Panel 1

Last time:

Exam #1

Network Layer

1

Panel 2

Congestion Control

- too many packets on network
- begin to loose packets
- acks are not returned
- packets are resend
- More traffic
- Gets worse

Congestion control is different from flow control:

Flow control: involves two connected nodes

Congestion control: involves entire network

2

Panel 3

Congestion vs. Flow Control

Fiber optic network, 10000 Gbps speeds
Supercomputer sends data a PC
] Flow Control

1000 PC's on 1 Mbps line, sending files at 100 Kbps to each other
] Congestion Control

3

Panel 4

Open Loop vs. Closed Loop Congestion Control

Open Loop: solve congestion by design, before it starts, e.g. regulate flow of traffic, rules to allow/disallow new traffic, ...

Closed Loop: based on feedback loops
- monitor systems, detects congestion
- pass that info to a place where action can be taken
- adjust system parameters

4

Panel 5

Traffic Shaping

Cong. happens frequently because of traffic bursts

⇒ need more uniform traffic

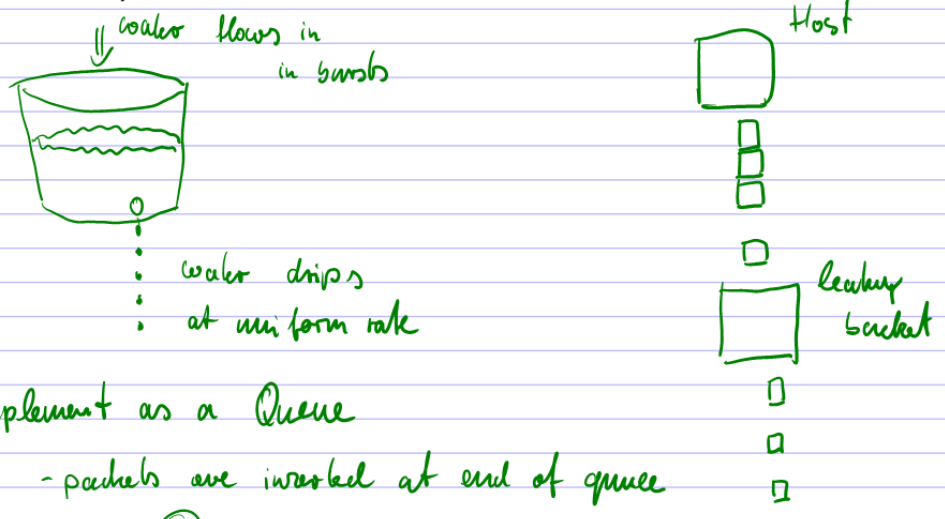
Employ alg. to ensure uniform data flow.

Open / Closed Loop ?

5

Panel 6

The Leaky Bucket Algorithm



Implement as a Queue

- packets are inserted at end of queue
- every T secs. dequeued at the head

Extra packets are dropped !

6

Panel 7

Token Bucket Algorithm

Leaky Bucket enforces rigid pattern

More flexible: token bucket

Bucket contains tokens, new token is added every T secs. (until full). Packets need to capture + destroy a token!

Implement by incrementing a counter every T secs.

if counter > 0 packet can leave + decrement counter

if counter $= 0$ packet waits

Other alg: choke packets - closed loop!

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Panel 8

Network Layer in the Internet

IP = Internet Protocol

next time!

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