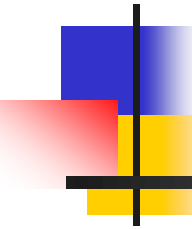

CPSC 441: Computer Networks

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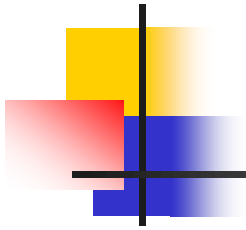
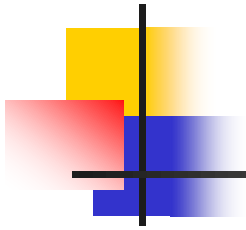
University of Calgary



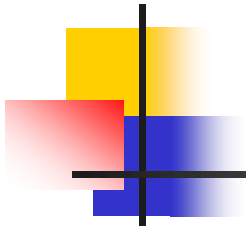
Today's Agenda

- Welcome!
- CPSC 441 Overview
  - Networking Basics and Definitions
  - "Warriors of the Net" video
- Administrative Details
- Questions?



Some Definitions (1 of 2)

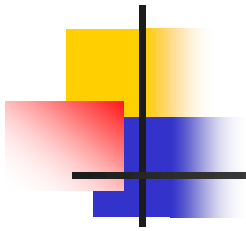
- Computer Network: a set of autonomous computers that are hooked together somehow so that they can communicate with each other
- Examples:
  - Your home network
  - U of C campus network
  - The Internet



Some Definitions (2 of 2)

