Web Design & Programming

Domain Name System

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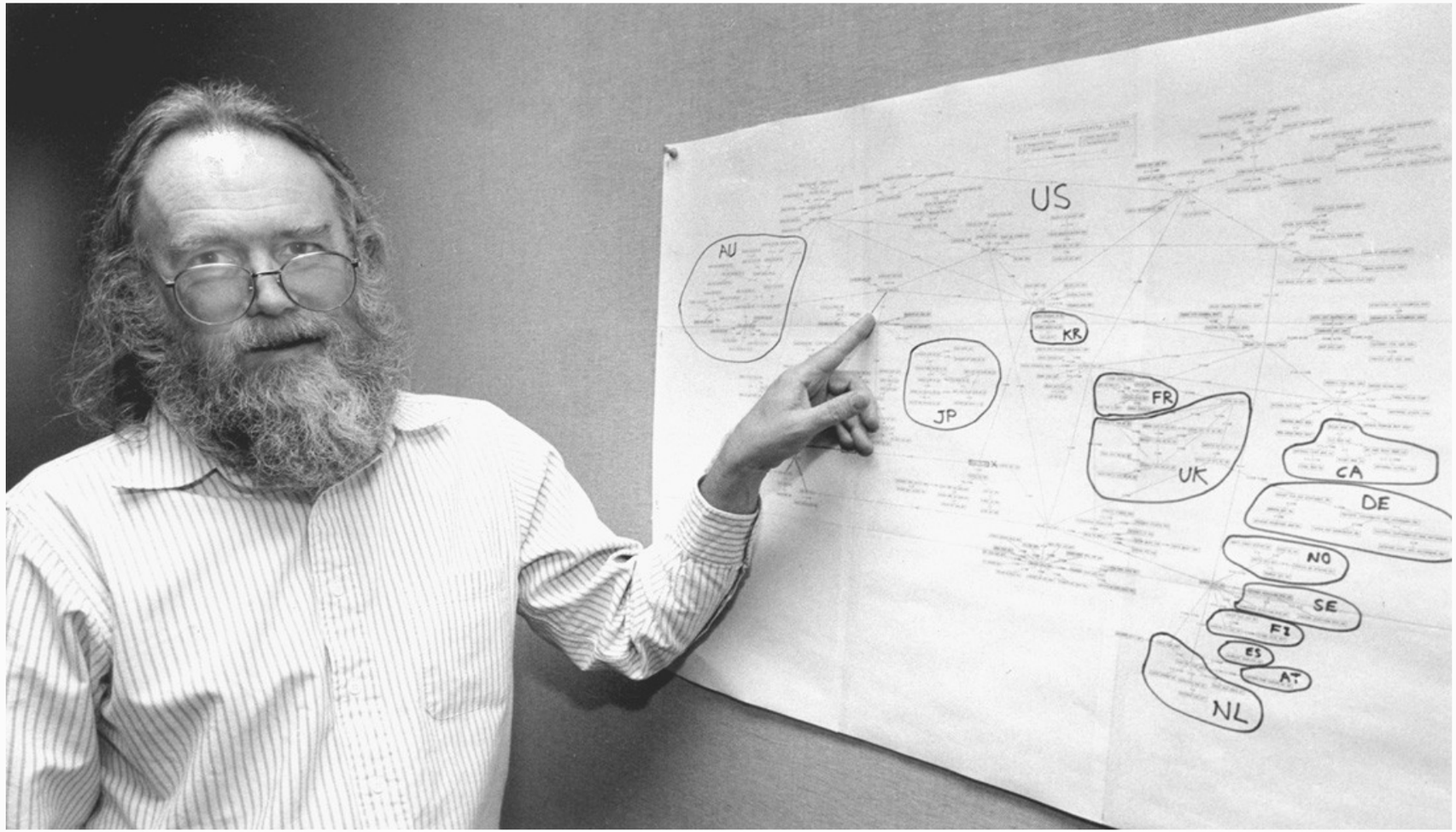
Why do we need DNS?

- Computers can talk to each other by using the Internet Protocol (IP), relying on IP addresses.
- Human beings are not very good at working with IP addresses.
- Some servers are used to host multiple websites, each one with different names (the server will still use only one IP address). Also some services are hosted by more than one server.
- Hence, we need a service to resolve names to IP addresses (and vice-versa): the Domain Name System.

History

- A long time ago, names and addresses were managed manually by Jon Postel.
- With the expansion of Arpanet, a better system was needed. Jon Postel asked Paul Mockapetris to evaluate five different solutions. Mockapetris came with another idea instead, the Domain Name System.
- DNS became official with RFC 882 and 883 in November 1983; many more RFC about DNS have been added since.



