

# CSE 123a

# Computer Networking

Fall 2005

Final Review

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# When/when/who?

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- Tuesday 3:00-6:00 in this room
- I need to be giving a talk in Toronto so the final will be proctored by the TAs

# Final Mechanics

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- Will cover entire year of material (but with some bias to the material post-midterm)
- Based on lecture material, homeworks, textbook reading and project work
- Closed book, closed note, closed PDA, cell phone, etc
  - ◆ You get one 8.5x11 sheet of notes (both sides is fine)
- Will be similar in style to midterm

# Protocol Layering & Internetworking

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- Why do we layer protocols? Pros/Cons?
  - ◆ What are the layers and what functions do they serve?
  - ◆ What layer do the protocols we've studied fall into?
- What is Internetworking? What is it good for?
- What features does the IP protocol provide and why (and why not others?)
- What is the end-to-end principle and how you might use it when designing a set of protocols?

# Physical layer

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- Signaling
  - ◆ Shannon's law (limits from noise)
  - ◆ Nyquist limit (limits from sampling)
- Clock Recovery
  - ◆ Asynchronous coding (e.g. start bit)
  - ◆ Synchronous coding (e.g. NRZI, Manchester, 4B5B)

# Data-link layer

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- Framing
  - ◆ Sentinel schemes
  - ◆ Length based
  - ◆ Clock-based
- Error detection codes
  - ◆ Parity schemes, CRC
- Media Access Control
  - ◆ Channel Partitioning (FDMA, TDMA, etc)
  - ◆ Random access
    - » Contention based (Aloha, CSMA, CSMA/CD)
    - » Contention-free (RTS/CTS, Token Ring, Polling)
  - ◆ Special issues for wireless

# Bridges & switching

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- Repeaters/Hubs
- Learning bridges
- Spanning tree protocol

# Reliable communications

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- What is the difference between ARQ and FEC?
- How does ARQ work?
- How to detect delayed or duplicated packets?
- How to detect lost packets?
  
- What are Stop and wait and sliding window?
  - ◆ How does the window size impact throughput?
  - ◆ How to implement each? 😊
- How does flow control work in sliding window protocols?

# Connections

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- How to differentiate packets belonging to different “sessions”? (distinct conversations between pairs of processes)
- Connection-oriented vs connection-less protocols
  - ◆ Usefulness of each?
- How to establish a reliable connection?
- How to tear down a reliable connection?
- How do you use state machines to implement this?
- How do TCP and UDP work wrt these issues?

# Congestion Control

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- How does queuing work? How is congestion caused?
- What techniques can be used to reduce/manage congestion?
  
- How to detect congestion?
- How to respond to it?
  
- How does TCP congestion control work?
  - ◆ Slow start?
  - ◆ Congestion Avoidance?
  - ◆ Fast retransmission and fast recovery?
  - ◆ What assumptions are being made in these protocols?

# Packet Forwarding

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- IP addressing & use
  - ◆ DHCP
  - ◆ Destination lookup
- Router design issues

# Intra-domain Routing

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- What purpose does routing serve?
  - ◆ What are the pros/cons of destination-based routing?
- What is the difference between routing and forwarding?
- How does Distance Vector Routing work?
  - ◆ Poison reverse and split horizon?
- How does Link State Routing work?
  - ◆ What is in a link-state packet?
  - ◆ Reliable Flooding? Shortest-Path algorithm?

# Inter-domain routing

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- Why are inter and intra-domain routing different?
- What is a path vector protocol?
  - ◆ Why is it appropriate for inter-domain routing?
- How is BGP used to enforce routing policies?
- Routing policies?
  - ◆ What is peering vs transit? Why do they exist?

# Multicast

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- What is it?
- How does it work in a local-area network (IGMP)?
- Shared tree vs source-based tree (pros/cons)
- How does RPM work?
  
- How does tunneling work?

# QoS

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- Integrated Services
  - ◆ Why?
  - ◆ Kinds of services offered
  - ◆ RSVP design
  - ◆ Token bucket mechanism
  - ◆ Scaling issues
- Differentiated services
  - ◆ Advantages vs IntServ
  - ◆ Difference in service guarantees

# Questions?

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# Quick admin stuff

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- Project 1
  - ◆ Max = 100, Mean 86, Std Dev=20, Median = 96
- HW 2
  - ◆ Max = 20, Mean = 17.59, Std Dev=2.1, Median = 18

# Thanks and good luck

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- You are now ready to cause problems on the Internet...