

# CS 716: Introduction to communication networks

- 2<sup>nd</sup> class; 27<sup>th</sup> July 2011

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# For those who missed the last class

- Eligibility for taking this course in credit mode.
  - Course is for non-CSE, non-ECE, PG students.
  - CSE/ECE PG students should take CS 653 or CS 641.
  - UG students should take CS 348.
- Objective of the course:
  - Introduction to communication networks.
  - Institute elective offered by CSE dept.
  - There is no lab/programming in this course.

# Emphasis of the course

- The course will not go into much excruciating details; It will not be too top-level either.
- The course will focus on concepts that are 'broadly useful', in networking and elsewhere.
- Mostly we will try to understand: “How does X work?”, with emphasis on “Why is X designed this way?”
- Technical topics: Internet, TCP/IP, WiFi, GSM, etc.
- Textbook: Instructor will draw from many sources;
  - You can refer to the book by **Kurose and Ross**.

# Teaching-Learning methods

This course is oriented towards being:

- learner-centric:
  - I will not be simply lecturing.
  - You will have to do a lot of thinking during class!
- collaborative-learning:
  - You will do many group discussion activities.
  - You will teach and learn from each other!
- analogy-based reasoning:
  - I will pose problems from familiar areas (analogy).
  - You will solve them and apply the solution to Networking.

# Revisit problem from last class

- There are two companies A and B, located in cities about 200 km apart.
- The CEO of company A wants to send a document, of about 100 pages, to the CEO of company B.
- What is your opinion on how can this be done, given the following constraints:

# Constraints

- There is no email, no fax, no phone, no post office - no form of modern communication whatsoever.
- The only means of communication are some messenger boys.
- The messenger boys are very weak. Each can carry only 10 pages at a time!
- The messenger boys are very fickle. They may decide to quit without notice, at any time, even in the middle of carrying some pages!

# Activity: Think-Group-Share

- Think.
  - Take 2 minutes to think about it individually.
  - Record your ideas for the solution in your notebook.
- Group.
  - Discuss your ideas with others in your group.
  - Then, work out the solution in detail, as a group. You can take 5-10 minutes for doing this.
- Share.
  - Share your group's solution with the entire class.
  - Other groups to identify pros and cons of each.

# Problem-Solving: ABCDE Process

- A) Assume a simple, favourable case of given scenario
  - State your assumptions clearly (and later relax them)
- B) Brainstorm for possible solutions
  - Evaluate pros and cons of each wrt given scenario constraints
- C) Choose one solution that satisfies the given constraints
  - Avoid attempts for premature optimization
  - Avoid including “additional features” that are not asked for
- D) Do the detailing of the chosen solution
  - Do not go back to brainstorming for evaluating other ideas
- E) Examine correctness and completeness
  - Carry out 'What-if' scenarios on various boundary conditions and see if your solution needs to be modified



# Key points for the CEO example

- Need for secretary and dispatch sections.
- Need to specify actions of each entity clearly.
  - CEO gives **data** - document (D) and name (CEO-B) to secretary, along with **control** – send this by tomorrow.
  - Secretary looks up name and finds address, packetizes, inserts sequence numbers, maintains acknowledgement.
- Specify the actions for each entity, starting with CEO-A, till the document reaches CEO-B.

# Analogy with Networking

- The networking topic for today - Overview.
- Show correspondence between entities in the network and the analogy. Give the terms – layers (http; tcp; ip).
- Show correspondence between the concepts used in the analogy and those in the network. Give the networking terms for these concepts – protocol, pkt...
- Maintain a list of concepts being discovered.
- Summarize the network discussion, highlighting the application of the concepts discovered.

# Key points for the Overview

- Notion of layers, protocols and interfaces.
  - CEO corresponds to application layer.
  - Secretary corresponds to TCP.
  - Dispatch corresponds to IP.
- Concerns and functions at each layer are different.
  - Need to be clearly specified for the abstraction to work!
- Notions of reliable versus best-effort service.
- DNS and other topics touched upon.

# Animation

- Here are some links to animation applets:
  - [http://highered.mcgraw.hill.com/sites/0072967722/student\\_view0/animations.html#](http://highered.mcgraw.hill.com/sites/0072967722/student_view0/animations.html#)
  - <http://www.cs.stir.ac.uk/~kjt/software/comms/jasper.html>
- Here is a link to a 13-minute animation video:
  - <http://video.google.com/videoplay?docid=-5019530929128132102#>

# At the end of this topic

You should be able to do:

- Recognize the analogy between the CEO example and communication in a network.
- Identify layers, interfaces and entities in a protocol.
- State the need for communication protocols.
- Design a reliable communication protocol over an unreliable network.
  
- Work in a group towards solving a given problem.
- Clarify specifications of a problem by identifying and asking the appropriate questions.
- State the assumptions made for your solution.
- Make simplifying assumptions for the initial solution, before going on to general/efficient/optimal ones.

# Repeat: Why does this course emphasize...

- Your idea of the “solution”:
  - To help you see that most technology evolves from simple ideas; You already know many such ideas!
- Group discussions:
  - That is how details of most technologies are worked out.
  - Evaluate pros and cons of solutions, within 'constraints'.
- Analogies:
  - That is how scientists attempt to solve new problems.
  - Analogies may help you to see conceptual similarities in various areas of your work (and adapt solutions).
- Fun:
  - That is when you learn; See last year's students' comments.

# Reflection

- What did I learn in today's class?
- Each student to mention one point.
  
- Take-home questions:
  - What are the differences between an interface and a protocol? What are the similarities?