

Research Methods in computer science

Fall 2013

Lecture 8

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September 24, 2013

Agenda

Research Conference Updates

Experiments in uncontrolled environment

Description of experiment setup

Feedback from HW3

HW5 and HW6 preview

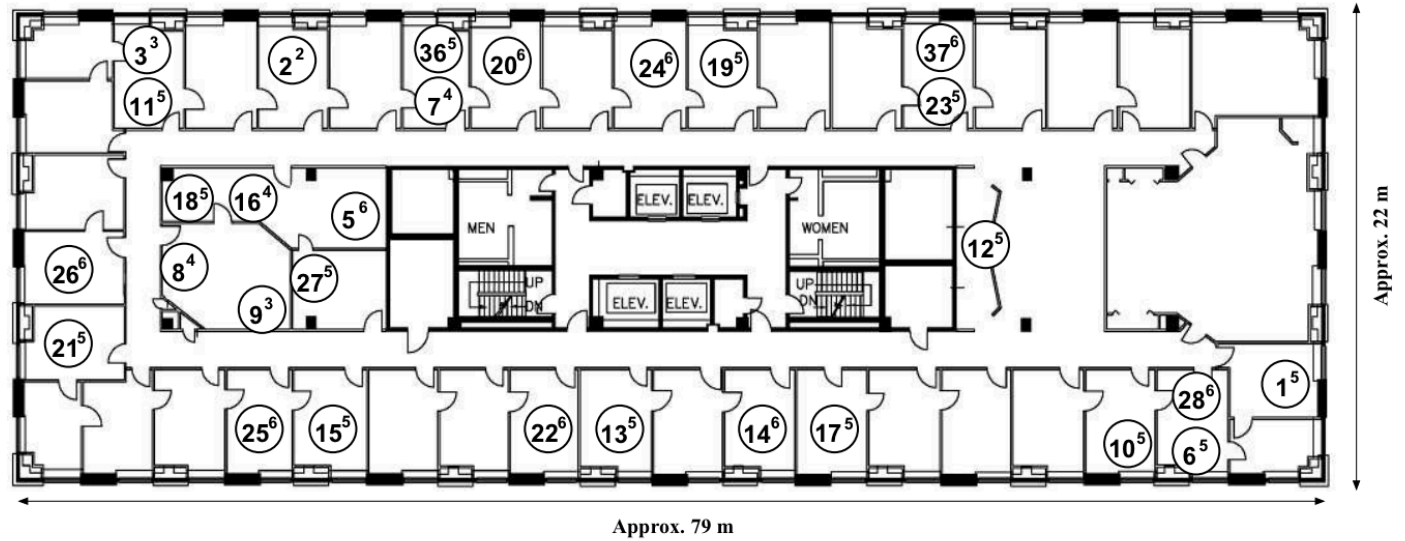


Figure 1: A map of the test-bed. Each circle is a node; the large number is the node ID, and the superscript indicates which floor of the building the node is on.

