

WTF? Locating Problems in Home Networks

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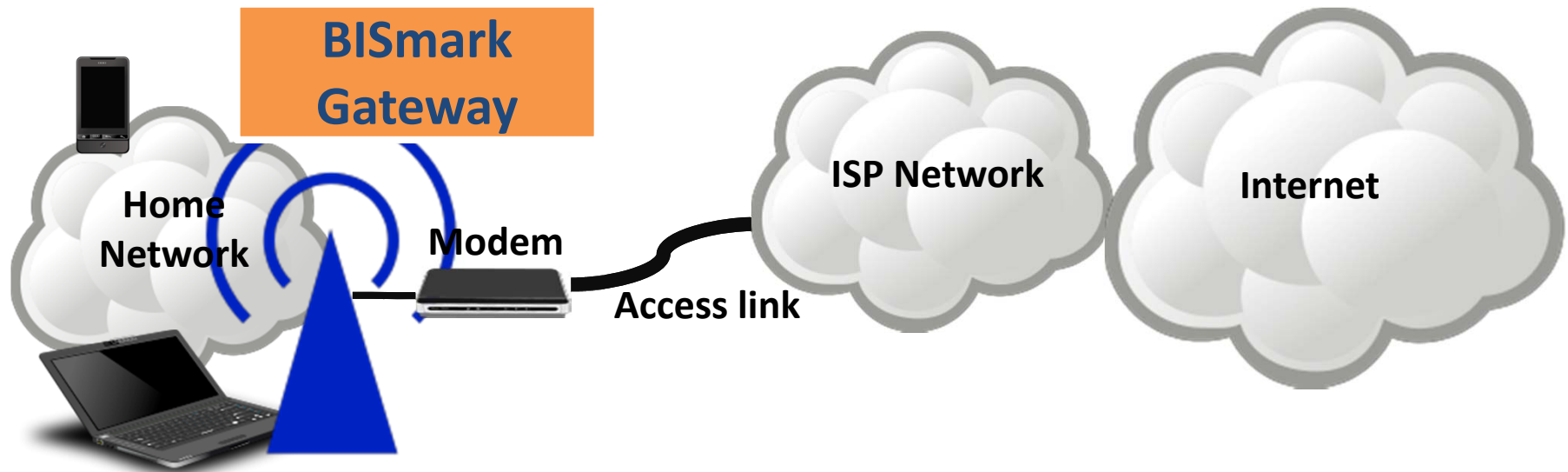
Nick Feamster

Georgia Tech

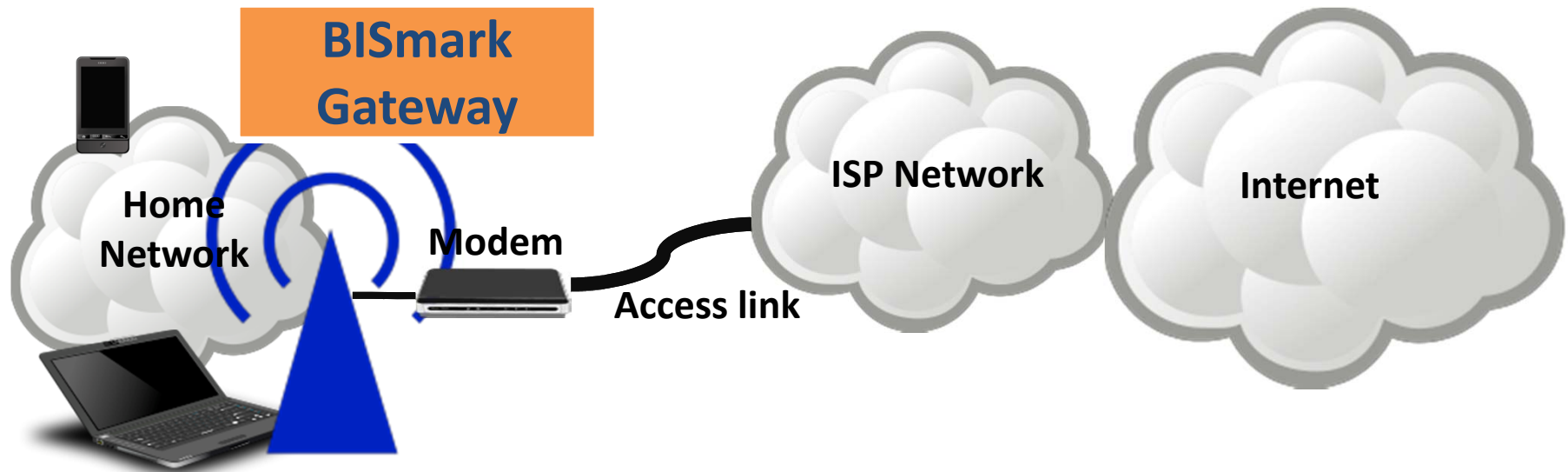
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Ongoing work with Federal Communications Commission.

