

Migration to IPv6 using DNS64/NAT64

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Agenda / About me



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- DNS Architect at Secure64 Software Corp.
- Director and founder of the TXv6TF
- Personal blog at IPv4depletion.com

IPv4 depletion



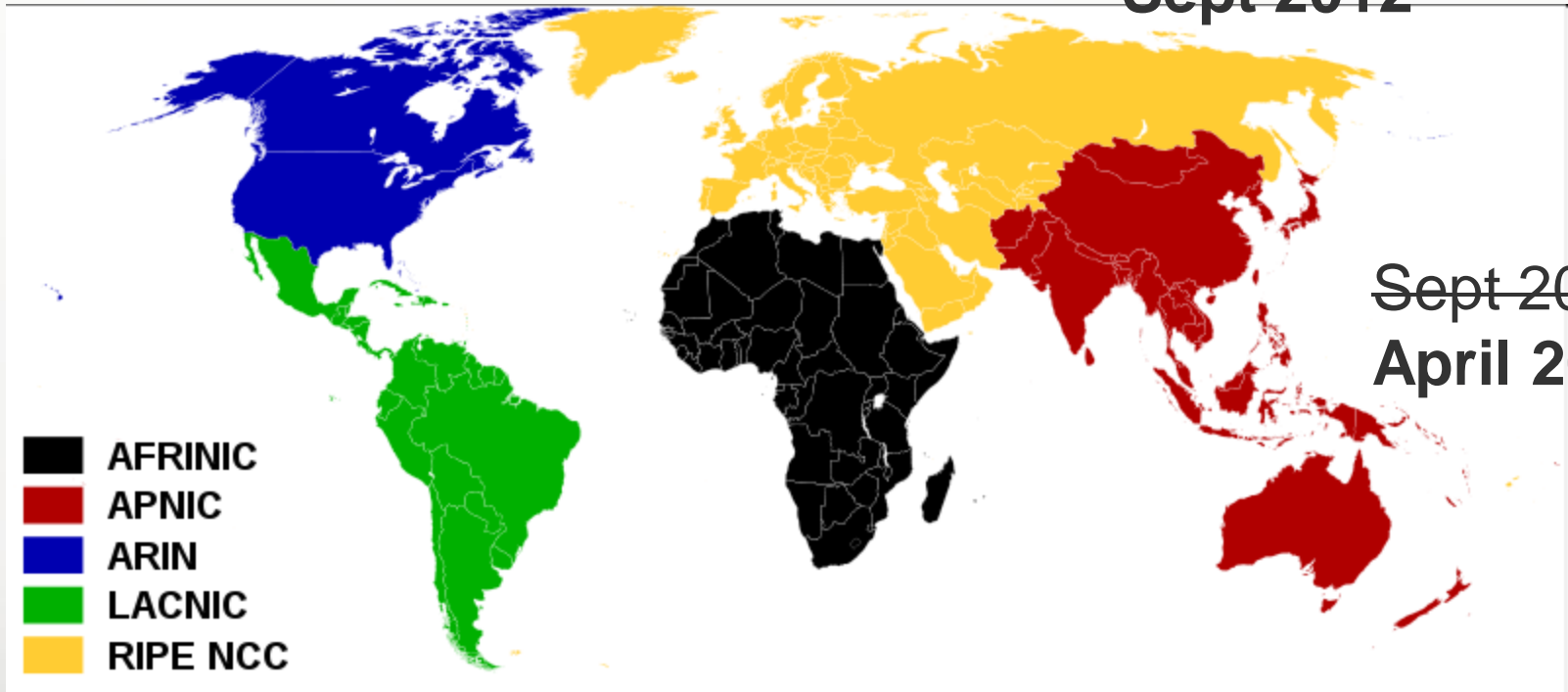
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- Global IANA pool depleted in Feb-2011

