

# A measurement experimentation platform at the Internet's edge

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# Motivation/Related Works

- Poor visibility into the network hampers research progress
- Numerous existing Internet Measurement Platforms rely on dedicated infrastructure
- Cooperative model- PlanetLab, RIPE Atlas, DipZoom)
- Altruistic model- Ark, RON, Scriptroute)
- Altruistic, but relying on end users (DIMES, SatelliteLab, NETI@home, Seattle)
- ‘Lack of representativeness’ to generalize network measurements
- Capturing the edge of the network is hard goal
- Experimental platform deployed at end user’s devices at scale, with continuous availability

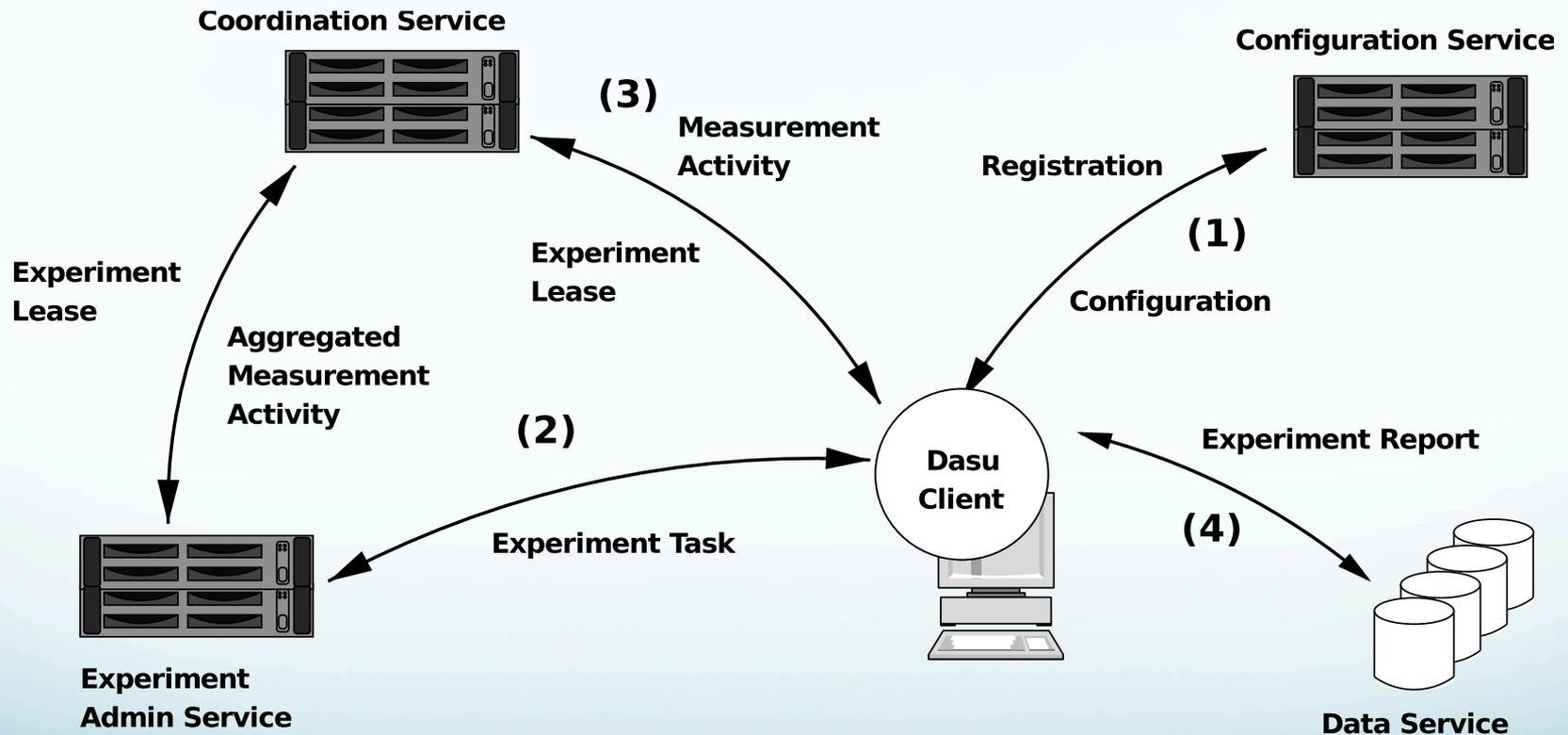
# Complex Edge-Network Environment

- Over 65% users have at least 1 UPnP device, and more than 16% have 3 or more devices
- UPnP-enabled gateways increasing from 45% to 81% as the number of extra devices goes from one to four
- Over 60% of users see no other traffic in the network
- For 60% of the clients, the traffic in their access-link never exceeds 50% of their link capacity

