Cpr E 489 (Spring 2020)
Computer Networking and Data Communications

Staff Information

- Instructor:
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- Teaching Assistant:
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  Office Hours: Email or by appointment

Course Information

- Lecture Time: TR 11:00 AM ~ 12:15 PM
- Room: GILMAN 1652
- Prerequisite: Cpr E 288 or Com S 327
- Course Homepage: Canvas

- Four lab sections:
  - T 2:10 ~ 4:00 PM (TA: Ethan)
  - T 4:10 ~ 6:00 PM (TA: Ethan)
  - W 1:10 ~ 3:00 PM (TA: James)
  - F 1:10 ~ 3:00 PM (TA: James)
- Lab location: COOVER 2061

Textbook Information

- No required textbook

- Recommended books:
  - A. Leon-Garcia and I. Widjaja, *Communication Networks: Fundamental Concepts and Key Architectures*, 2nd Edition, McGraw-Hill, 2004.
  - J.F. Kurose and K.W. Ross, *Computer Networking: A Top-Down Approach,* 6th Edition, Pearson, 2012
  - W.R. Stevens, B. Fenner, and A.M. Rudoff, *Unix Network Programming, Volume 1: The Sockets Networking API*, 3rd Edition, Addison-Wesley, 2003

Lecture Coverage

Topics	Coverage
Introduction to Computer Networking	2
Physical Layer • Digital transmission fundamentals • Line coding	2
Introduction to Sockets Programming	1
Error Detection and Recovery • Basic Error Detection Codes • CRC (Cyclic Redundancy Check) • Retransmission Strategies	7
Data Link Layer • Framing • MAC (Medium Access Control) • LAN (Local Area Network) • Ethernet	4

Lecture Coverage

Topics	Coverage
Network Layer • Naming, Addressing • ARP, RARP, DHCP, NAT, ICMP • Routing	5
Transport Layer • TCP Protocol • TCP Error Control • TCP Flow Control • TCP Congestion Control	6
	Total: 27

Week	Lab Information (Tentative)
1	First Week; No Lab
2	Lab #1: Network Utility Programs
3	Lab #2: TCP Sockets Programming
4	Lab #3: UDP Sockets Programming
5	Lab #4: Error Recovery with Go-Back-N ARQ Protocol
6	No Lab
7	Midterm #1; No Lab
8	Lab #5: Introduction to Geni
9	Lab #6: Static Routing with Geni
10	Spring Break; No Lab
11	Lab #7: Using CISCO IOS to Configure CISCO Routers
12	Lab #8: Using CISCO IOS to Configure OSPF Routing
13	Midterm #2; No Lab
14	Lab #9: Advanced Topic
15	Lab #10: TCP Congestion Control with Geni
16	Dead Week; No Lab

Exam Information

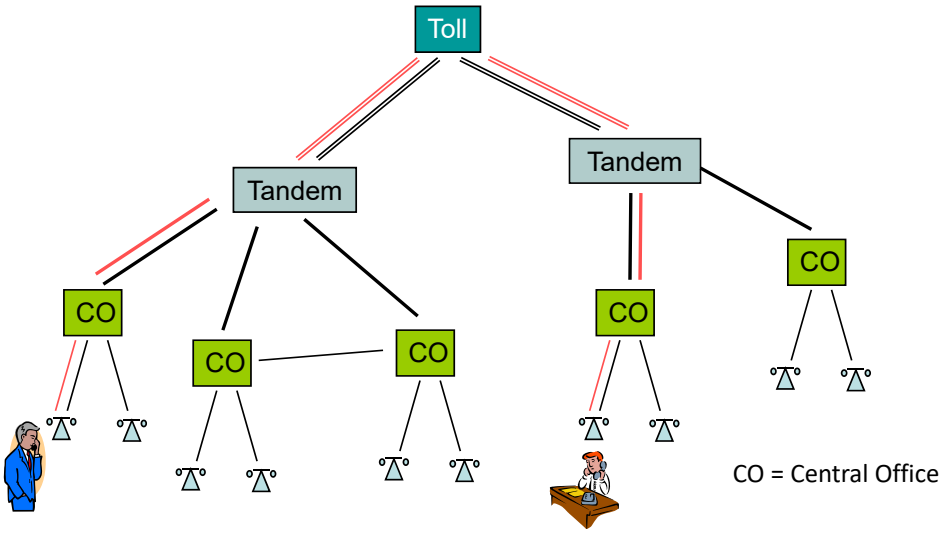
- All quizzes and exams are open-books/notes/references/assignments.
- Quizzes: random number, random time.
- Two midterm exams:
  - 02/27 (Thu) @ GILMAN 1652
  - 04/09 (Thu) @ GILMAN 1652
  - Midterm exams are non-comprehensive.
- Final exam:
  - 05/04 (Mon) 9:45 ~ 11:45 AM @ GILMAN 1652
  - Final exam is comprehensive.