Sept 2012

~~Sept 2011~~
April 2011

■ AFRINIC
■ APNIC
■ ARIN
■ LACNIC
■ RIPE NCC

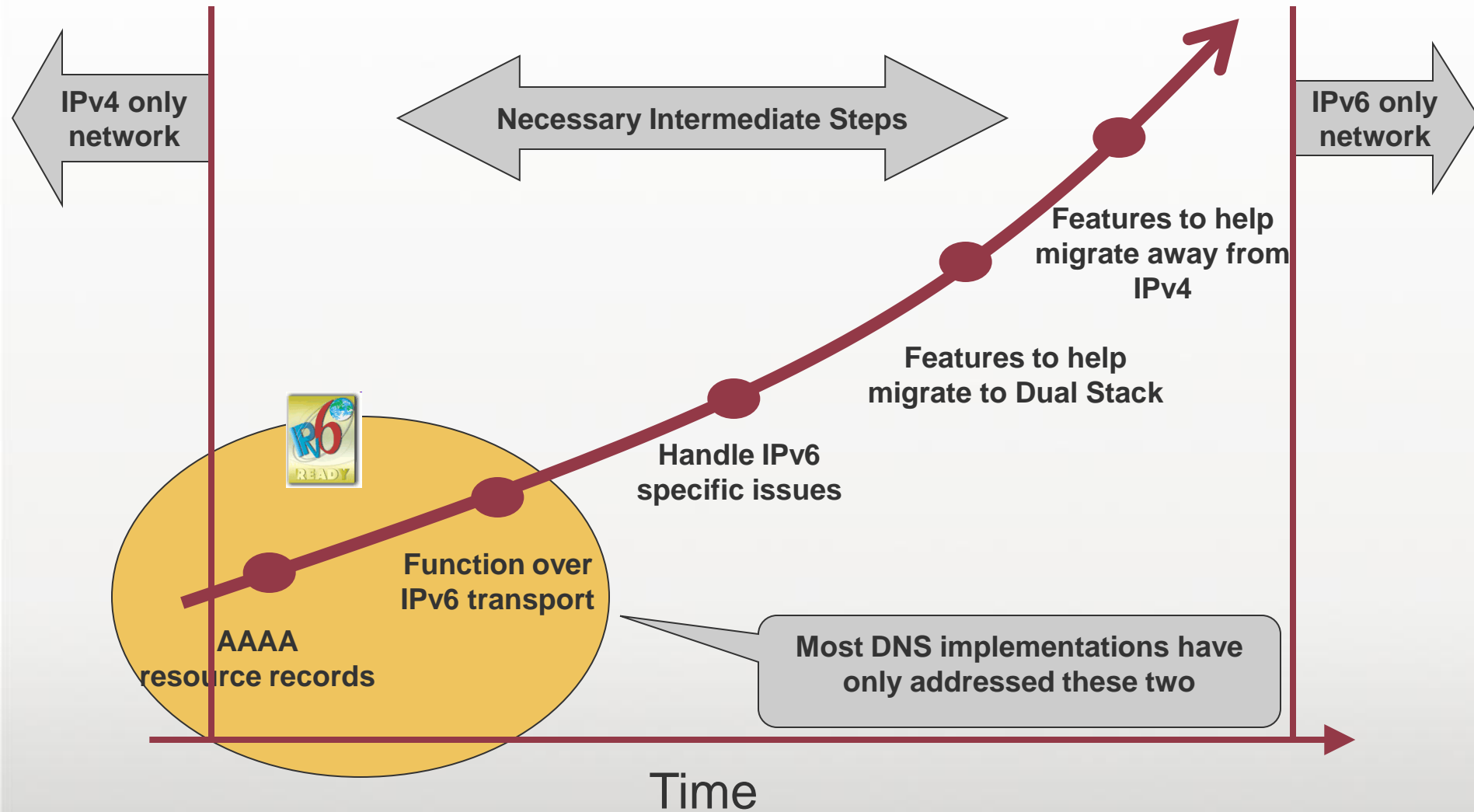