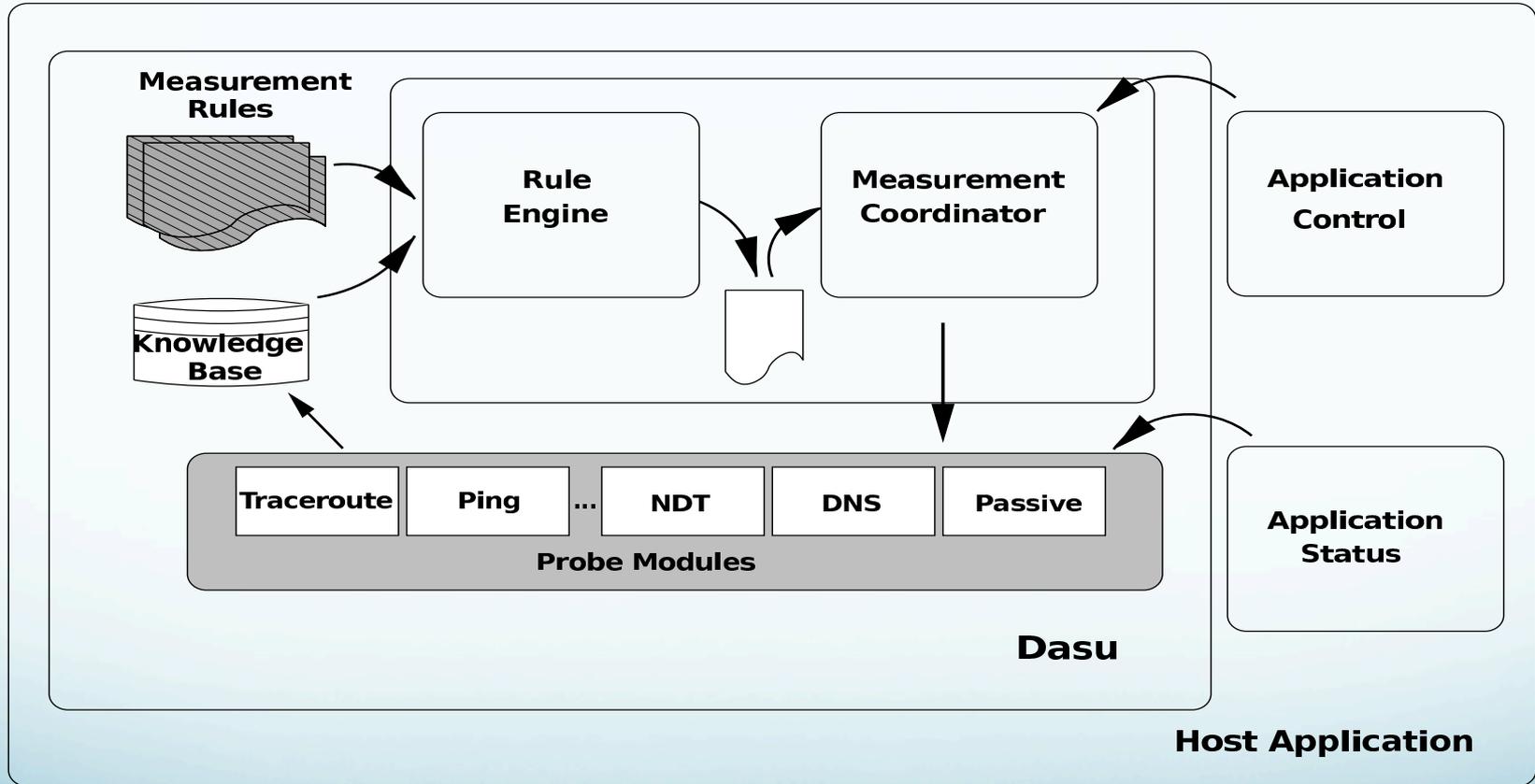
# Dasu

- Dasu- a measurement experimentation platform
- Support network measurement experimentation and broadband characterization
- Wide network coverage to capture network and broadband service diversity
- Captures network and broadband service diversity
- Publicly available since June 2010
- 100,118 users spread over 2,431 Ases and 166 countries