Jon Postel

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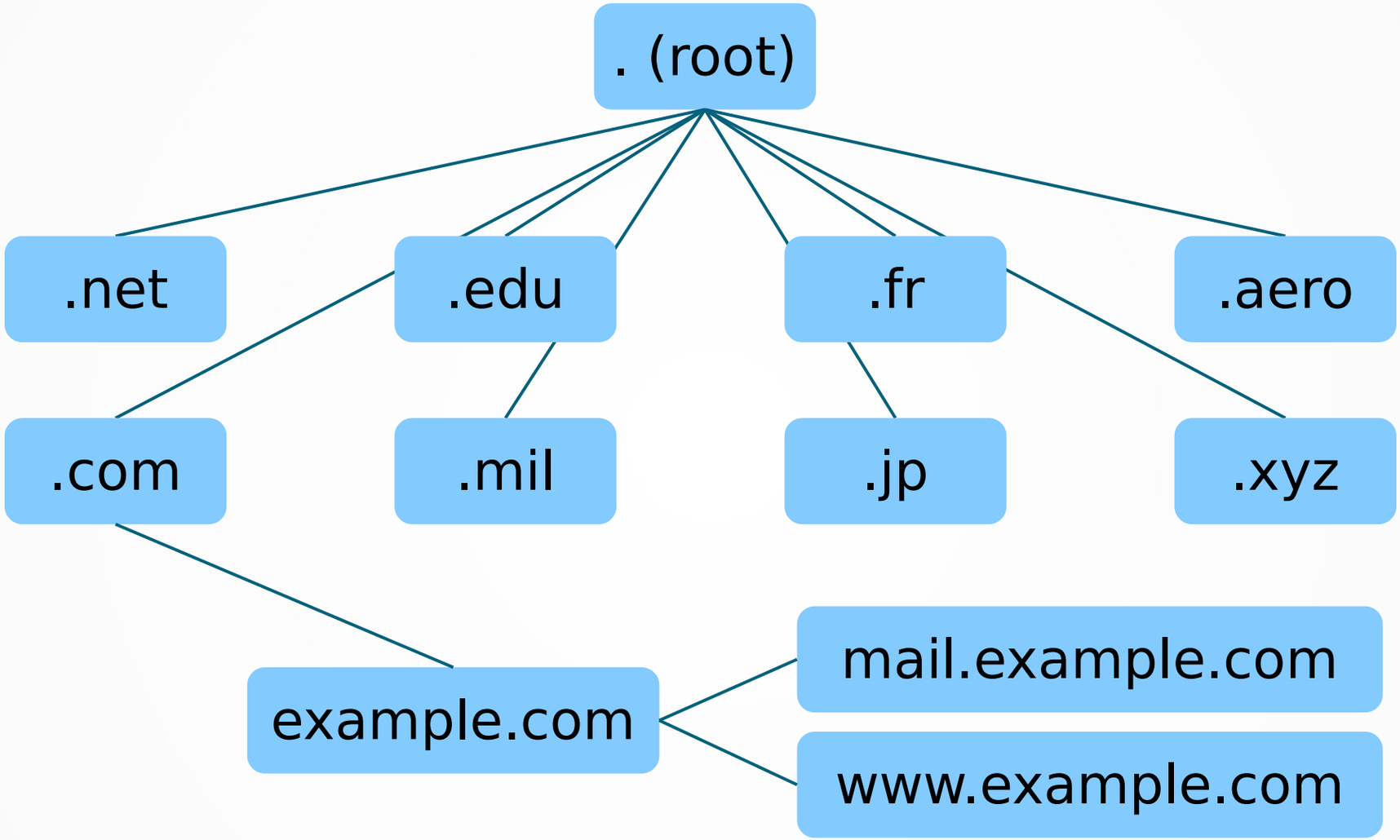
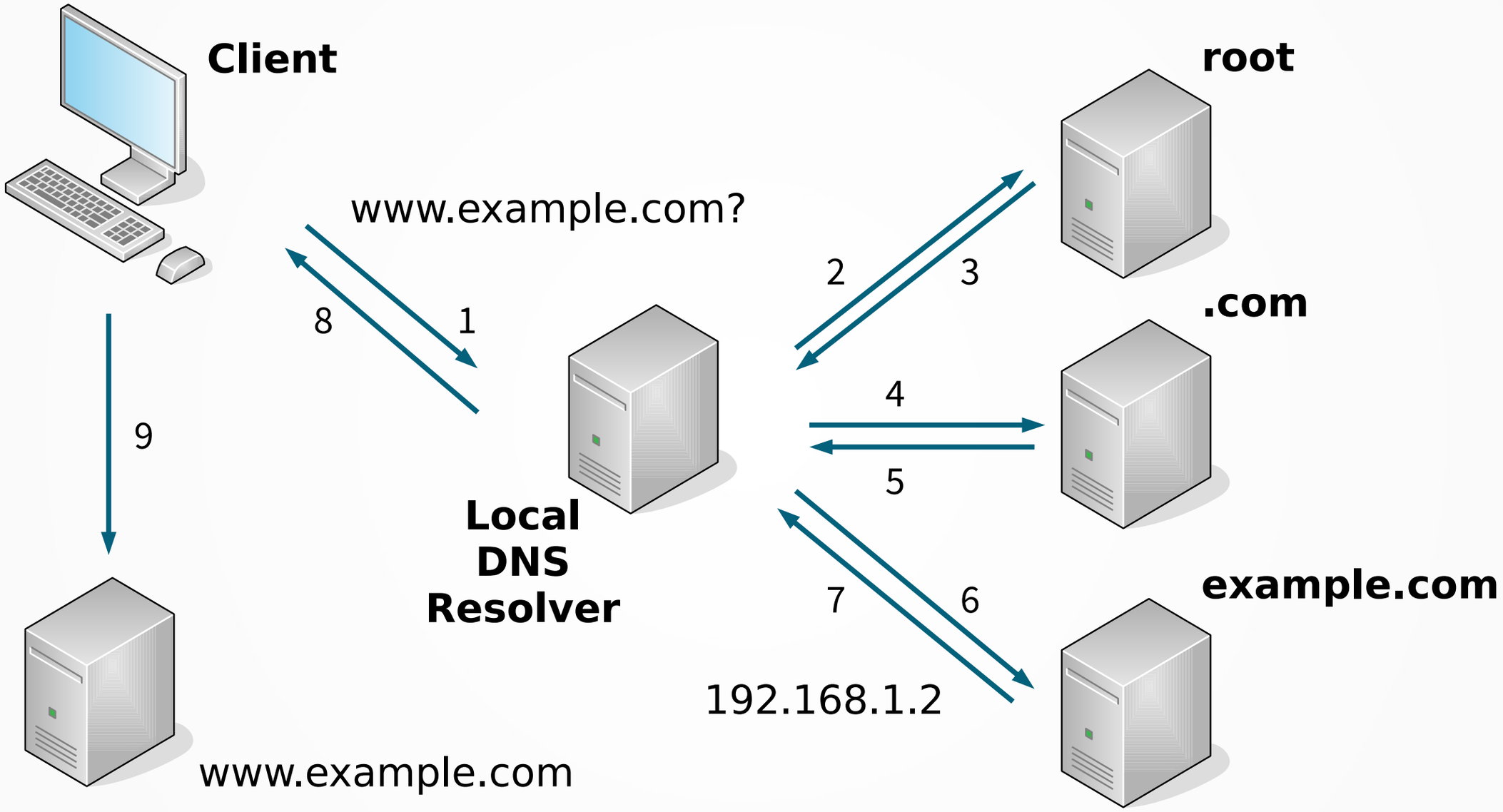
http://www.postel.org/pr.htm


