What is the Internet

Internet is a computers that can communicate

Each computer has an address - like mail or deliveries

- local traffic goes to a local hub
- local hub sends stuff for outside to a higher hub
- until a hub has the destination "inside"
- sends to the right lower hub

There is a lot of redundancy, not just one path

Internet was a US Defense Dept exercise, to survive interruptions. (Like nukes)

Internet Delivery

Internet Protocol (IP) addresses are not for humans

Domain Name System (DNS) is how to turn a name into an IP address
https://www.ultratools.com/tools/dnsLookupResult

Humans use names like `www.google.com`

Each "dot" separates a level in reverse

- ".com" knows all the domains inside it
- "google.com" knows all the domains inside it

Three is normal, but more depth is supported.

Traffic Protocols

Looking up DNS entries is one kind of traffic over the Internet

There are many others. Examples:

- Email
- Database
- Many online games
- Web

Internet is down!

"The internet is down" - Probably not

Could be

- their local internet routing is down
- some local web issue is down
- a provider used by many (example: Amazon) is broken, taking a lot of web sites down

But it's very rare for any notable portion of the Internet itself to be down.

Don't be that person

But don't tell be that person

The one that tells them they are wrong

We all know what they mean

What is a server?

This is really hard. **https://jvns.ca/blog/2019/12/26/whats-a-server/**

A server can be

- a program that responds to requests
- the machine that runs that program
- a virtual machine running on a physical machine

A server can run a server running a server

Generally, for this class a server is the program

Web Request Response

For the Web

- A client (usually a browser) makes a **request**
- A server gets the request and gives a **response**

Each request gets one response.

Only with special preparations and moving outside basic web can you get anything else.

Bad cases on the web

- A stock-ticker app that is told when stocks change
- A weather app that is told when weather changes

Both of these worked very poorly on the early web.

You couldn't be told of changes, so you had to ask repeatedly and frequently.

That is a lot of pointless traffic.

Web was for linking scientific papers

- Text
- linking back and forth
- readable on different platforms

Not WYSIWYG

- H - Hyper
- T - Text
- T - Transfer
- P - Protocol

Web provided unique benefits

- Common port (80 for HTTP, 443 for HTTPS)
    - Meant once you got through a firewall, you had access to everything
- Not tied to a particular appearance
- Tolerant of bugs/typos
- Human readable
- Searchable

Web was searchable

- A program (crawler, spider, bot) reads a page
- Makes a list of all the links on that page
    - Adds any new links to list of pages to crawl
- Reads the text of the page and save info (index)
- Repeats with next link on list

Users go to site with index, enter search terms

- Program gets search terms
- Program uses index to get matches
- User sees list of matching links

Web is stateless

Each request is considered by itself

- without respect to previous requests

Can go straight to any link

- without passing through others

What about requiring login?

Isn't login stateful? (not stateless)

Yes and no. The *protocol* doesn't enforce that.

- Request comes in
- Based on info IN REQUEST, server decides:
    - send you elsewhere (redirect)
    - show you alternate content (login screen)
    - show you the requested material (content)

There has to be information **in** the request to let the server decide if you are logged in.

There is no state in the **handling of** the request.

Browser Rendering

Not every web client is a browser, (a spider is a web client and not a browser)

Browsers, after they get the content, will decide what to do with it

Often this means rendering an HTML page

But it could be displaying an image, playing a sound file, showing a PDF, saving a file

