Research Methods in computer science

Fall 2014

Lecture 7

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September 17, 2014

Agenda

Research Conference Updates

Experiment and metric design exercise

Experiments in uncontrolled environment

Description of experiment setup

HW

Metric Design Exercise

Project: Instruction system (HCI)

Goal: Make furniture assembly faster

Possible metrics and experiments?

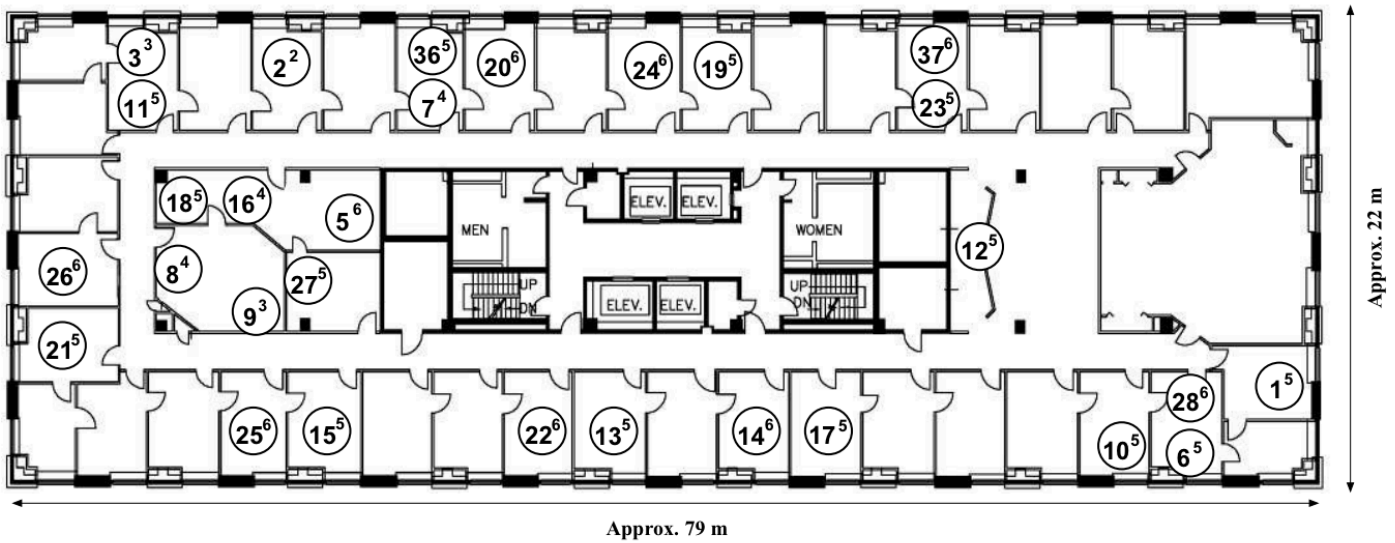


Figure 1: A map of the test-bed. Each circle is a node; the large number is the node ID, and the superscript indicates which floor of the building the node is on.