Supporting IPv6 in DNS



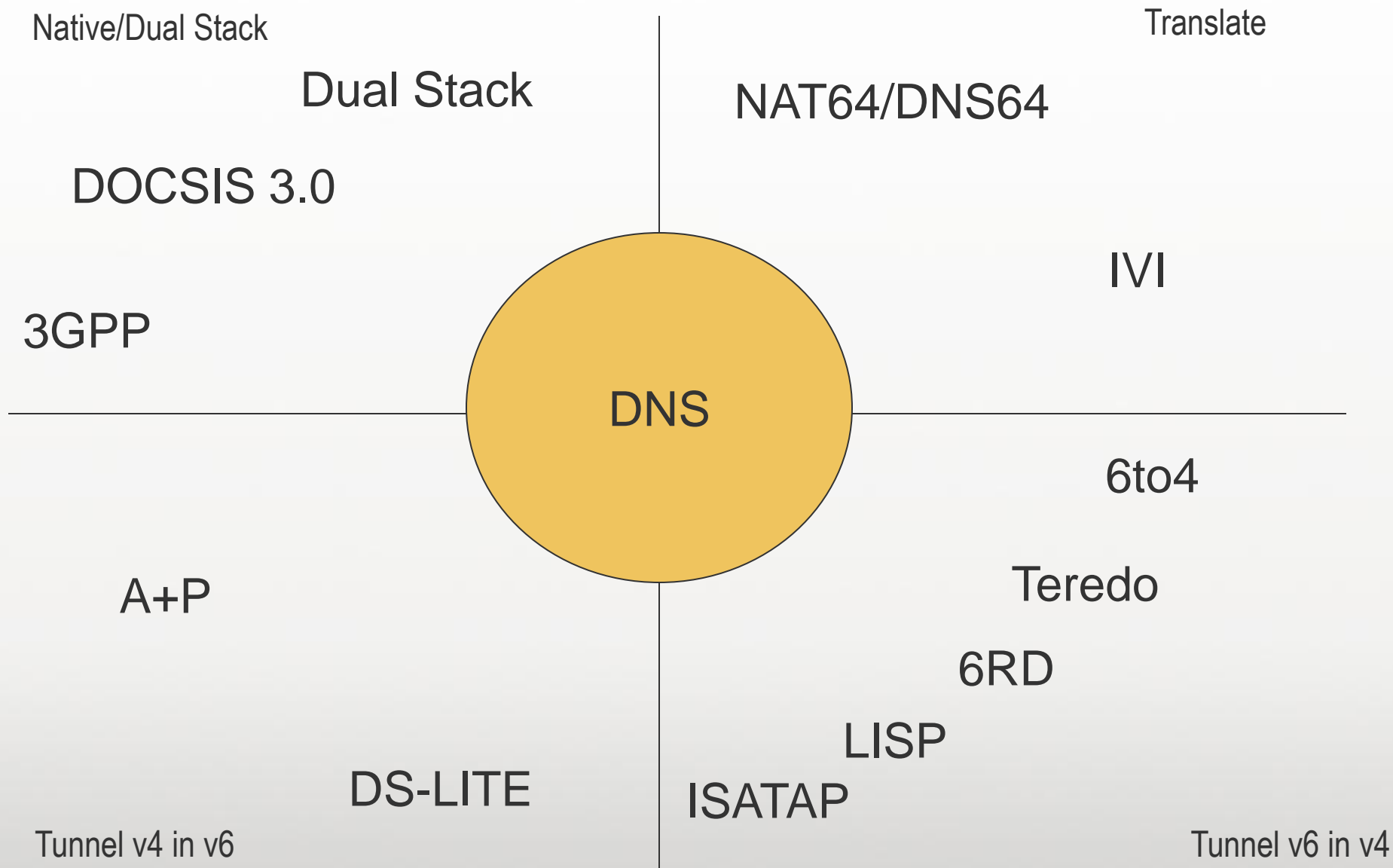
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Transition Mechanisms



