ACIT 2620

Principles of Enterprise Networking

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Objectives

- Course logistics

- Overview of networking concepts and terminologies

- Layered networking model

- Project introduction

- Packet capture

Course logistics

Software and equipment

- Software: Python 3, Virtualbox, Wireshark

- Equipment:
  - Windows 10 or higher, preferably Pro or Education editions
  - Limited support for Mac, especially the new Apple Silicon generation (i.e. you may need to get a different computer for this course. Older Macs are fine.)
  - Linux: I'll suppose you know what you're doing

Assessment

Criteria	%	Comments
Quizzes	40	Four equally weighted quizzes. No midterm
Project	20	Cumulative. 5 milestones
Final exam	40	Practical, based on project

- Quizzes are in person. If you miss a quiz, it's gone; there are no makeovers!

- Late project submissions (more than 1 week after deadline) will not be graded.

What is the internet

- What is it made of?
  - catalog the different components that make up the internet infrastructure and describe the role of each

- what is its purpose?

- How does it work?
  - how do the different networking components interface with each other
 - what governs communication between them

Network

- Collection of `nodes` connected by some type of transmission media or `link`, for the purpose of sharing services, devices or data (i.e. networked `resources`)
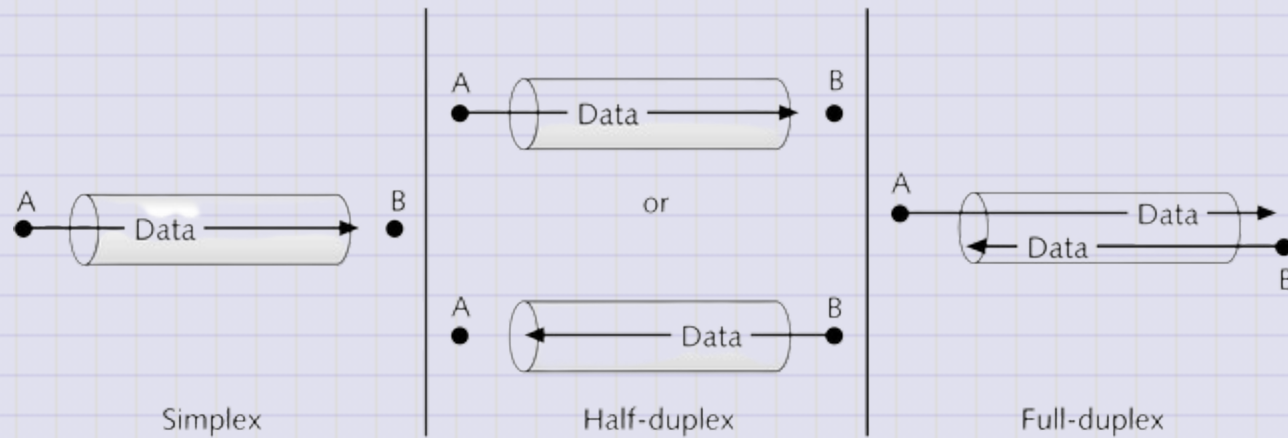
Node

- Any device that can communicate over the network and is identified by a unique identifying number, known as its `network address`.