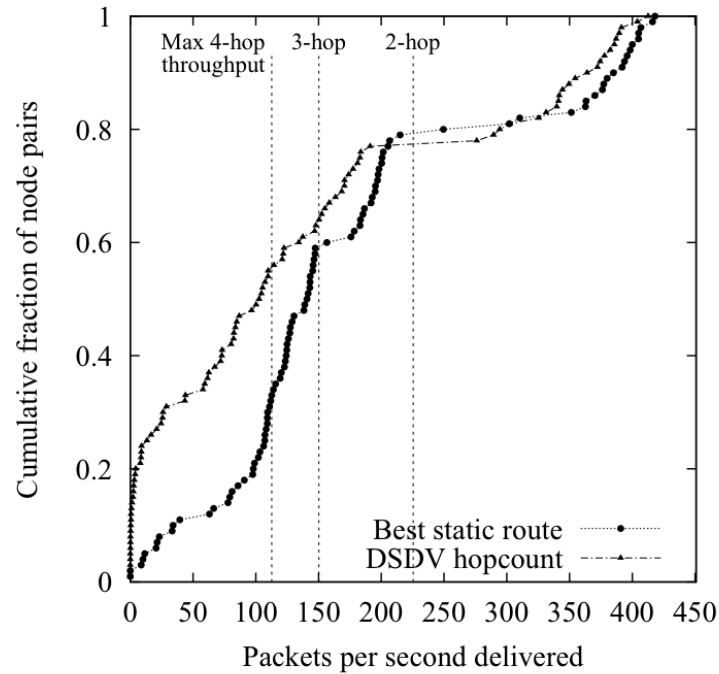


Figure 2: When using the minimum hop-count metric, DSDV chooses paths with far less throughput than the best available routes. Each line is a throughput CDF for the same 100 randomly selected node pairs. The left curve is the throughput CDF of DSDV with minimum hop-count. The right curve is the CDF of the best throughput between each pair, found by trying a number of promising paths. The dotted vertical lines mark the theoretical maximum throughput of routes of each hop-count.

Deployment Experiments

Realistic setup and inputs

Uncontrolled environment

Spans the parameter space?

Wireless Experiments Today

Protocol Comparison Experiments

- Run the new protocol

- Run best-known prior work

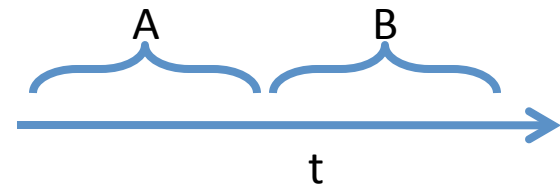
- Compare

Simulations + Testbed experiments

Serial Experiments

Run one protocol at a time

Compare the results

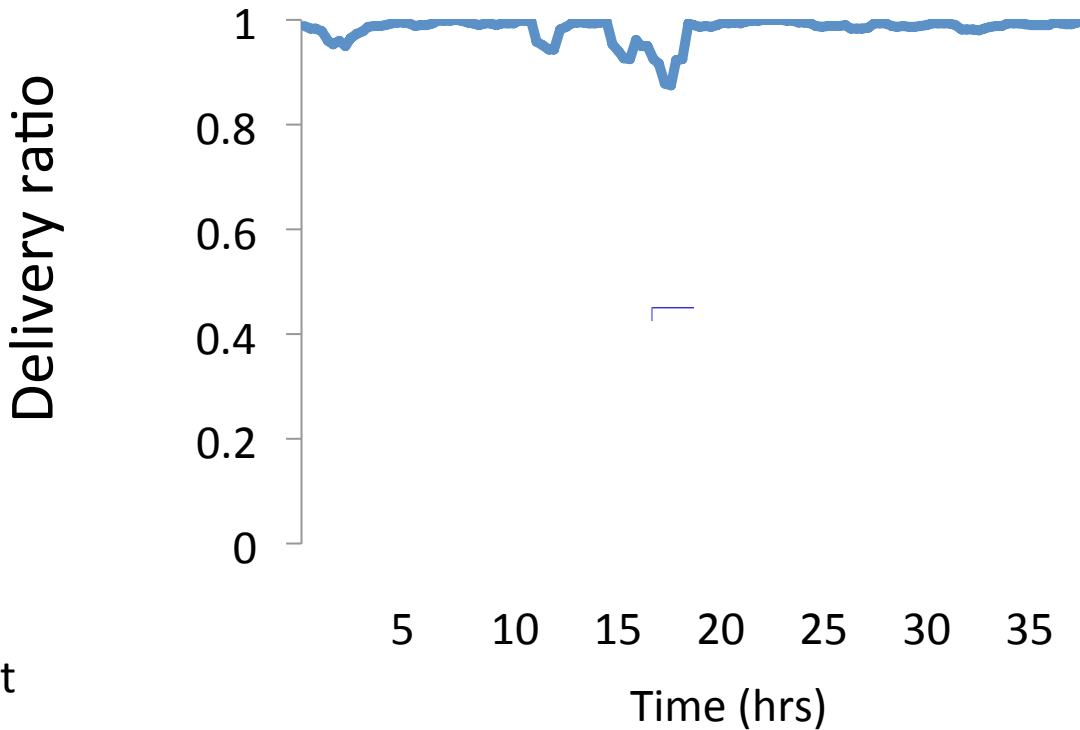


Difficult to distinguish the contribution of these these variables

Environment

Protocol mechanisms

Repeating Experiments Enough?