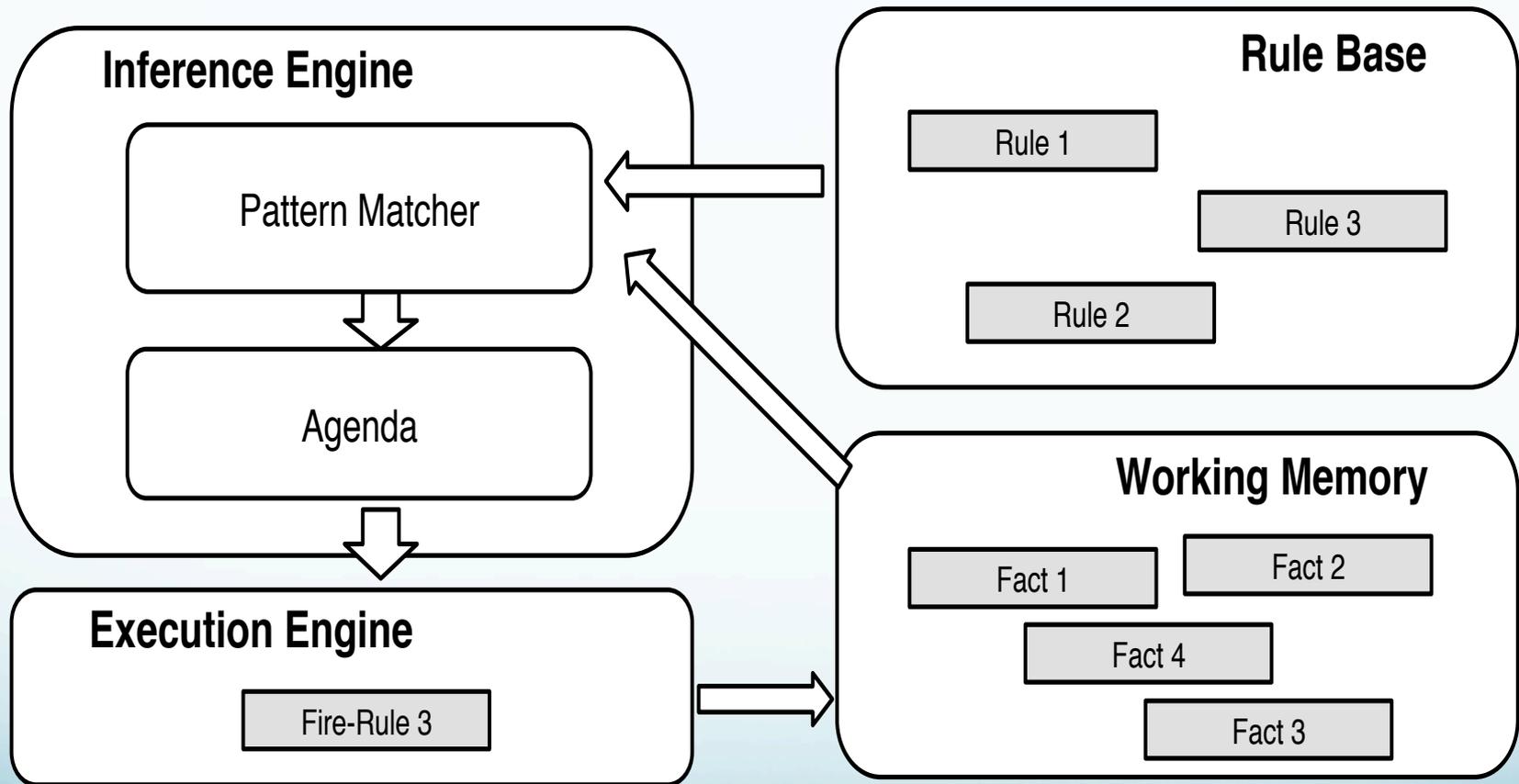
# Dasu System Components



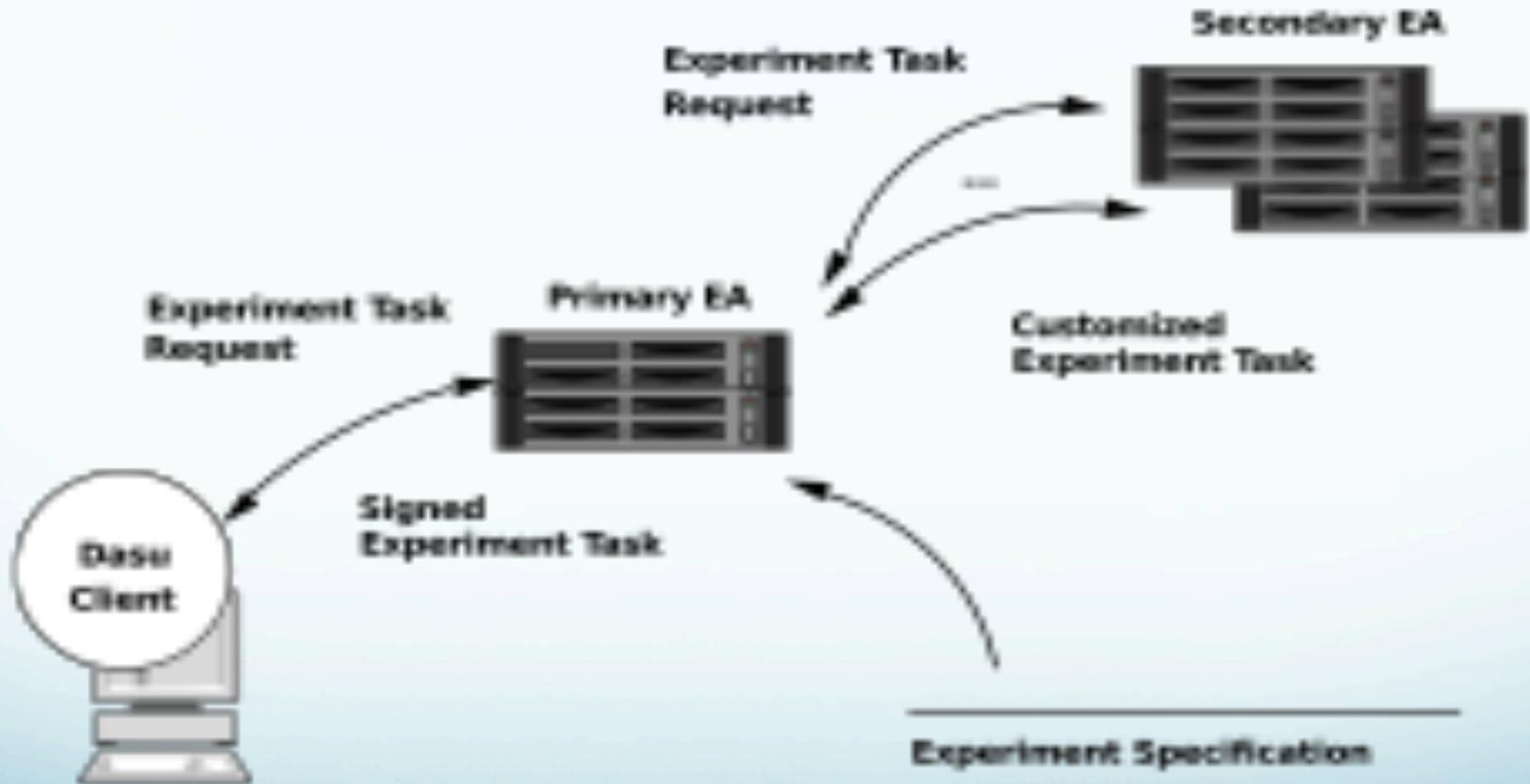
# Dasu Client Architecture



# Rule-based program execution environment

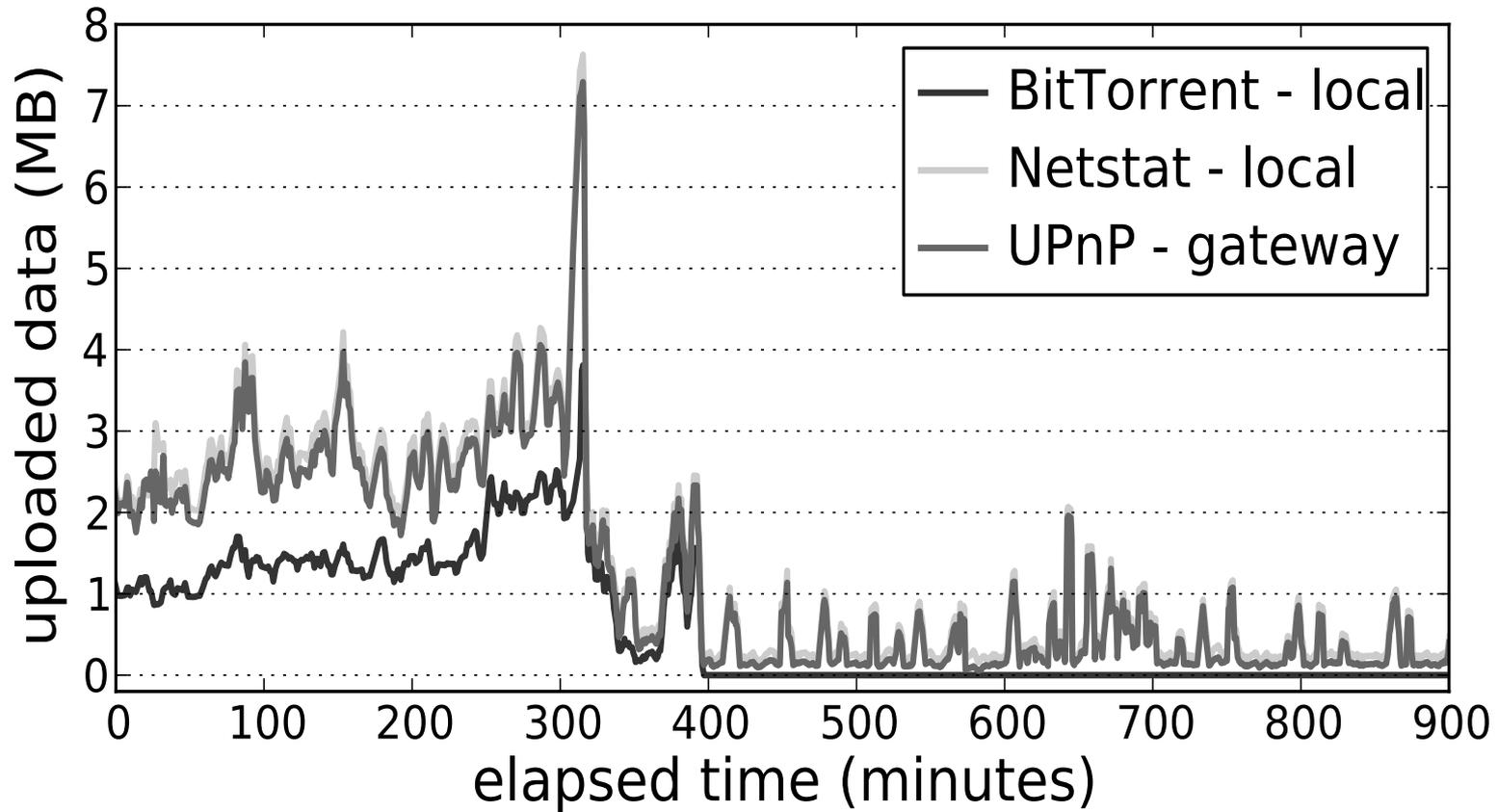


# Delegating Code Execution to Client



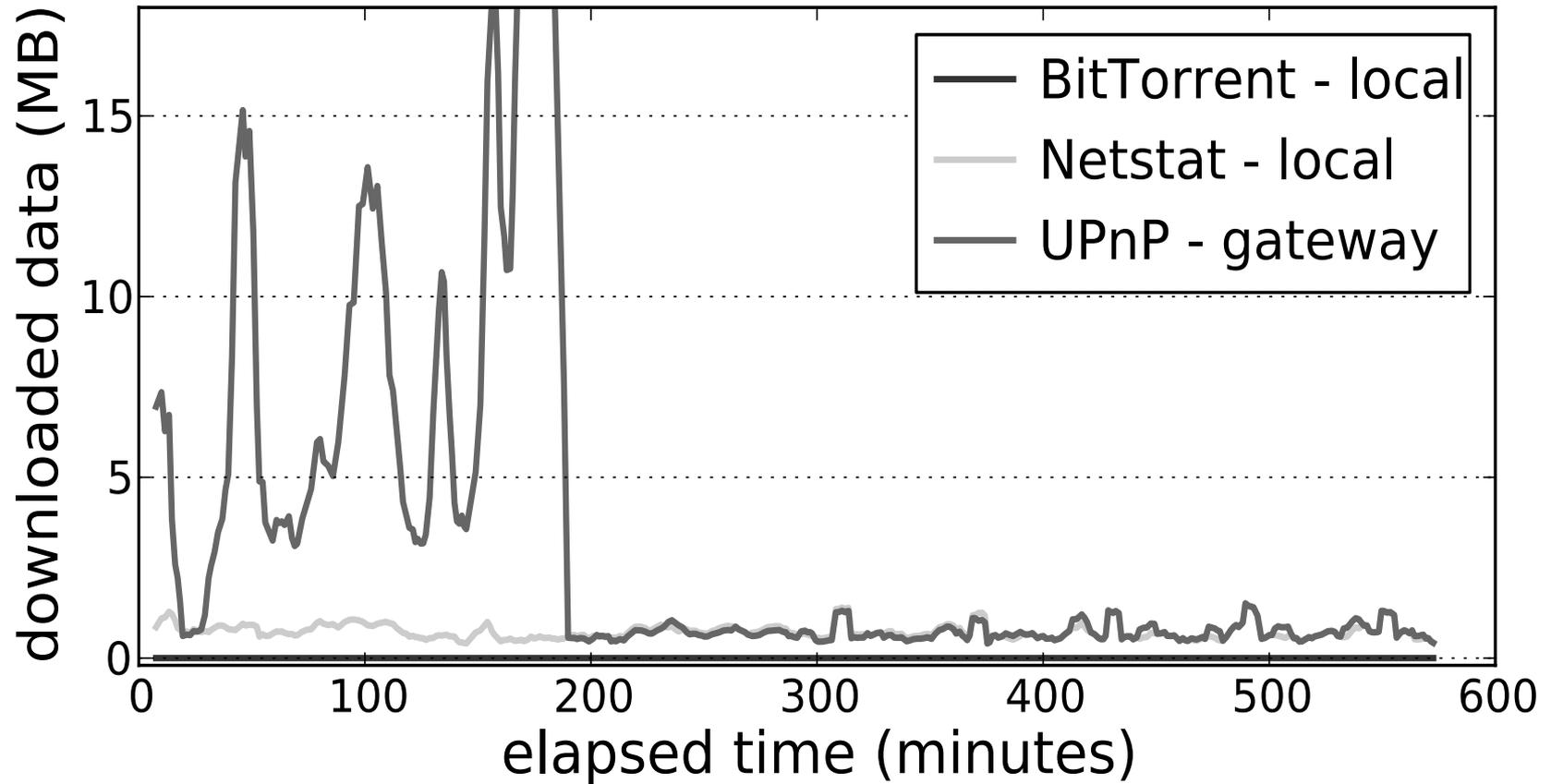
# Detecting cross-traffic

## Local cross-traffic



# Detecting cross-traffic

## Cross-traffic (down)



# Security and Safety

- Security and Safety
  - Experiment Sandbox
  - Secure communication
  - Limits on resource consumption