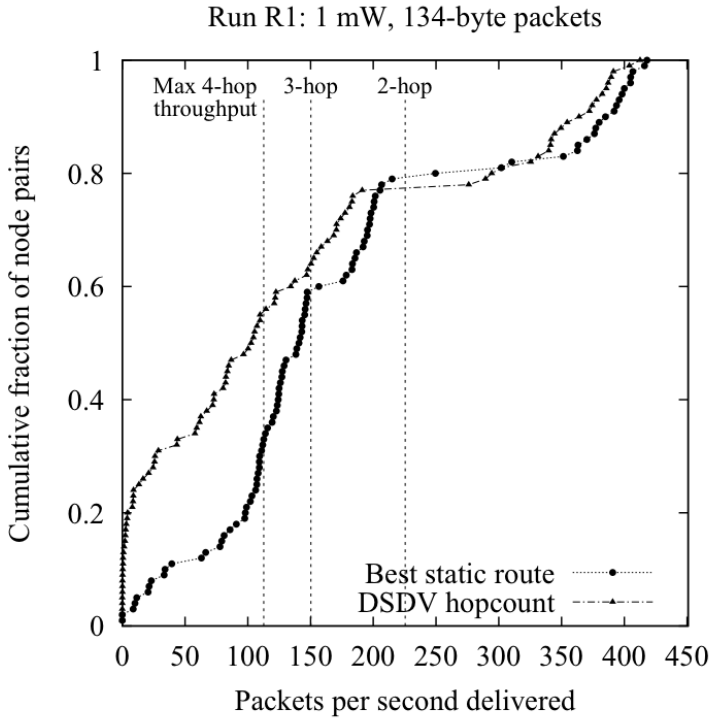


Figure 2: When using the minimum hop-count metric, DSDV chooses paths with far less throughput than the best available routes. Each line is a throughput CDF for the same 100 randomly selected node pairs. The left curve is the throughput CDF of DSDV with minimum hop-count. The right curve is the CDF of 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

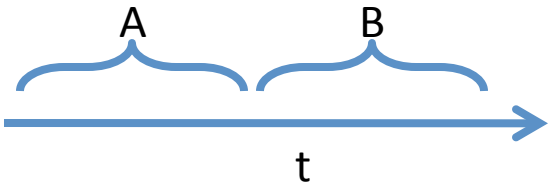
- Protocol Comparison Experiments
  - Run the new protocol
  - Run best-known prior work
  - Compare

- Simulations + Testbed experiments

Serial Experiments

Run one protocol at a time

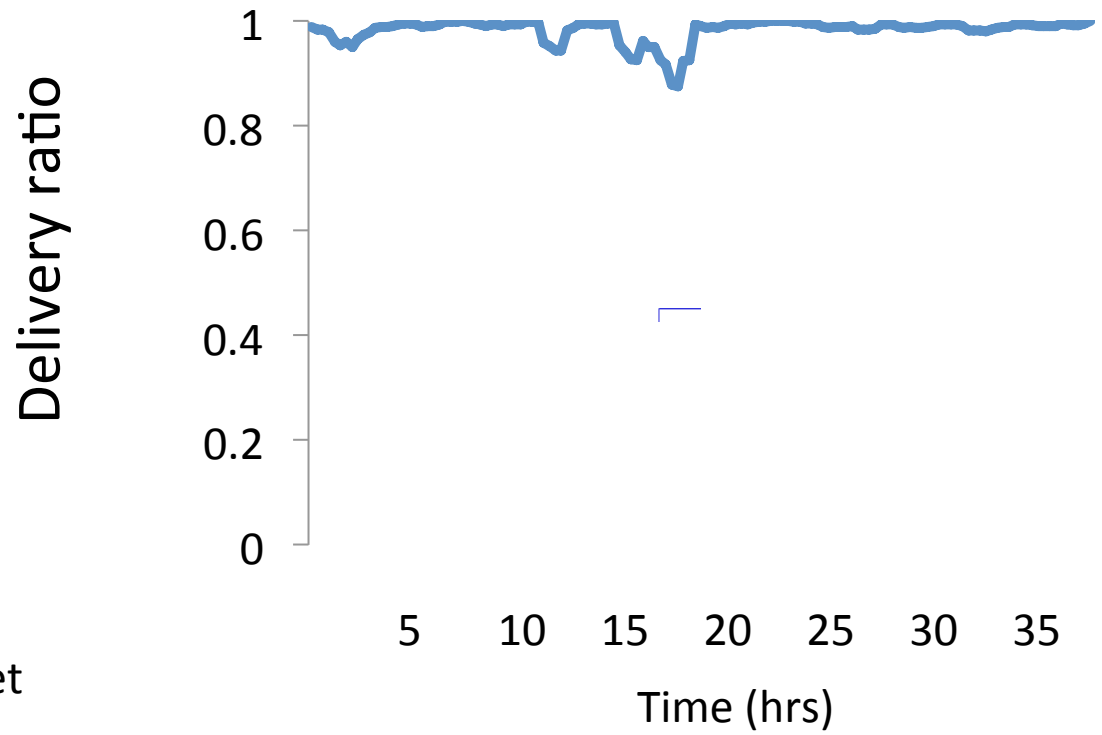
Compare the results



Difficult to distinguish the contribution of these these variables

- Environment
- Protocol mechanisms

Repeating Experiments Enough?



