Recitation 11: DCTCP
Plan

* Feedback summary
* Recitation Qs
* Backyard on DCs
* Queue game
* DCTCP

Logistics

* DP Prep report assignment out
due TODAY 5pm!!
* Participation check-in #2 out Saturday
  * Explain how works
* Midterm on Tuesday, April 6
  * Example exams posted
Feedback Summary

* Most people like the pace
* Request for course notes — now online
* Midterm
  => See past midterms on course website
* Go over pre-recitation Qs in class
  => Volunteers for next time?
* Breakout rooms
  => pros & cons
* Awkward pauses waiting for questions
* Kahoot
Recitation Qs

1. What is the goal of DCTCP?
   => Everyone type in chat, then send at the same time. (Item from feedback form)
   * Better net utilization in DC

2. How does DCTCP differ from TCP?
   * Management of buffers

3. Why does DCTCP differ from TCP?
   * Different setting
     => control endpoints
     => very low RTT
Why is this a great paper?

- Simple, important (?) problem
- Elegant solution
  - No new hardware
  - Simple changes to endpoints
- Works in practice (e.g., Cisco)
Types of Flows in Data Center

- Query traffic ~2 KB
- Short message traffic ~1 MB
- Background traffic ~50 MB

Small latency sensitive

big throughput is important

E.g. Search

"Cheese shops"

deadline = 100 ms

deadline = 50 ms

deadline = 10 ms

Updates
Queues

Why do they exist?

Switch

$\rightarrow$ What happens when queue fills up?

$\rightarrow$ Dropped packets = worse search results (connection times out)

$\rightarrow$ Even before queue fills up, can be problematic

$\rightarrow$ Latency grows?
Queue Game

Switch
(Amir)

Server

- Students: Type your initial in chat to simulate sending a packet

- Amir: Type $\sim$ to indicate processing and forwarding packet.

Trial run: One sender, every 3-5 seconds

Show what this looks like in queue
For real now...

- Two flows, both send every 1-2 seconds

- Everyone sends at same time
  → Lots of packets drop ("incast")

- One long flow, sending as quickly as possible
  → Some packets drop but throughput is good

- One long flow, one short flow
  → Queue length grows ⇒ latency?
    "better bullets"

→ What does DCTCP do to fix this problem?
**DCTCP**

Switch

As soon as queue grows beyond threshold, switch sets flag on each packet

Normal TCP: Wait until queue is full

Sender

Uses ECN flags to estimate whether queue size is > k

- If so, gradually back off (adjust window size)
- If not, continue as normal

Normal TCP: Cut window in half
Why would this not work on Internet?

- Practical: Need to modify both ends of the connection.

- Convergence time depends on RTT
  - Small in DC (0.1 ms)
  - Big in Internet (so ms)

  Time for new flow to get its fair share of bandwidth.

  3-4x slower than TCP

- Less clarity about types of Slow (?)

- Feedback is too slow... by the time sender gets CWN queue may be empty.