

Topic 1: Course Overview and Introduction

Cpr E 489 -- D.Q.

Course Information

✚ Cpr E 489: Computer Networking and Data Communications

- Lecture Time: TR 11:00 AM ~ 12:15 PM
- Location: 1115 Pearson
- Prerequisite: Cpr E 288 or Com S 327
- Course Homepage: Canvas

✚ Instructor:

- Daji Qiao (daji@iastate.edu), Professor
- Office: 313 Durham Center
- Tel: (515) 294 2390
- Office Hour: W 12-1

✚ Teaching Assistants:

- Ruminski, Thomas ruminski@iastate.edu
 - Office Hour: TBD
- Perrin, Owen operrin@iastate.edu
 - Office Hour: TBD

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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

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Tentative Lecture Coverage

Topics	Coverage (# lectures)
Introduction to Computer Networking	2
Physical Layer <ul style="list-style-type: none">Digital Transmission FundamentalsLine Coding	2
Error Detection and Recovery <ul style="list-style-type: none">Basic Error Detection CodesCRC (Cyclic Redundancy Check)Retransmission Strategies (ARQ Protocols)	8
Data Link Layer <ul style="list-style-type: none">Random AccessMAC (Medium Access Control)LAN (Local Area Network)Ethernet	4

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Tentative Lecture Coverage

Topics	Coverage (# lectures)
Network Layer <ul style="list-style-type: none">• IP Addresses• ARP, RARP, DHCP, NAT, ICMP• Routing Protocols	6
Transport Layer <ul style="list-style-type: none">• TCP Protocol• TCP Error Control• TCP Flow Control• TCP Congestion Control	6
Midterm Exam	1
Review & Recitation	1
	Total: 30 (15 weeks)

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Homework Assignments

✚ Homework Assignments

- We will have up to 6 homework assignments.
- Each student will work on HWs **individually**.
- **HWs usually are due one week from the assign date.**
- Please make sure to check Canvas about the exact due date and time.

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Lab Assignments

⊕ Lab Assignments

- We will have up to 10 lab assignments.
- Each student will work on labs **individually**, unless specified otherwise.
- **Lab attendance is required.**
- Lab location: **2061 Coover**
 - Section 1: Tue 2:10 – 4 PM (TA: Tom)
 - Section 2: Wed 1:10 – 3 PM (TA: Owen)
 - Section 3: Tue 4:10 – 6 PM (TA: Tom)
- **Lab reports are due the day *before* the next lab**, unless specified otherwise.

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Week	Lab Information (Tentative)
1	First Week
2	Lab #1: Network Utility Programs
3	Lab #2: TCP Sockets Programming
4	Lab #3: UDP Sockets Programming
5	
6	Lab #4: CloudLab – Basics
7	Lab #5: Error Recovery with Go-Back-N ARQ Protocol
8	Midterm
9	Spring Break
10	
11	Lab #6: CloudLab – Static Routing
12	Lab #7: Using Cisco IOS to Configure Cisco Routers
13	Lab #8: Using Cisco IOS to Configure OSPF Routing
14	Lab #9: CloudLab – TCP Congestion Control
15	Lab #10: Other Transport Layer Topics
16	Prep Week

Late Submission Policy

- ⊕ For all assignments, the following Late Submission Policy will be adopted:
 - 10% per day penalty for the first 5 weekdays (weekend days are exempted).
 - For example, for an assignment due Monday:
 - Tuesday submission carries 10% penalty
 - Wednesday submission carries 20% penalty
 - Thursday submission carries 30% penalty
 - Friday, Saturday, Sunday submissions carry 40% penalty
 - (Next) Monday submission carries 50% penalty
 - Any submission after one week receives zero credit.

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Exam Information

- ⊕ All quizzes and exams are **open** books/notes/references/assignments.
- ⊕ Midterm exam:
 - 03/07 (Thu) 11:00 AM ~ 12:15 PM @ 1115 Pearson
- ⊕ Final exam:
 - 05/08 (Wed) 9:45 ~ 11:45 AM @ 1115 Pearson
 - Final exam is comprehensive.

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Grading Information

	Percentage	Per Assignment
Homework Assignments (~6)	15%	~2.5%
Lab Assignments (~10)	25%	~2.5%
Quizzes	5%	~1%
Midterm Exam	25%	25%
Final Exam	30%	30%
	Total: 100%	

Course Grade	A	A-	B+	B	B-	C+	C	C-	D
Cumulative Total	90+	87+	83+	80+	77+	73+	70+	60+	50+

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Network Architecture and Transfer Mode

+ Communication Network

- A set of equipment and facilities that enable the transfer of information between users located at different locations

+ Network Architecture

- Specifies how the network is built and operated
- Specifies how information is transferred (transfer mode)

