M-Lab

open platform, *open* tools and *open* data
for an *open* Internet

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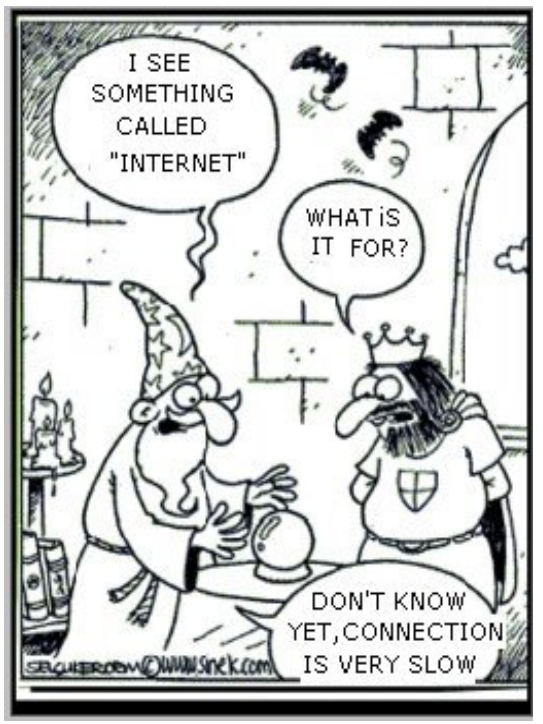
Fair questions

- **Internet users**
  - Which ISP should I use?
  - Am I getting what I am paying for?
- **Policy makers**
  - What's the status of broadband in my country?
- **Researchers**
  - Where can I get solid data about the state of broadband networks?



The **lack of open network data** makes it nearly impossible to answer these questions.

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Measurement Lab (M-Lab)

Goal

- Provide **Internet users**, **policy makers** and **researchers** with data about the broadband performance world-wide.

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How

- Open ***platform of distributed servers*** for ***researchers***, to deploy tools to measure broadband performance.
- Open (source) ***tools*** for ***Internet users***, to test their broadband connections.
- Open ***data*** for ***everyone***, to build on a common pool of network measurement data
  - Open, openly collected, free.
  - Collected in a consistent way world-wide, over time.
  - De-aggregated, not just aggregated stats.
  - Machine-readable format.

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Who's M-Lab?

