MP8, HTTP, and DNS

CS 241

Nov 20, 2013
MP8 Overview

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

Web Browsers

- Firefox
- Chrome
- wget

Your “MP8 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: ASPSESSIONIDAAEEESRAB=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.
• 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 addresses 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

Network Address Translation

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

<table>
<thead>
<tr>
<th>Private Address</th>
<th>Public Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC (192.168.0.2)</td>
<td>➔ 172.54.21.84</td>
</tr>
<tr>
<td>Laptop (192.168.0.3)</td>
<td></td>
</tr>
<tr>
<td>iPad (192.168.0.4)</td>
<td></td>
</tr>
<tr>
<td>Phone (192.168.0.5)</td>
<td></td>
</tr>
</tbody>
</table>

LAN: “Local Area Internet”