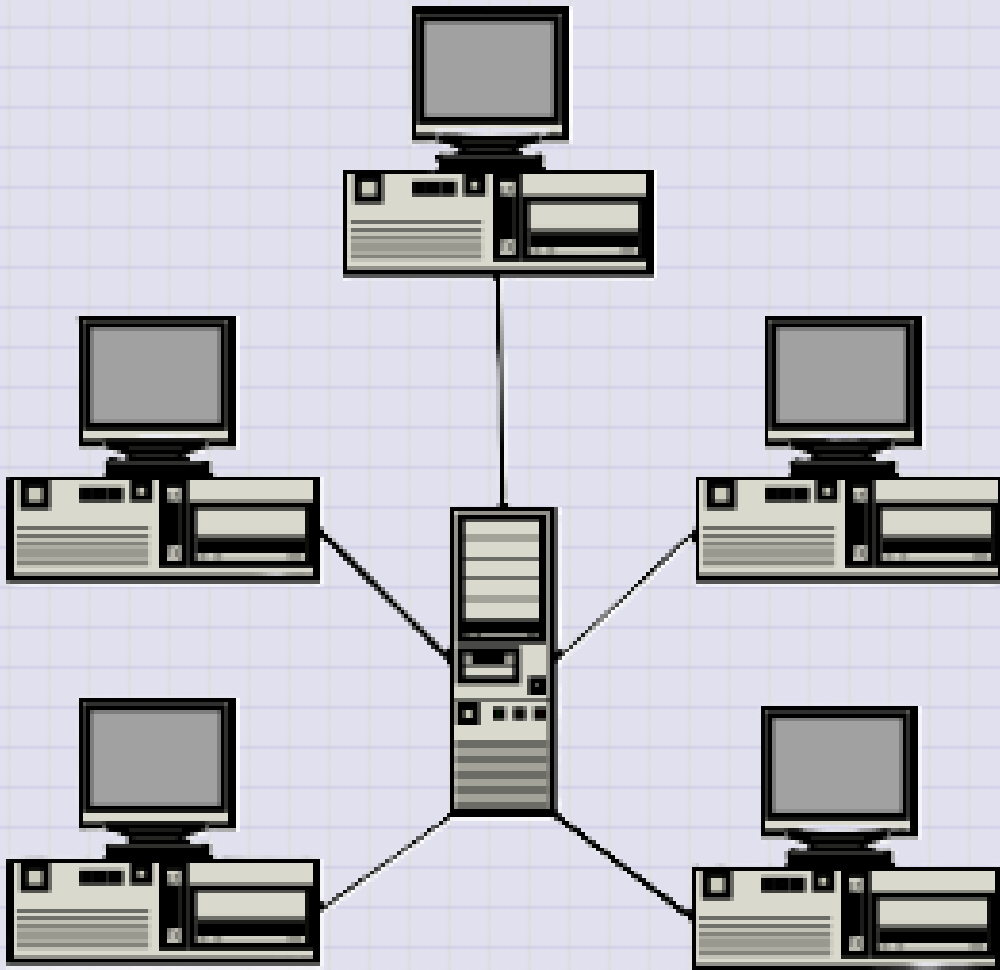# Link

Coaxial cable

Shielded twisted-pair cable

Fiber-optic cable

Infrared

Microwave
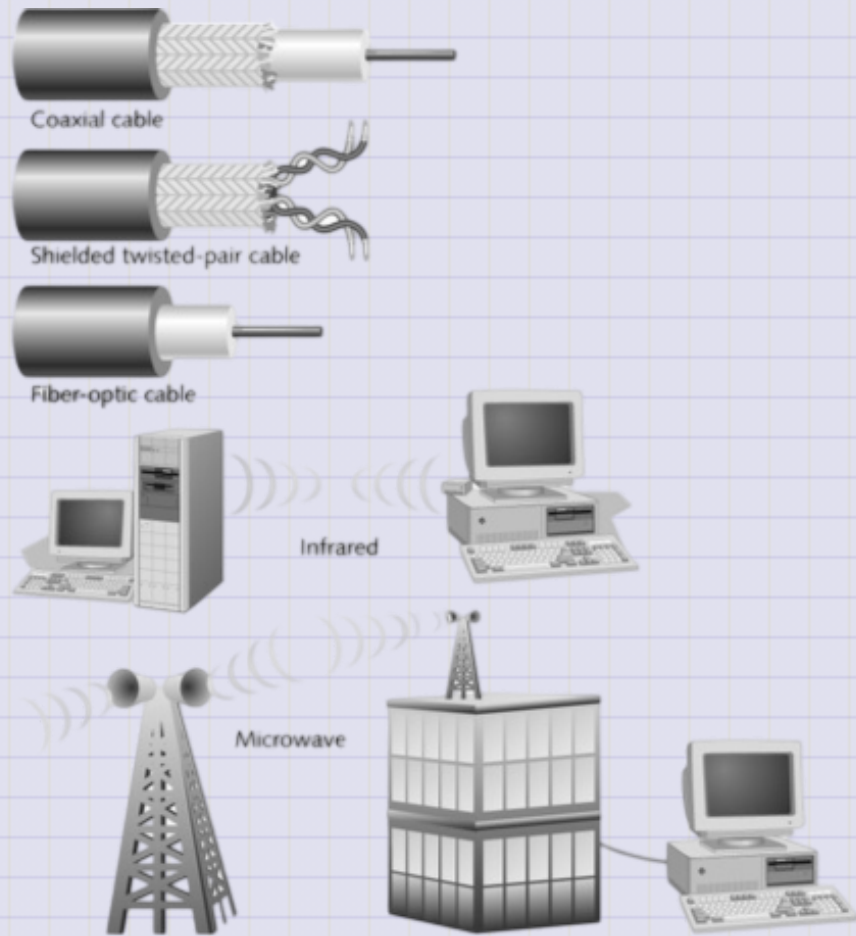
Media concurrency and direction

