

IPv6 in Application Space

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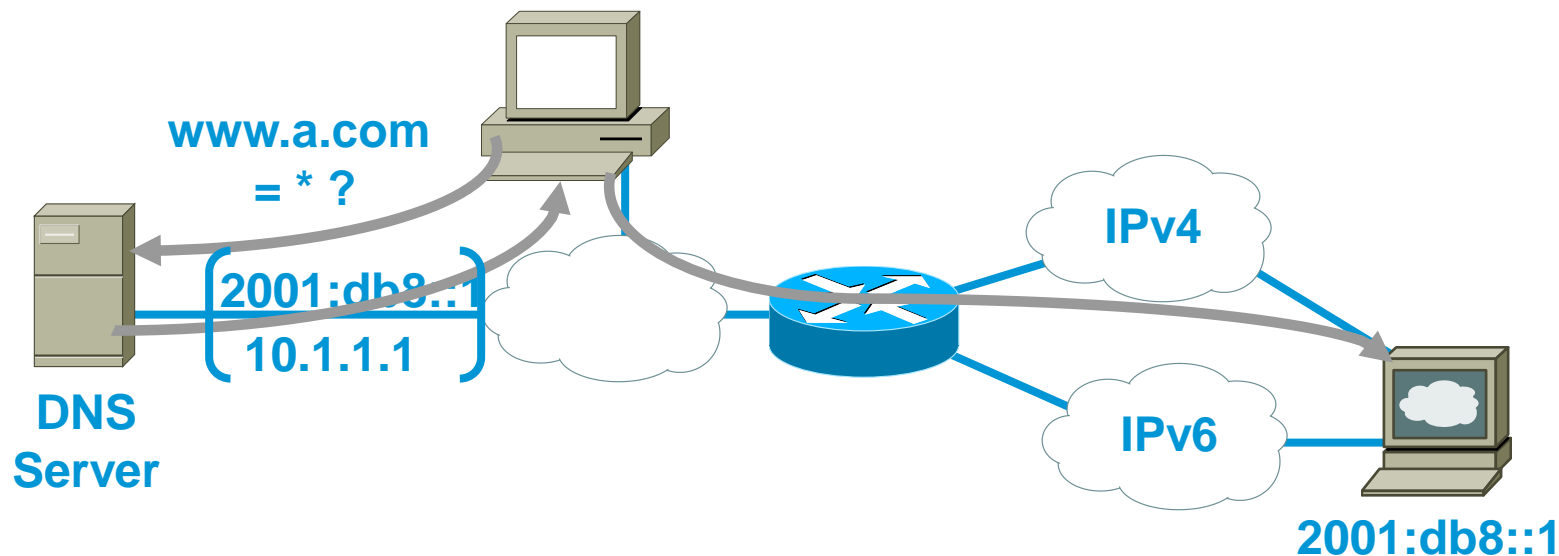
Domain Name Systems and IPv6

IPv6 and DNS

Actual DNS requests are transported over IPv4 or IPv6 and is not related to the request content.

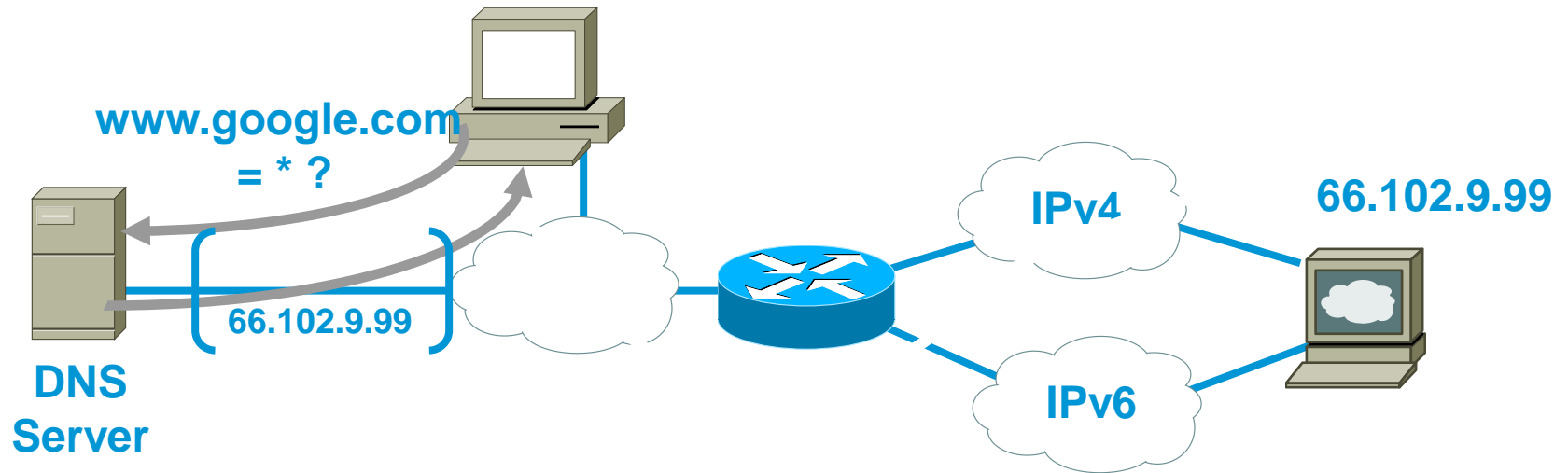
	IPv4	IPv6
Hostname to IP address	A record: www.abc.test. A 192.168.30.1	AAAA record: www.abc.test AAAA 2001:db8:C18:1::2
IP address to hostname	PTR record: 1.30.168.192.in-addr.arpa. PTR www.abc.test.	PTR record: 2.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.1.0.0.0.8.1.c.0.8.b.d.0.1.0.0.2.ip6.arpa PTR www.abc.test.

