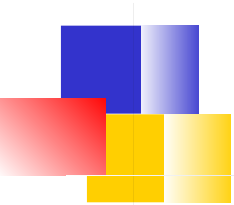


# HTTP in Action

*Experience HTTP*

# The Exercises

1. Use ncat 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 ncat 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 ncat

`ncat` or `netcat` (nc) 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: ncat as a HTTP server

*See what a request from a web browser really looks like.*

Web Browser

http://localhost:8080/

ncat as server

```
> ncat -v -l -p 8080
```

# Exercise 1: Use ncat as a server

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

```
ncat -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 ncat 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 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 from a web browser looks like.

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

ncat as client

www.cpe.ku.ac.th

```
> ncat -v hostname 80

GET /   HTTP/1.1
```

# Exercise 2: Use ncat to send http request

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

You must enter the HTTP request yourself !

```
cmd> ncat -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.

Most http requests are redirected to an https URL.

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

```
cmd> ncat -v www.rd.go.th 80
GET / HTTP/1.1
Host: www.rd.go.th
```

(*worked in 2021*)

What does the response say?

Whose web site is this?

# Can we *redirect* a web browser?

*See what a request from a web browser really looks like.*

Web Browser

ncat as server

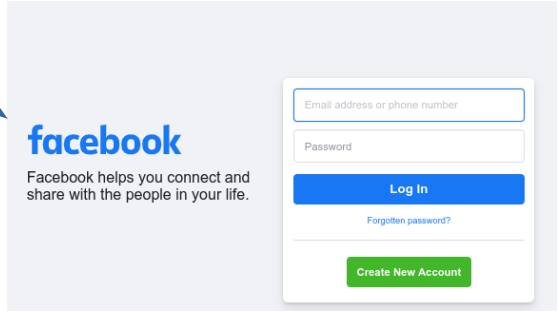
http://localhost:8080/

302 Moved Temporarily

redirect to

```
> ncat -v -l -p 8080

302 Moved
Location: facebook.com
```



# Can We Redirect a Browser?

Exercise:  Use ncat to redirect web requests to Facebook.

1. Start ncat in listening (server) mode:

```
cmd> ncat -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> ncat -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 always 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 ncat 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>
<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:

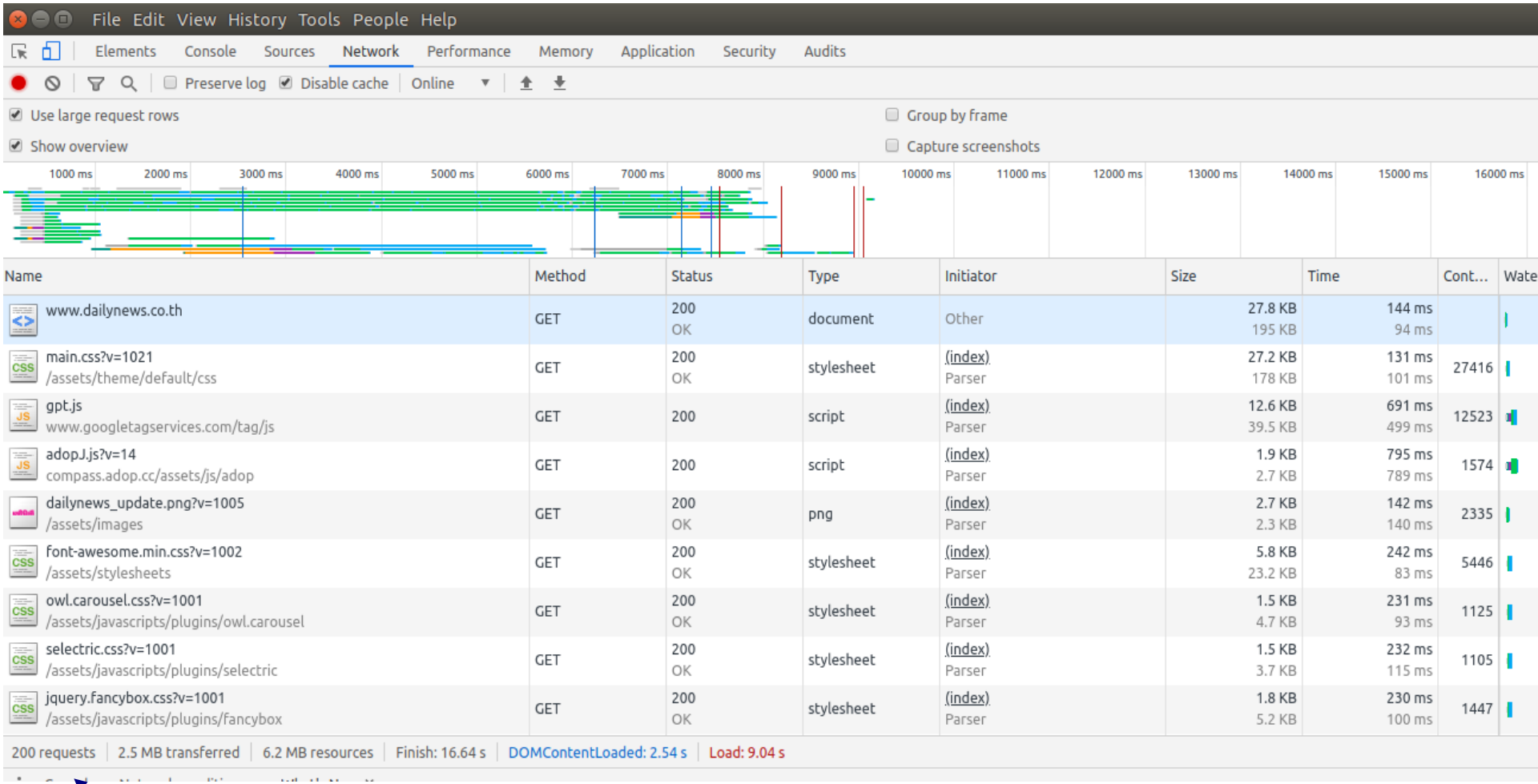
1. From "dots" menu choose More Tools -> Developer Tools
2. In "Developer Tools" window, choose Network tab.
3. Check the box: [x] Disable cache

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

# More Useful HTTP Tools

**`wget`** - Get one or more files via http/https.

- Used by Zuckerberg in *The Social Network*

**`curl`** - Transfer data to/from a server using many different protocols, including HTTP & HTTPS

*Browser Extensions* - send custom HTTP requests and see the response. Useful to experiment with web services and testing.