NEW AMERICA FOUNDATION

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PLANETLAB

INTERNET 2

PSC

PITTSBURGH SUPERCOMPUTING CENTER

EETT

HELLENIC TELECOMMUNICATIONS & POST COMMISSION

aarnet

Australia's Academic and Research Network

Max Planck Institute for Software Systems

Georgia Tech

Sam Knows™

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA UNIVERSITY OF WELLINGTON

voxel

DEI SVB NVMINE VIGET

NORTHWESTERN UNIVERSITY

QUAECUMQUE SUNT VERA

1851

BitTorrent™

FCC Federal Communications Commission

WIDE PROJECT

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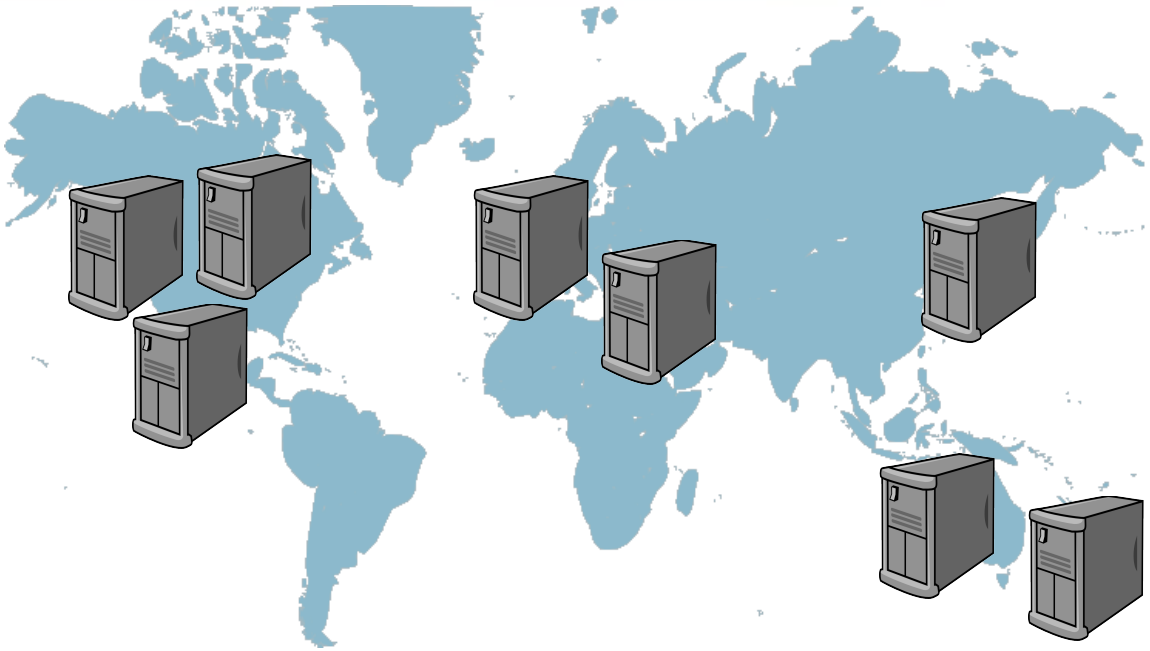
An open measurement platform



PlanetLab-like platform specialized for ***accurate* broadband measurements**

- Reserved resources & public IP address for every experiment
- Web100 instrumentation

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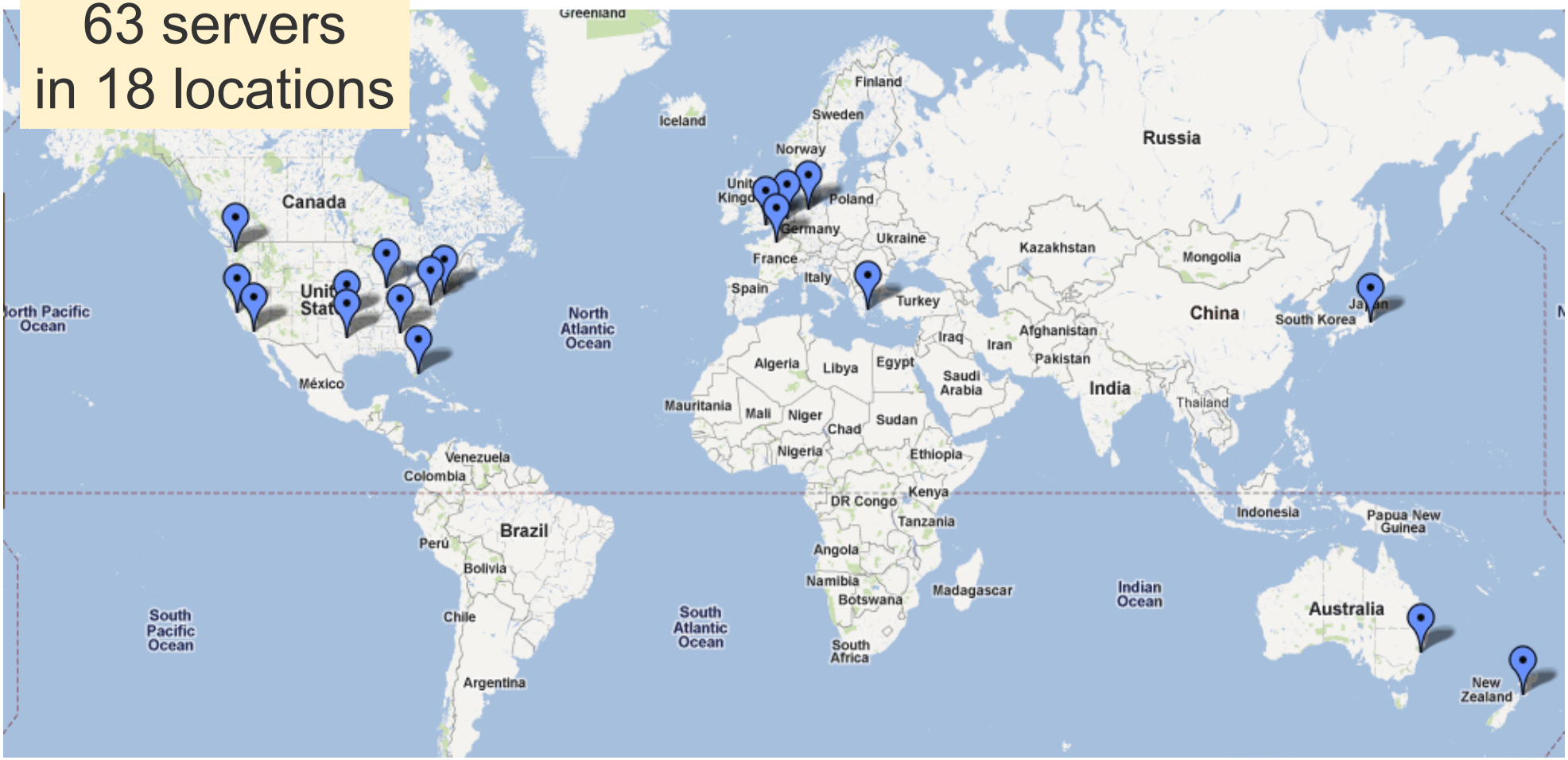
M-Lab's servers

