AGENDA

Layers of the Internet

TCP/IP & Below

Simple Chat Server

HTTP Fundamentals

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The Internet

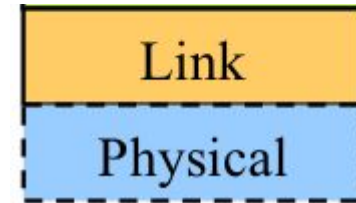- A the global system of interconnected computer networks

The Internet

- A the global system of interconnected computer networks

1. A Physical Network
   a. Copper Cables
   b. Fiber Optic Cables
   c. Satelites

Physical

The Internet

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1. Physical Infrastructure
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2. Protocols to link to the Physical Infrastructure
   a. Ethernet
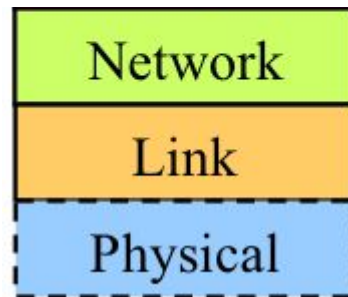   b. WiFi

Link
Physical

The Internet

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3. The Software Network
   a. IPv4 (192.168.0.1)
   b. IPv6 (2001:0db8:85a3:0000:0000:8a2e:0370:7334)

| Network |
| Link |
| Physical |

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The Internet
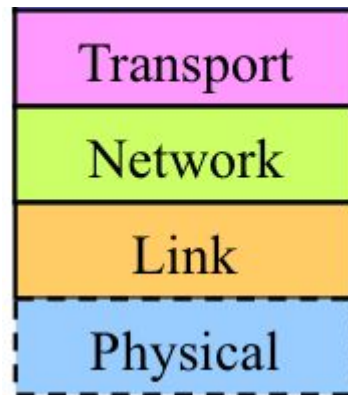
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3. Addresses and Routing Across the Network [Software]
   a. IPv4
   b. IPv6
4. Transport Protocols [Software]
   a. TCP
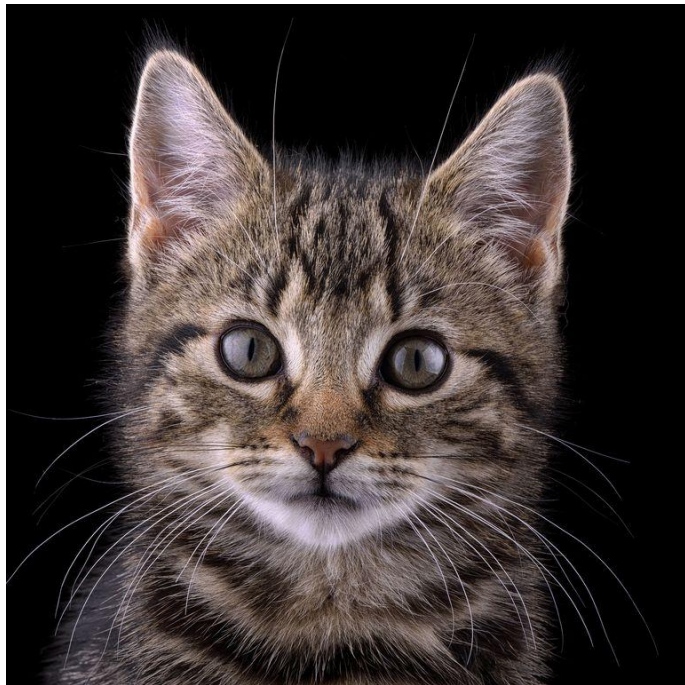   b. UDP

| Transport |
| Network |
| Link |
| Physical |

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TCP/IP Segmentation

It's much simpler to send fixed sized messages:

- ● Easy to confirm that the whole message has been received
- ● Each message takes less memory
- ● Less time tied up in sending/receiving

