



**6DEPLOY**

# IPv6 Support in the DNS

**6DEPLOY. IPv6 Deployment and Support**

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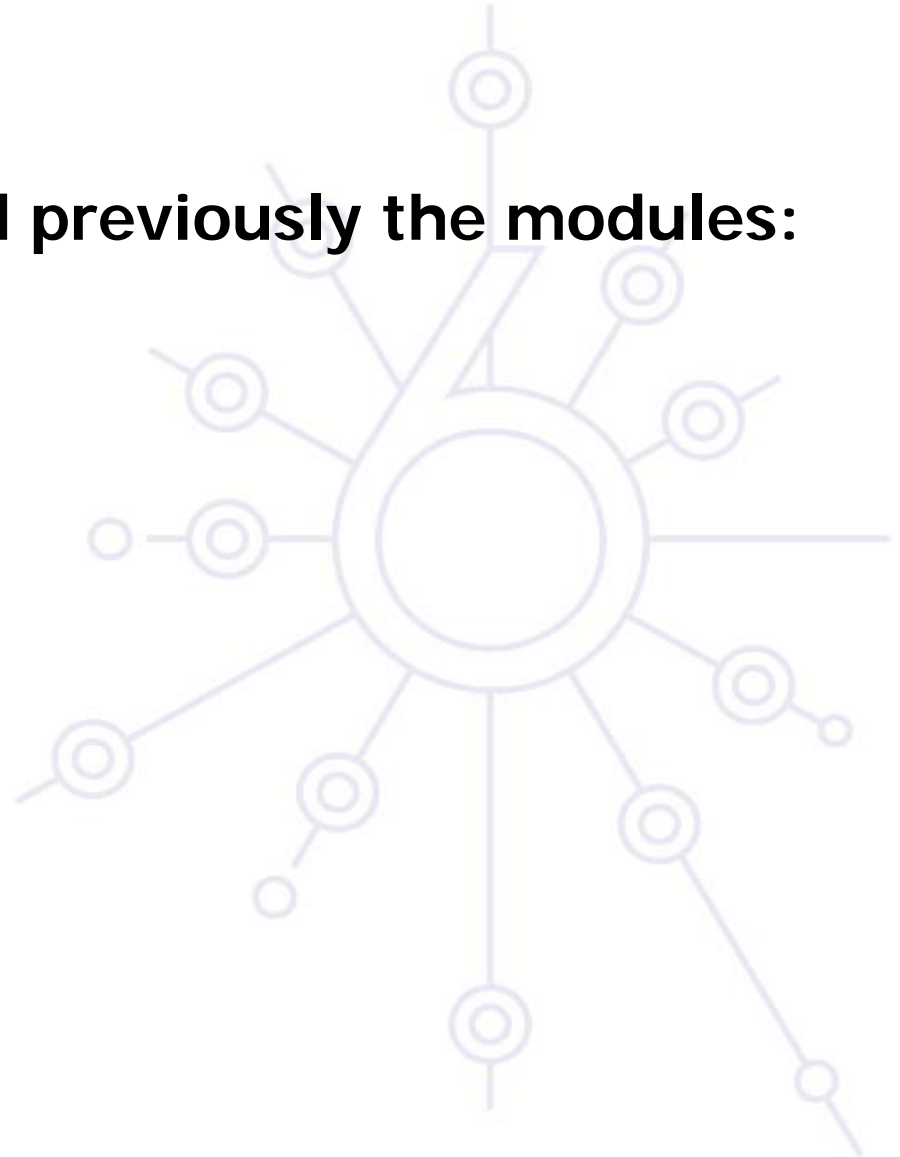
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# Prerequisites

