IPv6 Challenges & Tactics for Content Providers

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IPv4

* **Internet Protocol version 4 (IPv4)**
* Fourth revision in the development of the Internet Protocol (IP) (RFC 791)
* IPv4 uses 32-bit (four-byte) addresses - 4294967296 (2^{32}) addresses
* Exhaustion had been significantly delayed by address changes such as
  * Classful network design (A,B,C,D and D)
  * Classless Inter-Domain Routing (/N),
  * Network address translation (NAT).

IPv6

* **IPv6** (**Internet Protocol version 6**) is a version of the Internet Protocol (IP) intended to succeed IPv4 (RFC 2460)
* IPv6 uses 128-bit addresses, for an address space of 2^{128} (approximately 3.4×10^{38})
* Eliminates the primary need for network address translation (NAT),

Domain Name Server (DNS)

* A DNS translates (or maps) the name of a resource to its physical IP address - typically referred to as forward mapping
* A DNS can also translate the physical IP address to the name of a resource - typically called reverse mapping.
* Two approaches for DNS:
  * A Database Stores different types of Resource Records (RR)
  * A TCP/IP Protocol and a client/server application
    * IPv4 or IPv6, TCP & UDP, port 53

Forward Lookup

Domain → IP

* IPv4:

```
www.example.com      IN      A              192.168.0.1
```

* IPv6:

```
www.example.com      IN      AAAA           2607:f0d0:1002:51::4
```

Reverse Lookup

IP → Domain

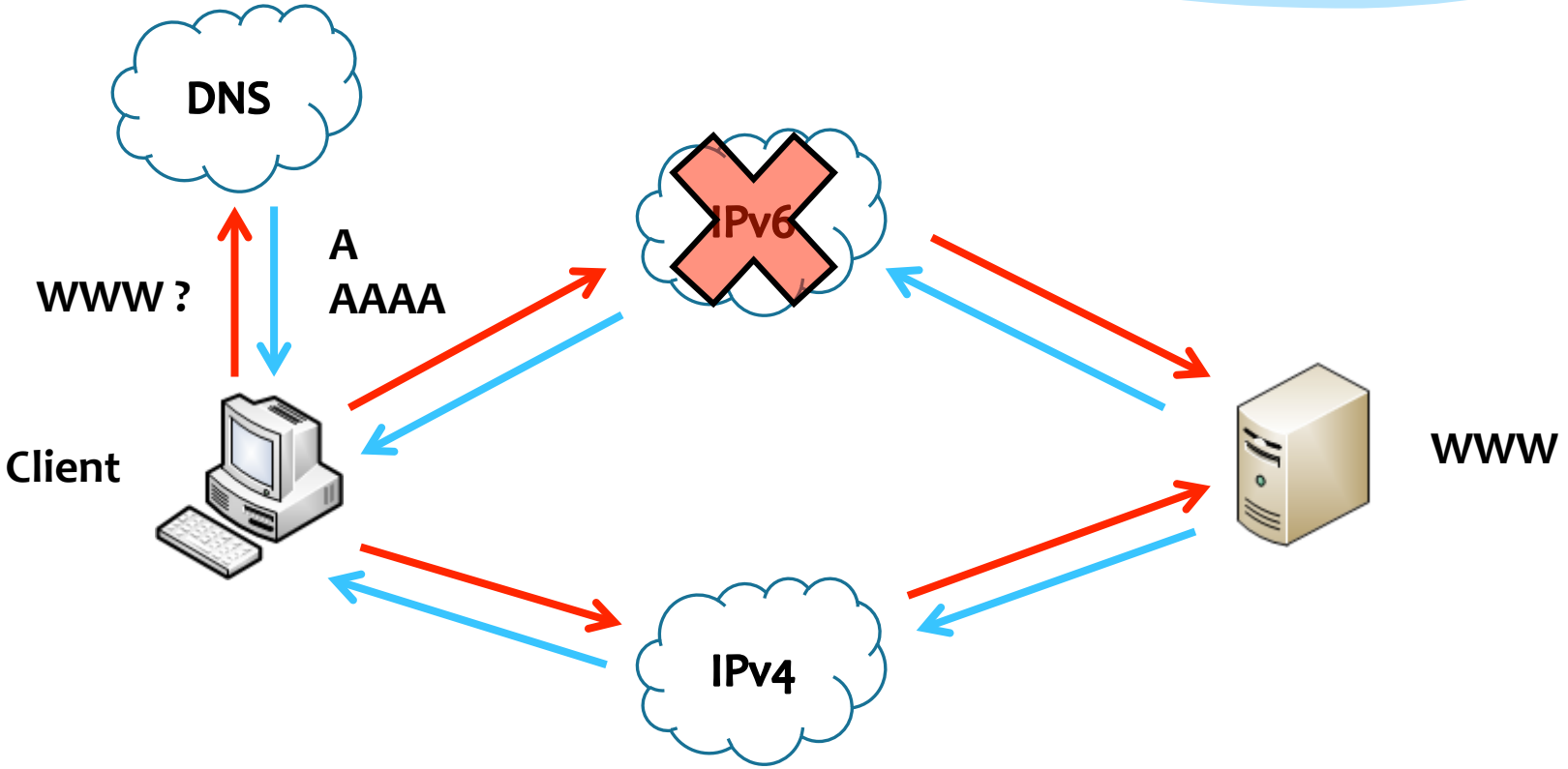
* IPv4:

```
1.0.168.192.in-addr.arpa.  IN     PTR    host.example.com
```