Simplex · Half-duplex · Full-duplex

Resource Control

Client-server Networks
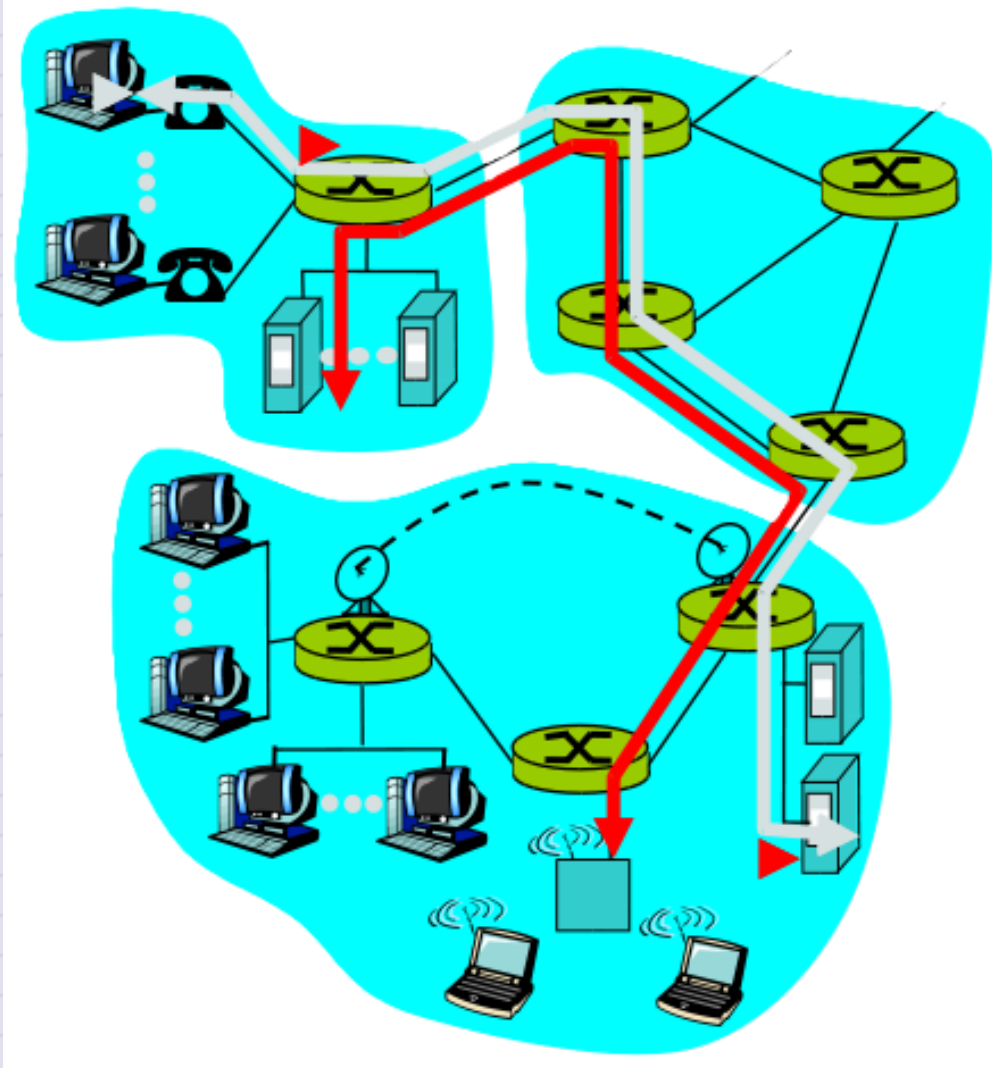
Peer-to-peer Networks