Grading Information

	Percentage	Per Assignment
Homework Assignments	10%	~2%
Lab Assignments	20%	~2%
Quizzes	5%	~1%
Midterm Exams	40%	20%
Final Exam	25%	25%
	Total: 100%	

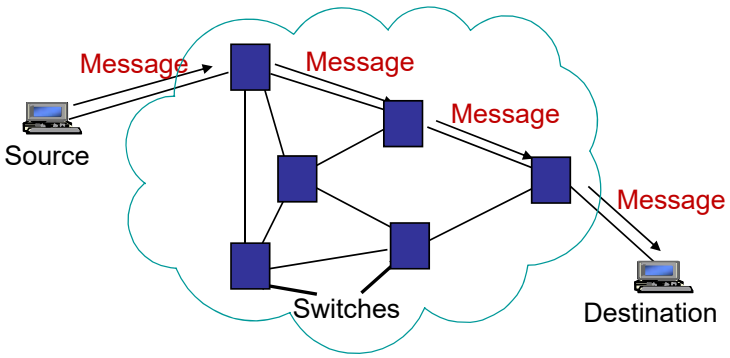
Circuit Switching in Telephone Networks

- Circuit Switching – "*Reserve and Use*"
  - Automated switches set up a physical circuit between two ends
  - All messages follow the same route (via the established circuit)



Message Switching in Telegraph Networks

- Message Switching – "*Store and Forward*"
  - Store-and-Forward Operation
  - Addressing, Routing, Forwarding



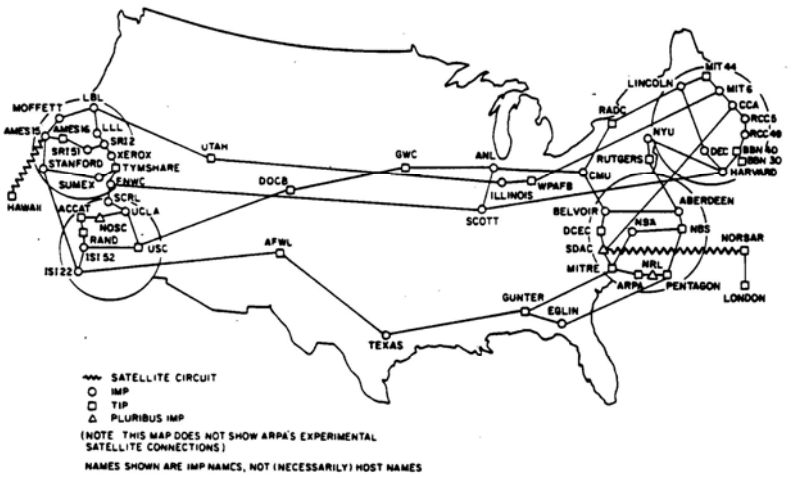
Packet Switching in Computer Networks

- Packet Switching – "*Break and Route*"
  - Break long messages into packets
  - Packets have maximum length
  - Network transfers packets using store-and-forward
  - Requires: Addressing, Framing, Routing, etc.
  - Intelligence is at the edge of the network

ARPANET

- ARPANET was developed to provide a test bed for researching packet-switching networks
  - Developed in the late 1960s; it was the first major effort to interconnect computers across a Wide Area Network (WAN)
  - For Packet-Switching Research:
    - Packet = Header + Data
    - ARPANET = Packet Switches + 56 Kbps Leased Lines
    - Distributed Routing
    - Congestion Control
    - Flow Control
  - ARPANET led to many innovations:
    - The TCP/IP protocols as the basis for Internet
    - Several lasting applications such as Email, remote login, file transfer

What did ARPANET look like?



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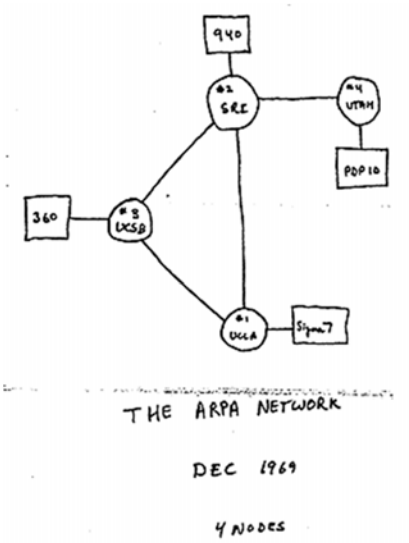

ARPANET Birthday: Oct. 29, 1969