BISmark: A platform to study home networks

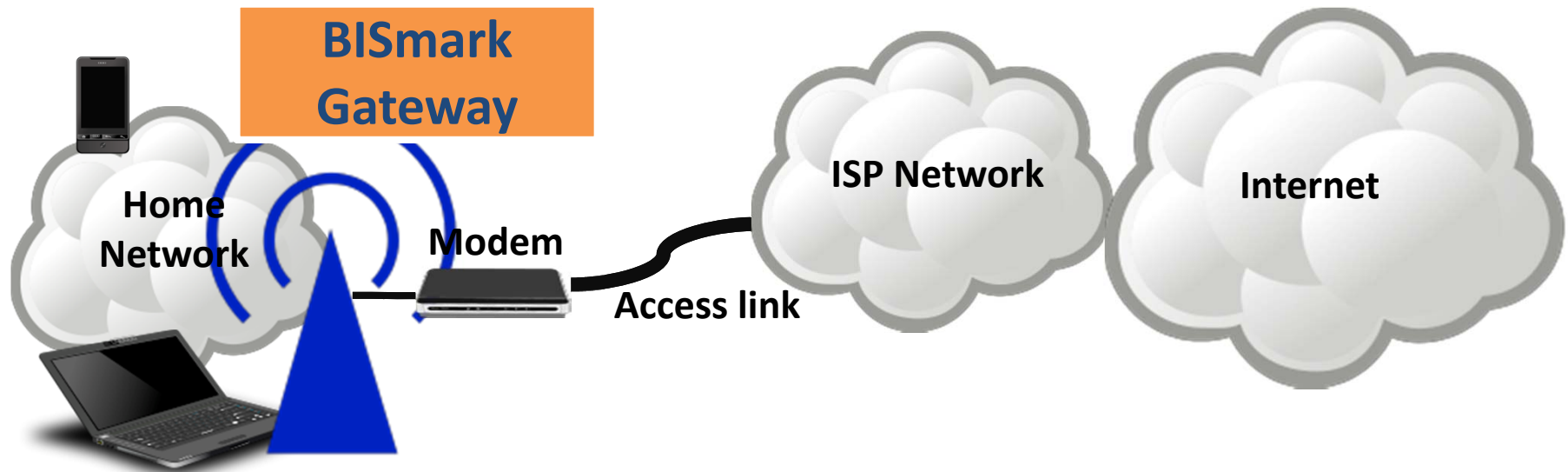


BISmark: A platform to study home networks



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- Active and passive measurements in and out of home network

Deployment



200+ gateways in 20+ countries (Jan 2014)

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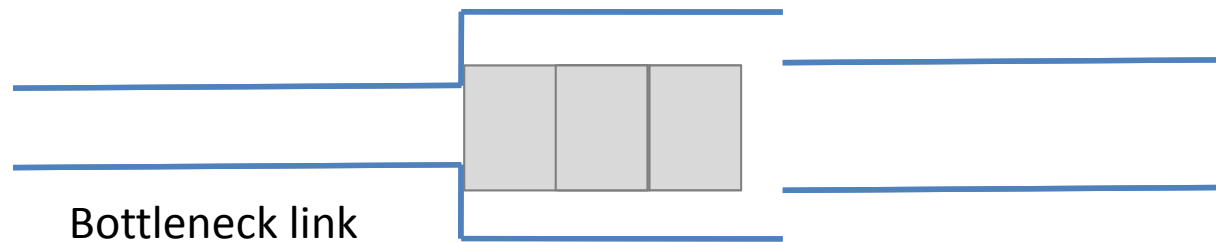
How can we exploit the gateway's vantage point to locate performance bottlenecks?

