HTTP in Action

Experience HTTP

The Exercises

1. Use netcat as HTTP server. Send a request from web browser. Send HTTP response using netcat.

   So you can see what a web browser <u>really</u> sends.

2. Use netcat as web client. Send a request to a real web server.

   So you can see what a web server <u>really</u> sends.

3. Redirect a web browser using HTTP response codes and Location header.

Send & view HTTP using netcat

`netcat` (nc) or `ncat` are tools that let you:

- manually send and receive TCP packets

- be a server that accepts client connections

- "netcat" (nc) is included on Linux and Mac OSX. Windows users: use ncat instead.

- "ncat" is newer implementation that supports SSL/TLS. Available for all OS.
  `https://nmap.org/ncat/`
  You can download executable app as a ZIP file (install yourself) or Windows setup file. This may vary over time.

Exercise 1: Use netcat as a server

In a terminal window. run netcat or ncat as a TCP server listening on port 8080

```
netcat -v -l -p 8080
```

- **-l** means listen for connections, **-v** means verbose

- You can use any free port number 1024 - 65535.
  You must be *root* (*admin*) to use ports 1-1023.

- To receive a request from a *different* host, make sure there is no firewall blocking tcp port 8080 (or 80).

What is my browser sending?

Open a web browser and send a request to your local
  server:

`http://localhost:8080/make-my-day`

(use the actual port number netcat/ncat is listening on)

You must `http`, not `https` (encrypted http).

If you use https, the request shown in netcat/ncat
  windows will look like gibberish.

What did the netcat server receive?

The netcat console should print something like this:

```
GET /make-my-day HTTP/1.1
Host: localhost
Connection: keep-alive
User-Agent: Mozilla/5.0 (X11; Linux x86_64)
   AppleWebKit/537.36 (KHTML, like Gecko)
   Chrome/69.0.3497.81 Safari/537.36
Accept:
   text/html,application/xhtml+xml,application/xml;
   q=0.9,image/webp,image/apng,*/*;q=0.8
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9,th;q=0.8
```

The Browser is Waiting for a Reply

You can see the browser is waiting for a reply.

We will use netcat to send a reply.

You are a human web server!

Send a Reply using HTTP protocol

In the netcat cmd window, type a reply using HTTP.

First line **must** be "`HTTP/1.1 200 OK`"

The body of the reply is HTML.

HTTP/1.1 200 OK

Content-type: text/html

                              `<--blank line`

<html><body>

<h1>Hello, Web Surfer</h1>

(you can send more stuff as html)

(more stuff and will be appended to the browser page as you send it). Press CTRL-C to stop the server.

What does a *real* web server send?

Now we know what a request <u>from</u> a web browser looks like.

What does a *real* reply from a **real** web server look like?

Exercise 2: Use netcat to send http request

Send an HTTP request to http://cpe.www.ku.ac.th/

You must enter the HTTP request yourself !

```
cmd> netcat -v www.cpe.ku.ac.th 80
GET / HTTP/1.1
Host: www.cpe.ku.ac.th
(enter a blank line)
```

- -v means verbose. Netcat will print a message when you are connected.

- Another way: `curl -v http://www.cpe.ku.ac.th/`
  curl can also use https.

What does server's reply mean?

What does the reply mean?

```
HTTP/1.1 301 Moved Permanently
Server: nginx
Location: https://www.cpe.ku.ac.th/
Content-Length: 178
Content-Type: text/html
...  (more header and body)
```

- Status codes 301, 302, and 303 are redirects

- A web browser will automatically go to the new URL.

- Server "leaked" some info: it's running nginx server

Plain "http" sites are hard to find

Entire web is moving to https only.

Almost any http request will be redirected to an https URL.

But there are a few. Try: `www.rd.go.th`

`cmd>` **netcat -v www.rd.go.th 80**

GET / HTTP/1.1

Host: www.rd.go.th

What does the response say?

Whose web site is this?

Can <u>We</u> Redirect a Browser?

Exercise: Use netcat to redirect web requests to Facebook.

1. Start netcat in listening (server) mode:

   cmd> **netcat -v -l -p 8080**

2. Use a web browser, goto **http://localhost:8080**

Redirect the Browser

3. Redirect the browser to Facebook (or anyplace).
   Send status code 302 Moved Temporarily (**not** 301).

   cmd> **netcat -v -l -p 8080**
   Listening on 0.0.0.0 (family 0, port 80)
   Connection from localhost 44240 received!
   HTTP/1.1 302 Don't Bother Me
   Location: https://facebook.com

   (blank line)

   If you send status code 301 (Moved Permanently) the web browser will <u>always</u> go to Facebook instead of localhost.

Did the Browser obey your redirect?

Browser should follow 302 Redirect to new Location.

You can also send a message in the response body.
In case the browser doesn't follow the redirect.

```
HTTP/1.1 302 Sorry, humans not allowed
Location: https://facebook.com
Content-type: text/plain

Only robots allowed.
Try https://facebook.com instead. :-)
```

Optional Exercises

1. Redirect a friend's web browser.

2. Redirect from inside a web page.

3. How many requests on a page?

4. View page-load statistics using Chrome or Firefox Developer Tools.

   - see how much stuff is downloaded for a single page!

Can you Redirect your Friend's Browser?

Can you get a friend to connect to your netcat server,

and redirect his browser to facebook.com?

