



IPv6 support in the DNS

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Prerequisites

- You must have followed previously the modules:
 - 010-IPv6 Introduction
 - 020-IPv6 Protocol
 - 030-IPv6 Addressing
 - 040-IPv6 Associated Protocols



Agenda

- How important is the DNS?
- DNS Resource Lookup
- DNS Extensions for IPv6
- Lookups in an IPv6-aware DNS Tree
- About Required IPv6 Glue in DNS Zones
- The Two Approaches to the DNS
- DNS IPv6-capable software
- IPv6 DNS and root servers
- DNSv6 Operational Requirements & Recommendations

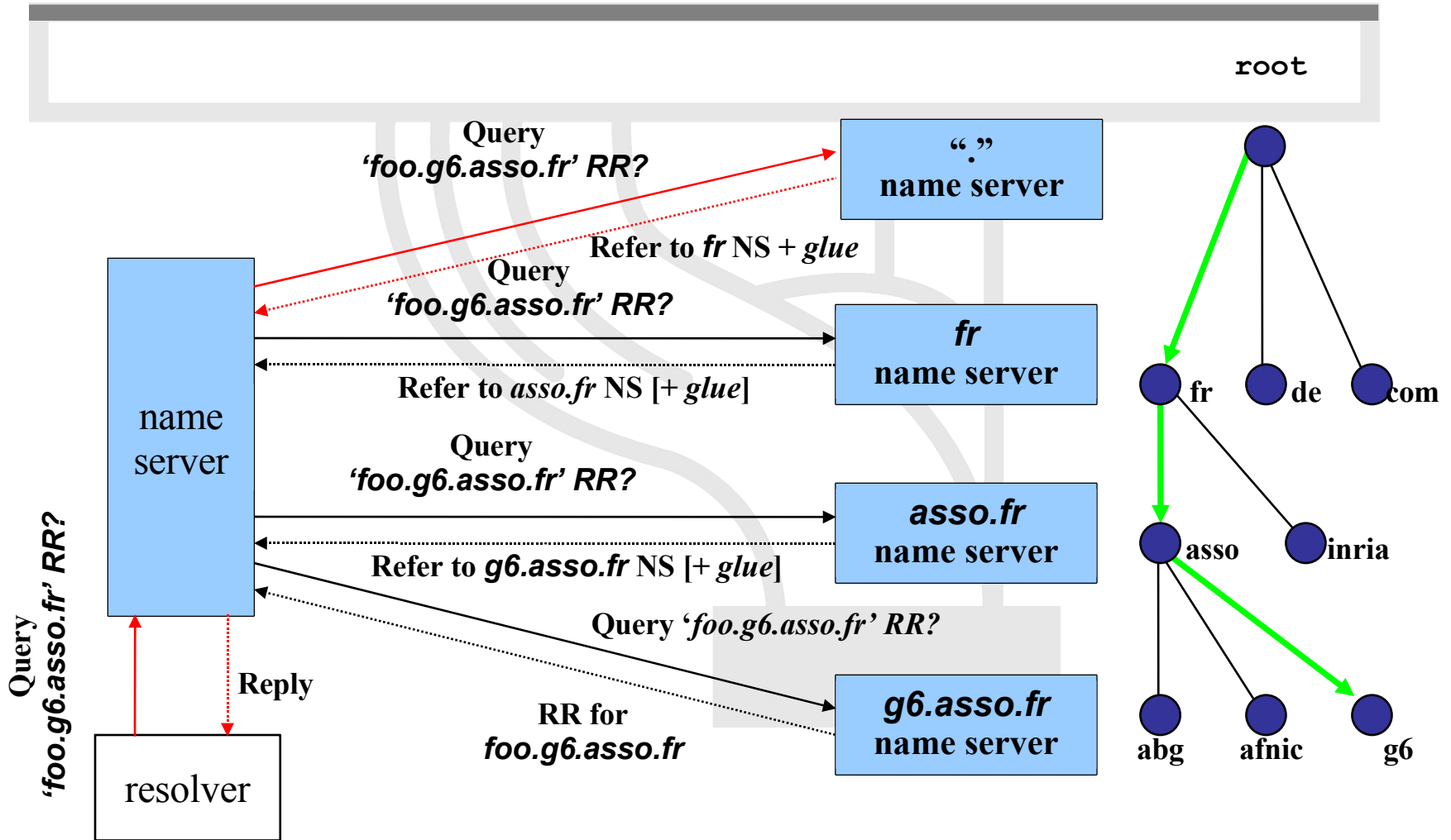


How important is the DNS?