. (root)
.net
.edu
.fr
.aero
.com
.mil
.jp
.xyz
example.com
mail.example.com
www.example.com

How does DNS works?

- Your computer (the client) asks the local DNS resolver: “I need to reach www.example.com do you know its IP address?”
- If the local resolver doesn’t know, it will ask the root. With that response the resolver will ask other servers, and eventually get a response.
- All of this in few milliseconds on average (relying on caching).
- DNS traffic uses UDP/53 and in some specific circumstances TCP/53.


Client
root
www.example.com?
2
3
8
1
.com
4
9
5
Local
DNS
Resolver
example.com
7
6
192.168.1.2
www.example.com

Internationalization

- Domains and records are not limited to the ASCII character encoding anymore. Arabic, Chinese, Russian and other alphabets can be used. Punycode is used to “translate” those names into ASCII.
- 日本語.jp → `xn--wgv71a119e.jp`
  (*Japan Registry Services Co.*)

DNS Resource Record Types

- SOA and NS
- A, AAAA, PTR and CNAME
- MX, TXT
- And many, many more

SOA and NS Records

- The Start of Authority (SOA) is the essential record to define a zone with the primary name server, a contact email address and various time values (in seconds) used by the secondary servers for memory caching.
- Name Server (NS) records will list all the DNS servers for a zone.

A, AAAA, PTR and CNAME Records

- The hostname for an IPv4 address is registered with an ‘A’ record; for an IPv6 address, an ‘AAAA’ record is used.
- The pointer from an IP address to a hostname is handled by a PTR record (*in-addr.arpa* and *ip6.arpa* special domains).
- CNAME records are used to create aliases for a hostname.

```
$ dig A www.example.com

www.example.com.          86400 IN CNAME web01.example.com.

web01.example.com.        86400 IN A     10.5.4.47


$ dig -x 10.5.4.47

47.4.5.10.in-addr.arpa. 86400 IN PTR   web01.example.com.


$ dig AAAA www.example.com

www.example.com.          86400 IN CNAME web01.example.com.
web01.example.com.        86400 IN AAAA  2001:db8:4:6b00:473:186:33:77
```

MX and TXT Records

- Servers accepting e-mails for a domain must be listed as *Mail Exchangers* in the DNS with MX records.
- Those records also provides a weight for each server; that is the priority for e-mail delivery (low value = high priority).
- TXT records are text records; some text records are used to prove the source domain (for email) or to access a third-party service (online applications).

Getting your own Domain Name

- Check for the desired name availability (think about alternate names as secondary choices).
- Create an account with the Domain Name Registrar of your choice (if possible).
- Once the domain is activated, create the appropriate DNS records for your servers.
- Do not forget to renew your domain registration.