Mobiperf:
Open source, open data crowdsourced mobile network measurement

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Re:

Solicitation of input contributions by IEEE 802.16's Metrology Study Group <http://ieee802.org/16/sg/met> for IEEE 802.16's Session #79 of 14-17 May 2012.

Base Contribution:

[none]

Purpose:

Consideration during discussions of Study Group activity and plans.

Mobiperf

Open source, open data crowdsourced mobile network measurement

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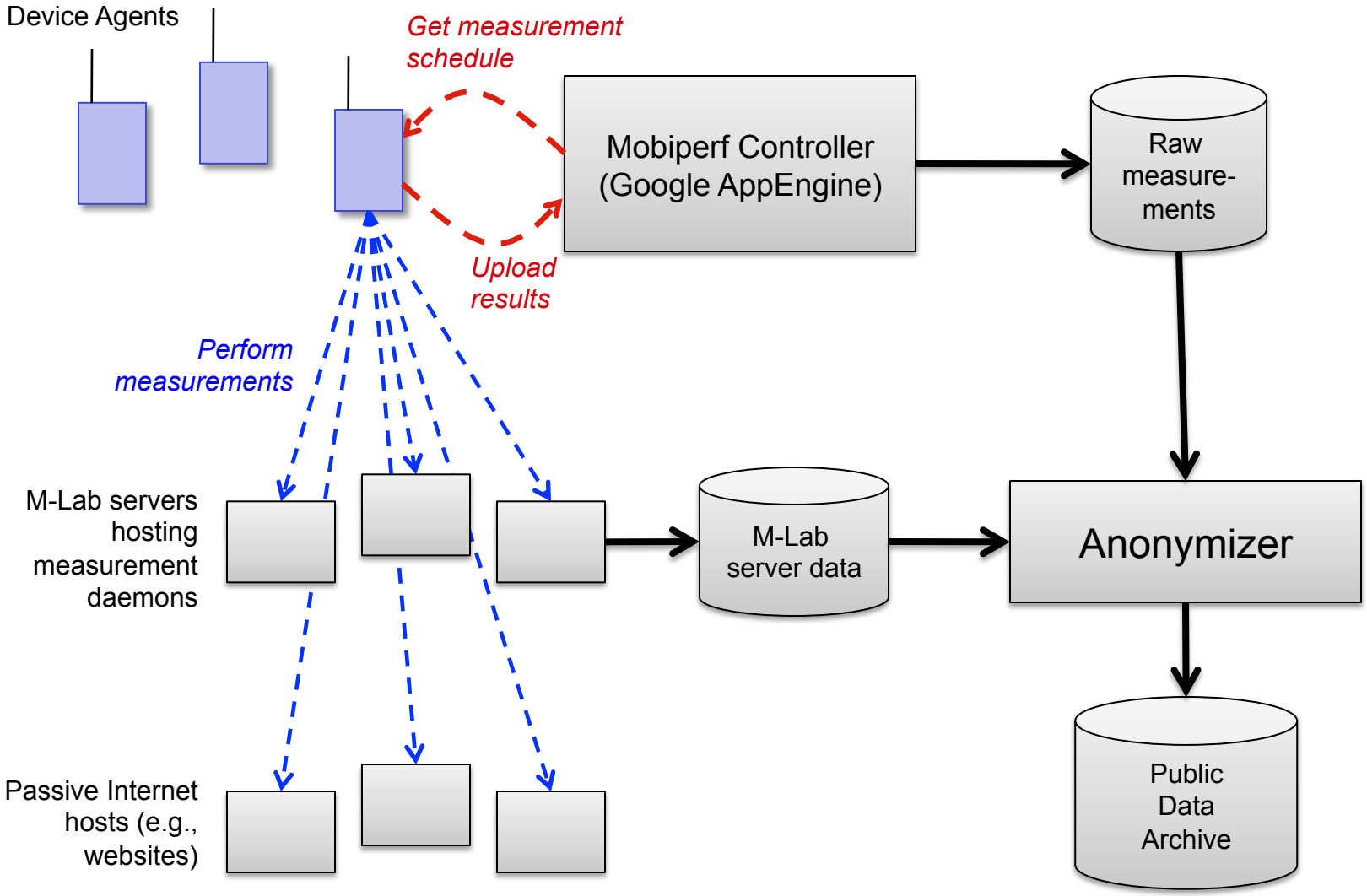
Mobiperf - Background

- Mobile app + service for measuring cellular network conditions in the wild
- Collaboration between Google, Univ. Michigan (Morley Mao) and Univ. Washington (David Choffnes)
- Mobile devices collect active network measurements and upload results to server
- Code is open source, all data will be open

Key goals

- Provide a common measurement facility for the research community to collect and analyze mobile network performance data
- Free individual researchers from having to build and deploy their own mobile measurement apps – common framework for use by many measurement campaigns
- Provide free, scalable infrastructure for collecting data from millions of mobile devices
- Provide open repository of measurement data to benefit entire community

Mobiperf Overview



Measurement Framework

- Device agent supports extensible measurement framework – new measurement types can be added over time

- Existing measurements:
  - Round-trip time, uplink/downlink throughput, packet loss, DNS lookup, traceroute
  - Server-side daemons run on M-Lab hosts for those measurements requiring them
  - Some measurements (e.g., ping, traceroute) can be performed to any Internet host

Measurement Schedule

- Devices periodically check into Mobiperf controller and download measurement schedule
  - Schedule specifies measurement period, start/end time, measurement type, and parameters
- Devices upload measurement results to server periodically
- Device agent supports user-specified threshold for limiting battery and cellular data usage

Raw measurement data

- Raw measurement records contain:
  - Timestamp
  - Measurement parameters and result
  - Device identifier (e.g., IMEI)
  - Device IP
  - Network type (e.g., UMTS, LTE), carrier, and cell ID
  - Make and model of device
  - OS and agent version information
  - Coarse geolocation (e.g., via WiFi positioning, not GPS)

- This data must be **anonymized** prior to release in the public data archive

Data anonymization

- Raw measurement data is sanitized before release

- Strip out all PII from the measurement records
  - Namely, device ID is removed
  - Device location is quantized to nearest ~ 1 sq km grid (truncate least significant digits of lat/long)
  - We feel this represents good balance between usefulness of data and need to maintain user privacy
  - User may also opt out at any time by disabling app on the device

Data publication

- Aggregated device and server (M-Lab) data will be released to the public

- Initial plan: Release weekly tarball via Google Storage
  - Will also make data available via Google BigQuery (SQL-like query interface to large datasets)
  - Web dashboard to explore data and see map of aggregate measurements

Current status

- Expect to release v1.0 in June/July 2012
- Preliminary version in use internally at Google with thousands of devices
- After initial launch, support new measurement campaigns in collaboration with other researchers
- More details: http://mobiperf.com, mdw@google.com