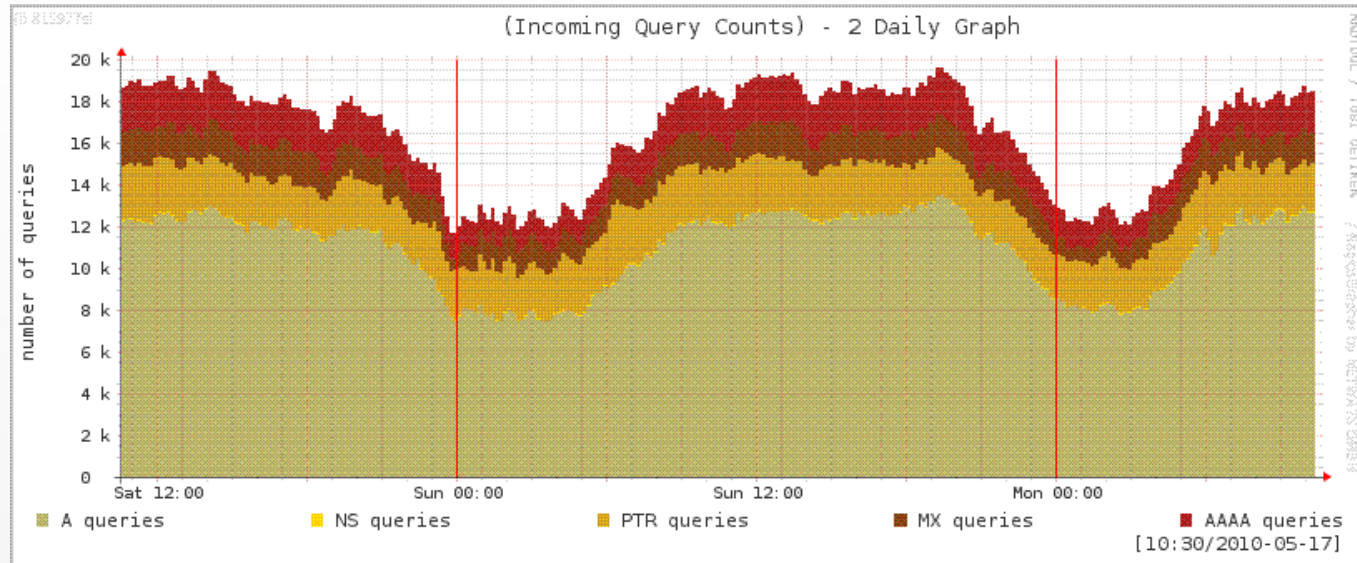
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x2 load on DNS



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getaddrinfo()



A

AAAA

- Some common misunderstandings and pitfalls about v6 and DNS:
- The network protocol (v4 or v6) is not linked to the record type (A or AAAA) that can be looked up.
- The network protocol (v4 or v6) used between the client and the recursive DNS is not related to the network protocol used between the recursive DNS and the authoritative DNS.
- If there is an outgoing v6 interface, then the DNS system will start to use it.

Secure64 IPv6 features



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- Basic features:
 - IPv6 interfaces (autoconfig and statically configured)
 - Syslog, Ping6, NTP, dig, SNMP
 - Routing protocols with IPv6 support
 - Denial of Service protection over IPv6