Host Running Dual Stack



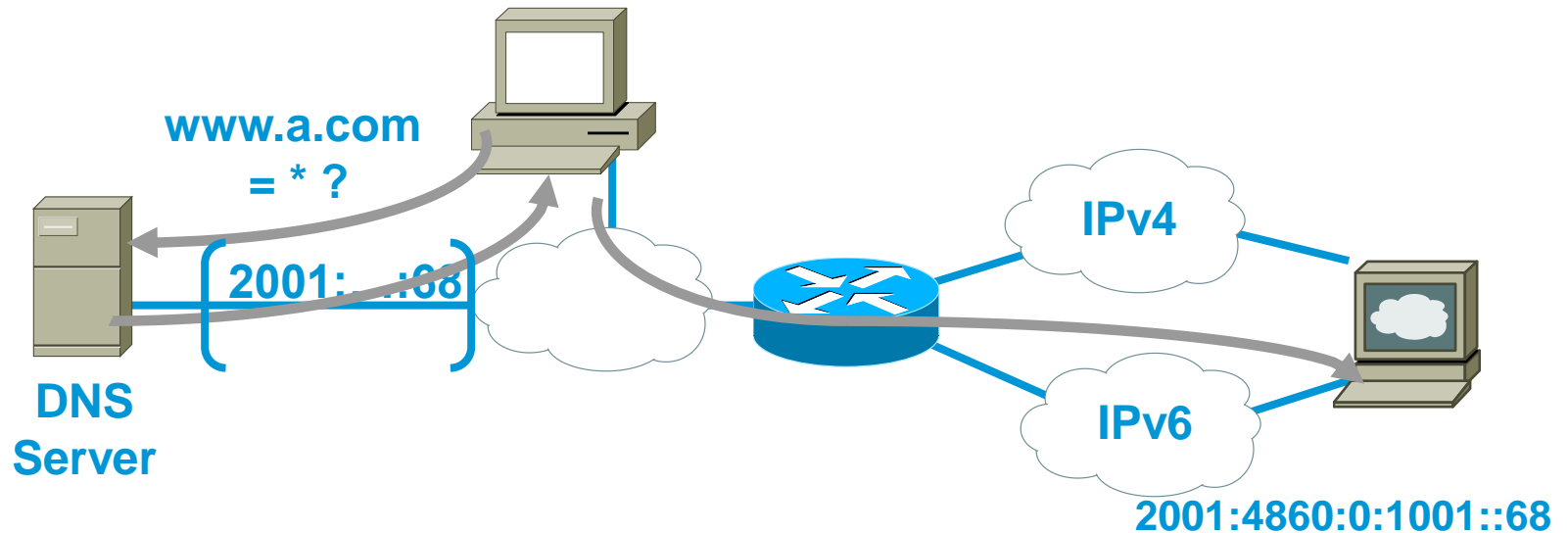
- In a dual stack case, an application that:
 - Is IPv4- and IPv6-enabled
 - Asks the DNS for all types of addresses
 - Chooses one address and, for example, connects to the IPv6 address