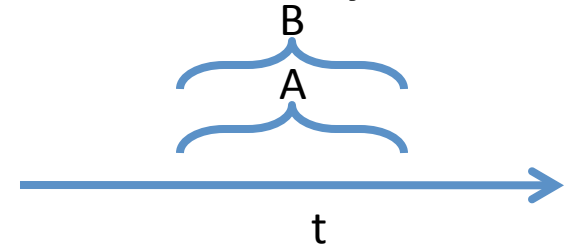
Tutornet

**High delivery ratio across time
(short experiments can be misleading!)**

Concurrent Experiments

Run multiple protocols concurrently

Compare the results



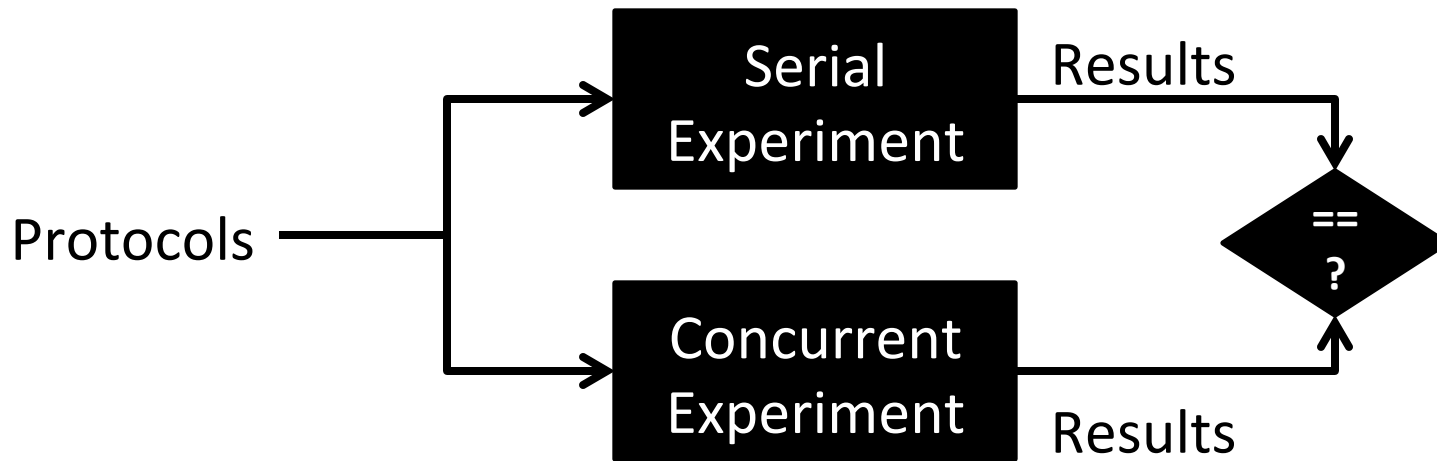
Advantages

Consistent environment for both the protocols

Concerns

Contention of different types

Evaluation Strategy



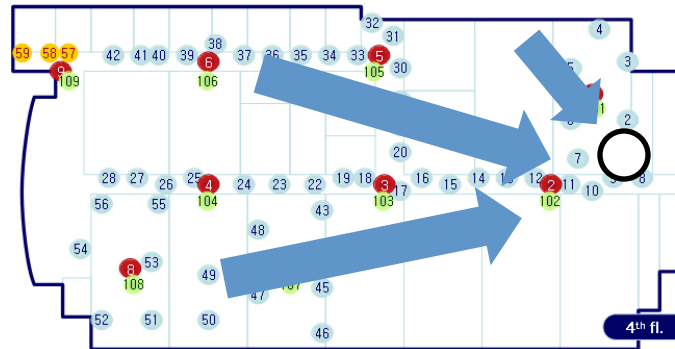
Ideally same conclusions from both methods
Evaluating methodologies not protocols
Experiments on Tutornet testbed