Types of Networks

- LAN
- WLAN
- PAN
- CAN
- MAN

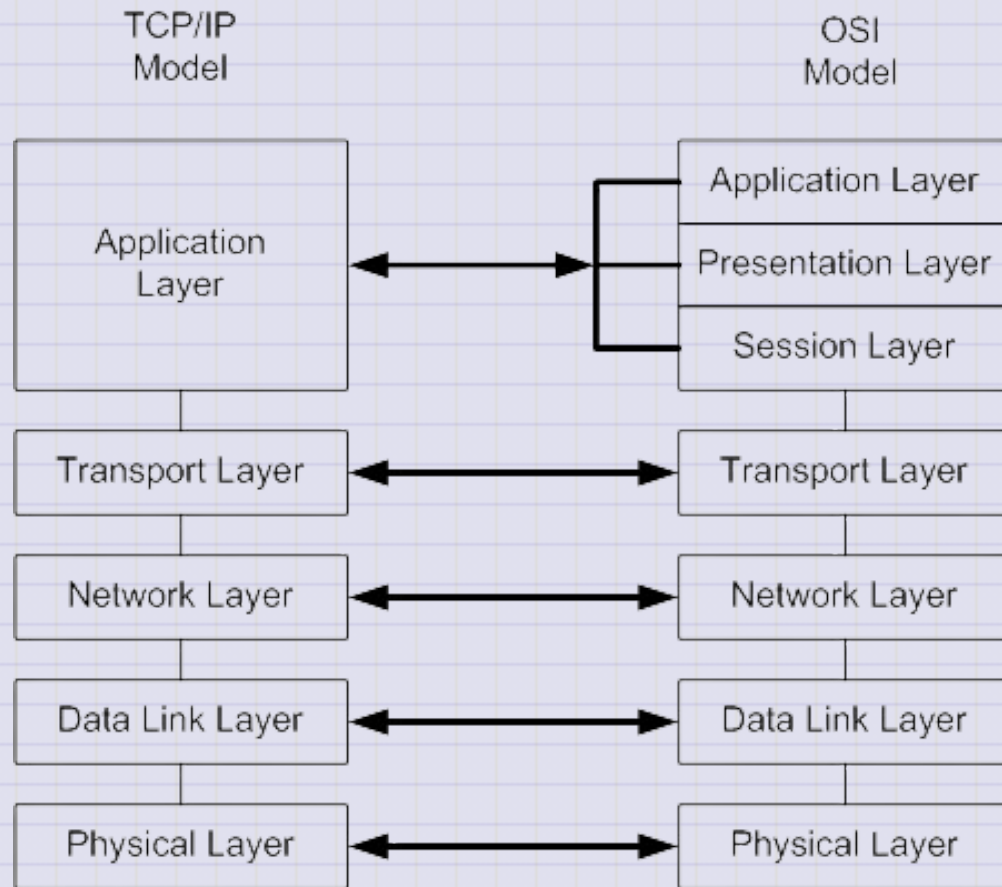- WAN

- SAN

- EPN

- VPN

- Learn more

Switching Methods

Circuit Switching

Packet Switching