Host Running Dual Stack: www.google.com



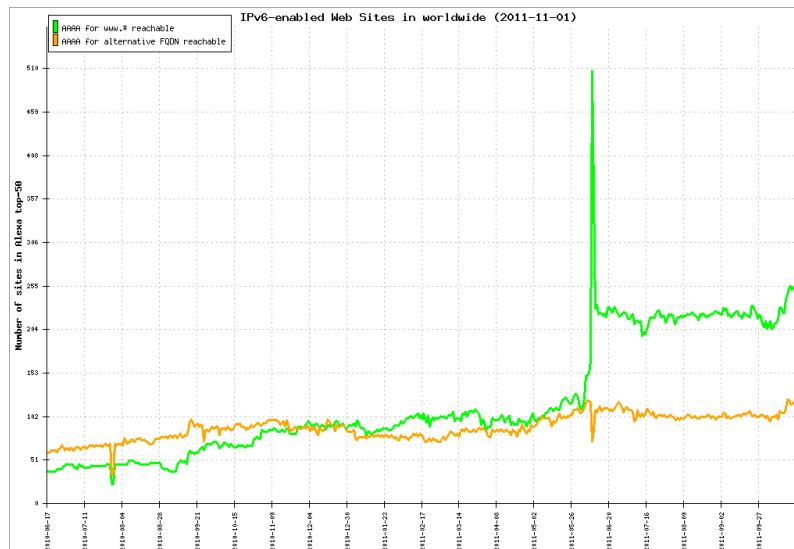
Host Running Dual Stack

ipv6.google.com



Impact on DNS

- In 2011, it was not recommended to add AAAA to all A records
What if the client has poor IPv6 connectivity?
RFC 3484 says IPv6 is to be preferred (see later)
- Rather add a <http://ipv6.cisco.com> to all <http://www.cisco.com>
- 8th of June 2011: World IPv6 Day, major web sites added a AAAA for their IPv6 content for 24 hours.



Impact on Existing Applications

Impact of IPv6 on Applications...

- Is the software package available?
- What about the network part?
- What about the logs and DB?
- What about the API?

Socket library

RFC 6724

IPv6-Enabled Applications

- Most open-source packages have been IPv6 enabled for several years

BIND `listen-on-v6 { any; };`

SSH (including WinSCP, Putty)

On by default, else `ListenAddress ::`

Apache

Sendmail, Qmail,

Postfix `inet_protocols=all`

VLC, Mozilla

- Specific IPv6 open-source

Dibbler: DHCP server

Wide-DHCP

Linux-DHCP

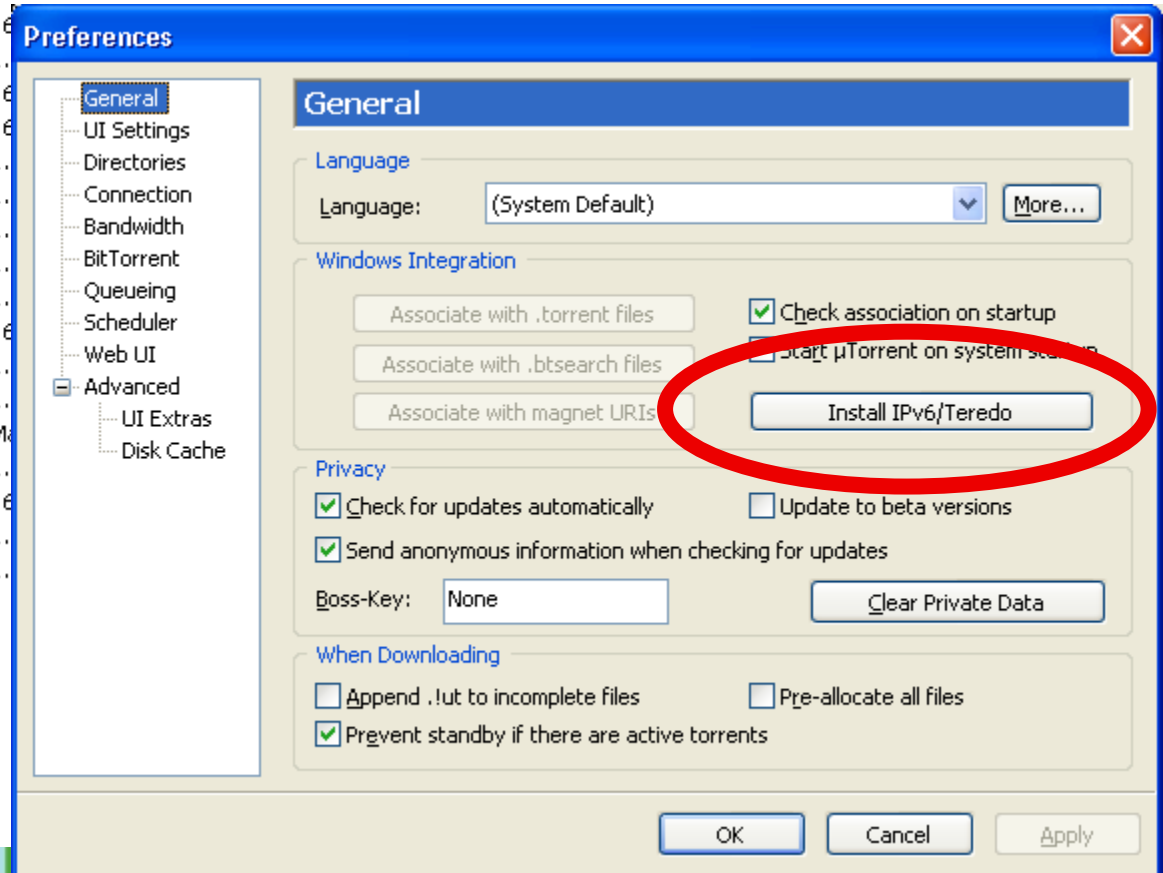
Ip6tables

radvd

Is it real?