- Getting the IP address of the remote endpoint is necessary for every communication between TCP/IP applications
- Humans are unable to memorize millions of IP addresses (specially IPv6 addresses)
- To a larger extent: the Domain Name System (DNS) provides applications with several types of resources (domain name servers, mail exchangers, reverse lookups, ...) they need
- DNS design
 - hierarchy
 - distribution
 - redundancy



DNS Lookup



About Required IPv6 Glue in DNS Zones

When the DNS zone is delegated to a DNS server (among others) contained in the zone itself

Example: In zone file renes.enst-bretagne.fr

```
@    IN    SOA    rsm.renes.enst-bretagne.fr. fradin.renes.enst-bretagne.fr.
      (2005040201 ;serial
      86400 ;refresh
      3600 ;retry
      3600000 ;expire}

      IN    NS    rsm
      IN    NS    univers.enst-bretagne.fr.

[...]
ipv6  IN    NS    rhadamanthe.ipv6
      IN    NS    ns3.nic.fr.
      IN    NS    rsm
;
rhadamanthe.ipv6      IN    A    192.108.119.134
                       IN    AAAA 2001:660:7301:1::1
[...]
```

IPv4 glue (A 192.108.119.134) is required to reach rhadamanthe over IPv4 transport

IPv6 glue (AAAA 2001:660:7301:1::1) is required to reach rhadamanthe over IPv6 transport



IPv6 DNS and root servers

- DNS root servers are critical resources!
- 13 roots « around » the world (#10 in the US)
- Not all the 13 servers already have IPv6 enabled and globally reachable via IPv6.
- Need for (mirror) root servers to be installed in other locations (EU, Asia, Africa, ...)
- New technique : anycast DNS server
 - To build a clone from the master/primary server
 - Containing the same information (files)
 - Using the same IP address
- Such anycast servers have already begun to be installed :
 - F root server: Ottawa, Paris(Renater), Hongkong, Lisbon (FCCN)...
 - Look at <http://www.root-servers.org> for the complete and updated list.



The Two Approaches to the DNS

- The DNS seen as a Database
 - Stores different types of Resource Records (RR): SOA, NS, A, AAAA, MX, SRV, PTR, ...

DNS data is independent of the IP version (v4/v6) the DNS server is running on!

- The DNS seen as a TCP/IP application
 - The service is accessible in either transport modes (UDP/TCP) and over either IP versions (v4/v6)

Information given over both IP versions **MUST BE CONSISTENT!**



DNS IPv6-capable software

- BIND (Resolver & Server)
 - <http://www.isc.org/products/BIND/>
 - BIND 9 (avoid older versions)
- On Unix distributions
 - Resolver Library (+ (adapted) BIND)
- NSD (authoritative server only)
 - <http://www.nlnetlabs.nl/nsd/>
- Microsoft Windows (Resolver & Server)
- ...



DNSv6 Operational Requirements & Recommendations

- The target today **IS NOT** the transition from an IPv4-only to an IPv6-only environment
- How to get there?
 - Start by testing DNSv6 on a small network and get your own conclusion that DNSv6 is harmless, **but remember:**
 - **The server (host) must support IPv6**
 - **And DNS server software must support IPv6**
 - Deploy DNSv6 in an incremental fashion on existing networks
 - DO NOT BREAK something that works fine (production IPv4 DNS)!





Questions?



EXTRA SLIDES



TLDs and IPv6



- One of IANA's functions is the DNS top-level delegations
- Changes in TLDs (e.g ccTLDs) has to be approved and activated by IANA
- Introduction of IPv6-capable nameservers at ccTLDs level has to be made through IANA



TLDs and IPv6 #2

How many servers supporting a domain should carry AAAA records?

- Usually conservative approaches
- One or two servers
- Don't use long server names. 1024 bytes limit in DNS responses
 - Some ccTLDs had to renamed their servers (same philosophy used by root servers)



TLDs and IPv6 #3

- 17/04/2005
 - 4 TLDs (.AEROS, .NET, .COM, .INT)
 - 42 ccTLDs
- European: About half already glued
- Servers: 35 different ones, worldwide



Bind 9 configuration/1

- **named.conf entries**

- More than one `listen-on-v6` option can be used:

```
options {  
    listen-on-v6 port 53 { any; };  
    listen-on-v6 port 1234 { any; };  
};
```

- In order the DNS server not to server IPv6 requests. (Before 9.2.0 – now it is the default):

```
options {  
    listen-on-v6 { none; };  
};
```



Bind9 configuration/2

- Zone transfer:

```
transfer-source-v6 1:2:3:4:5:6:7:8;
```

- Query over IPv6 enable:

```
query-source-v6 address * 53;
```

- Don't forget to update ACLs for IPv6 addresses!