63 servers
in 18 locations



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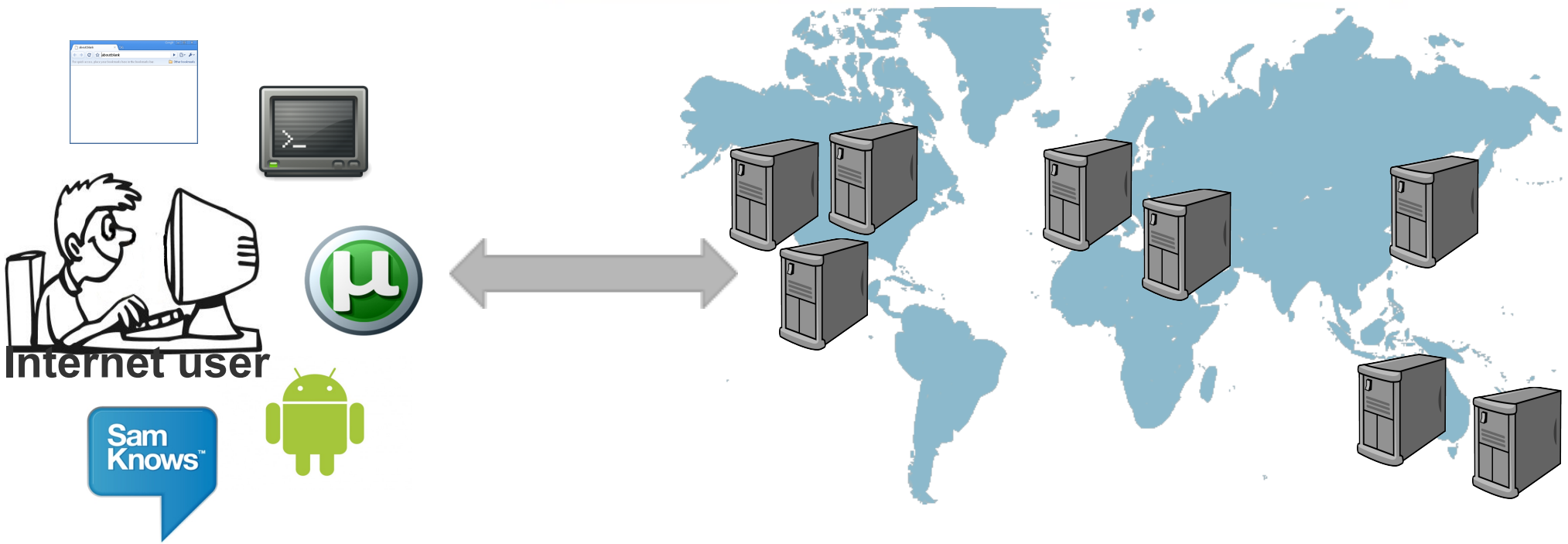
Open-source measurement tools