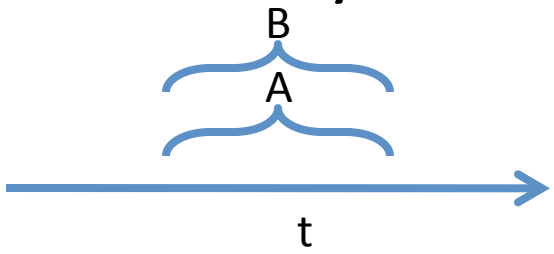
Tutornet

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

Concurrent Experiments

Run multiple protocols concurrently

Compare the results



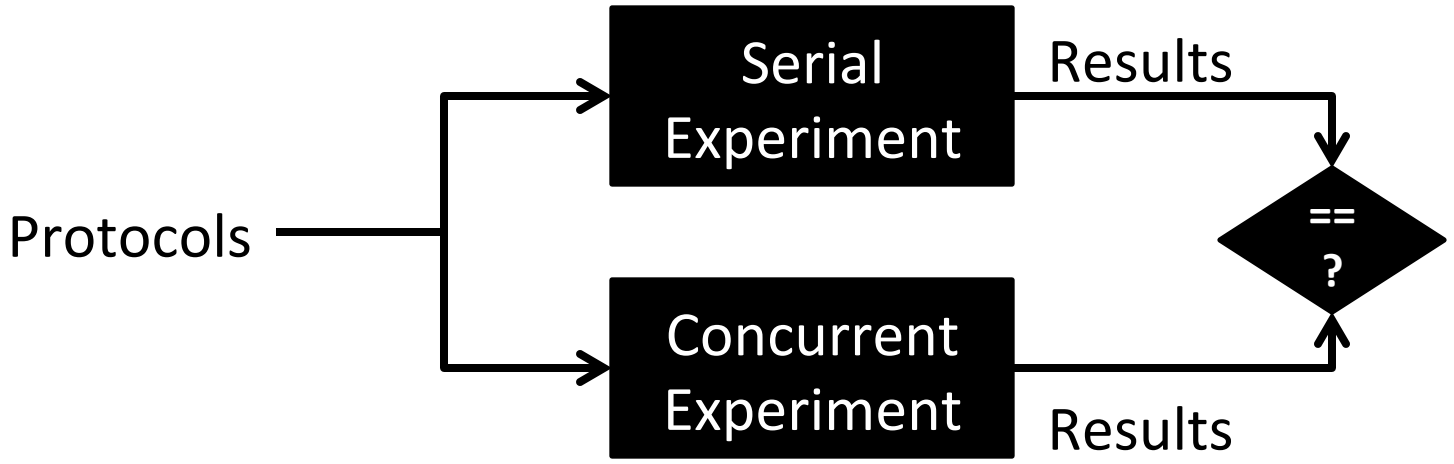