Protocols

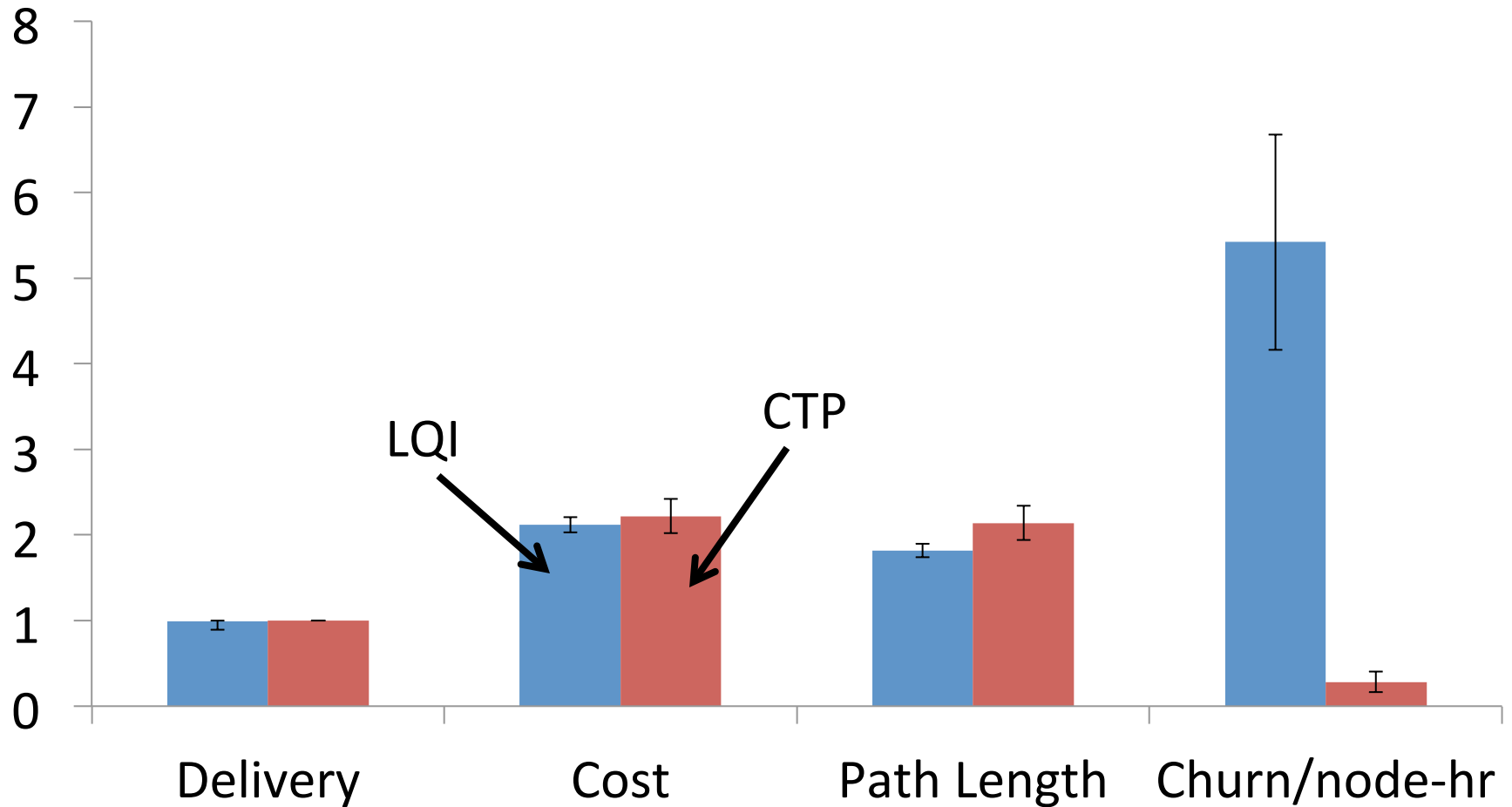
Collection

CTP [Gnawali 2009]