- **Software-based tools**
  - NDT, Glasnost, NPAD, Pathload2, ShaperProbe,
  - **Mobile apps**: MobiPerf, 4G Test, NDT, WindRider
- **Hardware-based tools**
  - SamKnows, BISmark

- **Client-server** applications
- **Active** measurement only
- Country-customized clients (FCC, EETT)

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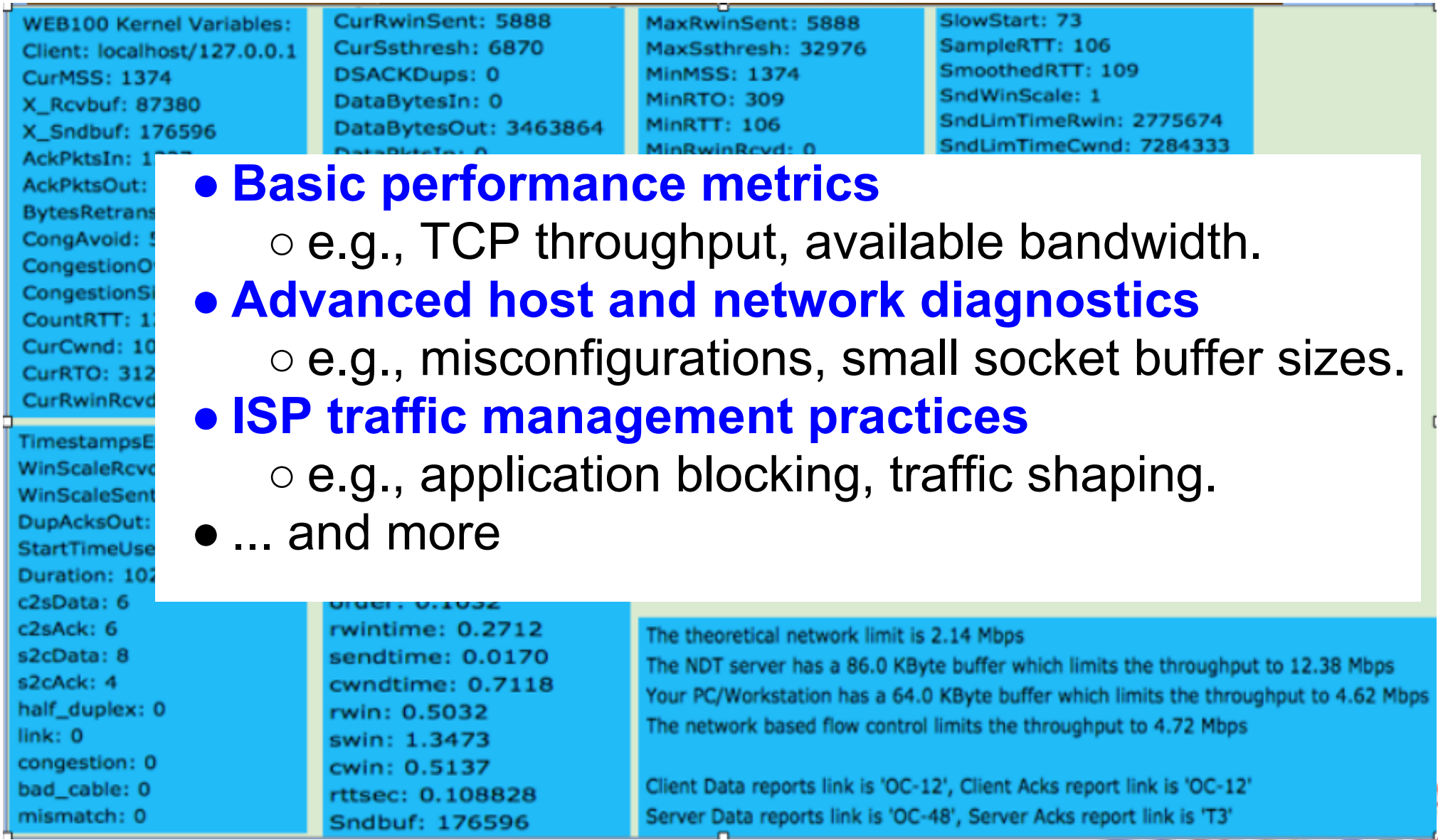
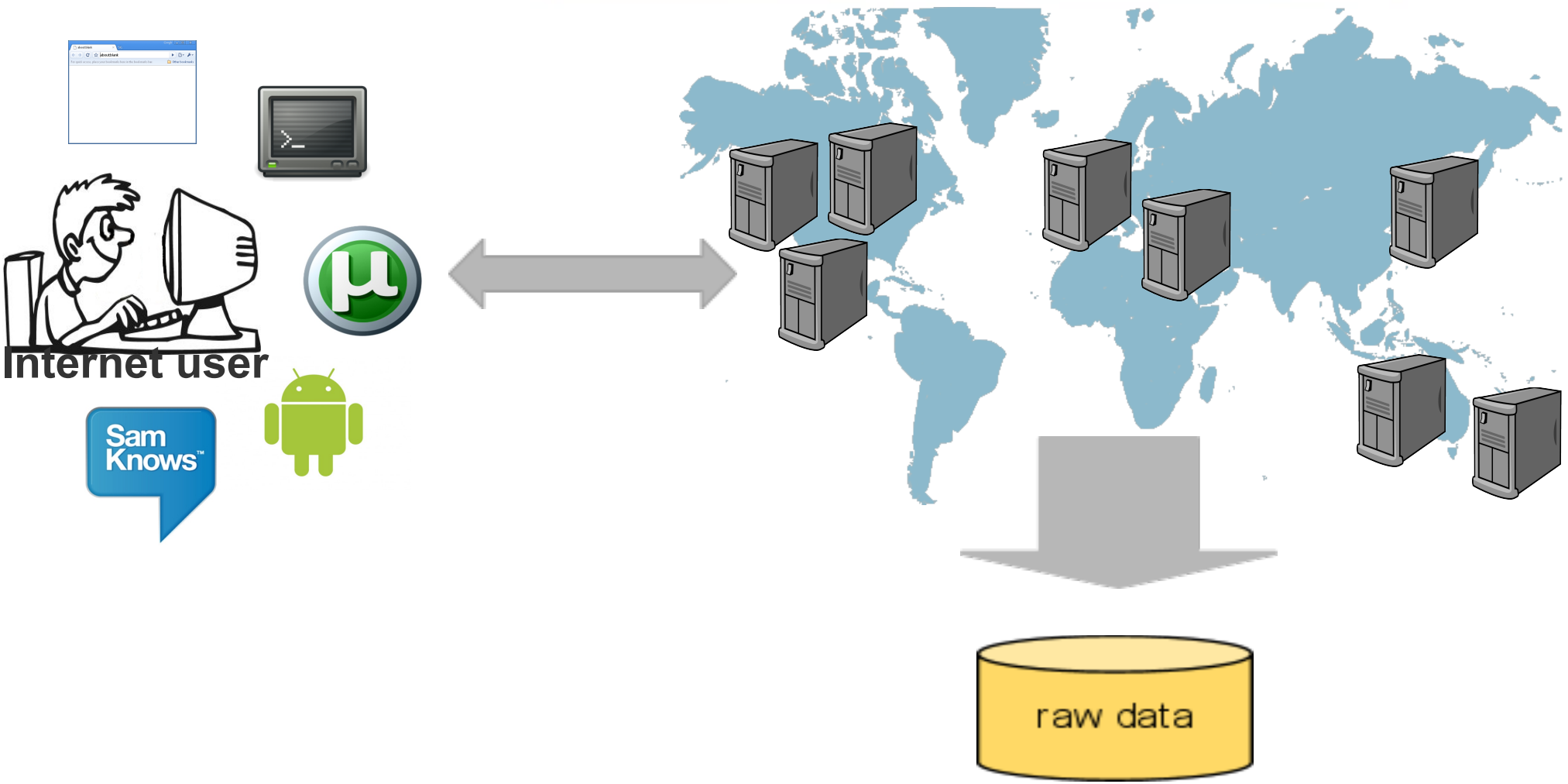
Currently available tools measure ...