Advantages

- 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

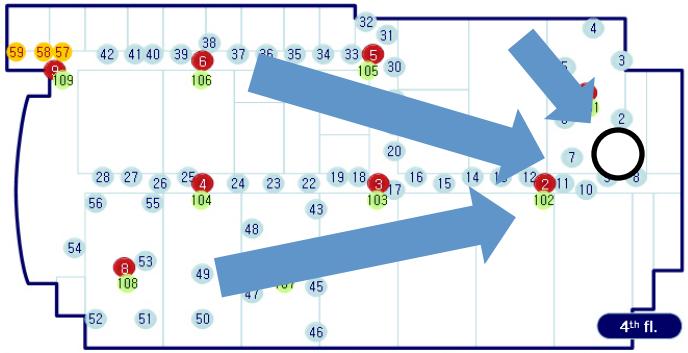
Protocols

Collection

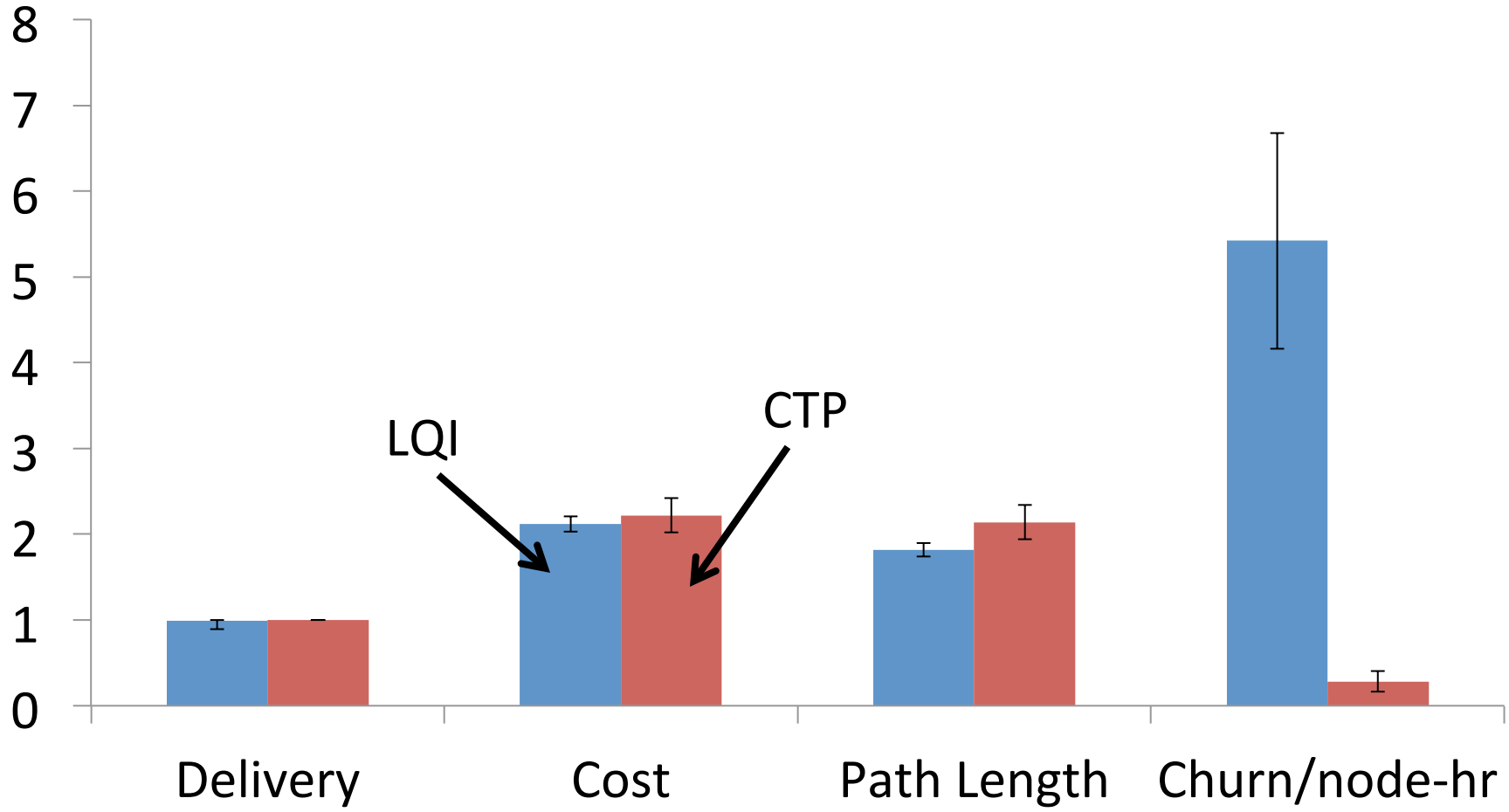
CTP [Gnawali 2009]

MultihopLQI [TinyOS 2007]