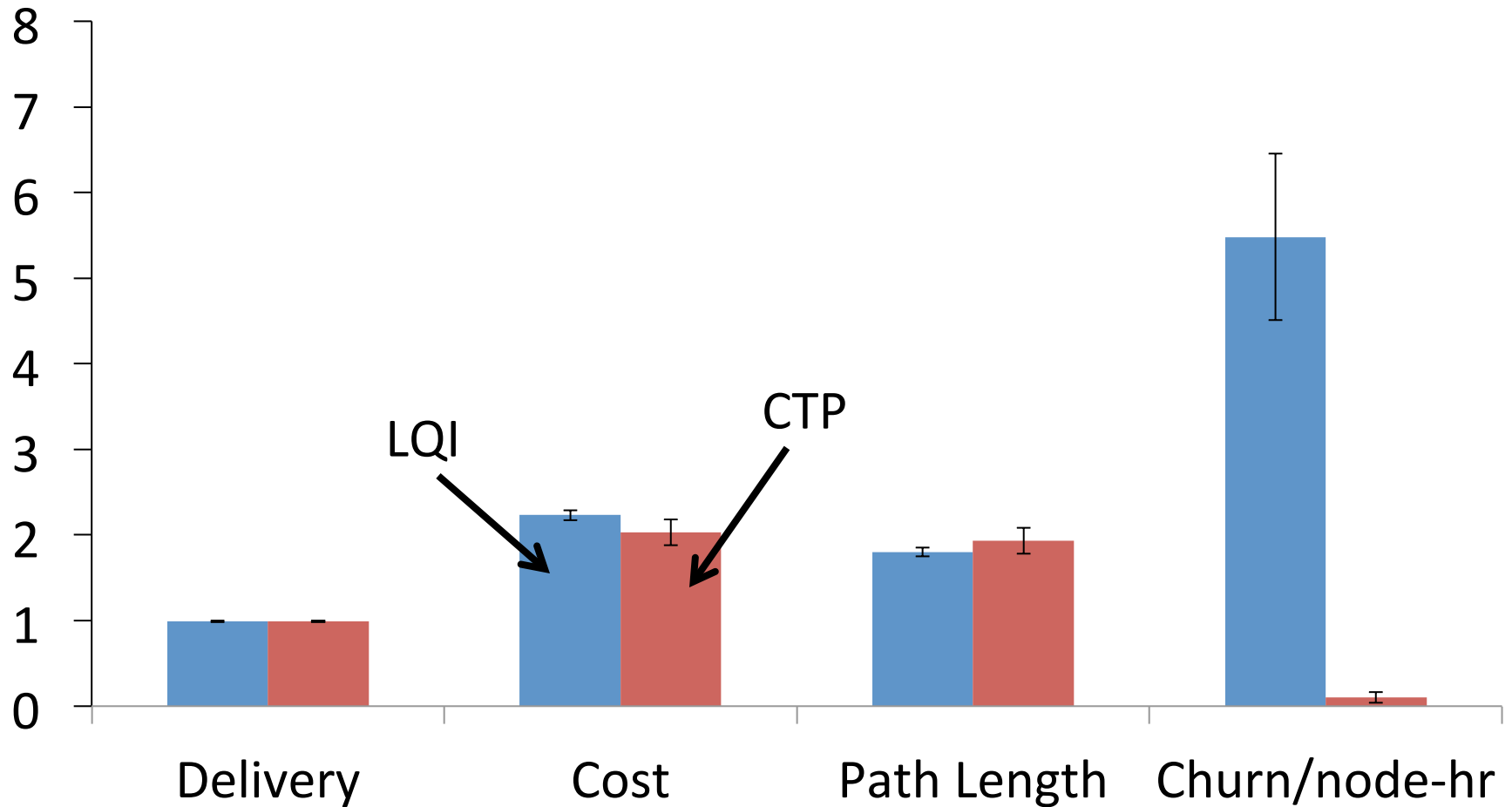
MultihopLQI [TinyOS 2007]
(LQI)