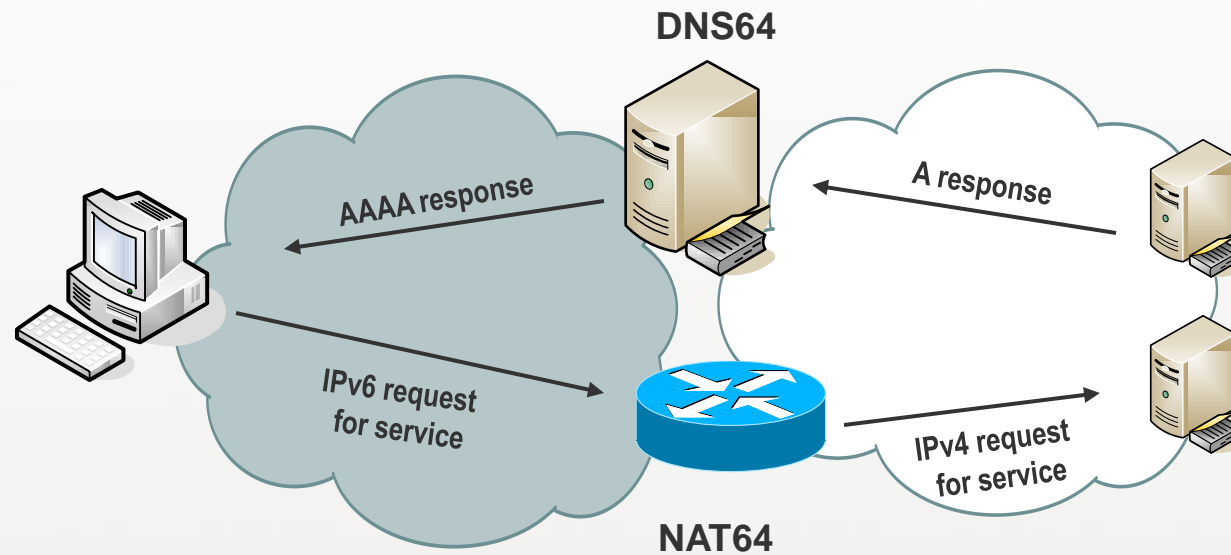
- Advanced features:
 - DNS64
 - Disable AAAA on IPv4 transport (the Yahoo! hack)