- **Basic performance metrics**
  - e.g., TCP throughput, available bandwidth.
- **Advanced host and network diagnostics**
  - e.g., misconfigurations, small socket buffer sizes.
- **ISP traffic management practices**
  - e.g., application blocking, traffic shaping.
- ... and more

Collecting measurement data



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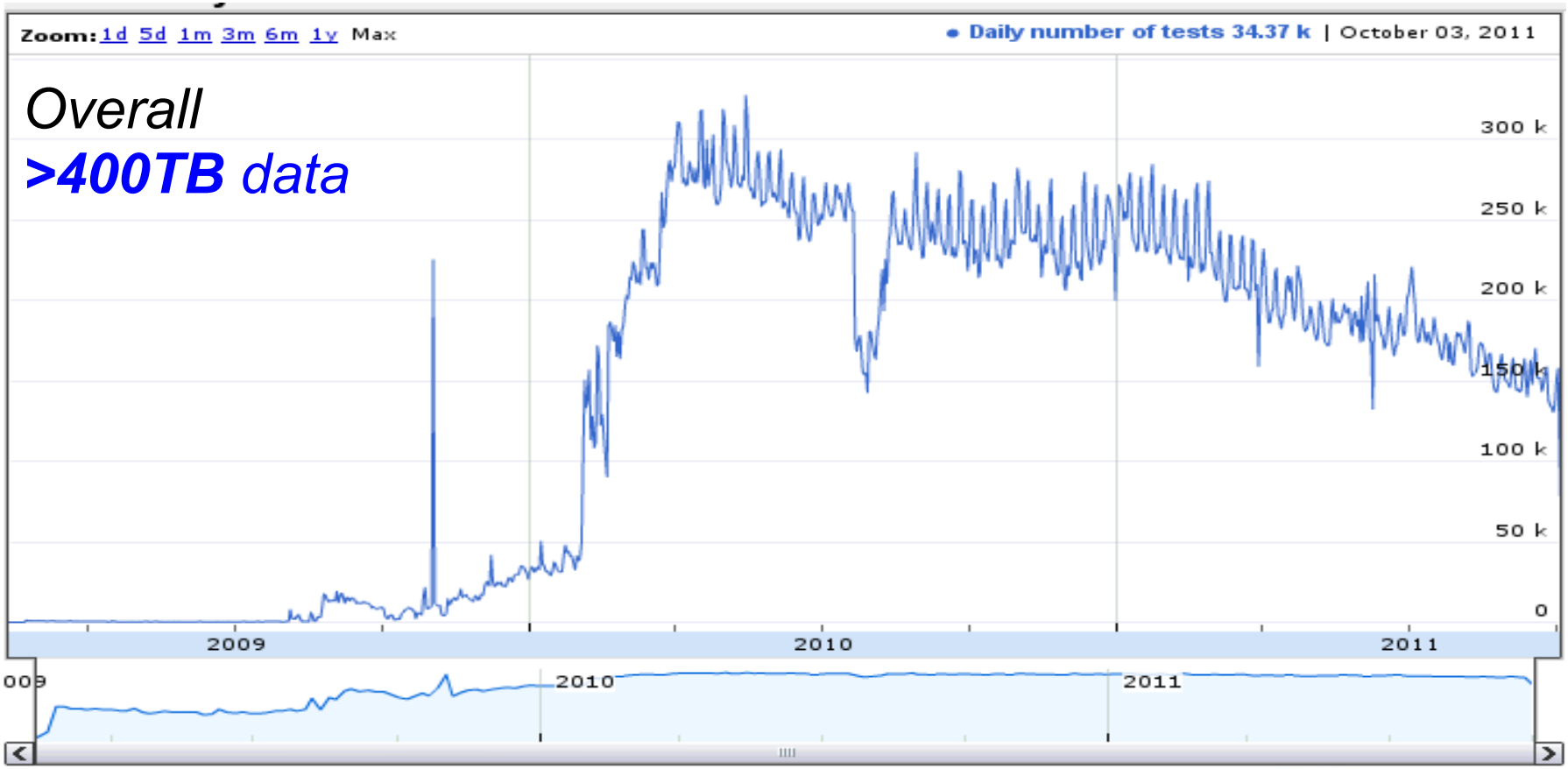
How much data? How many tests?

