Web and Mobile Application Development

Image from www.1and1.co.uk

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HTTP Requests

- We retrieved webpages using a protocol called the Hypertext Transfer Protocol (HTTP)
- Your web browser issues an HTTP request known as an HTTP GET to download the webpage for rendering on your screen.
- There's all sorts of information provided by your web browser and returned by the web server.
- Let's look at some of this!

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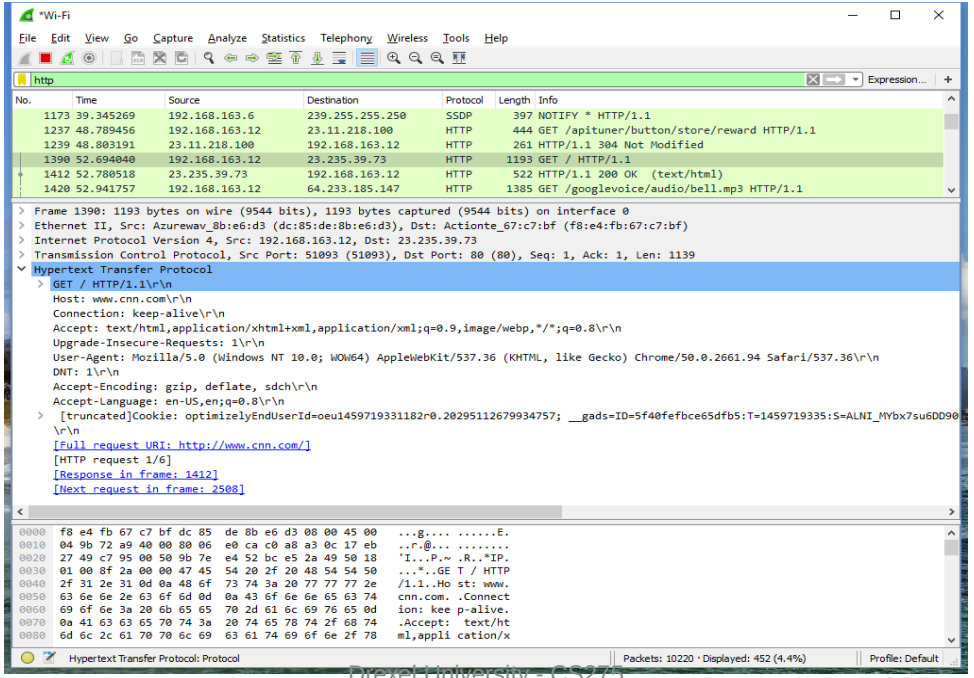
Brief Anatomy of an HTTP Request

- Here our web browser made an HTTP request for the site www.cnn.com



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http

Expression...

