Recitation 7: Ethernet
Plan

- Warm up: "Game"
- Ethernet & networking

Key concepts:
* Shared broadcast medium
* Exponential backoff

Logistics

* DP Prep assignment due tomorrow 2/25 at 5pm ET

* Next assignment online by this weekend.

* Participation prelim grades by this weekend.
Recitation Qs

- What problem are the authors trying to solve?
- What choices do they make, and how do they explain or justify those choices?
- Do they mention alternatives? If so, what do they say is undesirable about those alternatives?
- What is the connection between this paper and lecture?

On Ethernet...

- You use it all the time
  - Basically any "wired" network in home/office
  - Even wireless networks use similar design idea ("Wireless Ethernet")
Game: Multiple Access to Shared Network ("Aloha")

Theme: How to share a resource when many parties want to use it.

- We each have one msg to send
  - Our favorite _______

- Everyone closes eyes, shouts word.

- If two people tx at once → **COLLISION** - both lost!

Goal: Get to 20 uncorrupted transmissions in minimum time.

⇒ Amir keeps score.
Game

* What are some strategies?
  - Never tx - fairness
  - Always tx
  - Randomized?
     - How randomized?
       - How often? \( \frac{1}{\# \text{people}} \)

* Change # people and see what happens.
  - First name ends with L.

* What is the max score we can hope to achieve? \( \text{Need some theory!} \)

* What happens if someone gets annoyed and wants to mess up our conversation?

* What if we don't know how many people are transmitting?
Computer network

What is it?

What kind of network is this?
LAN vs WAN vs Internet

Some history on Ethernet....

- The most widely used LAN scheme
  (xerox PARC, etc)
- Netcalfe xerox PARC, 3com,....

Idea: local broadcast:

- One party sends msgs.
  all hearer

Packets = data sent in short blocks — not as one superlong stream
Technical ideas

- Communicate over "dumb network"
  ➔ Why is this nice? (cheer!)
  ➔ Like our game example

- CSMA/CD
  - carrier sense multiple access / all detect
  - MA = many people sharing same medium (as in our game)
  ➔ Why is this good?
  - CS = don't transmit when someone else is transmitting
  ➔ Why is this good?
  - CD = Sender listens to itself, broadcasts junk if there's a collision
  ➔ Why is this good?

How does exponential backoff work?
  ➔ Why this makes sense (binary search)
  ➔ Why not additive backoff?
Questions

- What happens if different terminals run at different speeds?

- Why is promising error-free communication costly & dangerous?

- What do you do if someone usurps the ether? E.g. Zoom

- What is a good packet length for Ethernet?
To discuss in groups...

1. Why this design is clever/took over the world?
   - Cheap
   - Easy to configure/change/expand
   - Easy to implement
   - No (?) single point of failure
   - Scalable (?)

   How do you scale?

2. What are potential limitations?
   - Throughput?
   - Collisions
   - Utilization - ineffect use of cables if not topology is fixed (e.g. undersea cable)
   - Limited size - can't scale to many nodes