Some issues:

1. Friend needs to know your IP address.
   Type `ifconfig` or `ipconfig` to view it.

2. Your TCP port must not be blocked by firewall running on your computer. Windows: use Control Panel to create an exception`.`

3. KUWIN may block wifi-to-wifi connections (called Wifi isolation)

Redirect inside a Web Page?

In some situations you may want to use redirect a single web page.

You can also add a delay and display a text message:

```html
<html>
<head>
<meta http-equiv="refresh"
    content="5; URL='https://facebook.com'" />
</head>
<body>
<h2>You will be redirected in 5 seconds.</h2>
</body>
</html>
```

One page, many http requests

How many HTTP requests are needed to show this page?

```
<HTML>
<link rel="stylesheet" href="stylesheet.css">
<!-- Bootstrap makes my page look cool. -->
<link rel="stylesheet"
  href="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.7/css/bootstrap.min.c
  ss">
<BODY>
<h1>My vacation</h1>
<p>
For vacation we went to <a
  href="http://www.unseen.com/bangkok">Bangkok</a>.
We visited <em>Wat Phra Kaeo</em>, and took this photo:
<br/>
<IMG src="images/watprakaew.jpeg" alt="Wat Phra Keao"/>
```

How Many Requests to Load a Site?
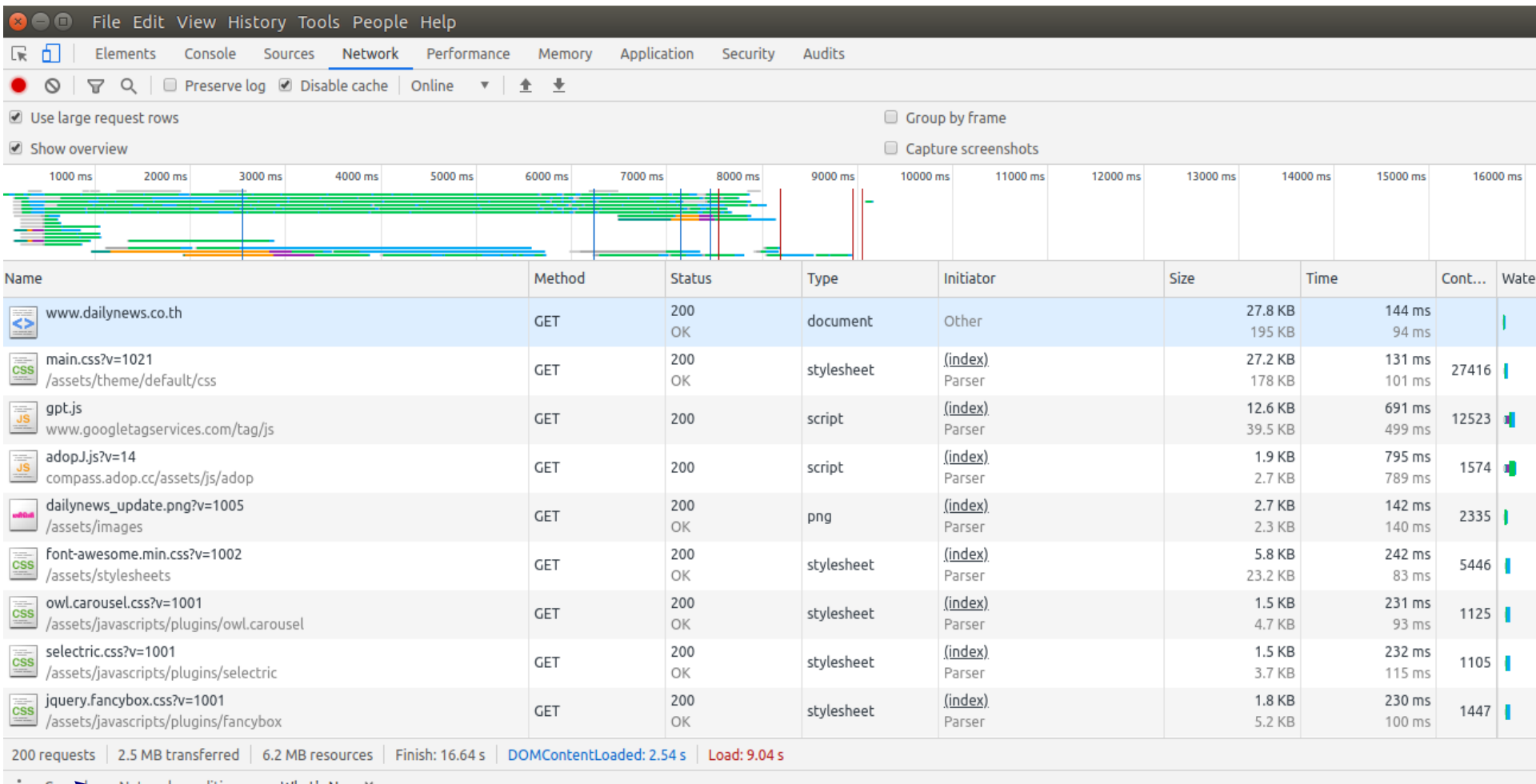
Use web developer tools to see requests, size, & time.

In Chrome:

1. From "dots" menu choose More Tools -> Developer Tools

2. In "Developer Tools" window, choose Network tab.

3. Check the box: [x] Disable cache

4. In Chrome, enter a URL (such as dailynews.co.th)

How many requests?   How many MB?

For just one web page!

network stats for www.dailynews.co.th

201 requests, 2.5 MB transferred, 6.2 MB resources, Load: 9.04s