Router Sees Bottlenecks in the Last Mile



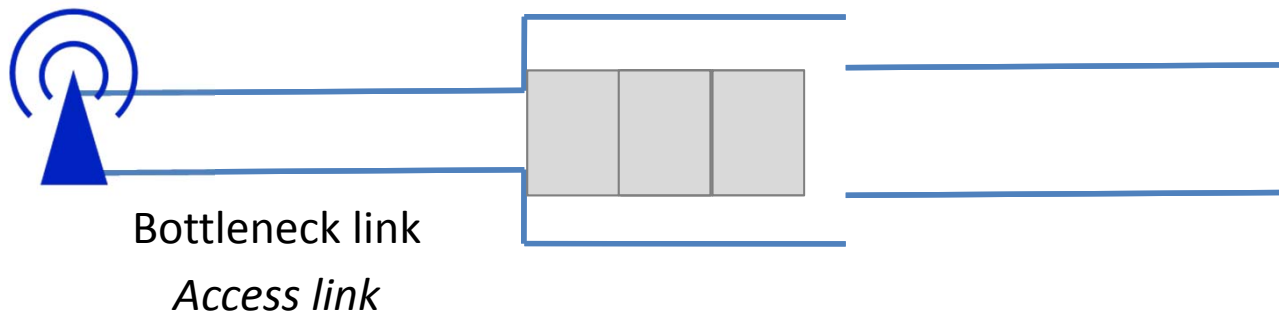
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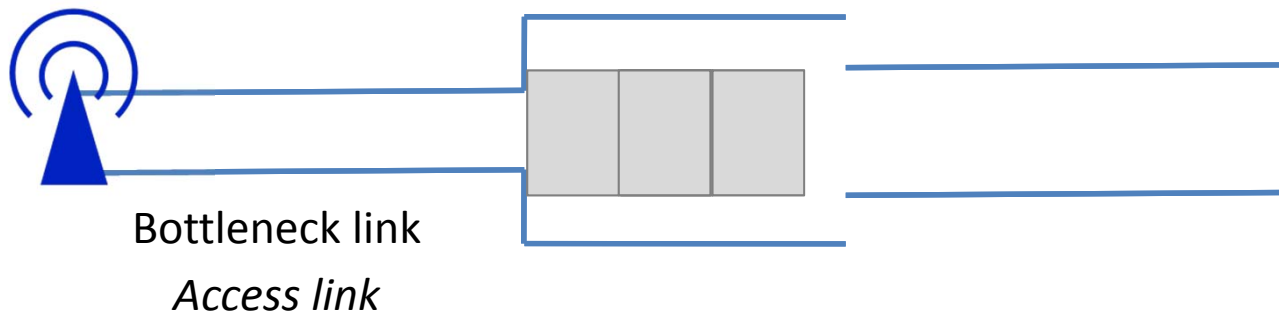
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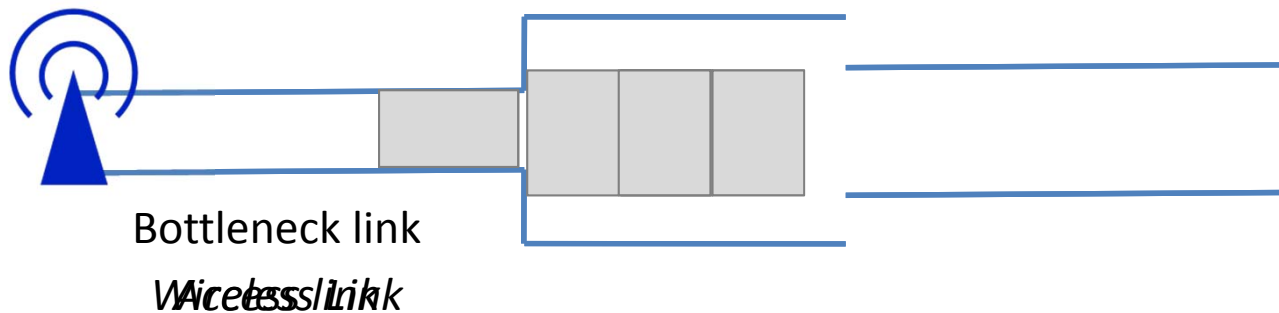