* IPv6:

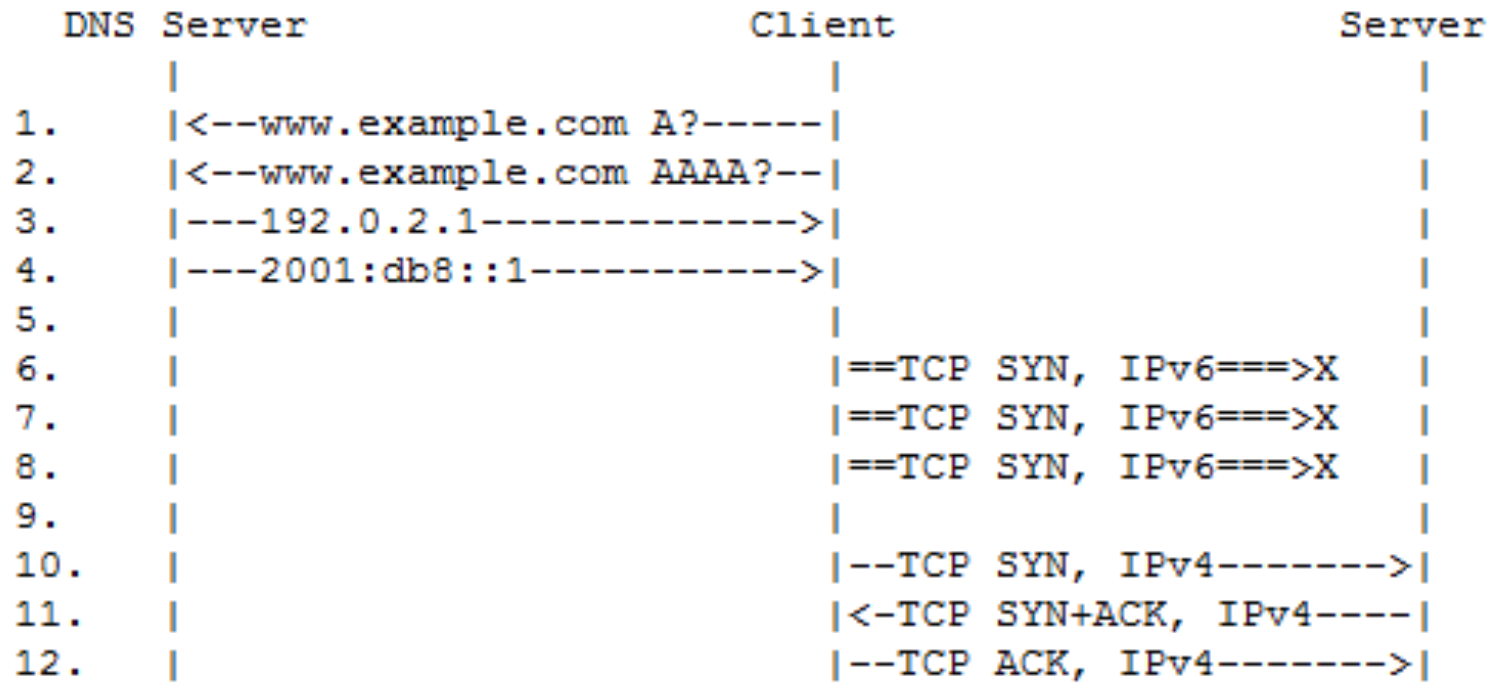
```
4.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.1.5.0.0.2.0.0.1.0.d.0.f.7.0.6.2.ip6.arpa
        IN      PTR     host.example.com
```

Which one to use IPv6 or IPv4 ?



