thus provides a set of combinations that is needed to consider jointly with the availability or unavailability of IPv4/IPv6 connectivity



IPv6 Applications (2)

- **DNS lookups** are used to make or differentiate an available service through IPv4 and/or IPv6
- If a clients wants to connect to service.example.com, when resolving the domain name he/she can get an IPv4, IPv6 or both addresses
- In the case of getting both (v4 and v6) it is up to the client which protocol (v4/v6) to choose. The common practice is to choose v6 as the first option by default





IPv6 Tutorial

6. IPv6 DNS



IPv6 DNS : Introduction (1)

- Several elements were defined to support IPv6 on DNS:
 - Forward Resolution RRs: **AAAA** and **A6**
 - Reverse Resolution: **IP6.INT** and **IP6.ARPA** domains, **DNAME** and **PTR** RRs, in addition to the **nibble** and **bitstring** notations
- 1995: **AAAA**, **nibble** and **IP6.INT** (RFC1886)
- 2000: **A6**, **bit-string** and **IP6.ARPA** (RFC2874)
- 2002: **A6** and **bit-string** -> **Experimental** and **DNAME** -> **Deprecated** (RFC3363)



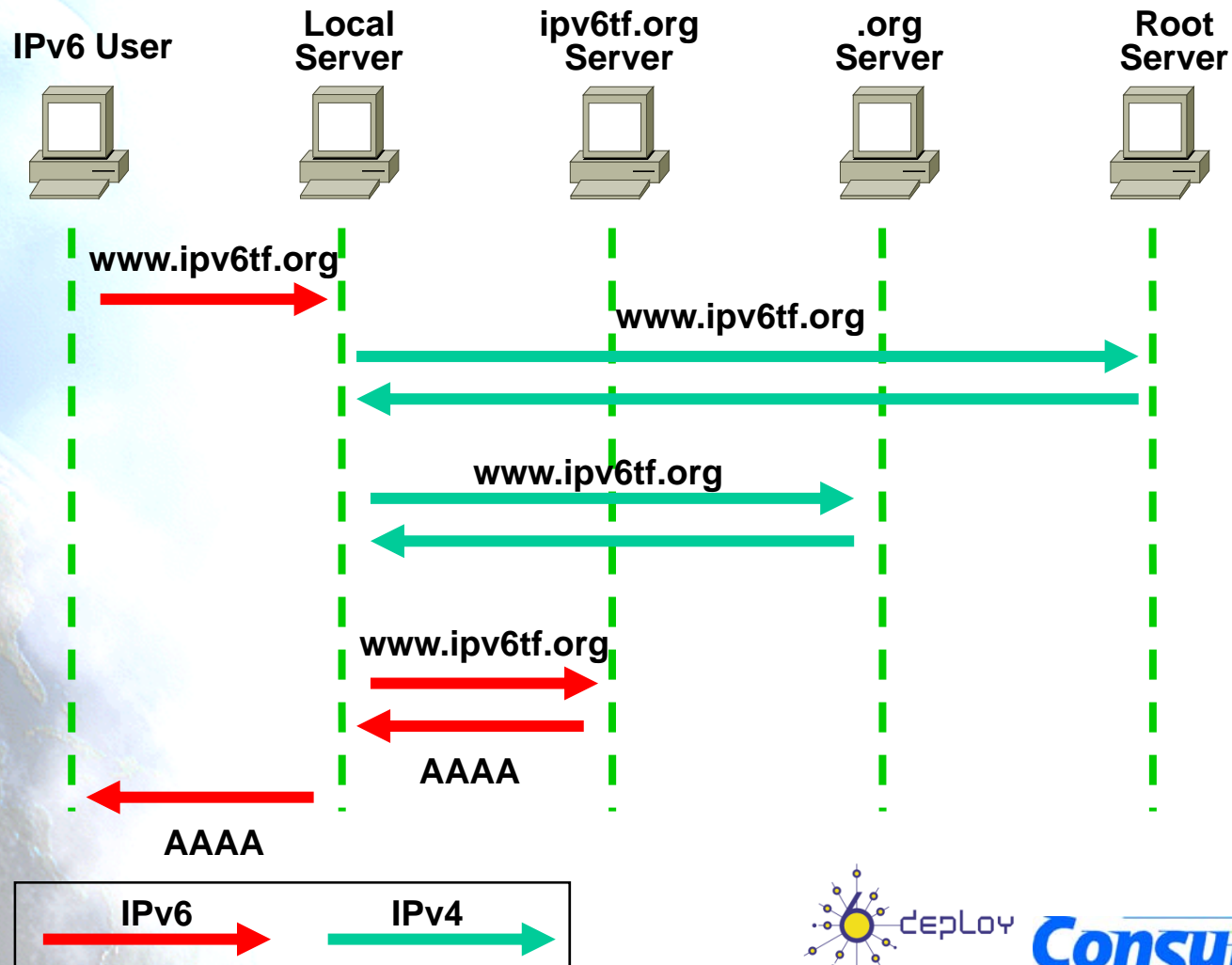
IPv6 DNS : Introduction (2)