10 Mbs
Ethernet

statistical multiplexing

A

C

1.5 Mbs

queue of packets
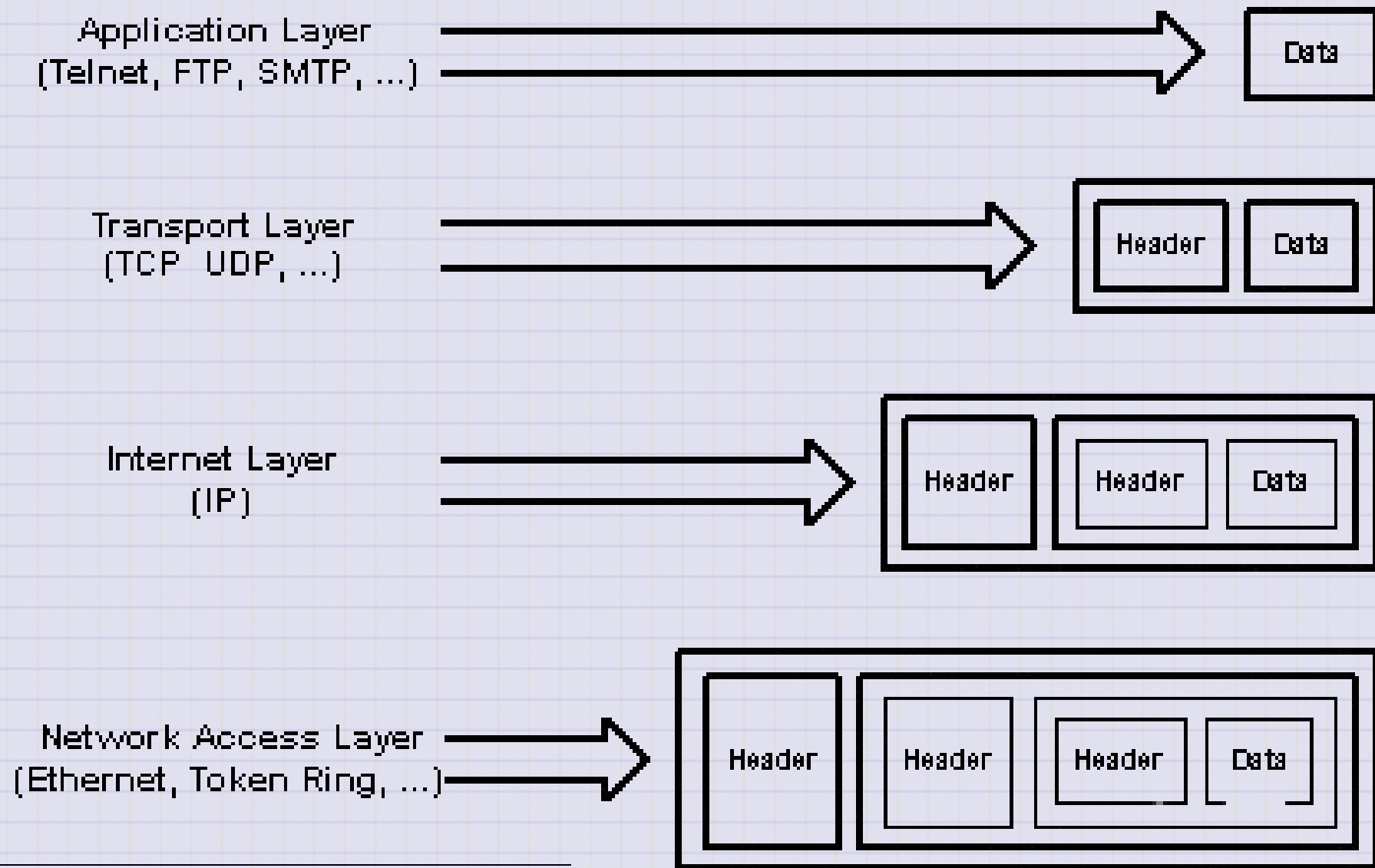waiting for output
link
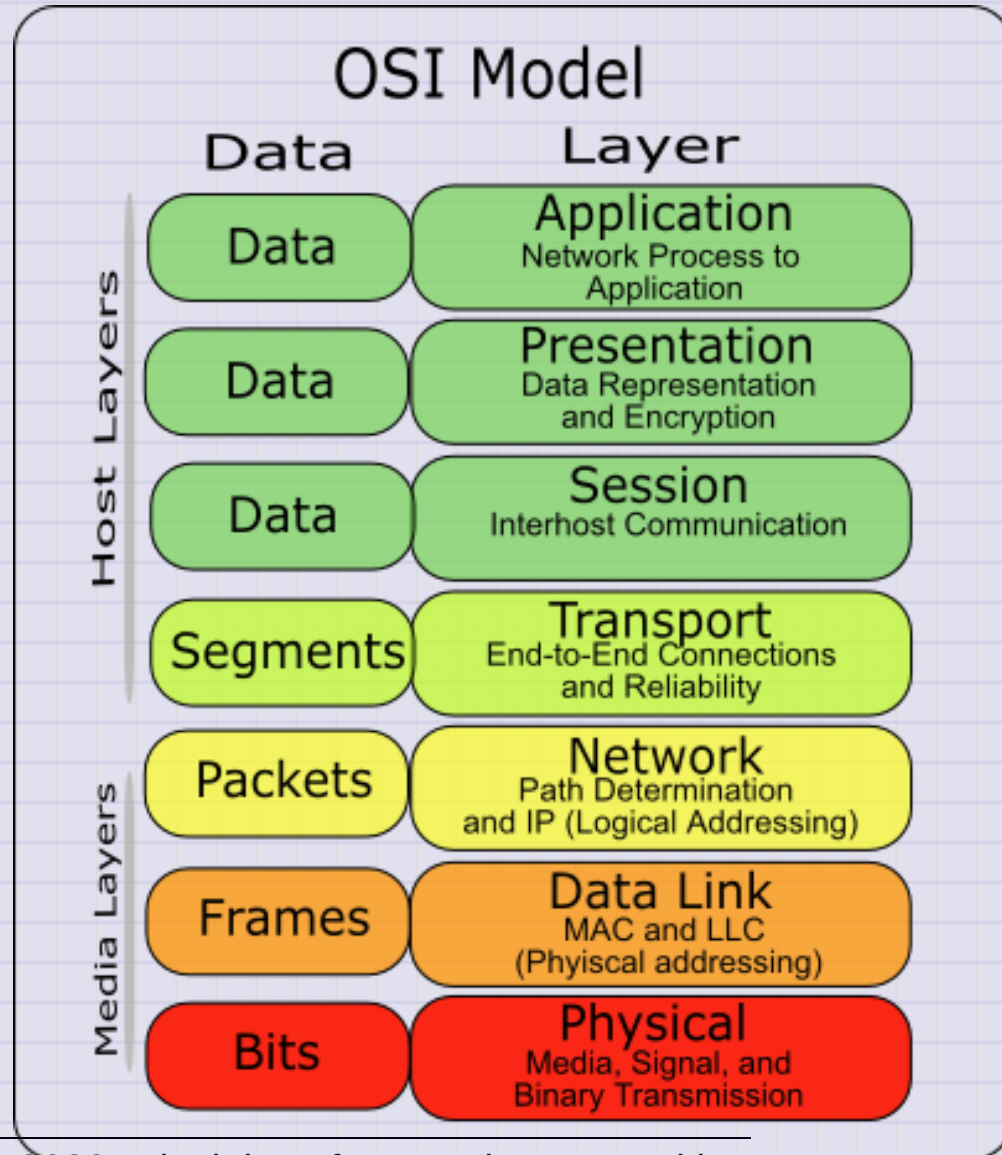
45 Mbs