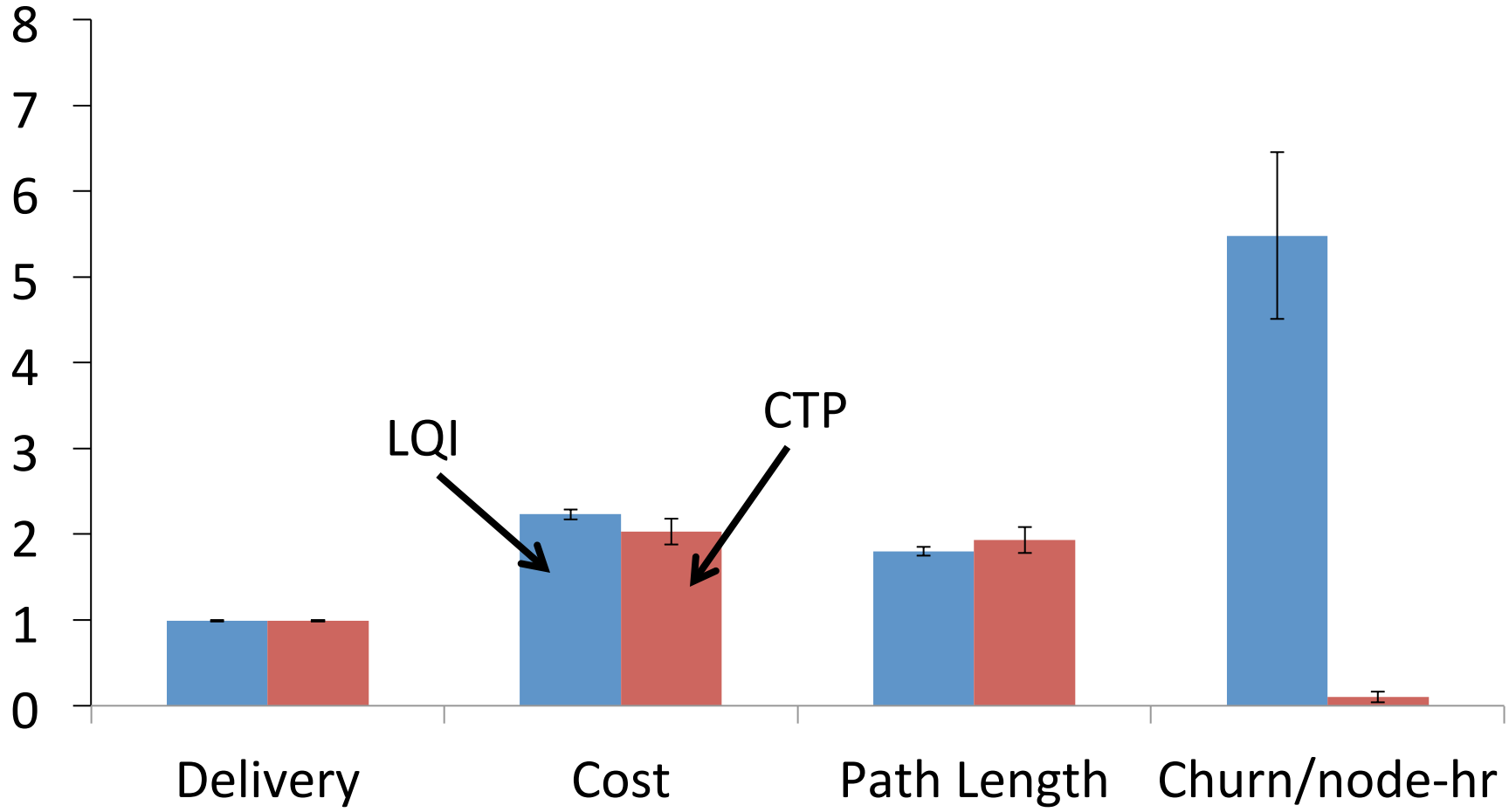
(LQI)