- Only some of the above mentioned elements are used:
 - AAAA
 - IP6.ARPA
 - PTR
 - Nibble notation (4 bits in hex)



IPv6 DNS : Transport vs. Content

- The transport and content should be clearly differentiated



IPv6 DNS : Recommendations

- IPv4 and IPv6 will coexist, three types of servers:
 - IPv4 only -> Only reachable by IPv4
 - IPv6 only -> Only reachable by IPv6
 - Dual-stack -> Reachable by both IPv4 and IPv6
- Fragmentation of the name space should be avoided, this happens when the recursive resolution is broken (e.g. when only one IPv6-only server is authoritative for a domain, resulting that an IPv4-only recursive DNS server won't be able to follow the recursive resolution process)
- IDEA: backward compatibility
- Administrative policies (RFC3901)
 - Every recursive DNS server must be IPv4-only or dual-stack
 - Every DNS zone must be server by at least one IPv4-reachable authoritative server



IPv6 DNS : State of the Art (1)

- **Clients:** Good support of IPv6 DNS
- **Servers:** Very good support: BIND, nsd, newbie, maradns and djbdns [8][9]
- Extended implementation in **TLDs** (.fr, .ik, .jp, etc.)
- In progress: The implementation over **root servers** has just started. Available in 6 of the 13.



IPv6 DNS : State of the Art (2)

- Since July 2004 with ICANN's announce [1] about the support of IPv6 addresses on root servers, several TLDs have used them [2]
- There was a previous ICANN's work on IPv6 issues on root servers by means of RSSAC [7] and SSAC [6].
Resulting:
 - Report on AAAA glue records on root servers [5]: root zones and root hints
 - An study about real IPv6 traffic in root servers is being carried out
 - Transport state report: B, F, H, I, J, L and M were IPv6 capable but without a production quality connectivity
- At present, (root zone 2008020400) [3] six root servers officially have IPv6 addresses. The announce was made [4] and since February 4th 2008 they are reachable using IPv6.



DNS IPv6: References

- [1] Next-generation IPv6 Address Added to the Internet's Root DNS Zone:
<http://www.icann.org/announcements/announcement-20jul04.htm>
- [2] IANA Administrative Procedure for Root Zone Name Server Delegation and Glue Data: <http://www.iana.org/procedures/delegation-data.html>
- [3] Root Zone Hints File in IANA Popular Links: <http://www.iana.org/popular.htm>
- [4] IPv6 Address Added for Root Servers in the Root Zone:
<http://www.icann.org/announcements/announcement-04feb08.htm>
- [5] “Accommodating IP Version 6 Address Resource Records for the Root of the Domain Name System”, ICANN, March 2007.
<http://www.icann.org/committees/security/sac018.pdf>
- [6] ICANN Security and Stability Advisory Committee (SSAC).
<http://www.icann.org/committees/security/>
- [7] ICANN DNS Root Server System Advisory Committee (RSSAC).
<http://www.icann.org/committees/dns-root/>
- [8] Internet Systems Consortium <http://www.isc.org>
- [9] DeepSpace6 - Current Status of IPv6 Support for Networking Applications
http://www.deepspace6.net/docs/ipv6_status_page_apps.html



Thanks !

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6DEPLOY Project

<http://www.6deploy.org>

The IPv6 Portal:

<http://www.ipv6tf.org>