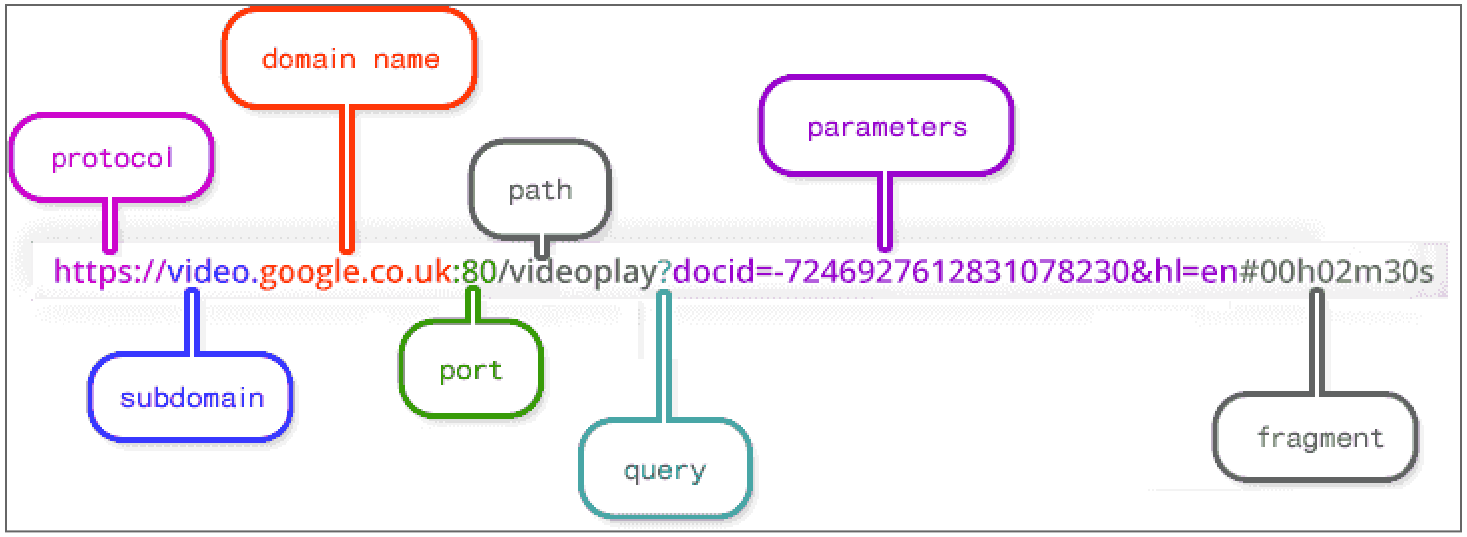
What is a URL?

A Uniform Resource Locator (URL) tells you what something on the internet is (identifies it) and how to find it (locates it).

http://catalog.northeastern.edu/graduate/engineering/multidi systems-msis/

Often called a `Web Address`, though they cover more than the web

Parts of a URL


domain name
protocol
path
parameters
https://video.google.co.uk:80/videoplay?docid=-7246927612831078230&hl=en#00h02m30s
subdomain
port
query
fragment

From **https://doepud.co.uk/blog/anatomy-of-a-url**

Fully Qualified

A URL with all the parts is known as "Fully-Qualified"

Without all the parts, it might just be a path

That path might be "absolute" or "relative"

Absolute Path

Absolute Paths are different paths on the same server

- a different query (params and hash/fragment)

Absolute path is taken from some "root" of the server.

This is NOT the "root" of the file system.

The "document root" is how the web server treats requests for the "root".

```
<img src="/images/complex_url.png">
```

Relative Path

A Relative Path is based on navigation from the path of the currently loaded page.

- `<img src="cat.png"/>`
- `<img src="images/cat.png"/>`
- `<img src="../images/cat.png">`

Paths

What fully qualified urls would match these if you were on `http://example.com/foo/index.html` and `http://example.com/bar/images/index.html`

- `<img src="cat.png"/>`
- `<img src="images/cat.png"/>`
- `<img src="/images/cat.png"/>`
- `<img src="../images/cat.png"/>`
- `<img src="images/../cat.png"/>`

Summary - Part 1

- Internet vs Web
- Internet routing
- DNS/Domain names/subdomains
- Web is request/response
- Web is stateless
- Searching isn't built in
- Searching is easy because stateless

Summary - Part 2

- URLs can be fully qualified or not
- A path can be absolute or relative
- Paths in URLs taken from document root
- Browsers render a page after getting the data
- Not all clients are browsers
- Not all data is rendered