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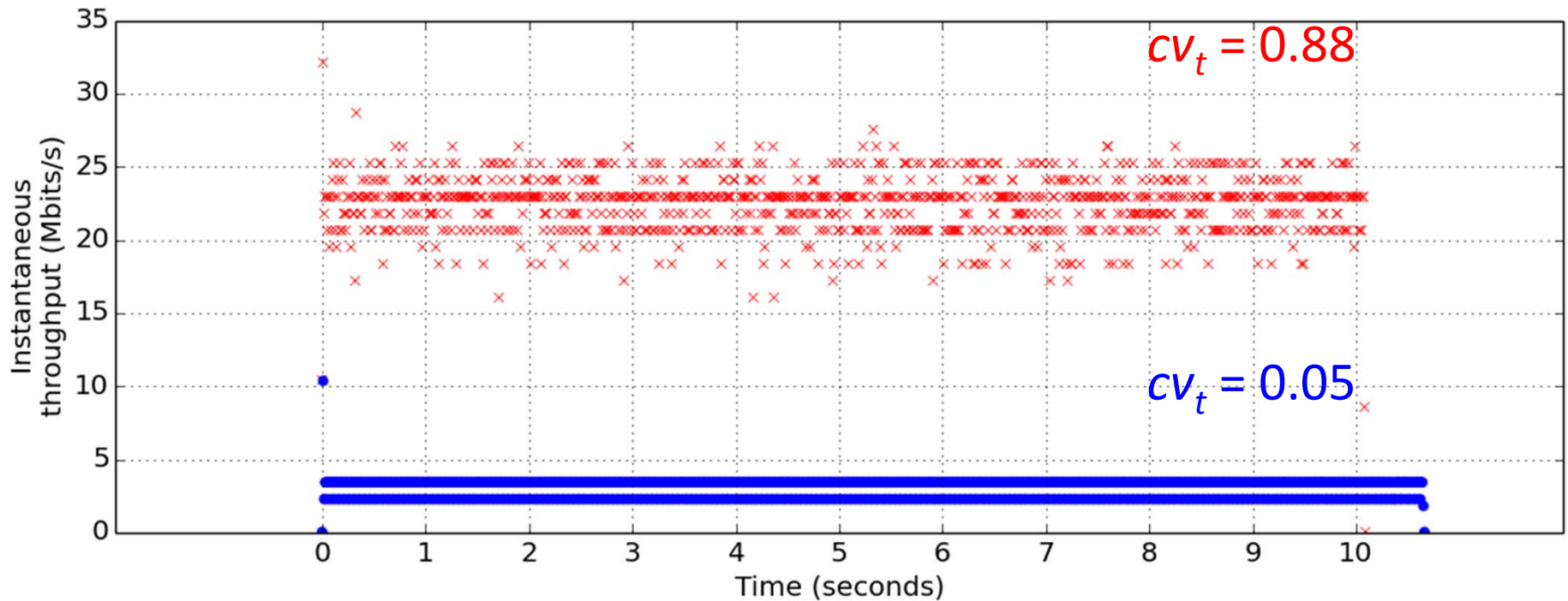
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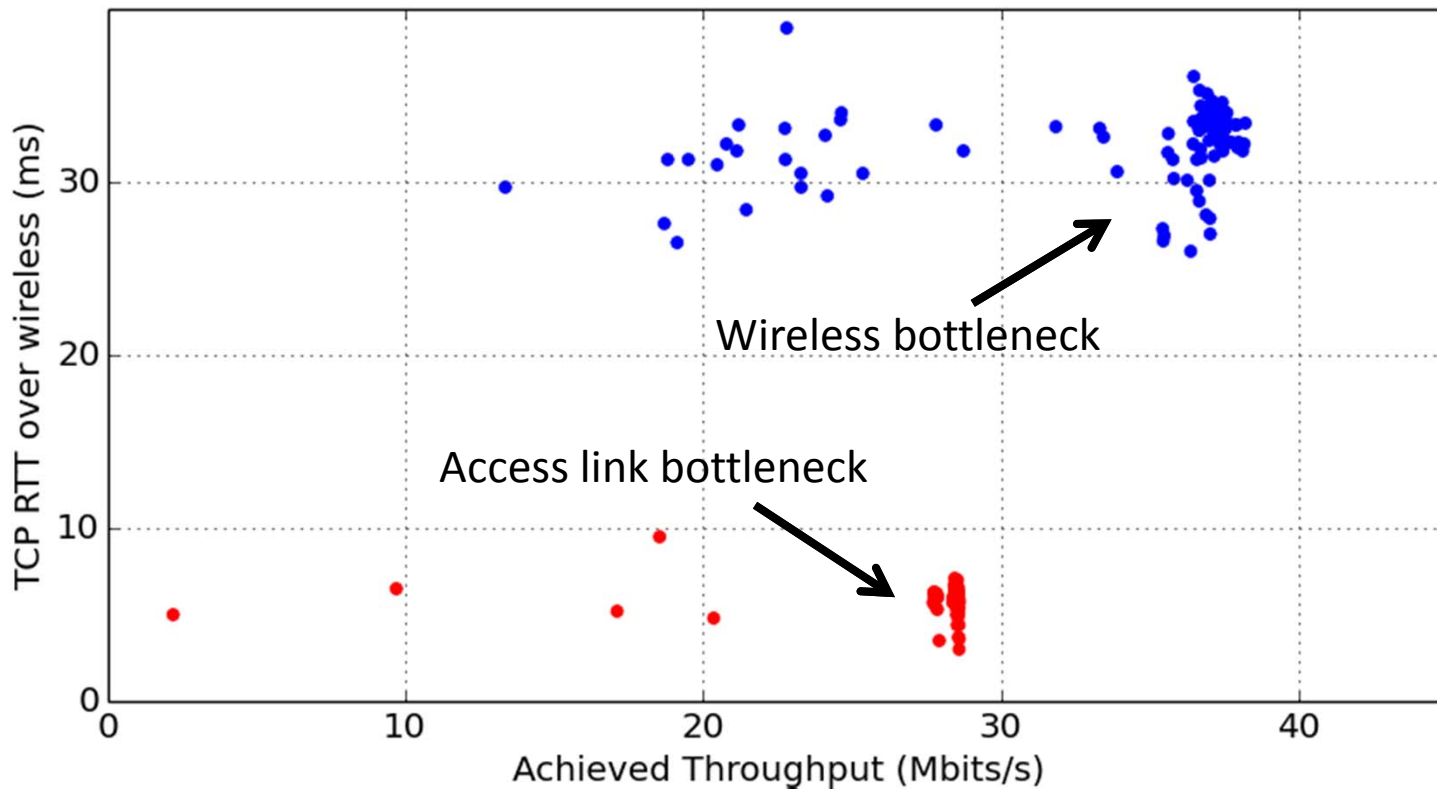
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Bottleneck Smooths Interarrival