B

D

E
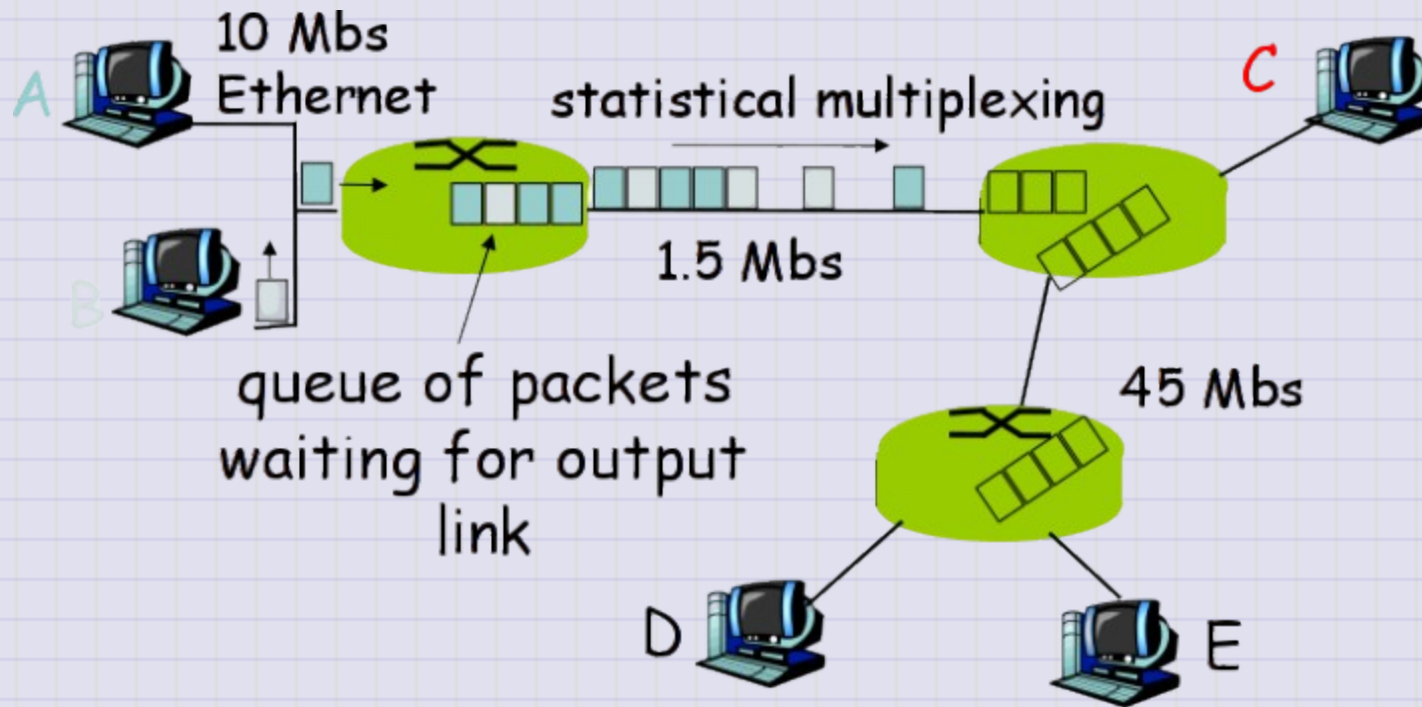
Layered networking model

Layered why?