NAT64 / DNS64 Solution



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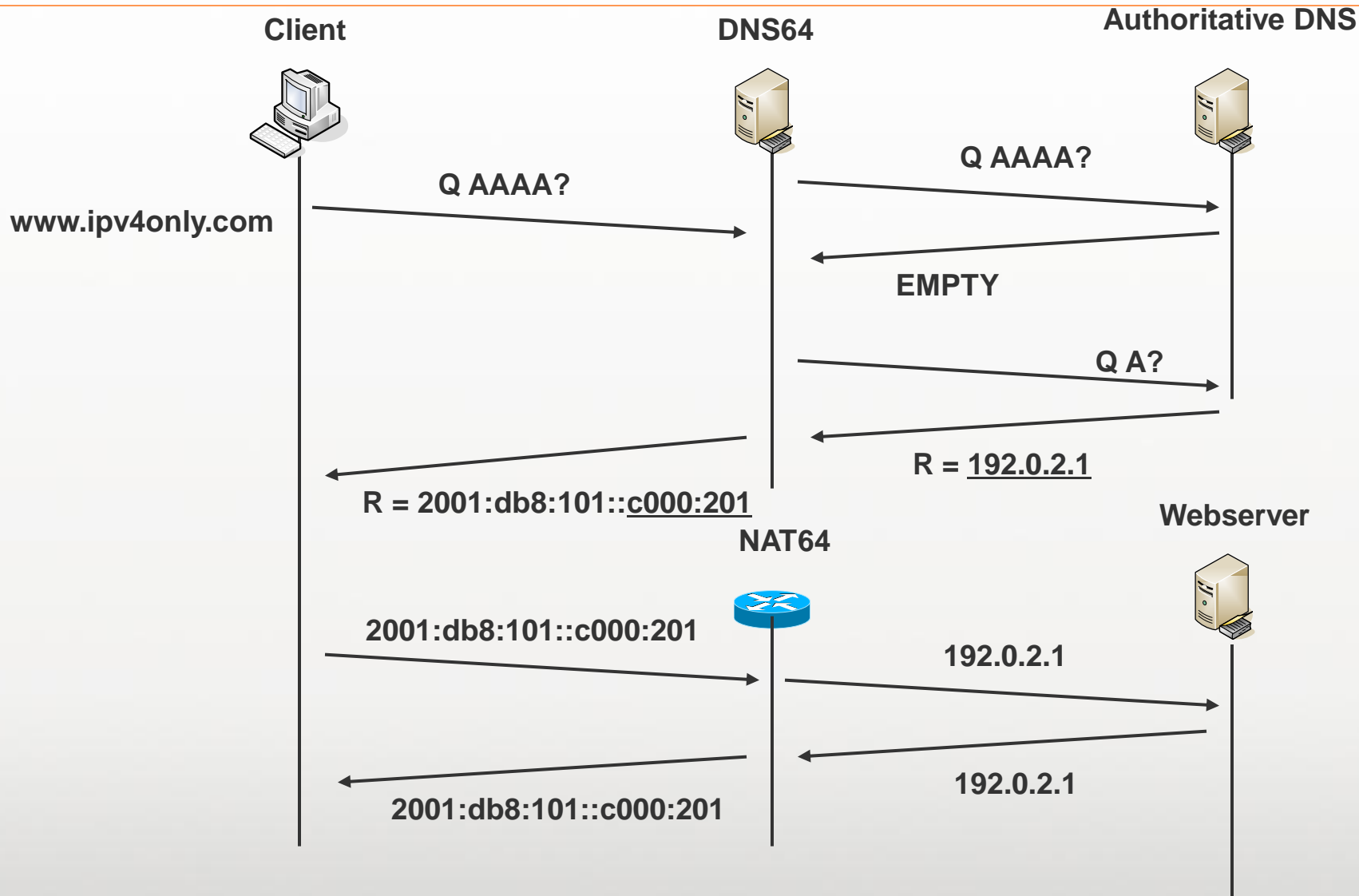
- RFC 6146/6147



