MP8, HTTP, and DNS

CS 241

Nov 20, 2013

MP8 Overview

- **Goal**: Build a simple HTTP web server.

Working with HTTP

- On Monday, we looked at HTTP packets…

```
HTTP/1.1 200 OK
Content-Length: 23774
Content-Type: text/html
Server: Microsoft-IIS/7.5
Set-Cookie: ASPSESSIONIDAEEESRAB=PN[...]
X-Powered-By: ASP.NET
Date: Mon, 15 Apr 2013[...]
Connection: close

[23.22 KB of HTML]
```

Reading the HTTP Header

HTTP Considerations

- Data that comes in HTTP packets:
  - Web pages
  - Images
  - Your downloads
  - Buffered video (usually non live streaming)

- How do you deal with **binary data**?

DNS

- DNS (Domain Name System) translates domain names to IP addresses.
  - illinois.edu ➔ 128.174.180.122
  - cs.illinois.edu ➔ 130.126.112.3

- DNS works through a hierarchical lookup based on the **fully qualified domain name** (FQDN).
  - FQDN: **www.illinois.edu.**

DNS

- First step: **.**, a root name server
  - As of Feb. 2013, a total of 13 root name servers.
    - **A**: 198.41.0.4, **B**: 192.228.79.201, **C**: 192.33.4.12, …
    - *These IP address are fixed and almost never change!*
  - Responsible for maintaining a list of the DNS servers for all 20 top-level domains (TLDs) and 248 country code TLDs.
    - Ex: .com, .co.uk, etc
  - DNS Request: Where can I find **edu** ?
    - Response: Try 174.45.186.2

DNS

- Next: **edu.**, a TLD name server
  - Responsible for maintaining a list of the DNS servers for all edu domains.
  - DNS Request: Where can I find **illinois.edu** ?
- Next: **illinois.edu.**, a TLD name server
  - DNS Request: Where can I find **www.illinois.edu** ?
    - Its IP address is: **128.174.180.122**

DNS Caching

- If a lookup was required for every request:
  - RTT: . ➔ ask “edu.”
  - RTT: edu. ➔ ask “illinois.edu.”
  - RTT: illinois.edu. ➔ IP is “**128.174.180.122**”
  - 3x RTT before we can send the HTTP Request

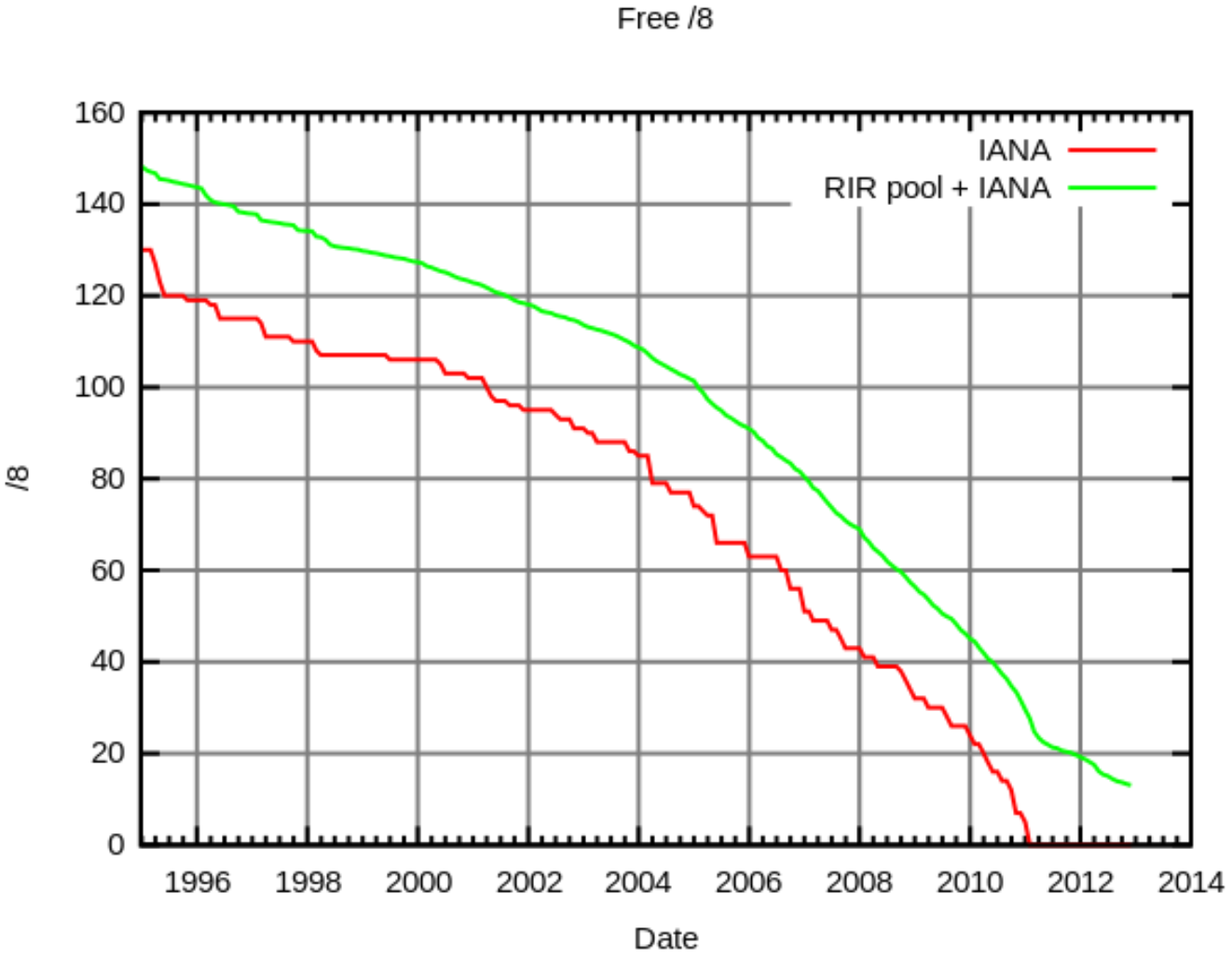
DNS Caching

- Solution: **DNS Resolvers**
  - Idea: Have DNS records cached at various logical hops.
    - First cache: Your computer
    - Next cache: Your ISP
    - Next cache: Your ISP's backbone provider
  - These sources are known as "non-authoritative", as they are not part of the official name servers.

DNS Resolvers

IPv4 Address Exhaustion

- **Problem**: IPv4 addresses are running out



Source: http://en.wikipedia.org/wiki/File:Ipv4-exhaust.svg

Network Address Translation

- **One Solution**: Network Address Translation
  - Allows multiple IP-enabled devices to connect using a single “public IP address”.