- Managing complexity: explicit structure allows identification and makes explicit the relationship of complex system's pieces

- Modularization: changing of an implementation of a specific layer's service is hidden from the rest of the system

Encapsulation

Application Layer
(Telnet, FTP, SMTP, ...) ➡️ | Data |

Transport Layer
(TCP UDP, ...) ➡️ | Header | Data |

Internet Layer
(IP) ➡️ | Header | Header | Data |

Network Access Layer
(Ethernet, Token Ring, ...) ➡️ | Header | Header | Header | Data |

Protocol Data Units (PDU)

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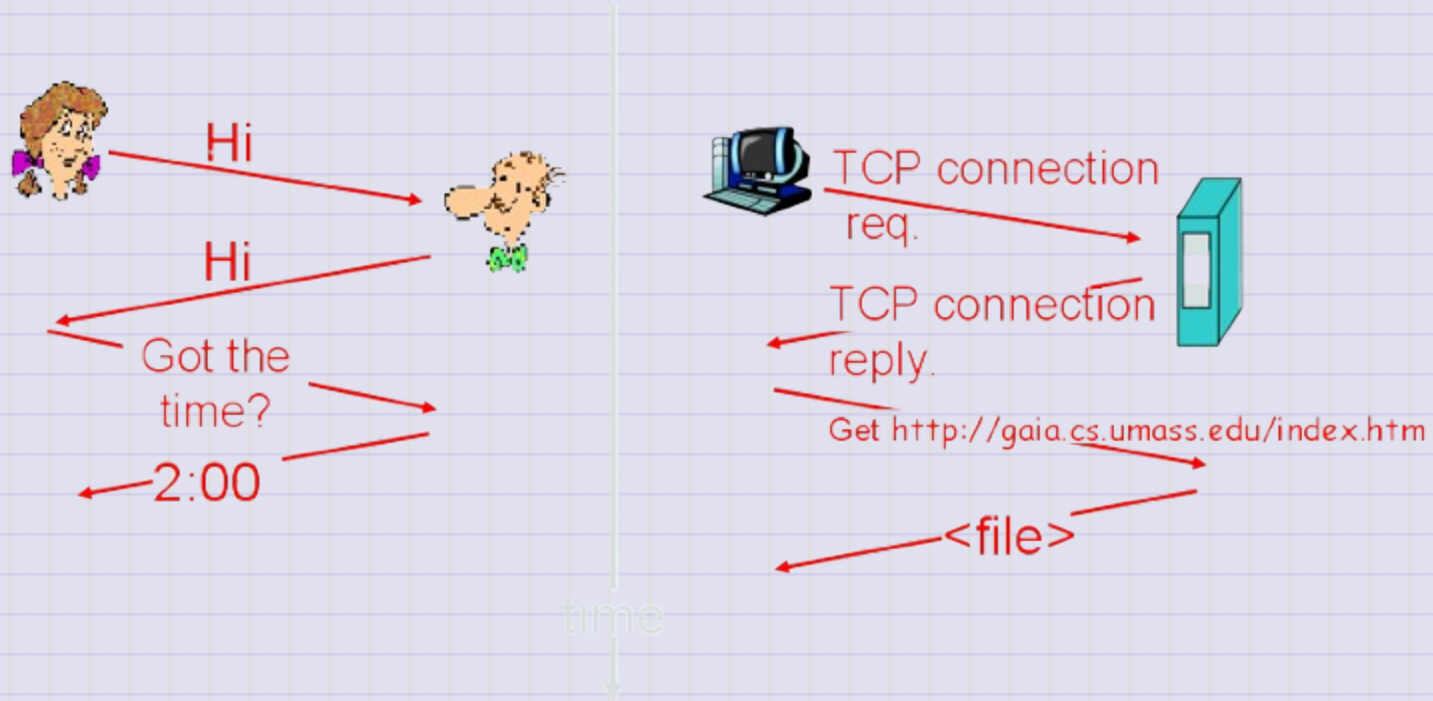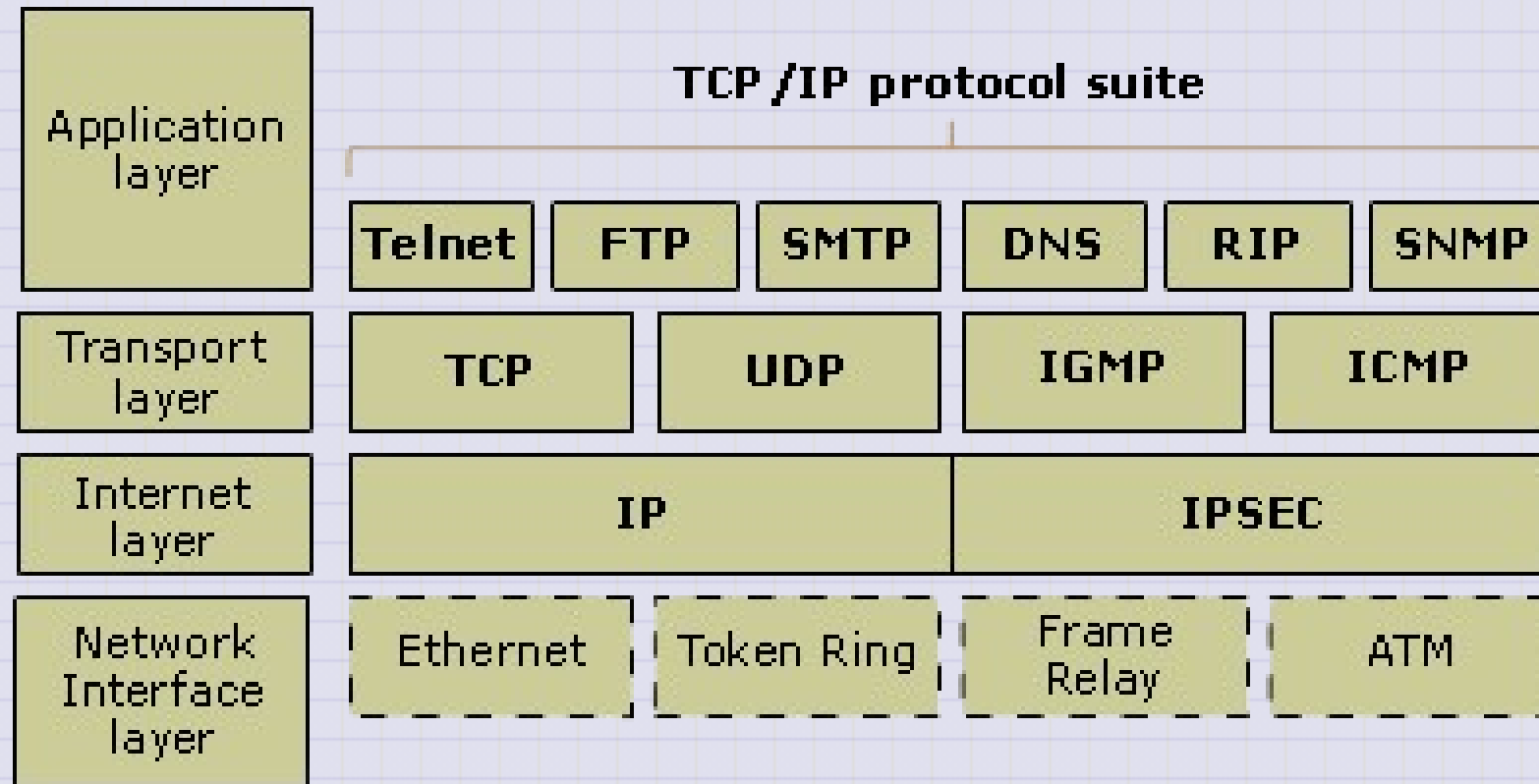
Protocols

- Mutually agreed upon rules for communication

- Define the format, order of messages sent and received among network entities, and actions taken upon transmission, receipt, and timeout

- Govern all communication activity on the internet

TCP/IP protocol suite

TCP/IP model

Application layer	TCP/IP protocol suite					
	Telnet	FTP	SMTP	DNS	RIP	SNMP
Transport layer	TCP	UDP		IGMP	ICMP	
Internet layer	IP			IPSEC		
Network Interface layer	Ethernet	Token Ring		Frame Relay	ATM	

Wireshark

- A tool for capturing network traffic for analysis

- Grab the installer and install it on your system

Reading list

- This week
  - OSI Model

  - Optional reading:
    - Wireshark: filtering while capturing

    - Capture filters

    - Display filters

- Week Two (read/watch these before next class)
  - Common Network Infrastructure devices
  - Network devices
  - Network Topologies
  - Overview of networks
  - Optional (but highly recommended):
    - Linux command line (recommended for beginners)