May be uTorrent 1.8 (released Aug 08)

Général		Trackers	Clients	Pièces	Fichiers	Gra
IP	Logiciel client					
2002:53e1:661c::53e1:661c	µTorrent 1.8.2					
2002:5853:3a0f:0:20a:95ff:fed1:5c2e	Transmission 1.51					
2002:59d4:b885::59d4:b885	µTorrent 1.8.2					
2002:7730:ce96::7730:ce96	µTorrent 1.8.2					
2002:bec5:9619::bec5:9619	BitTorrent 6					
2a01:e34:ee07:a7d0:687a:e559:4aaf:556f	µTorrent 1.					
2a01:e34:ee4b:b570:45c1:5889:9c6b:a9d2	BitTorrent 6					
2a01:e35:1380:d200:a13e:1919:8e4e:be93	BitTorrent 6					
2a01:e35:242c:e500:1087:f807:2aa3:64e6	µTorrent 1.					
2a01:e35:243e:b430:29eb:c2f9:f86d:329b	µTorrent 1.					
2a01:e35:2e37:5670:25ef:9941:1d10:c6bc	µTorrent 1.					
2a01:e35:2e58:bd30:2c5e:c2c2:d040:8d0	µTorrent 1.					
2a01:e35:2e60:89b0:96:8b64:1b3c:dcac	µTorrent 1.					
2a01:e35:2e76:d200:7888:4fb8:6adc:54a9	BitTorrent 6					
2a01:e35:2e87:f40:c947:2f74:f5c7:cc99	µTorrent 1.					
2a01:e35:2e9d:ce10:389a:378:a7c7:a715	µTorrent 1.					
2a01:e35:2eb5:2820:221:e9ff:fee5:a32d	µTorrent 1.					
2a01:e35:2f24:7990:ad15:fc01:6907:4b07	µTorrent 1.					
2a01:e35:8a17:4c70:6c5b:3560:b117:49a5	BitTorrent 6					
2a01:e35:8a85:e8f0:d514:7e66:7db:81c8	µTorrent 1.					
2a01:e35:8b43:4c80:e516:cab2:f9af:beec	µTorrent 1.					



The Network Part of IPv6 Applications

Path MTU Discovery

- No fragmentation by routers
 - Path MTU Discovery MUST work
 - Free flow of ICMPv6 must be guaranteed
 - All routers must be able to send ICMP
 - Even if using link-local address on infrastructure
- Let's get real: it does not in 2011
 - Set the MSS to 1220 (minimum MTU of 1280 – 40 – 20)**
 - Or `setsockopt()` and `IPV6_MTU`

IPv6 and Back End Databases

IPv6 Addresses are Larger...

- User Interface

Needs to accept wider data

Needs to accept : in addresses

Multiple ways to represent the same address

1. Use lower case (uppercase is reserved for MAC addresses)
2. Canonicalization with `inet_pton()` & `inet_ntop()`

Needs to redesign GUI to fit field in the screen ☹

- Logging the remote address

Needs to support 2 address families

Needs to store 39 characters instead of 15

- Audit

Need to adapt to IPv6

Multiple IPv6 addresses per end host

Multiple ways to write an IPv6 address

Privacy extension ...

Changing IPv6 address

The socket() API in C or C++

- Mostly unchanged, but should use some new functions
 - `inet_ntop`, `inet_pton`
 - `getaddrinfo`, `getnameinfo`
 - `struct sockaddr_storage`
- Either one socket
 - AF_INET6 in all calls
 - IPv4 address in compatibility mode (::ffff:192.0.0.2)
 - S = `socket(AF_INET6, ...)`
- Or two sockets (one IPv4 & one IPv6) for specific options
 - Happy eye-ball: clients open two connections and use the 'better' one

The IPv6 Support in Other Language

- Most of the scripting language Python, Perl, PHP, ...

IPv6 support built-in

Scripts with FQDN simply runs

Beware of logging remote IP* addresses

RFC 6724:

Source Address Selection (SAS)

- Policy
 - Several local host addresses
 - Several remote server addresses
 - Which one to use?
- Scope is important in RFC 6724
 - Link-local vs. global

Prefix	Precedence	Label
::1/128	50	0
::/0	40	1
::ffff:0:0/96	35	4
2002::/16	30	2
2001::/32	5	5
fc00::/7	3	13
::/96	1	3
fec0::/10	1	11
3ffe::/16	1	12

Thank you.