Packets *after* bottleneck have low coefficient of variation of interarrival time (cv_t)

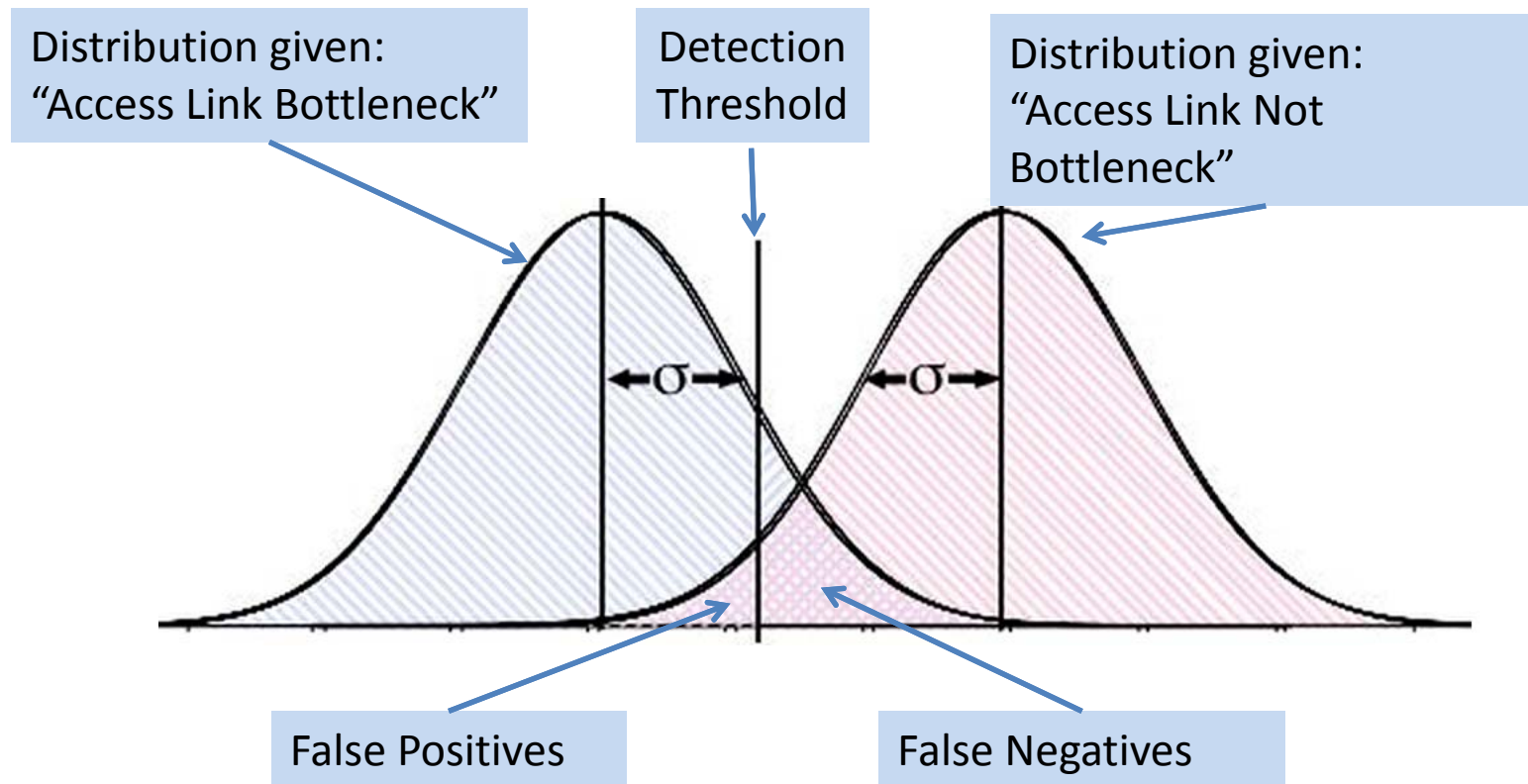
LAN RTT Detects Wireless Bottlenecks



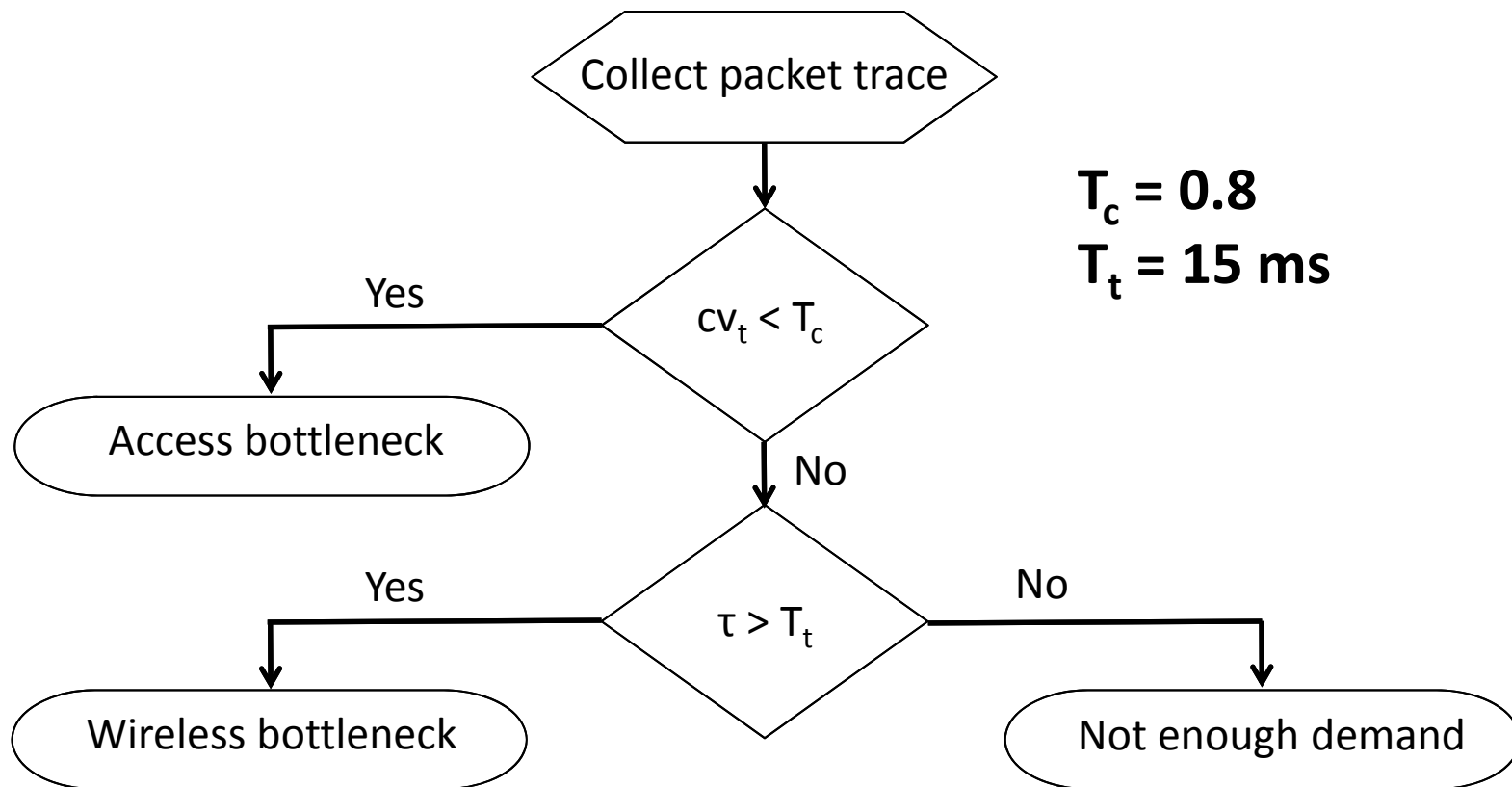
LAN RTT (τ) between gateway and client increases significantly if the wireless is the bottleneck

Maximum Likelihood Detector

- Random variable takes different values depending on conditions
- Pick a threshold that minimizes false positives and false negatives