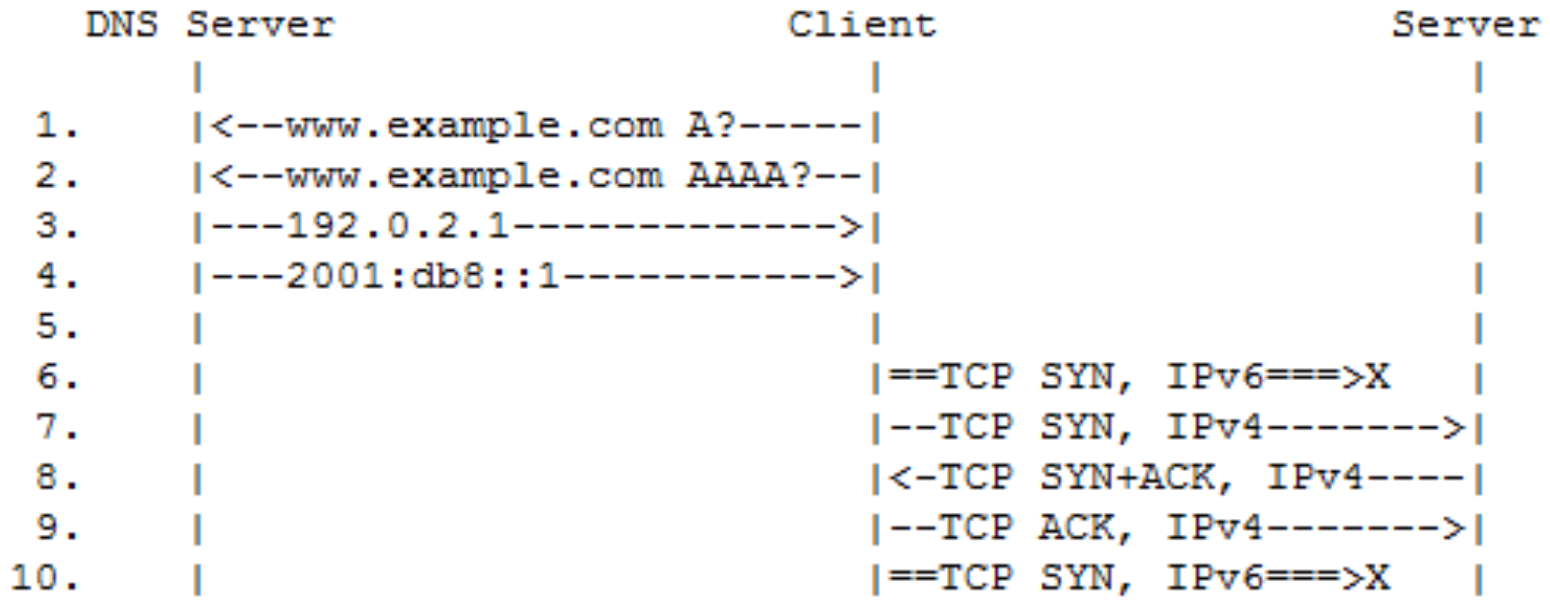
Happy Eyeballs Algorithm

* **Problem:** Delay When IPv6 is not Accessible



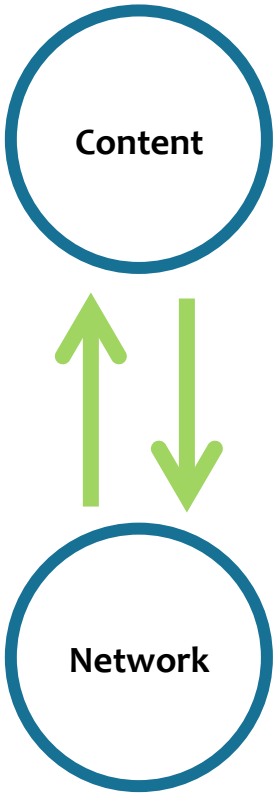
Happy Eyeballs Algorithm

* **Solution:** the client sends two TCP SYNs at the same time over IPv6 (6) and IPv4 (7)