NAT64 / DNS64 Under The Hood



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Secure64 DNS configuraton



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```
[view@Secure64]#> enable sysadmin
[sysadmin@Secure64]#> route default 10.10.5.1
[sysadmin@Secure64]#> route default 2001:DB8:1:5::1
[sysadmin@Secure64]#> route sym
[sysadmin@Secure64]#> ifconfig eth1 10.10.5.2 255.255.255.0
[sysadmin@Secure64]#> ifconfig eth2 2001:DB8:1:5::2/64
[sysadmin@Secure64]#> activate
[sysadmin@Secure64]#> save
[sysadmin@Secure64]#> show config
```

```
[view@Secure64]#> enable cachednsadmin
[cachednsadmin@Secure64]# edit cache.conf
  interface: 10.10.5.2
    interface: 2001:DB8:1:5::2
    outgoing-interface: 10.10.5.2
    outgoing-interface: 2001:DB8:1:5::2
    access-control: 0.0.0.0/0 allow
    access-control: ::0/0 allow
  dns64-prefix: 64:ff9b::/96
<CTRL-X to save and exit>
```

```
[cachednsadmin@Secure64]# stop cachedns
[cachednsadmin@Secure64]# start cachedns
```

Transition using translators (DNS64)



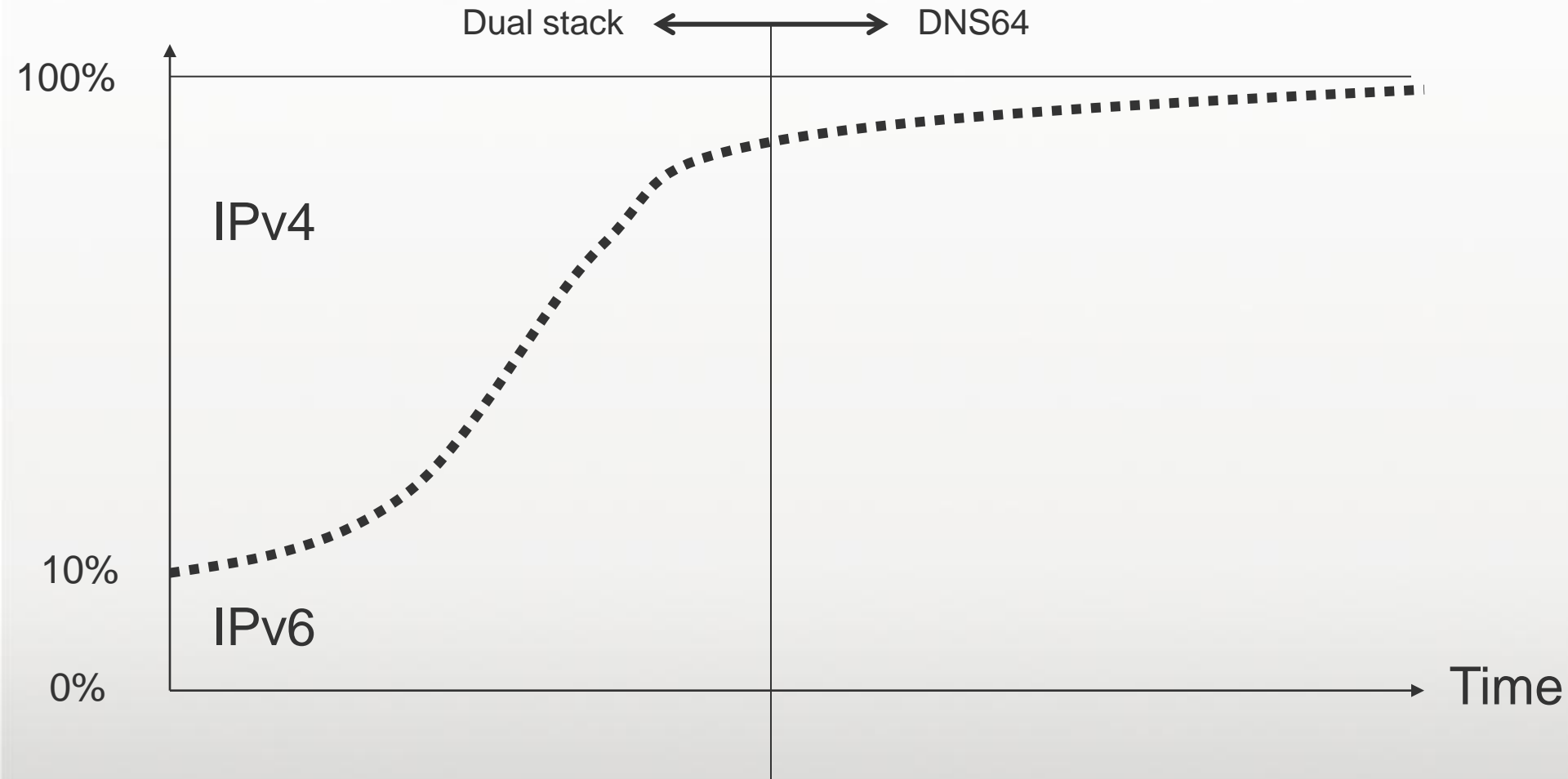
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- Good approach if you don't have enough IPv4 addresses for dual stack.
 - IPv6-only network on the client side!
 - User experience with NAT64 is (almost) the same as NAT44
-
- Stuff that's broken doesn't work.
 - Only one network to maintain.

DNS64 everybody will need it



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Additional DNS64 functionality



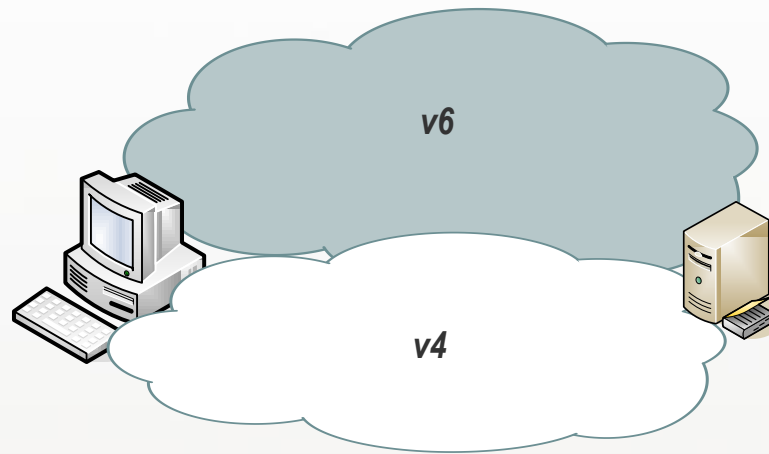
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- *Sticky clients*
 - *You don't want a client to change from one NAT64 gateway to another during a session*
- *Mixed deployments using views*