- Coordination
  - Experiment Leases
  - Elastic Budgets
- Synchronization

# Current Deployment

- An extension to BitTorrent client (June 2010)
- Standalone client (June 2013)
- Provides information about services they receive from ISP
- Coverage:
  - 100,118 users spread over 2,431 Ases and 166 countries
  - More than 57% countries of different continents
  - 93% of Dasu peers are located in small transit providers and eyeball ASes

# Dasu Dynamics

- For 90% of the clients, the median task (75 seconds) completes  $< 150$  seconds
- 60% of Dasu clients complete 80% or more of the tasks assigned to them
- For 30% of the clients, median probe is launched  $< 1$  sec, 60%  $< 30$  seconds
- Every scheduled probe can be launched for 85% of peers (capping at a download utilization of 80%)

# Third-party Experimenters

- Secondary EA responsible for task parameterization and client allocation
- Secondary EA\_dataColector responsible for collecting and storing experiments
- Secondary EA interacts with primary EA
- Primary EA responsible for allocating clients, authenticating and signing assigned experiments

# Summary

- Characterize the challenging setting of edge-network experimentation platforms
- Design and implementation of Dasu – an extensible platform for measurement experimentation for the Internet's edge.
- Characterize Dasu's current deployment

# Moving Forward/ Open Issues

- Extending platform beyond single incentive for adoption
- Integrating with stable experimental platforms like PlanetLab
- Determining feasible but inappropriate for end users

**Thank You!!!!**

**Queries???**