Challenges When Transitioning Content to IPv6

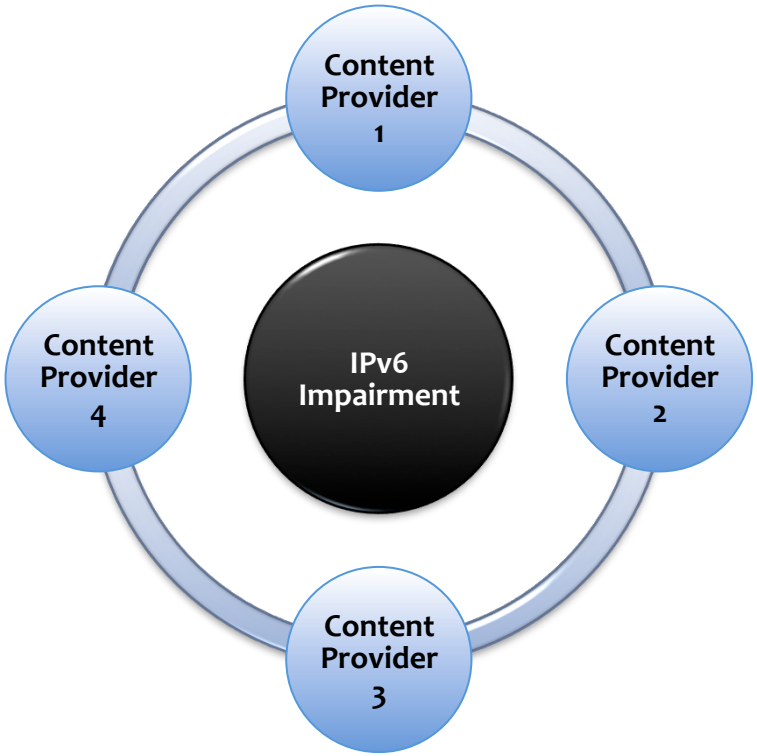
* The main objective is to make that content natively dual-stack enabled
* Technical, operational, investment challenges in being able to transition smoothly for all end users
  * Technical (poor performance and security concerns)
  * Operational (immature support process, procedure, system)
  * Investment (HW/SW upgrade, IPv6 solution , training, testing)



Content Transition Tactics

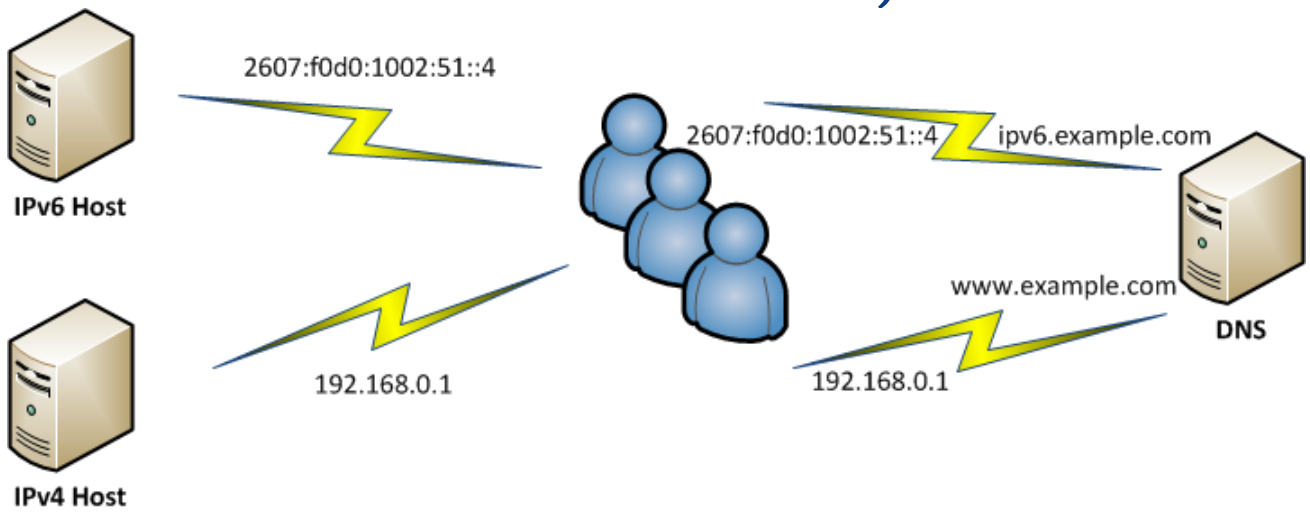
Solve Current End User IPv6 Impairments

* Content providers has little or no control over the network connectivity,
* One domain cannot do it alone,
* Difficult to motivate internet community members (sharing resources, time, cost),
* But, W6D shows internet community can work as a team to fix this issue
* Without progress in each part of the Internet ecosystem, networks and/or content sites may delay, postpone, or cease adoption of IPv6, or to actively seek alternatives to it.