Jan 2010 **µTorrent launch**
Mar 2010 **FCC launch**



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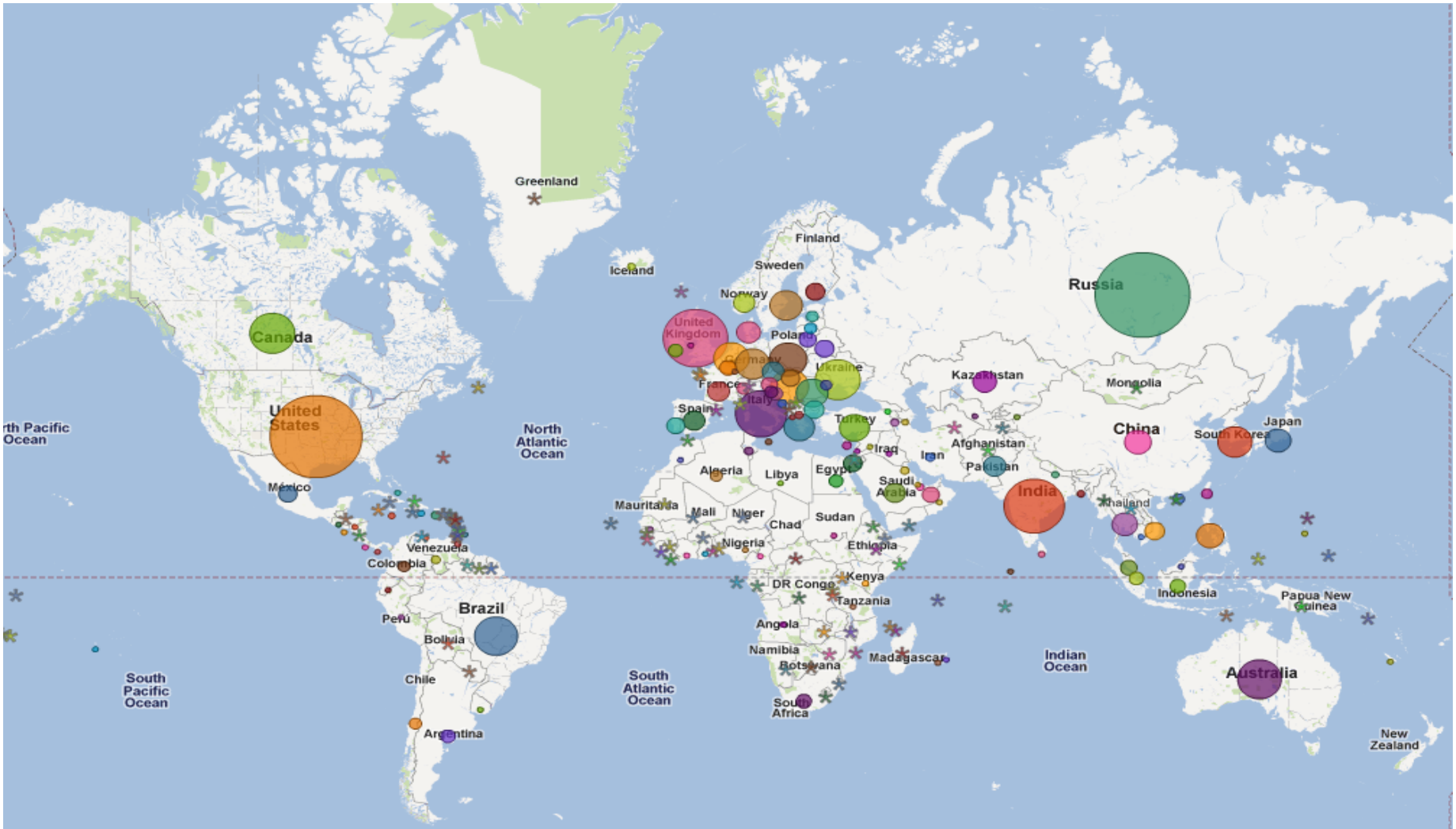
Where do users come from?