- 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

Protocols and Applications



SLIP PPP MIMO NNTP

TELNET CSMA/CD FTP UDP

ATM HTTP ADSL Snapchat

RARP IPv6

CSMA/CA FaceBook

Instagram SSH

DNS WWW TCP RTSP BGP ARP

WiFi SMTP QAM DASH

RIP IPv4 HTTPS

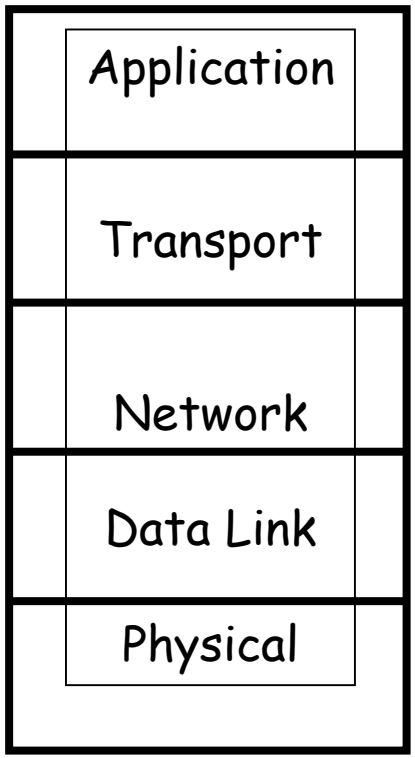
FEC BitTorrent

YouTube NTP

Ethernet QUIC FDDI

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



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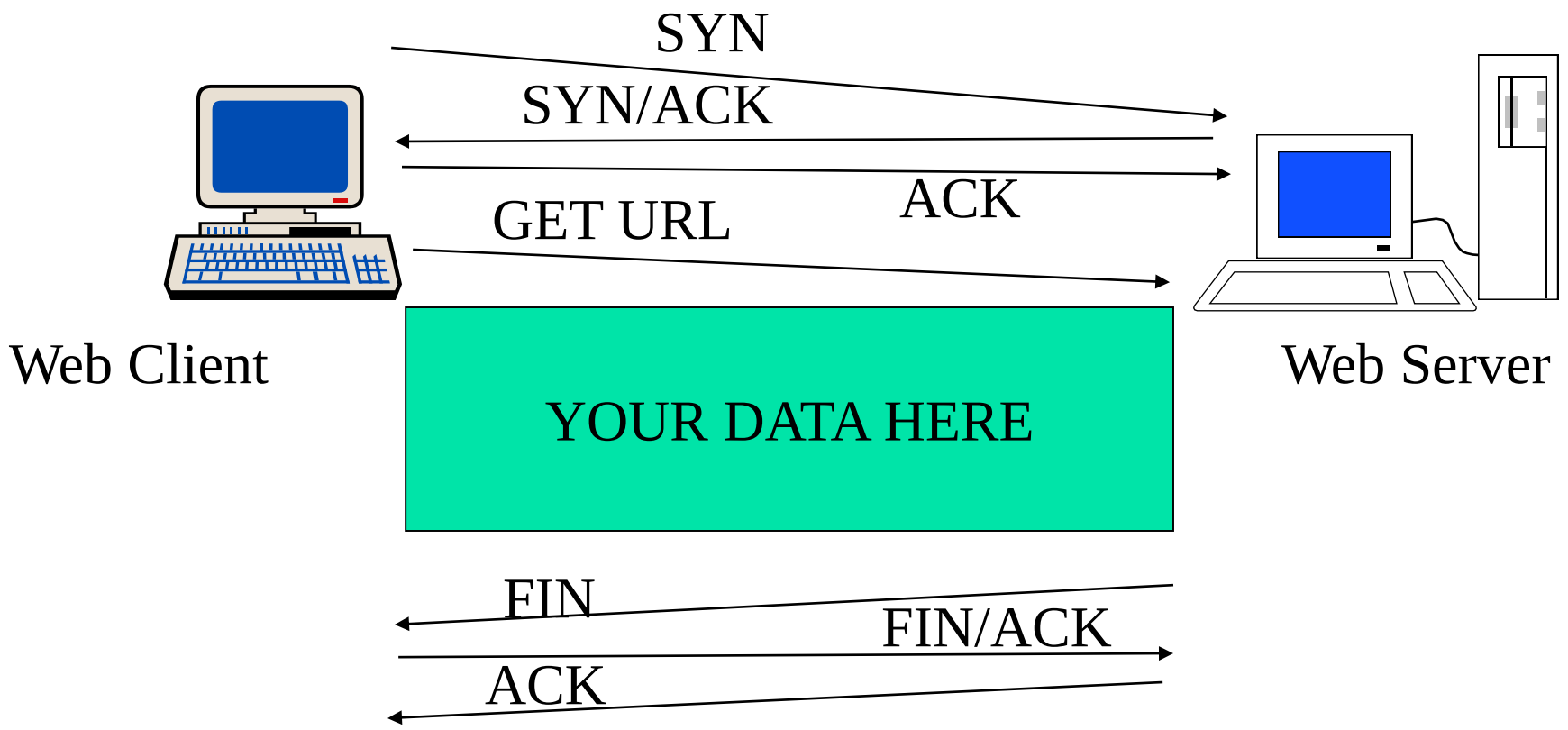
Example: HTTP and TCP

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



Network Packet Structure

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)

Network Packet with HTTPS

Protocol Headers (Control Information)

Payload

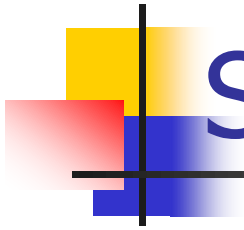
Src 12:BD:07: AF:B0:6E Dst 37:F9:14: FD:C1:08 CRC 0xFC147E	SrcIP 372.19.44.108 DstIP 136.159.99.114 Length 1500	SrcPort 80 DstPort 2579 SeqNum 61842 ACK 3756812 Window 8192 Flags: PA	DuZUVjXc3W7gYav3B8yENzkmEeXOvdPRn+hndKMv6 DFqlmMfrR6K7M1U56x+h/IJtunLc7sa60bz4kqFlBqS/EifD XwvUbMzXoI2rJRI9KaqPJrzGe6Kc502lDcADCcs4YlXQ1 m7OENZIPfM4ZJ/OZ2q8s089uy3ZfGUVXlaZ2UB/aRCHz CkO7wWcJvWBtoVu8bJNSYhv4gHd3cNERseb4g/+IQ2i 2StgfxTGf4JMAAhpmQyDQplbmRzdHJlYW0NZW5kb2Jq DTIxIDAgb2JqDTw8L0ZpbHRlci9GbGF0ZURlY29kZS9M ZW5ndGggNDMwPj5zdHJlYW0NCkiJfJTbboJAEIbv9yn2 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)



Summary

- This course focuses on the principles underlying the design of modern computer communication networks
- The Internet and its protocol stack will be used as the primary examples

- Aside: The Internet is pretty amazing!
- My research: make the Internet bigger, better, faster, stronger, and safer for all!