No.	Time	Source	Destination	Protocol	Length	Info
1173	39.345269	192.168.163.6	239.255.255.250	SSDP	397	NOTIFY * HTTP/1.1
1237	48.789456	192.168.163.12	23.11.218.100	HTTP	444	GET /apituner/button/store/reward HTTP/1.1
1239	48.803191	23.11.218.100	192.168.163.12	HTTP	261	HTTP/1.1 304 Not Modified
1390	52.694040	192.168.163.12	23.235.39.73	HTTP	1193	GET / HTTP/1.1
1412	52.780518	23.235.39.73	192.168.163.12	HTTP	522	HTTP/1.1 200 OK (text/html)
1420	52.941757	192.168.163.12	64.233.185.147	HTTP	1385	GET /googlevoice/audio/bell.mp3 HTTP/1.1

```
> Frame 1390: 1193 bytes on wire (9544 bits), 1193 bytes captured (9544 bits) on interface 0
> Ethernet II, Src: Azurewav_8b:e6:d3 (dc:85:de:8b:e6:d3), Dst: Actionte_67:c7:bf (f8:e4:fb:67:c7:bf)
> Internet Protocol Version 4, Src: 192.168.163.12, Dst: 23.235.39.73
> Transmission Control Protocol, Src Port: 51093 (51093), Dst Port: 80 (80), Seq: 1, Ack: 1, Len: 1139
v Hypertext Transfer Protocol
  > GET / HTTP/1.1\r\n
    Host: www.cnn.com\r\n
    Connection: keep-alive\r\n
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8\r\n
    Upgrade-Insecure-Requests: 1\r\n
    User-Agent: Mozilla/5.0 (Windows NT 10.0; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/50.0.2661.94 Safari/537.36\r\n
    DNT: 1\r\n
    Accept-Encoding: gzip, deflate, sdch\r\n
    Accept-Language: en-US,en;q=0.8\r\n
  > [truncated]Cookie: optimizelyEndUserId=oeu1459719331182r0.20295112679934757; __gads=ID=5f40fefbce65dfb5:T=1459719335:S=ALNI_MYbx7su6DD90
    \r\n
    [Full request URI: http://www.cnn.com/]
    [HTTP request 1/6]
    [Response in frame: 1412]
    [Next request in frame: 2508]
```

```
0000  f8 e4 fb 67 c7 bf dc 85  de 8b e6 d3 08 00 45 00   ...g.... ......E.
0010  04 9b 72 a9 40 00 80 06  e0 ca c0 a8 a3 0c 17 eb   ..r.@... ........
0020  27 49 c7 95 00 50 9b 7e  e4 52 bc e5 2a 49 50 18   'I...P.~ .R..*IP.
0030  01 00 8f 2a 00 00 47 45  54 20 2f 20 48 54 54 50   ...*..GE T / HTTP
0040  2f 31 2e 31 0d 0a 48 6f  73 74 3a 20 77 77 77 2e   /1.1..Ho st: www.
0050  63 6e 6e 2e 63 6f 6d 0d  0a 43 6f 6e 6e 65 63 74   cnn.com. .Connect
0060  69 6f 6e 3a 20 6b 65 65  70 2d 61 6c 69 76 65 0d   ion: kee p-alive.
0070  0a 41 63 63 65 70 74 3a  20 74 65 78 74 2f 68 74   .Accept:  text/ht
0080  6d 6c 2c 61 70 70 6c 69  63 61 74 69 6f 6e 2f 78   ml,appli cation/x
```

Hypertext Transfer Protocol: Protocol | Packets: 10220 · Displayed: 452 (4.4%) | Profile: Default

