Home Network Performance Diagnosis

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Home networks are becoming complex

Our goal

Develop techniques to assist users to diagnose performance problems in the home network

Roadmap

- Study contribution of the home net to e2e performance
  - Controlled experiments
  - Impact on latency and download speed

HomeNets2010

- Characterize home networks
  - Data collection: HomeNet Profiler

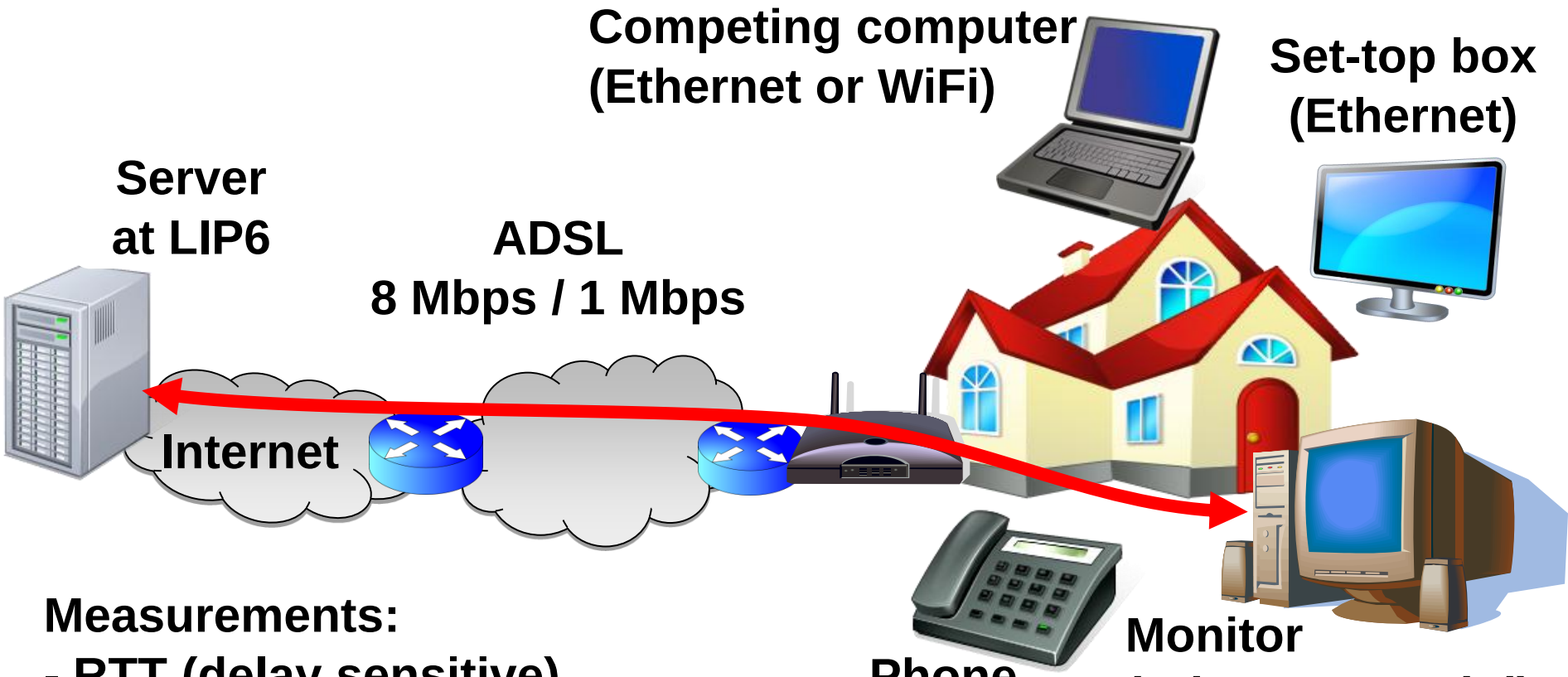
http://cmon.lip6.fr/hnp

- Design a troubleshooting tool for home networks
  - Study tradeoff between diagnosis on the end-hosts vs. gateway

Does the home network contribute to e2e performance?