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Segmentation

Segmentation
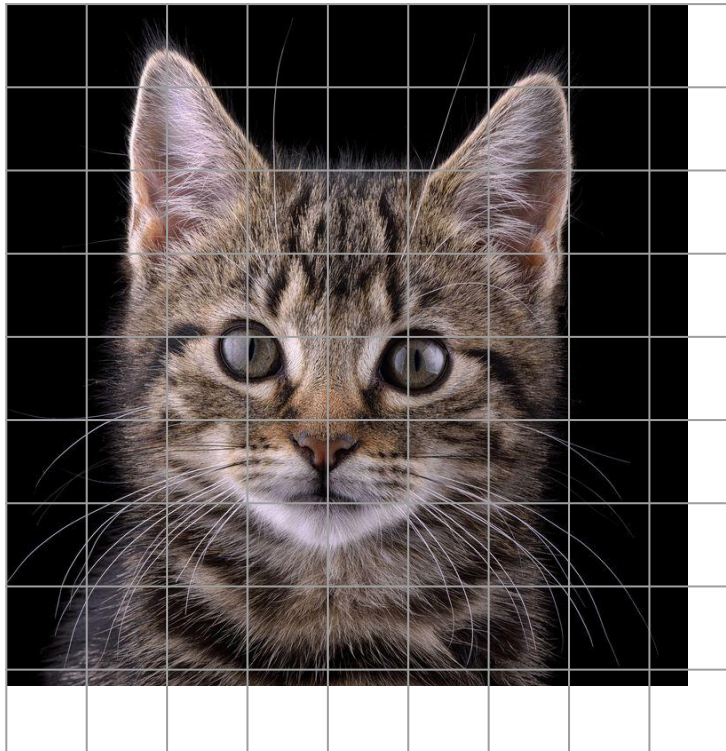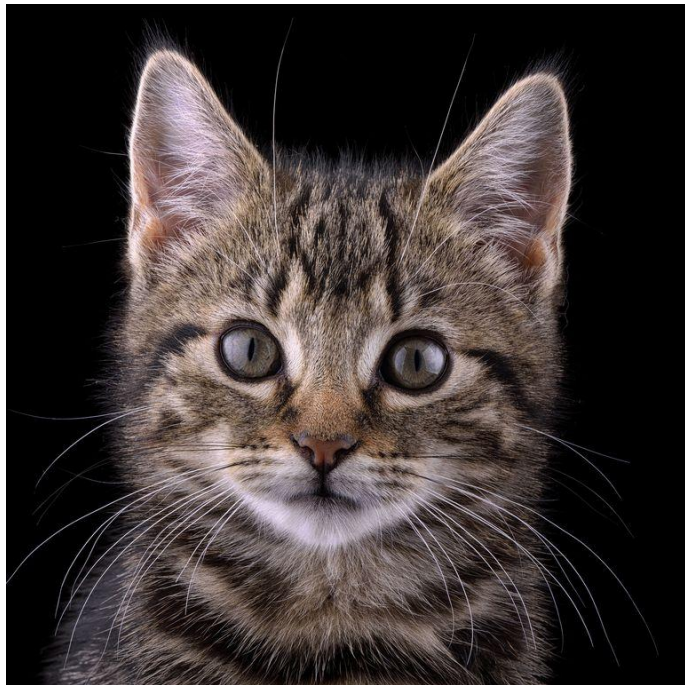
Segmentation

Segmentation

Segmentation

Segmentation

Packets - like an envelope

- A packet is made up of the segment of data and a variety of headers
    - IP information - who sent it, and where is it destined?
    - Sequence number - what segment of data is this
    - Acknowledgement number - to ensure reception
    - Checksum data - to ensure data integrity

TCP/IP

TCP

- TCP allows us to send a message made of **many** packets with guarantees.

- Your message will arrive **quickly and reliably**
    - Unreliable network retransmission - Timeouts
    - Error Detection - Hash functions
    - Packet Ordering - Sequence Numbers
    - Flow Control - Network Speed Mismatches
    - Congestion Control - Various Mechanism

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HTTP

The Internet

- A the global system of interconnected computer networks

1. Physical Infrastructure
   - Copper Cables, Fiber Optic Cables, Satelites
2. Protocols to link to the Physical Infrastructure
   - Ethernet, WiFi
3. Addresses and Routing Across the Network [Software]
   - IPv4, IPv6
4. Transport Protocols [Software]
   - TCP, UDP
5. Application Layer [Software]
   a. HTTP
   b. FTP
   c. telnet
   d. NFS
   e. SMTP
   f. >SSH

Application
Transport
Network
Link
Physical
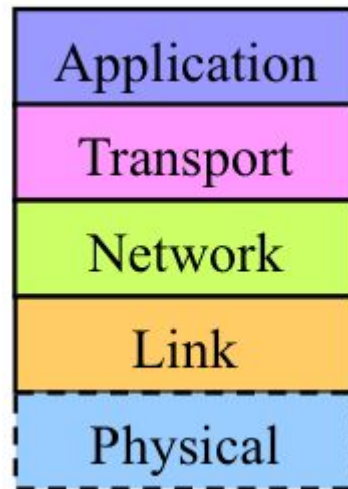
What is HTTP

- HTTP is a request-response communication protocol
- It utilizes TCP for client-server communication

Your browser is the client:

