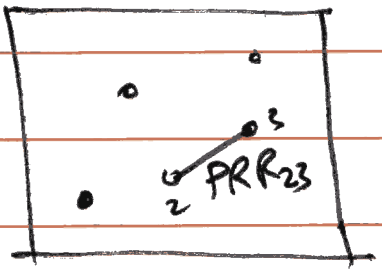
EE 597

April 19, 2012

Project 2

Compare Shortest Style path routing & Anypath routing via simulations.



- n nodes in a given region
- use a realistic topology generator that gives PRR between each pair of nodes (based on log-normal fading + exponential path loss)
  - Assume $ETX_{a,b} = \frac{1}{PRR_{a,b}}$

Goal is to compute the best route between nodes i, j using two algorithms:

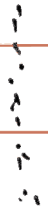
(1) shortest ETX single path (use Dijkstra's or Bellman-Ford)

(2) lowest ETX Anypath Route (use the Laufer et al. algorithm discussed in class, OR your own algorithm from HW3, assuming it's correct!)

Submit the code (C, C#, Java, MatLab, Julia, NS2)

& plots showing comparison of ETX (averaged over all pairs of nodes) versus n. For varying n, channel model parameters α, σ.

In your submitted figures, show the mean ETX with a 95% confidence interval in the mean



• C.I. $\frac{\text{STD. DEV}}{\sqrt{n}}$

Transport Layer

Functionalities

essentially same for wired & wireless networks:

- multiplexing applications
- End to end reliability & ordering
- Congestion Control

Congestion control: a tradeoff between loss-avoidance & utilization

Two major pieces:

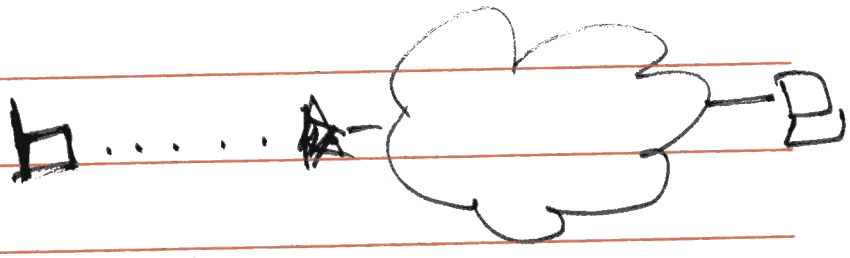
1. Congestion Detection
2. Response to congestion (rate allocation scheme)

TCP : Transmission Control Protocol

Key features:

- End to End implementation (host-centric)
- Window-based
- Losses are determined by timeouts

Problem of Loss Differentiation



Assumption: loss implies congestion

this can be mistaken often in a wireless networks

If the loss is due to link quality fluctuations, cutting back the

rate only reduces utilization.

One possible (and widely accepted) solution is to use Explicit Congestion Notification (router-centric mechanism)

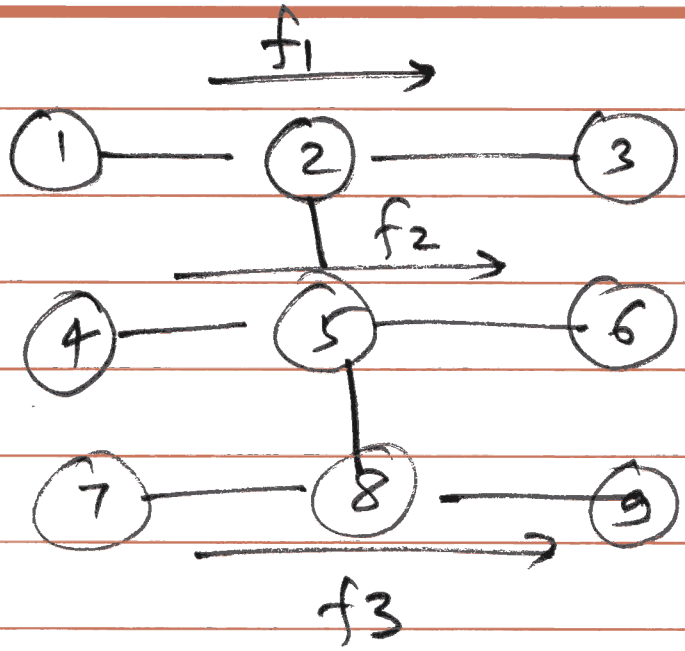
ECN bit is flagged by intermediate routers that detect congestion (possibly in advance, based on queue occupancy threshold)

Since only congestion events (and not like losses) are detected & marked, the source need only cut back its rate in the former case.

Tradeoff: technically, this violates the end-to-end principle.

Second problem w/ TCP
problem of short-term fairness

Illustrated by the flows-in-the-middle topology.



In a wired network, these flows are indep. of each other.

In a wireless network, the flow in the middle will starve.

Shrim: Congestion sharing

Basic idea: The flows that should respond to a congestion event at a router are not only those whose packets go through that particular router, but rather all flows whose packets might cause interference (hence congestion) at that router.

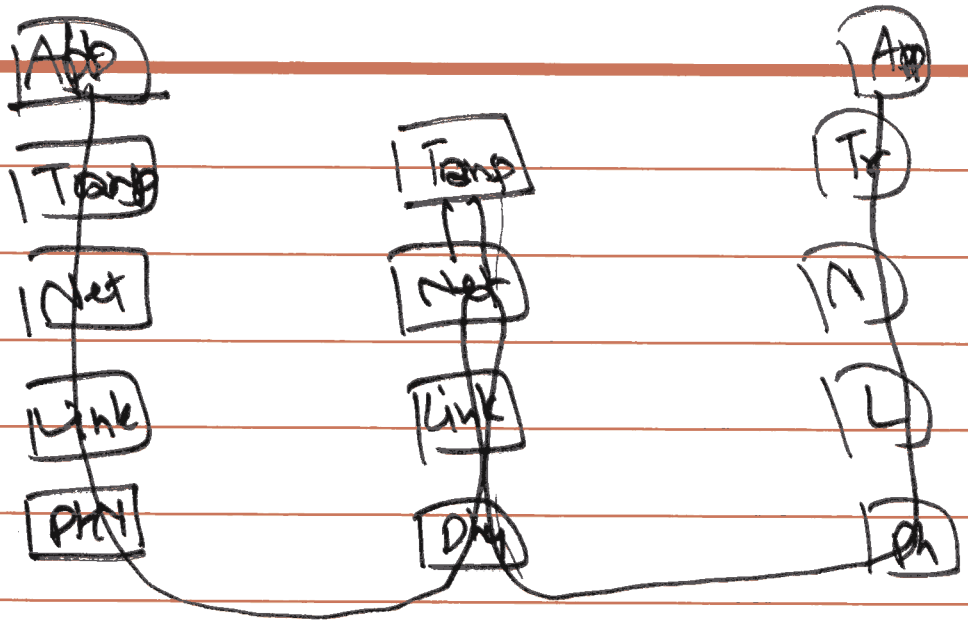
This is hard to implement with a pure end to end architecture.

WCP - wireless control protocol

- based on ECN (therefore, router-centric)

- congested router not only marks pkts going through it, it also signals neighboring wireless routers about this congestion, & they mark the ECN bits on pkts passing through them as well.

- The sources respond to ECN w/ AIMD.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