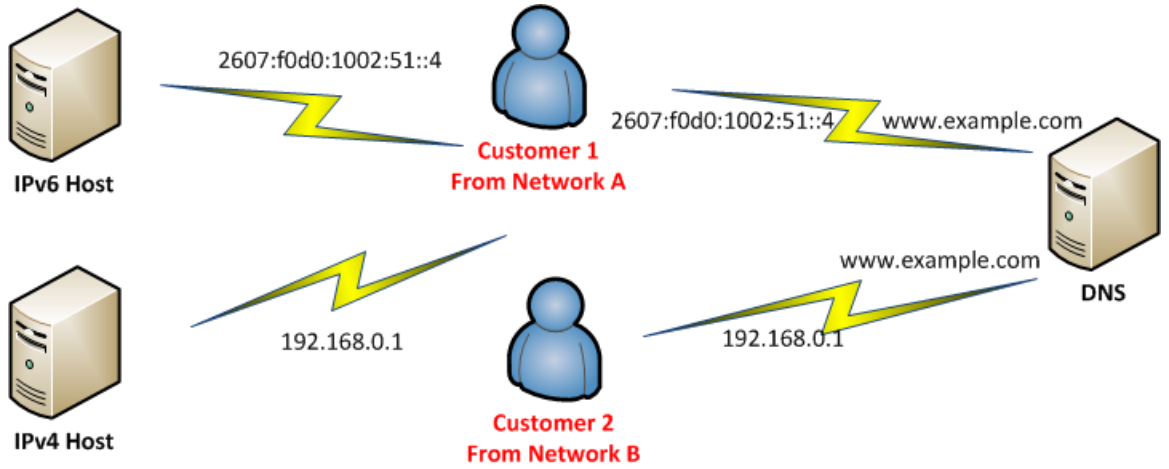
Use IPv6-Specific Name

* Use special FQDN to direct traffic to IPv6-ready host (ipv6.example.com)
* Enables the domain to **(1)** Gain IPv6 experience (Staff training, develop necessary procedures and operation tools) **(2)** Increase IPv6 use on a relatively controlled basis (ensure readiness of network and interconnect)



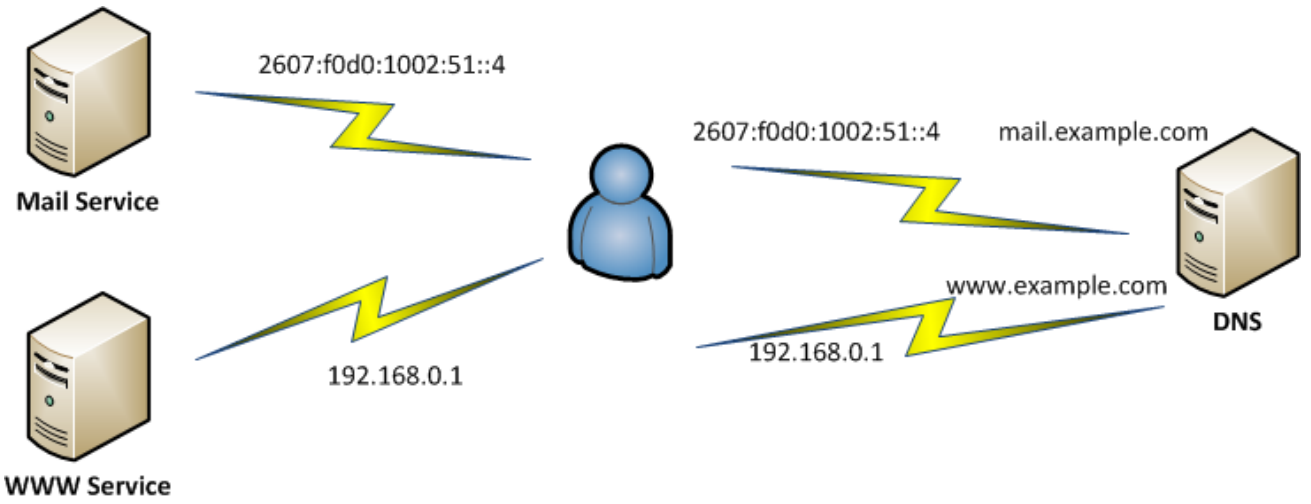
Implement DNS Resolver Whitelisting

* Done on the Authoritative DNS
* Selectively return AAAA resource records (RRs) to the IPv6-ready customers, otherwise it will give IPv4
* It can help a domain address operational maturity concerns without harming the non-IPv6 networks
* It does not fix the IPv6 issues, but avoid the customer who have them



Transition Directly to Native Dual Stack

* Have both IPv4 & IPv6 hosts for certain service
* Content provider can start with one service (mail service for example) and experience for a period of time. Then migrate other services gradually (www then ftp etc)
* This will give the content provider the ability to test & analyze any impact or effect on the traffic and/or the customer experience



Q & A

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