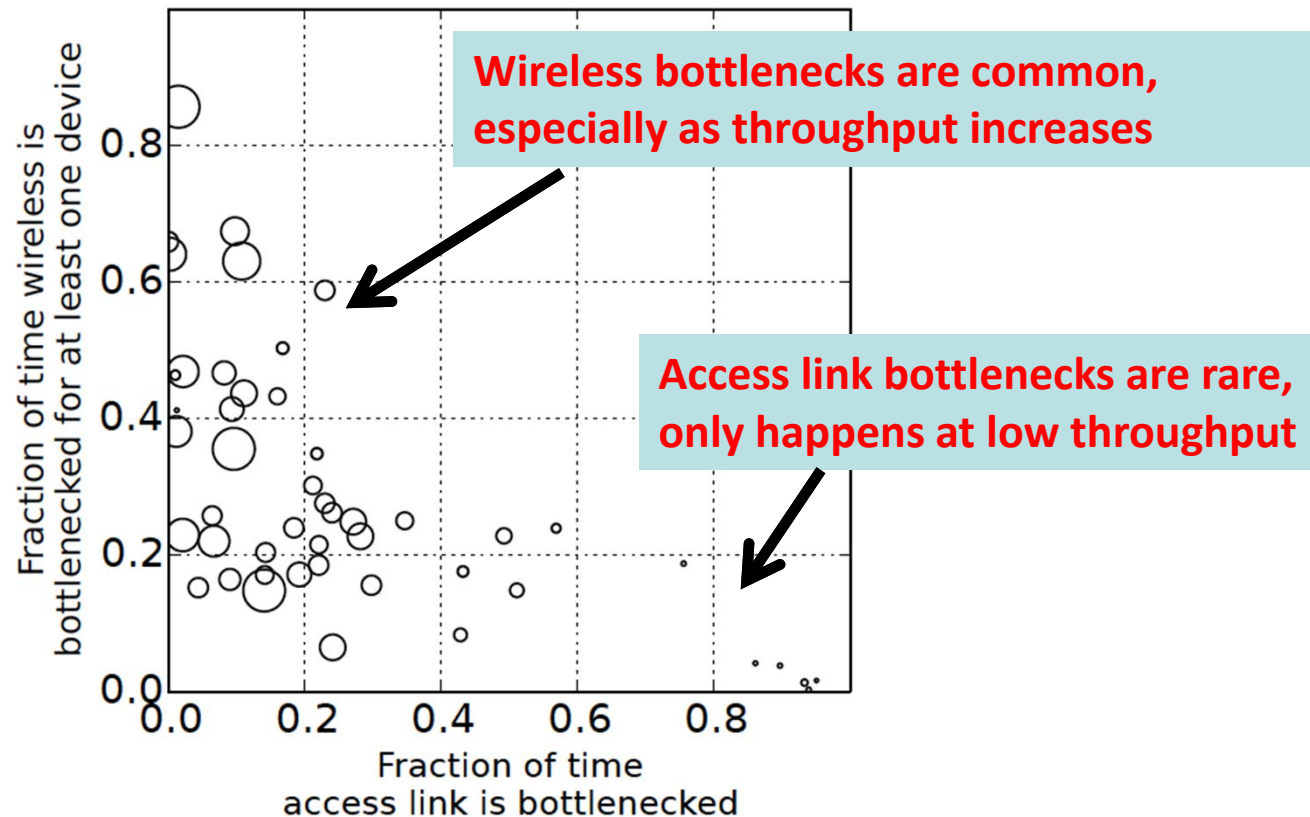


Putting It Together



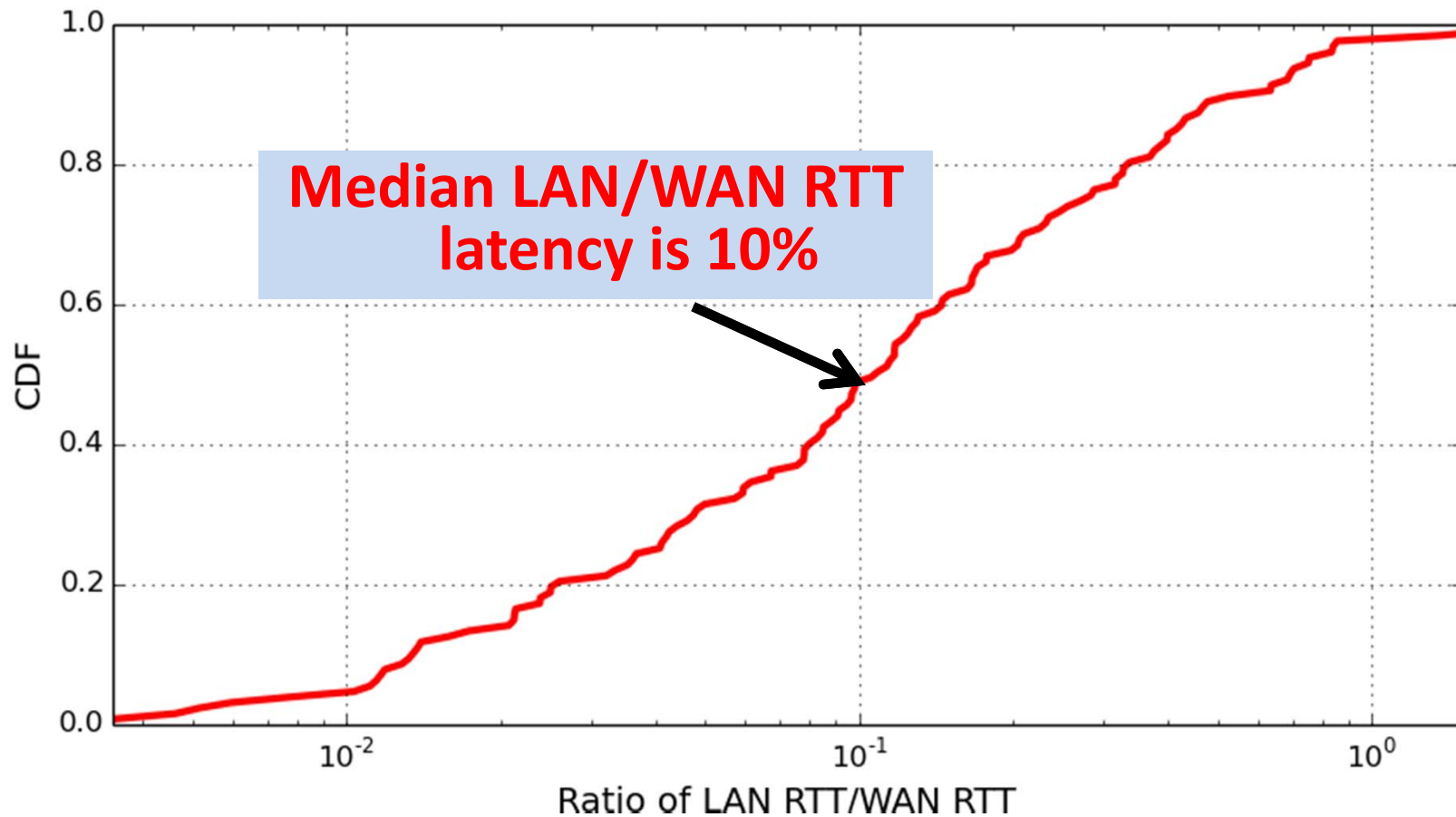
Where's The Fault (WTF): A lightweight threshold-based system that runs on the gateway