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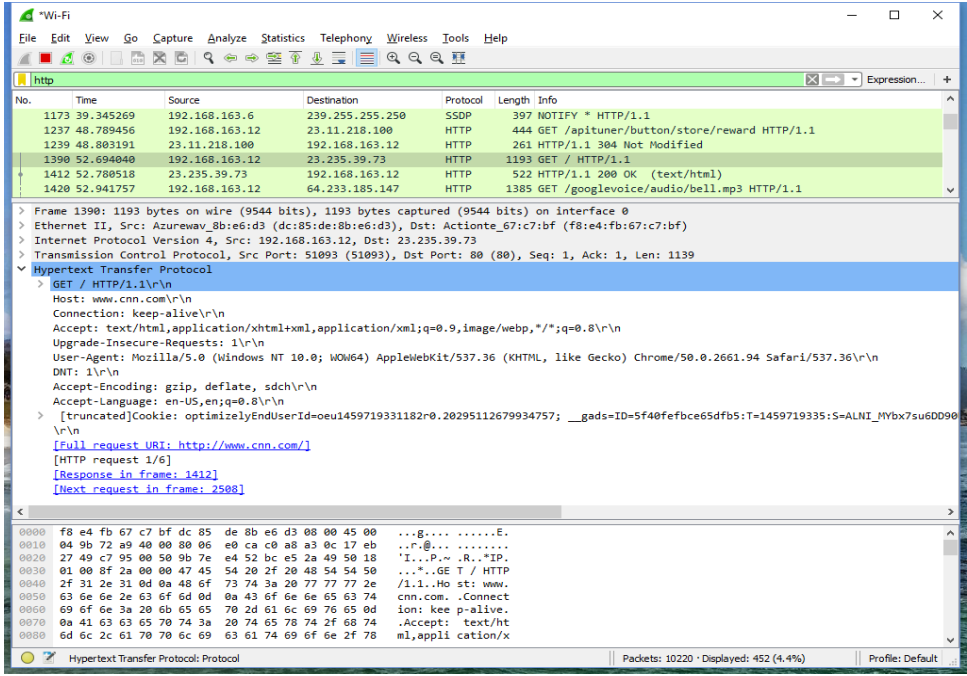
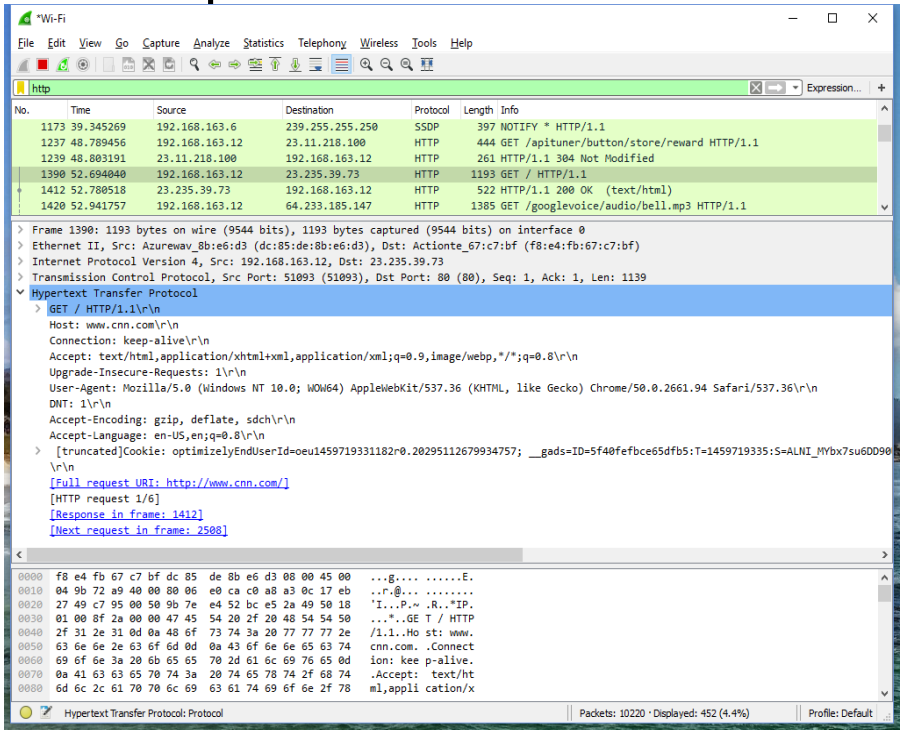
Brief Anatomy of an HTTP Request

- The first thing specified in the request is the type of request: GET / HTTP/1.1\r\n
  - GET is an HTTP verb
    - Others include POST, PUT, DELETE
  - HTTP/1.1 states the HTTP protocol version to use



Brief Anatomy of an HTTP Request

- Optionally the HTTP request can provide *headers* that tell the server a little more about the request.
- Headers are “key: value” pairs, one per line.
  - Host: www.cnn.com
  - Connection: keep-alive
  - Etc..