**You should have followed previously the modules:**

- 010-IPv6 Introduction
- 020-IPv6 Protocol
- 030-IPv6 Addressing



# 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

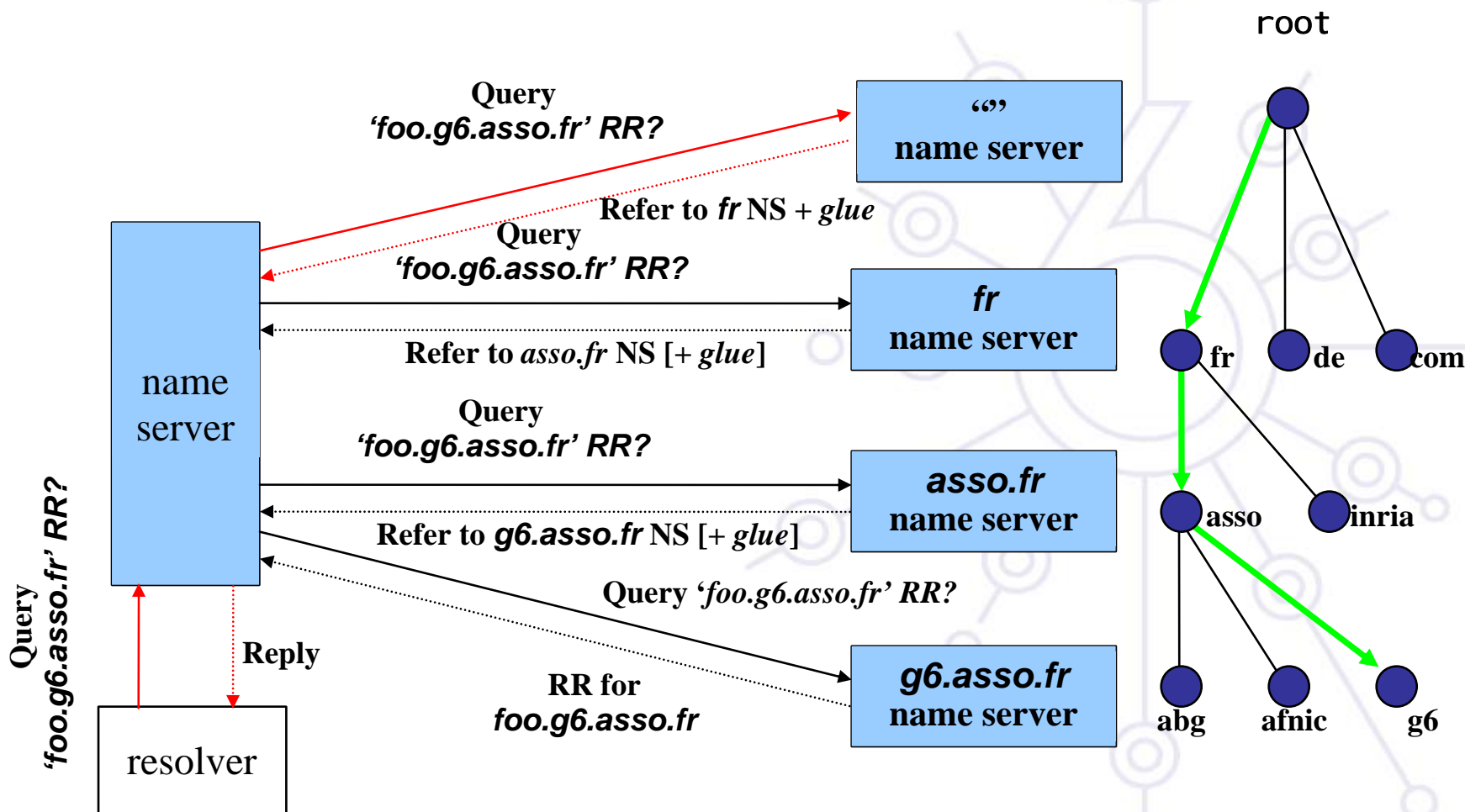
Humans are unable to memorize millions of IP addresses  
(**specially IPv6 addresses**)

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 rennes.enst-bretagne.fr

```
@           IN           SOA           rsm.rennes.enst-bretagne.fr. fradin.rennes.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)**

**As of 04/02/2008, 6 of 13 root servers are IPv6 enabled and reachable via IPv6 networks (A, F, H, J, K, M).**

**Need for mirror-like function for the root name servers to be installed in other locations (EU, Asia, Africa, ...)**

**New technique : anycast DNS server**

- To build a clone from the primary master
- Containing the same information (files)
- Using the same IP address(es)

**Such anycast servers have proved a successful strategy and more than hundreds are already 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 (1)

## 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)

- It has been reported that Windows XP resolver can not interact with DNS servers over an IPv6 transport. It needs an IPv4 network to query a DNS server. This is not an issue for Windows Vista users.

## DNS IPv6-capable software (2)

### Microsoft Windows XP default resolver only queries over IPv4 transport:

- Install BIND 9 for Windows XP and uses BINDs resolver; or
- Have a local dual stack DNS server.
  - Via DHCP, assign IPv4 address
  - advertise the DNS server IPv4 address to XP users.



# 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 (1)

**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 preferably two name 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)

### As of Abril 14th 2008

- 13 out of 21 TLDs with at least one IPv6 enabled DNS server (glued)
- 102 out of 252 ccTLDs with at least one IPv6 enabled DNS server (glued)

**Servers: 124 different ones, worldwide**