Results from Serial CTP vs LQI Experiment on Tutornet

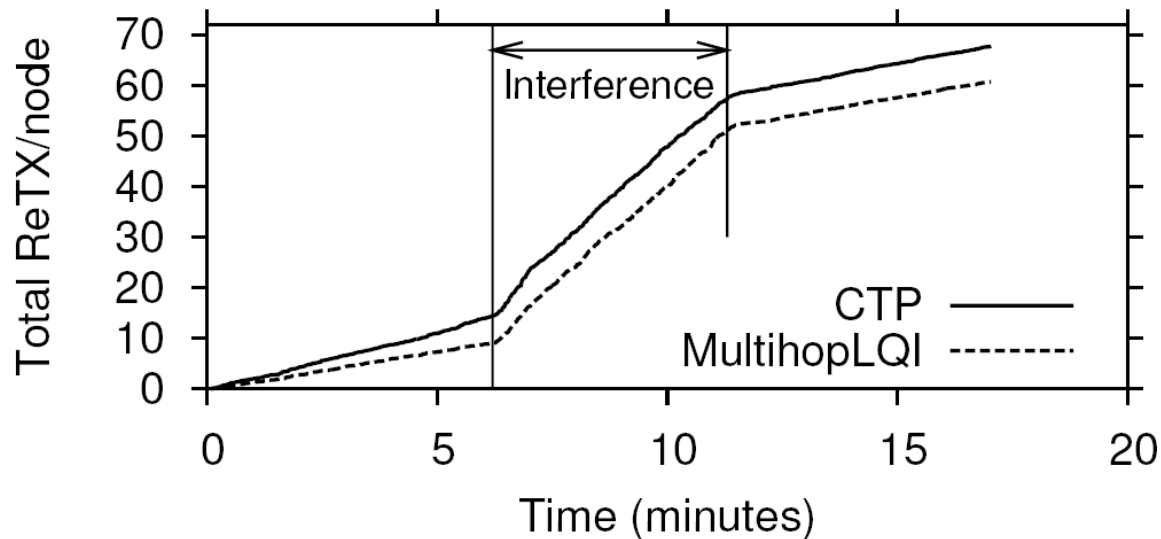


Results from Concurrent CTP vs LQI Experiment on Tutornet



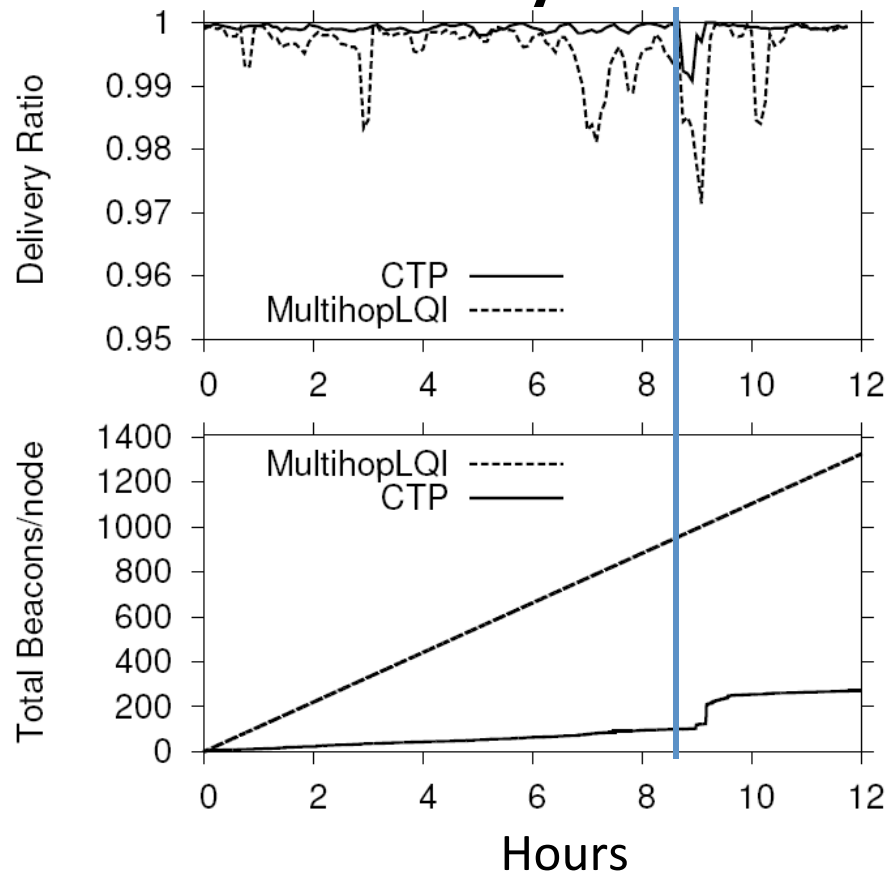
Putting Concurrent Methodology to Use: Expts. with External Interference

Engineered Scenario



Both protocols *struggle* in the same environment.

Putting Concurrent Methodology to Use: Experiments in a Dynamic Network



CTP and LQI react differently to dynamics.

Description of experiments?