Results from Serial CTP vs LQI Experiment on Tutornet

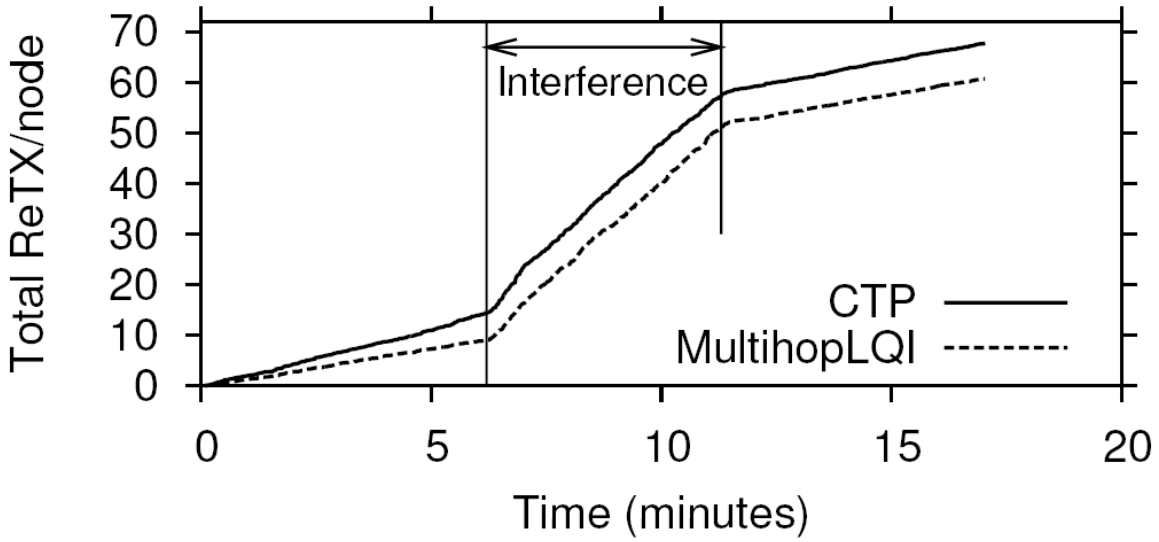


Results from Concurrent CTP vs LQI Experiment on Tutornet



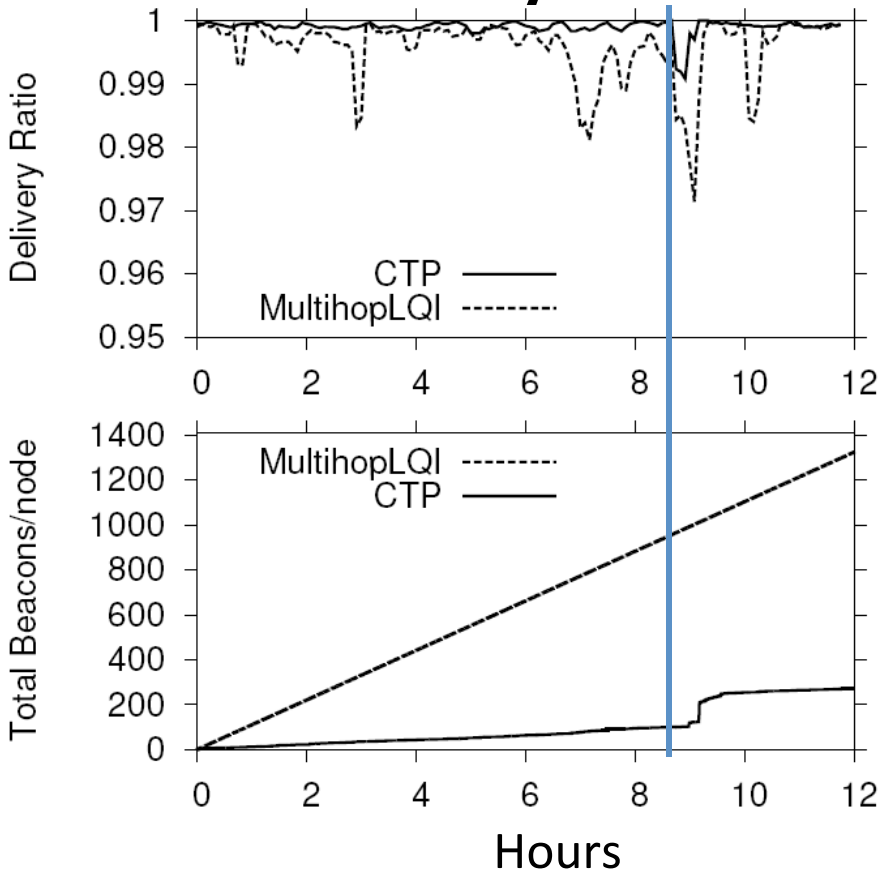
Putting Concurrent Methodology to Use: Expts. with External Interference

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.

HW

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

Most common metric, most uncommon metric

Most common and most unusual experiments