Wireless Bottlenecks are Common



Homes with throughput greater than 35 Mbits/s almost never see access link bottleneck.

Bottlenecked wireless latencies affect end-to-end latencies



In-home latency is a significant contributor to end-to-end latency

FCC Deployment: Challenges

- **Advantages:** Much bigger deployment
- **Challenges:** Weaker hardware, closed chipset

	WNDR 3800 (BISmark)	WNR3500L (SamKnows)
RAM	512 MB	128 MB
Processor	650 MHz Geode	480 MHz MIPS 74k
Flash Storage	16 MB	8 MB
Chipset	Atheros 9k (Open)	Broadcom (Closed)

- **Additional challenge:** Newer whitebox deployments are “off the critical path”

Implications

- Continuous packet capture is not an option
 - Even sampling is tricky
- Cannot collect wireless statistics, so full algorithm cannot be deployed

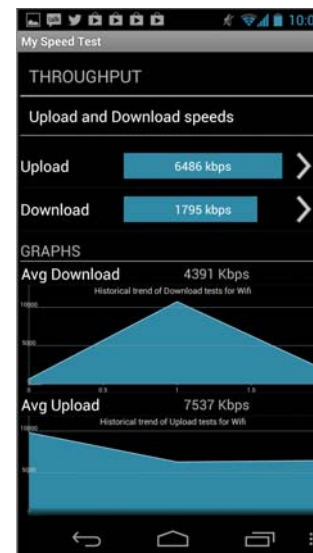
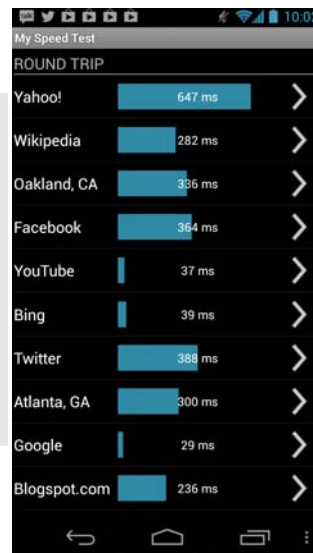
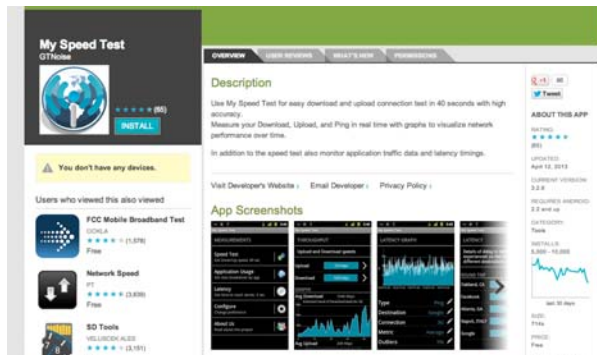
Broader Project: Fixed and Mobile Measurements

Home Gateway (BISmark)



- Fixed-line measurements
- Dongle-based measurements
- <http://projectbismark.github.com/>

Mobile Handset (MySpeedTest)



- Periodic latency measurements
- Upload and download throughput tests on demand
- Google Play: <http://goo.gl/28tx3>
- Github: <http://goo.gl/yAlp89>