- Request a website, image, js, css
- Upload a file
- Submit a form

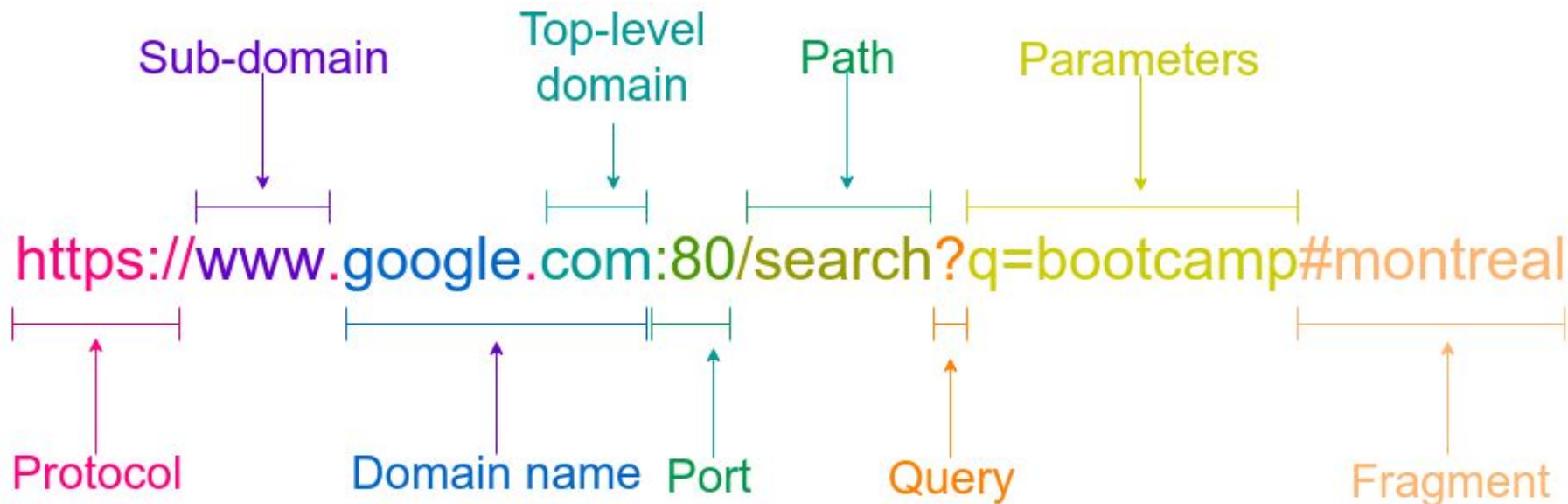The website's backend is the server:

- Respond with website, image, js, css
- Receive a form submission or file upload

Anatomy of HTTP request

- A URL
- A METHOD
- HEADERS [optional]
- BODY [optional]

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URL

Sub-domain

Top-level domain

Path

Parameters

https://www.google.com:80/search?q=bootcamp#montreal

Protocol

Domain name   Port

Query

Fragment

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METHOD

- GET - A request to **read** resource
- POST - A request to **write** resource
- PUT - A request to **update** resource
- PATCH - A request to **partially update** resource
- DELETE - A request to **delete** resource
- OPTION - A request to **read** information about a path

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HEADERS

HTTP headers allow us to specify additional information in a request.

- Authorization - used to specify credentials
- Cookie - used to maintain session between client and server
- Caching - used to improve performance
- Accept - used to specify acceptable response types
- CORS - used to specify security preferences

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BODY

HTTP allows you to specify a body along with your request.

- Usually used with POST/PUT/PATCH requests to **write** a resource
- This payload could contain
  - Form data - automatically generated from a form submission or through JS/AJAX
  - structured data like JSON through JS/AJAX
  - Multipart form data - for uploading larger images through your browser

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Anatomy of HTTP response

- A STATUS
- HEADERS [optional]
- BODY [optional]

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HTTP STATUS CODE

- 200 range: success
  - 200 OK - generic success
  - 201 CREATED - your resource was created
  - 202 ACCEPTED - request received, but not yet completed

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  - ○ 302 FOUND - temporary redirection, your browser will automatically redirect

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- ## 400 range: error
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  - 401 UNAUTHORIZED - server couldn't validate your identity
  - 404 NOT FOUND - server doesn't recognize path

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- 500 range: server error
  - 500 INTERNAL SERVER ERROR - something is wrong with the server

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BODY

The body of an HTTP response is the data you requested

- HTML/CSS/JS
- JSON - structured data
- Image

Your browser will receive this data, and do it's best to display it to the user

Questions?

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