

CSSE2310/7231 — B.2

DNS + HTTP

DNS

Internet phonebook

- ▶ IP packets need to use IP addresses.
- ▶ People (and some systems) would prefer to use names.
- ▶ We need a way to map names→IP addresses.
 - ▶ `source.eait.uq.edu.au`→130.102.79.223

Internet phonebook

First version:

1. Make a text file with every computer on the internet and their addresses in it.
 2. Put a copy of the text file on every computer using the internet.
 3. Send out updates when the internet changes
-
- ▶ It's called a "hosts file" and it is likely `/etc/hosts`
 - ▶ or `C:\Windows\System32\drivers\net\etc\hosts`
 - ▶ It's still used (but not expected to have the whole internet in it).

DNS — distributed phonebook

DNS = Domain Name Service

- ▶ Each “domain” will have at least two servers which know the name→address mapping for that domain.
- ▶ Have a collection of root nameservers (computers just need know some of these¹).
- ▶ The root servers know the information for the nameservers for the TLDs²
 - ▶ .com, .net, .au, .uk, ...
- ▶ Those servers each know the nameservers for subdomains (eg theforce.net, .com.au, .net.au, ...)

¹since they don't have a anyone to ask

²Top level domains

DNS — distributed phonebook

Suppose you want to contact `source.eait.uq.edu.au`:

1. A root server knows the NS for `.au`
2. `.au` knows `edu.au`
3. `edu.au` knows `uq.edu.au`
4. ...
5. `source.eait.uq.edu.au` known

DNS queries

Queries are UDP messages.

Servers could operate in:

- ▶ Iterative — “I don’t know but go ask that machine”
 - ▶ .au NS ←source.eait.uq.edu.au
 - ▶ .au NS →Go ask .edu.au
- ▶ Recursive
 - ▶ I’ll go and find out for you.
 - ▶ Local nameservers are probably doing this.

Notes

- ▶ DNS responses have TTL
 - ▶ Name servers can cache answers to reduce load
 - ▶ More stable mappings will have longer TTL
- ▶ Load balancing
 - ▶ Different requests for the same name could get different answers.
 - ▶ Give answers which are close to the query source (eg CDNs³)
- ▶ Change machine without changing contact details
- ▶ DNS domains are independent of networks
 - ▶ Nothing requires `www.uq.edu.au` to have an IP address in the `130.102.0.0/16` network.

³Content Distribution Networks

Q: How to get a domain?

A: Convince the super domain to add you.

- ▶ There may be multiple companies who will do this.

HTTP

HTTP

HTTP = HyperText Transfer Protocol

- ▶ The protocol for shipping web stuff around
- ▶ Currently v1.1
- ▶ Not the same as HTML⁴ (for writing pages)
- ▶ Runs on top of TCP (So it's layer 5)

⁴HyperText Markup Language

netcat for fun and profit

```
echo -e "GET / HTTP/1.1\n\n" | nc itee.uq.edu.au 80
```

And the server responds with:

```
HTTP/1.1 400 Bad Request
Server: nginx/1.10.3
Date: Tue, 08 Oct 2019 07:13:36 GMT
Content-Type: text/html
Content-Length: 173
Connection: close
X-Frame-Options: SAMEORIGIN
X-Request-Id: bdldb076aaubj37i3lrg
```

```
<html>
<head><title>400 Bad Request</title></head>
<body bgcolor="white">
<center><h1>400 Bad Request</h1></center>
<hr><center>nginx/1.10.3</center>
</body>
</html>
```

Request

We sent:

- ▶ GET /
 - ▶ GET == I want a page (there are other “methods” such as POST)
 - ▶ / == This is the name of the page
- ▶ HTTP/1.1 == the protocol we will be using
- ▶ A blank line

Response

We got:

- ▶ HTTP/1.1 400 Bad Request
 - ▶ HTTP/1.1 == Response is in this protocol
 - ▶ 400 == status code
 - ▶ Bad Request == Readable version of the status
- ▶ Headers (key: value pairs)
 - ▶ Content-Type: text/html == what sort of file is being sent back
 - ▶ Content-Length: 173 == how big is the file
- ▶ blank line
- ▶ HTML content telling us it was a bad request (in case we are displaying the result).

Fix request

```
echo -e "GET /index.html HTTP/1.1\nHost: itee.uq.edu.au\n\n" |  
nc itee.uq.edu.au 80
```

- ▶ There is one compulsory request header in HTTP/1.1 (Host).
- ▶ A browser would send a lot more information.

Reponse

```
HTTP/1.1 301 Moved Permanently
```

```
...
```

```
Location:  https://itee.uq.edu.au/index.html
```

```
...
```

- ▶ This is not an error.
- ▶ It is telling us that we should request it under a different name.
- ▶ Your browser would make a new request automatically.

So we would need to ask again using an encrypted channel to get the page.

No https?

We need a site which doesn't insist on https.

```
echo -e 'GET / HTTP/1.1\nHost: www.theforce.net\n\n' |  
nc theforce.net 80
```

Tutoring

If you are interested in tutoring any course in EAIT:

<https://tutor.eait.uq.edu.au>

Current status = "APPLICATIONS OPEN SOON."

Tutoring

- ▶ ITEE needs tutors
 - ▶ People graduate
 - ▶ 2310 is running both semesters in 2020.
 - ▶ 1001, 2010, 2002 are already in both.
- ▶ In earlier courses, you are often in teams.
- ▶ No you don't need a 7, or a 6 . . .
 - ▶ People having struggled with concepts (probably) makes them useful.
 - ▶ You don't need to be an extrovert
- ▶ Ask previous tutors about what it's like.
- ▶ Apply for multiple courses.
- ▶ Don't hassle coordinators