HTTP Response

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http

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1427	52.975743	64.233.185.147	192.168.163.12	HTTP	321	HTTP/1.1 304 Not Modified
1446	53.079867	192.168.163.12	23.67.250.176	HTTP	408	GET /cnn/.e/css/4.0/overrides.css HTTP/1.1

```
Hypertext Transfer Protocol
  HTTP/1.1 200 OK\r\n
  x-servedByHost: prd-10-60-168-45.nodes.56m.dmtio.net\r\n
  Cache-Control: max-age=60\r\n
  X-XSS-Protection: 1; mode=block\r\n
   [truncated]Content-Security-Policy: default-src 'self' http://*.cnn.com:* https://*.cnn.com:* *.cnn.net:* *.turner.com:* *.ugdturner.com:* *.
  Access-Control-Allow-Origin: *\r\n
  Content-Type: text/html; charset=utf-8\r\n
  Content-Encoding: gzip\r\n
  Via: 1.1 varnish\r\n
  Fastly-Debug-Digest: 1e206303e0672a50569b0c0a29903ca81f3ef5033de74682ce90ec9d13686981\r\n
  Content-Length: 21779\r\n
  Accept-Ranges: bytes\r\n
  Date: Sun, 08 May 2016 12:15:44 GMT\r\n
  Via: 1.1 varnish\r\n
  Age: 69\r\n
  Connection: keep-alive\r\n
  Set-Cookie: countryCode=US; Domain=.cnn.com\r\n
  X-Served-By: cache-iad2129-IAD, cache-atl6229-ATL\r\n
  X-Cache: HIT, HIT\r\n
  X-Cache-Hits: 1, 66\r\n
  X-Timer: S1462709744.180954,VS0,VE0\r\n
  Vary: Accept-Encoding\r\n
  \r\n
  [HTTP response 1/6]
  [Time since request: 0.086478000 seconds]
  [Request in frame: 1390]
  [Next request in frame: 2508]
  [Next response in frame: 2551]
  Content-encoded entity body (gzip): 21779 bytes -> 98971 bytes
Line-based text data: text/html
```

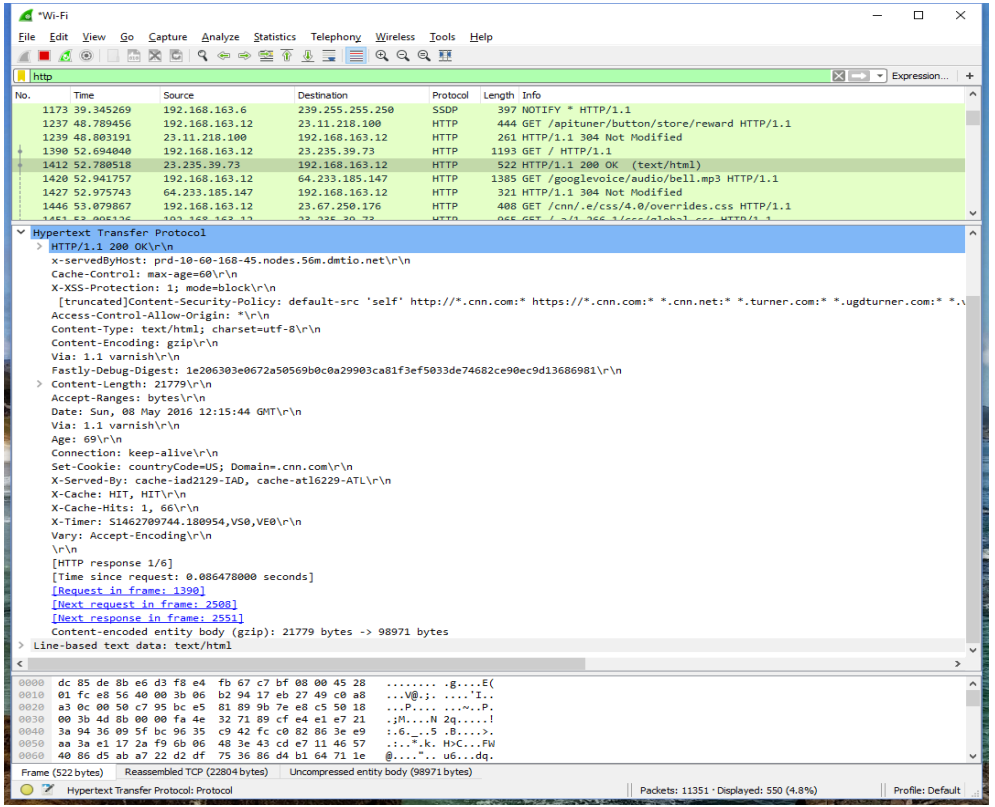
```
0000  dc 85 de 8b e6 d3 f8 e4  fb 67 c7 bf 08 00 45 28   ........ .g....E(
0010  01 fc e8 56 40 00 3b 06  b2 94 17 eb 27 49 c0 a8   ...V@.;. ....'I..
0020  a3 0c 00 50 c7 95 bc e5  81 89 9b 7e e8 c5 50 18   ...P.... ...~..P.
0030  00 3b 4d 8b 00 00 fa 4e  32 71 89 cf e4 e1 e7 21   .;M....N 2q.....!
0040  3a 94 36 09 5f bc 96 35  c9 42 fc c0 82 86 3e e9   :.6._..5 .B....>.
0050  aa 3a e1 17 2a f9 6b 06  48 3e 43 cd e7 11 46 57   .:..*.k. H>C...FW
0060  40 86 d5 ab a7 22 d2 df  75 36 86 d4 b1 64 71 1e   @....."..u6...dq.
```

