CPSC 441

Networking Basics/Definitions

→ can function individually outside the network.

Computer Network: A set of autonomous computers that are hooked together somehow so that they can communicate with each other.

Examples:

- Internet
- U o C campus network
- Home Network

Protocol: The rules used for communication between two parties.

Stack: A pile of things, usually with one thing on top of another. The Internet is built using a layered stack of communication protocols.

4 assignments → 12.5 % each

Midterm → 20%

Final → 30%

Some known protocols:

SLIP, PPP, MIMO, NNTP, TELNET, CSMA/CD, FTP, UDP, ATM, TELNET, RARP, HTTP, ADSL, Snapchat, Instagram, SSH, FaceBook, DNS, WWW, TCP, RTSP, BGP, ARP, WiFi, SNTP, RIP, IPv4, QAM, HTTPS, FEC, YouTube, BitTorrent, Ethernet, QUIC, CPSC441, FDDI, NTP.
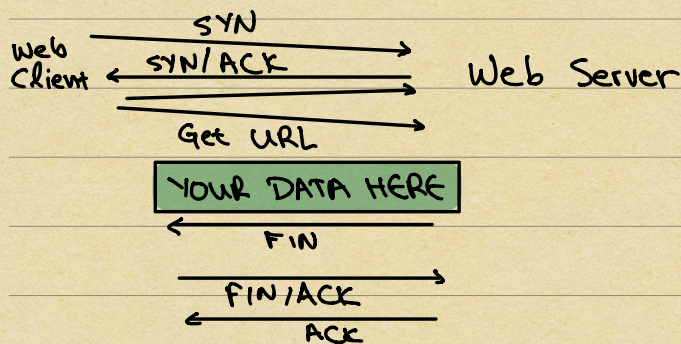
Internet Protocol Stack

- Application: Supports end-user services and network applications.
  - HTTP, SMTP, DNS, FTP, NTP
- Transport: End to end data transfer
  - TCP, UDP
- Network: Routing of datagrams from source to destination
  - IPv4, IPv6, BGP, RIP
- Data Link: Channel access, framing, flow (error control, hop by hop basis
  - PPP, Ethernet, IEEE 802.11b
- Physical: Transmission of bits

Application
Transport
Network
Data Link
Physical

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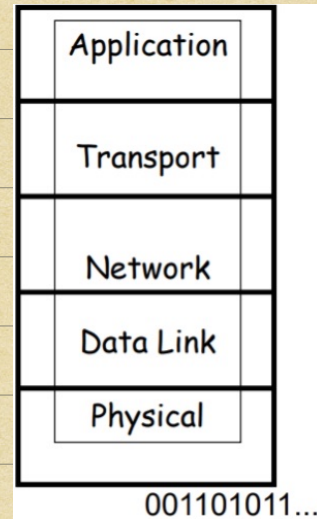
HTTP and TCP

- The Web uses HTTP & TCP (Transmission Control Protocol)

```
          SYN
Web   ─────────────→
Client ←── SYN/ACK ──── Web Server

          Get URL
      ───────────────→
     ┌──────────────────┐
     │ YOUR DATA HERE   │
     └──────────────────┘
      ←
            FIN
      ──────────────→
         FIN/ACK
      ←────────────
           ACK
```

Network Packet Structure

Without HTTPS

Protocol Headers (Control Information)			Payload
Src 12:BD:07: AF:B0:6E Dst 37:F9:14: FD:C1:08 CRC 0xFC147E	SrcIP 372.19.44.108 DstIP 136.159.99.114 Length 1500	SrcPort 80 DstPort 2579 SeqNum 61842 ACK 3756812 Window 8192 Flags: PA	HTTP/1.0 200 OK Content-Type: text Content-Length: 4732 <html> Welcome to Sponge Bob's home page! On this site, there are lots of fun activities for you: colouring pages, bath time singalongs, and more. <p> Please click <a> <href="./signup.html"> here to learn more about membership accounts and...
DataLink Layer Header (e.g., WiFi, Ethernet)	Network Layer Header (e.g., IP)	Transport Layer Header (e.g., TCP)	Payload (User Level Data)

With HTTPS

Protocol Headers (Control Information)			Payload
Src 12:BD:07: AF:B0:6E Dst 37:F9:14: FD:C1:08 CRC 0xFC147E	SrcIP 372.19.44.108 DstIP 136.159.99.114 Length 1500	SrcPort 443 DstPort 2579 SeqNum 61842 ACK 3756812 Window 8192 Flags: PA	DuZUVjXc3W7gYav3B8yENzkmEeXOvdPRn+hndKMv6 DFqImMfrR6K7M1U56x+h/IJtunLc7sa60bz4kqFlBqS/EifD XwvUbMzXol2rJRI9KaqPJrzGe6Kc502lDcADCcs4YlXQ1 m7OENZIPfM4ZJ/OZ2q8s089uy3ZfGUVXlaZ2UB/aRCHz CkO7wWcJvWBtoVu8bJNSYhv4gHd3cNERseb4g/+IQ2i 2StgfxTGf4JMAAhpmQyDQplbmRzdHJJYW0NZW5kb2Jq DTIxlDAgb2JqDTw8L0ZpbHRlci9GbGF0ZURlY29kZS9M ZW5ndGggNDMwPj5zdHJJYW0NCkiJfJTbboJAElbv9yn2 0t6M7LIH6KWHNk2aNhpegOhaaUQtYhPfvmiY7Q4o4Yo/ k+9bdmYQPGoewWMwXGvLs5JZkDx7Z6NsWx3OX....
DataLink Layer Header (e.g., WiFi, Ethernet)	Network Layer Header (e.g., IP)	Transport Layer Header (e.g., TCP)	Payload (User Level Data)

- Main focus on the principles underlying the design of modern computer communication networks.
- The Internet and its protocol stack will be used as an example.