+ Three Network Architectures and Transfer Modes

- Telephone network – circuit switching
- Telegraph network – message switching
- Computer network – packet switching

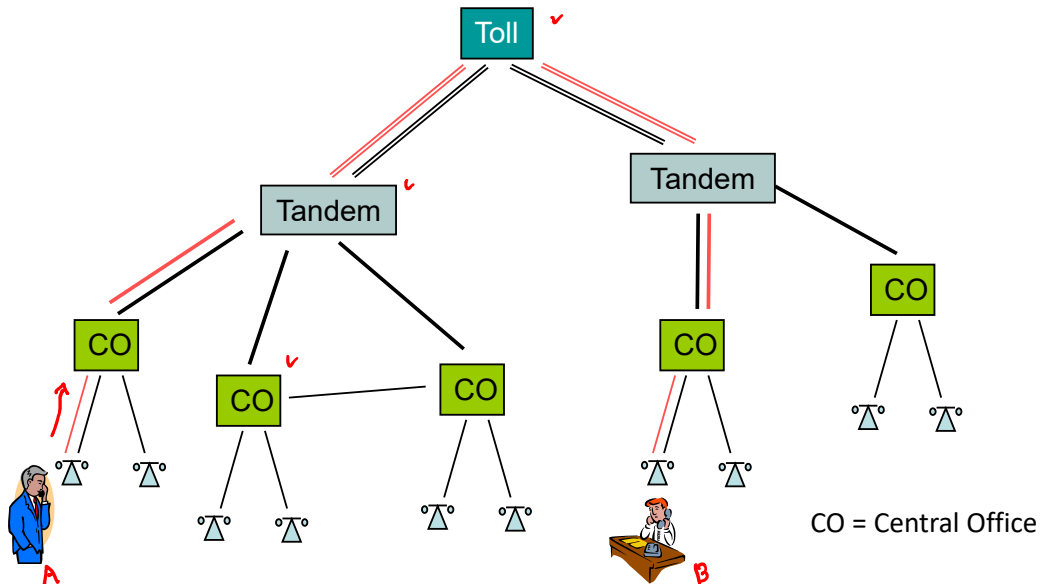
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Circuit Switching in Telephone Networks

POTS
(Plain Old Telephone Service)

⊕ 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)



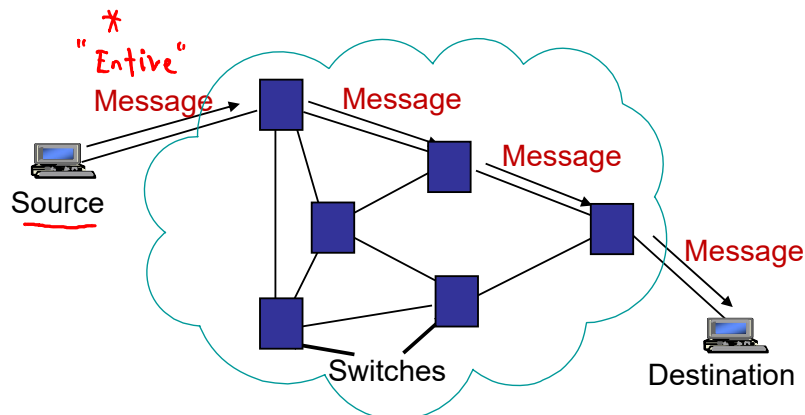
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Message Switching in Telegraph Networks

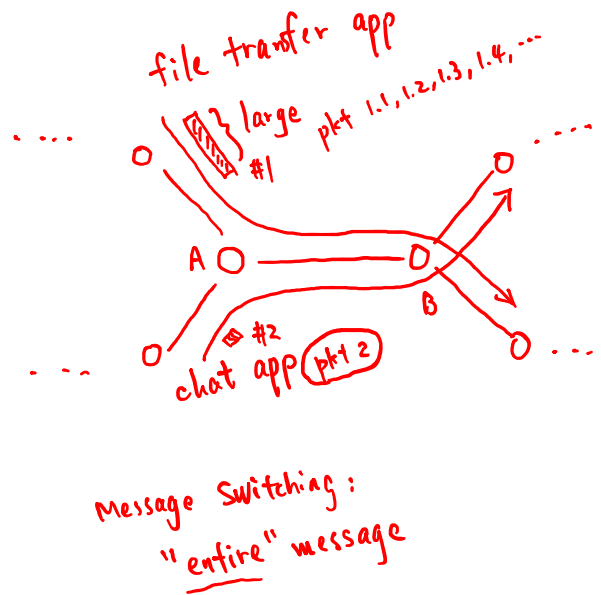
Telegraph Message
(Telegram)

⊕ Message Switching – “Store and Forward”

- Store-and-Forward Operation
- Addressing, Routing, Forwarding



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- not fair
- not flexible
- cannot provide desired QoS (Quality of Service)

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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

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