Frame (522 bytes) | Reassembled TCP (22804 bytes) | Uncompressed entity body (98971 bytes)

HTTP Response

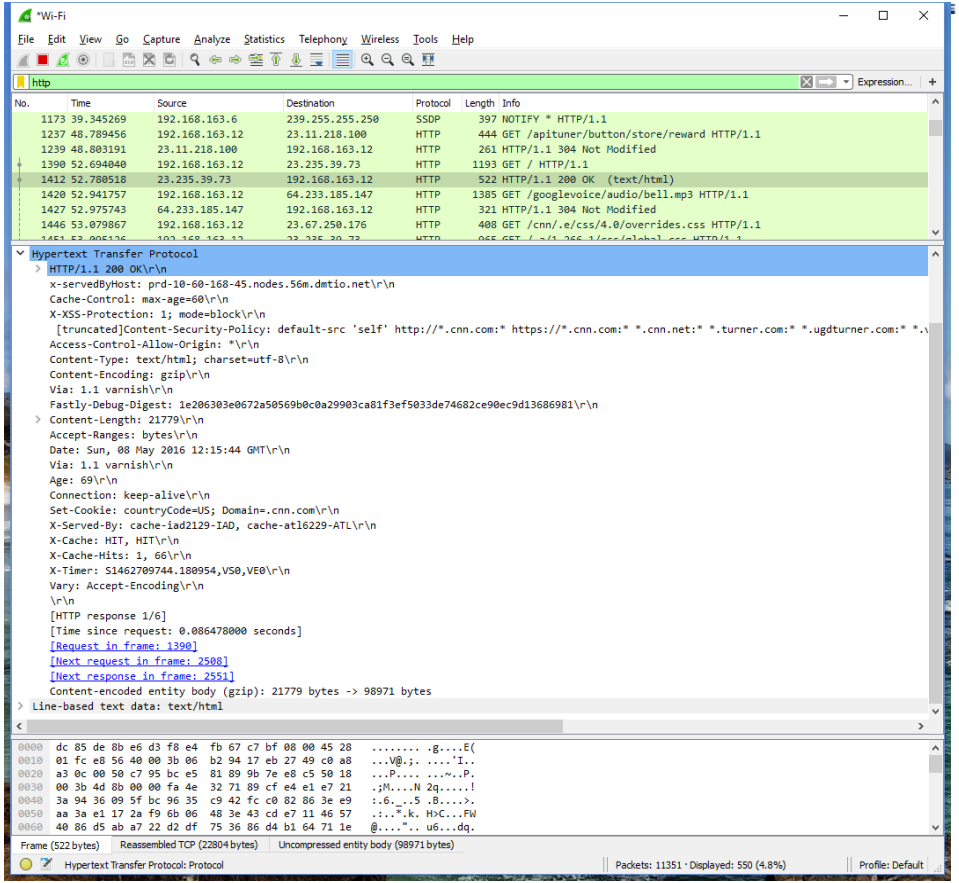
- Likewise the server sends back a response
- It starts with:

  HTTP/1.1 <CODE> <MSG>
- Common codes include
  - **200** means OK!
  - **301** means “this page was moved”
  - **404** means “not found”
  - **500** means “server error”



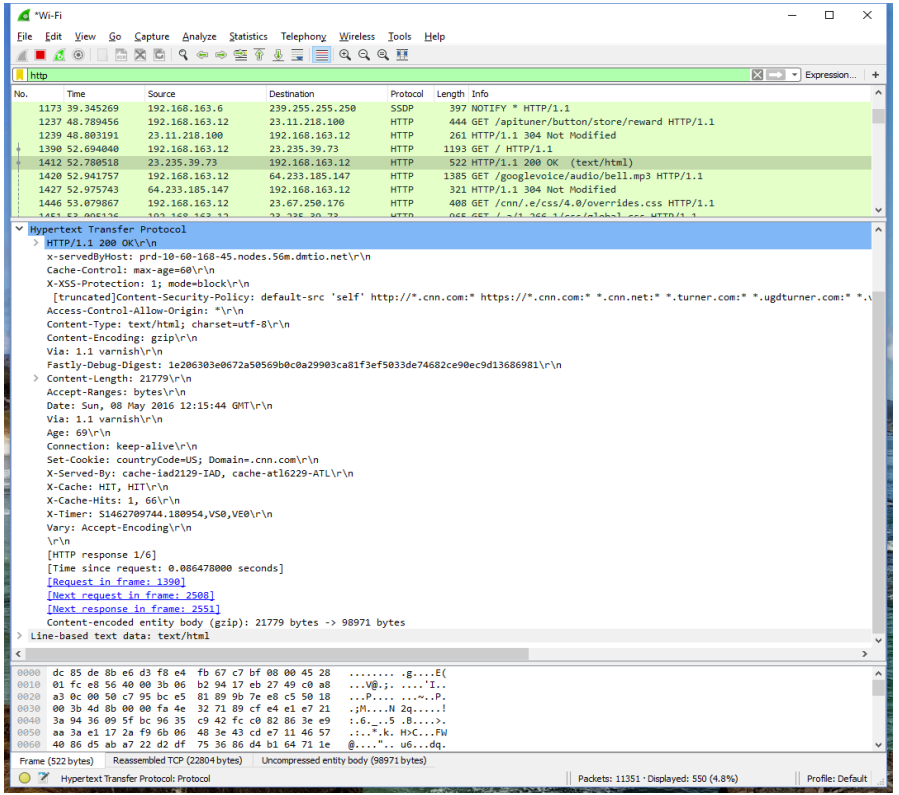
HTTP Response

- Then just like the request, the response can send a bunch of header “key: value” pairs:
  - x-servedByHost: prd-10….
  - Cache-Control: max-age=60
  - Etc..
- Finally there is a blank line to indicate the end of the header followed by a “body” that is your webpage HTML/text.



HTTP Response

- Of course the HTTP body data is not limited to HTML data
- The *content-type* header indicates the data format (*i.e.*, text/html or audio/mpeg) of the body.



HTTP Request/Responses

- We mention this stuff since in this class we'll be:
  - Sending requests to
    - External servers
    - Internal servers (our nodejs servers)
  - Responding to requests
- Some of this will be done automatically for us, but we may need to read/write to the HTTP request/responses as well.

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Putting it all Together….

- So let's see what all happens then when we request a webpage:

1. In web-browser type URL
2. URL sent to DNS to get translated to IP address
3. HTTP request sent from browser (client) to server at IP address.
4. Server extracts information from HTTP request, and populates HTTP response.
5. Client receives HTTP response and browser extracts information to build the web-page
   - Which may require additional HTTP requests for images, etc..