 - *Any combination of Dual stack, IPv4 only, IPv6 only*
- *Load balancing via DNS*
 - *Multiple DNS64 prefixes*
- *High availability*
 - *Provision multiple DNS servers to the clients*
 - *How can we take a NAT64 out of rotation?*

HTTP problem in details



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Today some content providers are not giving out AAAA unless you are on their white list because it might break 0.078% of IPv4 clients = could be millions of users and millions in revenue

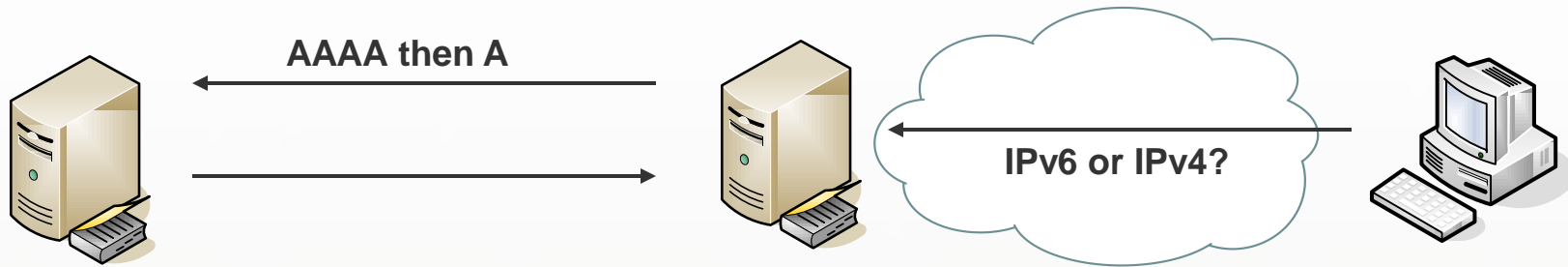
Content providers DNS decides if A or AAAA or both

- There are problems when client IPv6 connection is broken
 - Extreme slowdown as client retries AAAA and then A lookups
- Estimated 0.078% of clients have this problem
 - Some older Opera browsers, some older Apple OSes, etc.
 - Amounts to millions of users for some large content providers like Google, Yahoo, etc.
- This is a HTTP problem, not applicable for other protocols such as DNS and SMTP.

One Proposed Solution Using DNS



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- Caching side (ISP, consumer of content)
 - If query came in over IPv4, respond negatively to the AAAA request and wait for the A request

- Side effects:
 - Breaks DNSSEC
 - Turns off IPv6 for clients that can only do DNS queries over IPv4 (ie Windows XP)

- Future feature? Filter A over IPv6

- Useful Open Source Tools
 - ISIC6
 - ▶ Stack Integrity Checker
 - ▶ <http://isic.sourceforge.net/>
 - Resperf/dnsperf/dig
 - ▶ All work over Ipv6
 - Scapy
 - ▶ Packet Manipulation
 - ▶ <http://www.secdev.org/projects/scapy/>
 - THC
 - ▶ “The Hackers Choice” attack tools.
 - ▶ <http://thc.org/thc-ipv6/>



Questions?