We use all available nodes in every experiment. In some testbeds, this means the set of nodes across experiments is almost but not completely identical, due to backchannel connectivity issues. However, we do not prune problem nodes. In the case of Motelab, this approach greatly affects the computed average performance, as some nodes are barely connected to the rest of the network.

5.1 Methodology

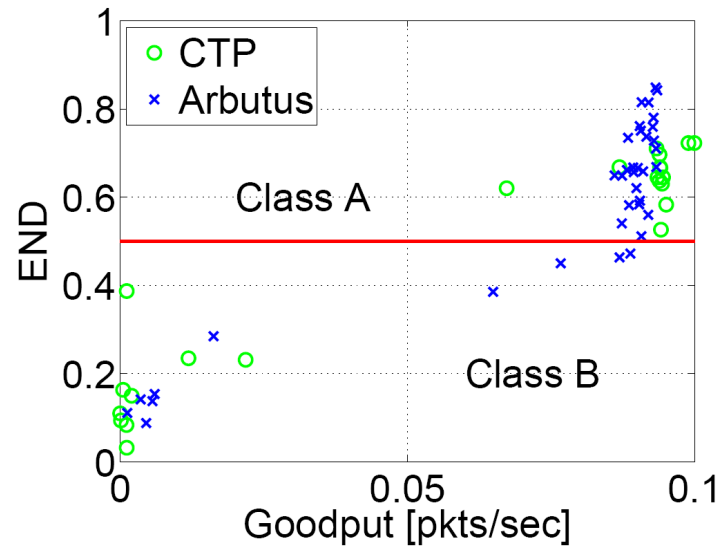
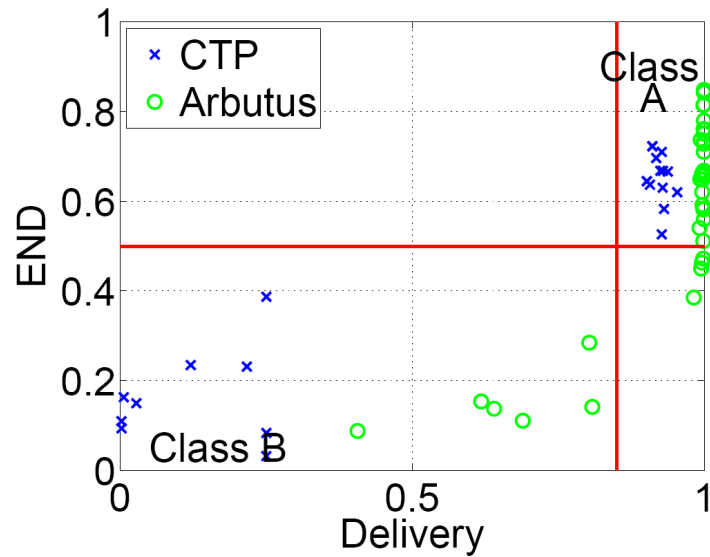
We conducted our experiments on a tiered network testbed with several Stargate nodes and 40 TelosB motes. All nodes are located above the false ceiling across multiple rooms and hallways on a floor of a large office building. The wireless environment above the false ceiling is harsh, with some links experiencing above 30% packet loss rates. All nodes run the Tenet stack modified to support AEM. In most experiments, we use a single Tenet master node. We configured the mote radios to transmit at -8.906 dBm, which results in a tree with 4-hop depth.

Experimental Methodology and Metrics We now compare the performance of Tenet-PEG and mote-PEG. Our experiments are conducted on the testbed shown in Figure 7. This testbed consists of 56 Tmotes and 6 Stargates deployed above the false ceiling of a single floor of a large office building. The Stargate and mote radios are assigned non-interfering channels. This testbed represents a realistic setting for examining network performance as well as for evaluating PEGs. The false ceiling is heavily obstructed, so the wireless communication that we see is representative of harsh environments. The environment is also visually obstructed, and thus resembles say, a building after a disaster, in which a pursuit-evasion sensor network might aid the robotic search for survivors.

Network Metric

Converting these subjective descriptions
to a more quantitative description

END and CTP Performance



HW5

Write a response to the pamphlet on smart meters.

HW6

Make a list of metrics from the ten research papers you selected

Define each metric in a few sentences.