- Intuitively, home net affects e2e performance
  - No study quantifies the impact of the home network
  - In which situations?
  - Can existing tools attribute performance disruptions to the home network?
- Our approach: controlled experiments
  - Test typical French services

Experiment setup

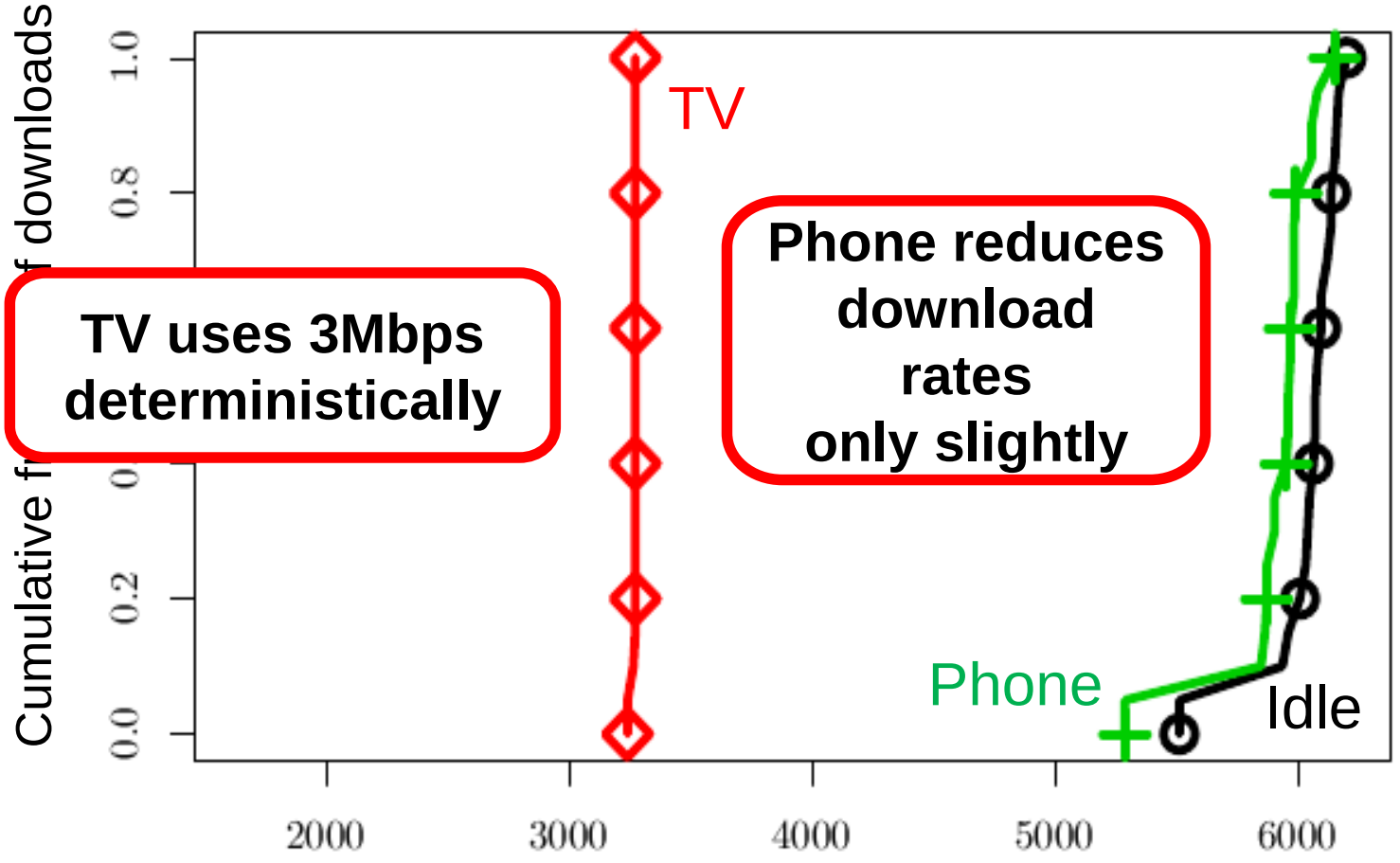


Measurements:
- **RTT (delay sensitive)**
- **HTTP DL (bandwidth hungry)**

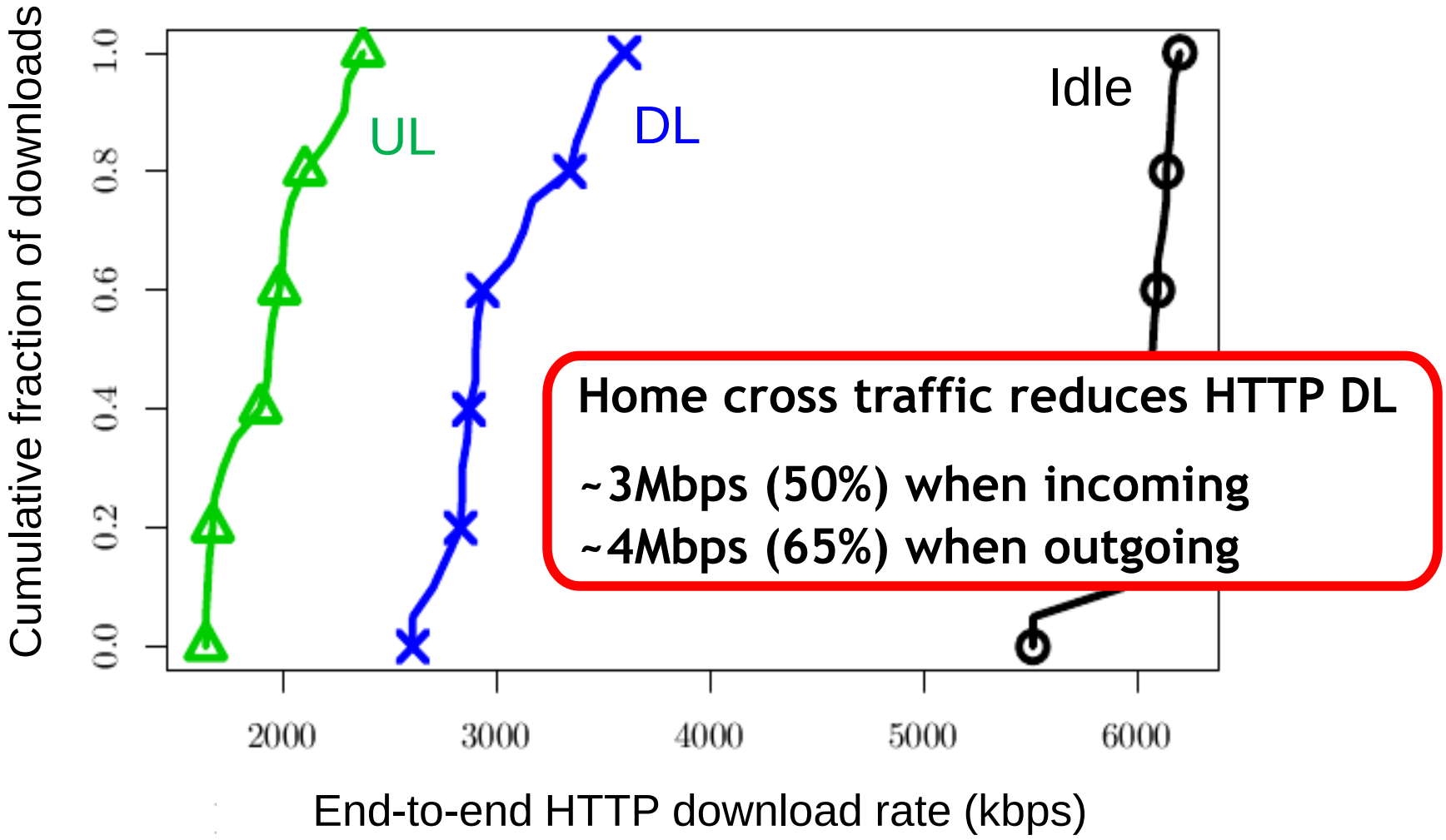
Case studies

- 5 scenarios to test each factor independently
  - Idle: performance baseline
  - Phone: triple play IP phone from the ISP
  - TV: triple play IP TV from the ISP
  - UL: competing TCP upload
  - DL: competing TCP download

Triple-play services and HTTP DL



Home cross traffic and HTTP DL



Summary

- Home can significantly affect e2e performance
  - Competing upload has highest impact
  - Competing download also disruptive, but less
  - TV deterministically cuts DL rates by 3Mbps
  - Phone has negligible effect on performance

- End-host tools cannot attribute performance degradations to the home network

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How do home networks look like?

- Goal: Measure a large variety of homes
- Questions
  - What are the most common home net configs?
  - How are homes connected to Internet?
  - Which devices can we find in home nets?
  - Which services, protocols, and tools do home devices support?
- Approach
  - HomeNet Profiler: data collection at end-hosts

Design challenges

- Easy to use
  - Portable to most operating systems
  - One-shot, no installation required
- Incentives to participate
  - Report to learn about home network
- Privacy concerns
  - Use random identifiers to match repeated reports
  - Anonymize reported values
  - Users can skip measurements

Collected data

- User survey
  - Internet plan
  - Connectivity of devices in home network
- Network information
  - Count devices in home network
  - Neighbor WiFis
- Performance
  - Traceroute to LIP6, DNS server
  - HTTP DLs to LIP6
- Gateway information
  - UPnP implementation
- Computer config
  - Installed/running applications

Status

- Home nets: important factor of e2e performance
  - But, hard to pinpoint home networks as cause
- HomeNet Profiler to collect data on home nets
  - Runs for MacOS, Linux, and Windows
- Next steps
  - Distribute HomeNet profiler
  - Evolve HomeNet Profiler into end-host diagnosis tool
  - Design a gateway-based diagnosis tool

Thank you!

To run HomeNet Profiler:
http://cmon.lip6.fr/hnp