

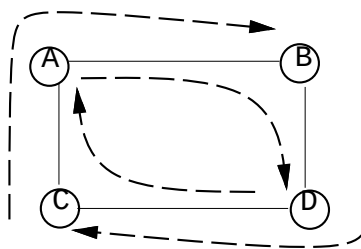
CS423: Lecture 25, Transport: Abstractions and Cong Control

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CONGESTION CONTROL: ISSUES

- Dynamic Problem, not static.
- Can't be solved by rerouting traffic within network; must stop admission to network.
- In worst case, throughput can collapse to 0. (Congestion collapse).
- 2 models for dealing with finite buffers:
 - Drop packets when buffers get full — LIVELOCK.
 - Wait at previous hop till next hop buffers empty. Highway model — GRIDLOCK.



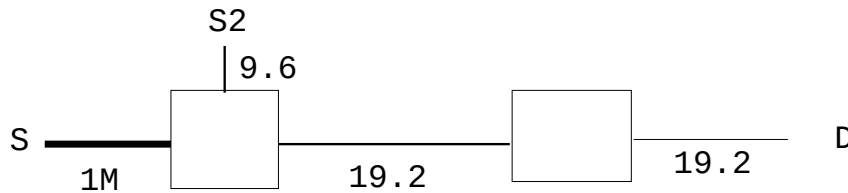
RESEARCH DIRECTIONS

- Reacting in 1 round-trip delay appears too slow as networks get faster (1 Gbit links).
- Some research transport protocols (NETBLT, VMTP) use rate based flow and congestion control.
- Use of virtual circuits makes problem easier once VCs are setup. But setting up VCs runs into the same congestion issues.
- Gridlock-free routing. (AN-1 network, also many multiprocessor networks like COSMIC CUBE and J-MACHINE).

COUNTDOWN: REST OF COURSE

- Useful Abstractions for using networks: RPC, Distributed Shared Memory, UNIX sockets. (1 lecture)
- Building efficient implementations, reading specs, management, and Final Review (1 lecture).
- Final Review (1 lecture).

FEEDBACK CONGESTION CONTROL



- 1) DETECT CONGESTION
- 2) FEEDBACK INFORMATION TO THE SOURCE
- 3) SOURCE ADJUSTS WINDOW:
 INCREASE POLICY
 DECREASE POLICY

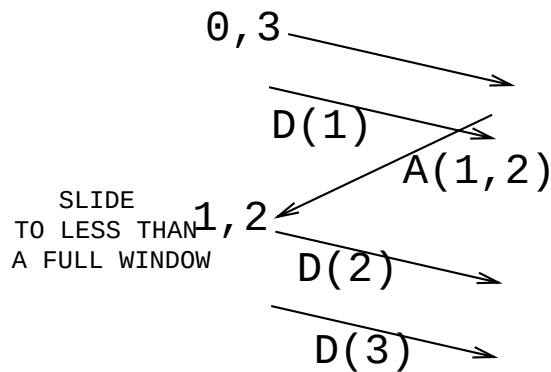
TWO INTERESTING CASES:

- a) HOW A SOURCE REACHES STEADY STATE.
- b) HOW A SOURCE REACTS TO A NEW SOURCE
 TO PROVIDE A FAIR ALLOCATION.

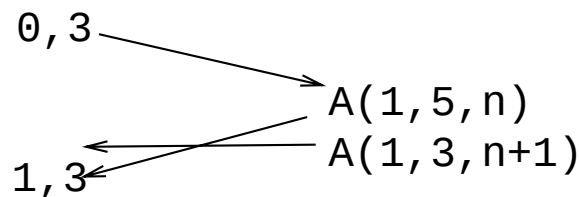
CONGESTION AVOIDANCE (OSI) VERSUS
CONGESTION CONTROL (TCP)

FLOW CONTROL

- Windows provide static flow control. Can provide dynamic flow control if receiver acks indicate what receiver will buffer.



- Need to avoid deadlock if window is reduced to 0 and then increase to $c > 0$. In OSI, receiver keeps sending c . In IP, sender periodically probes an empty window.
- In OSI, receiver can retract window from say 5 to 3. To detect out of order acks, use subsequence numbers.



- Real Window = Min Flow Control, Congestion Control windows.