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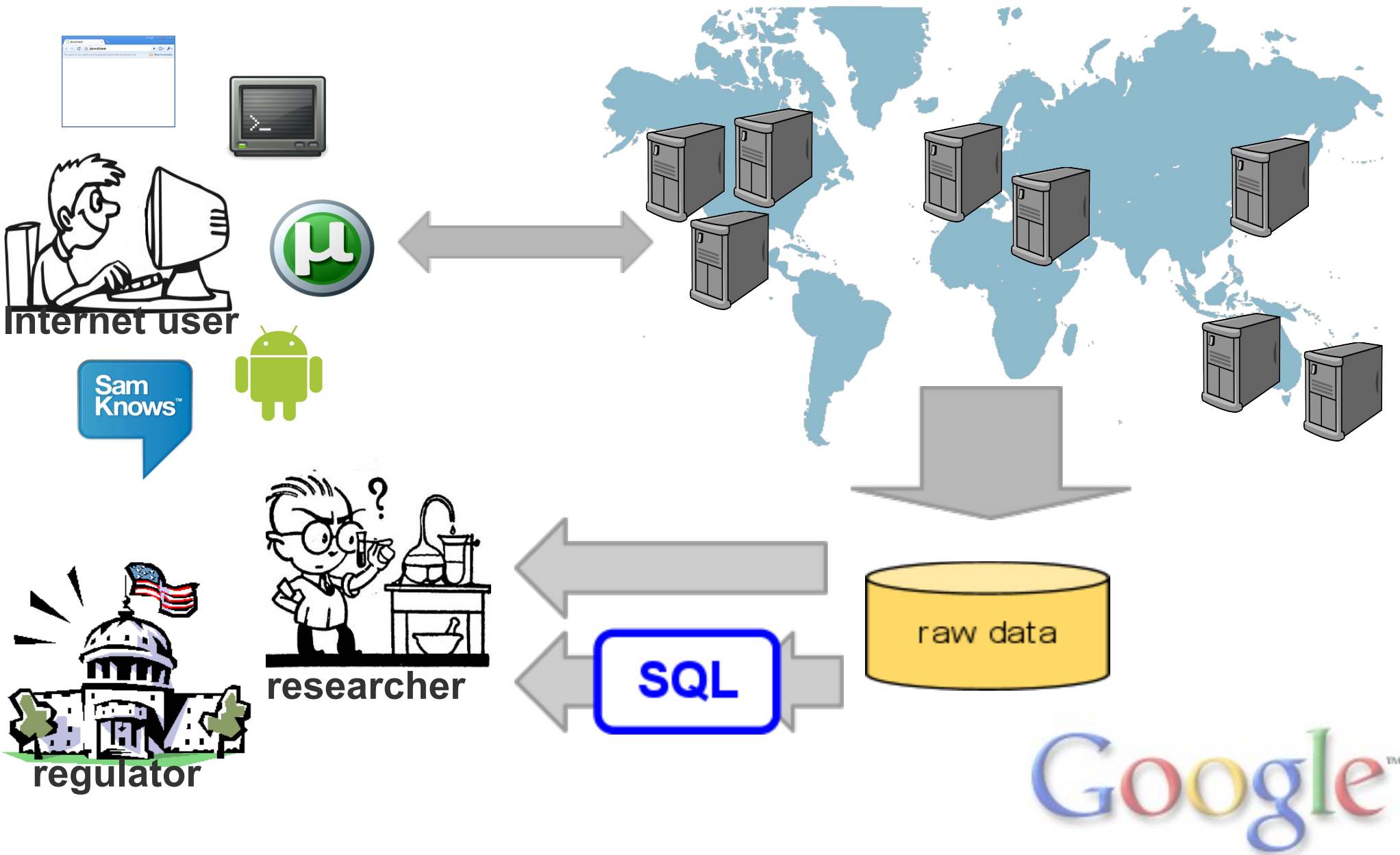
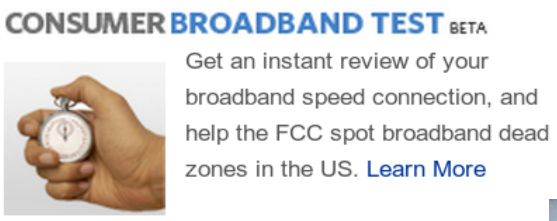
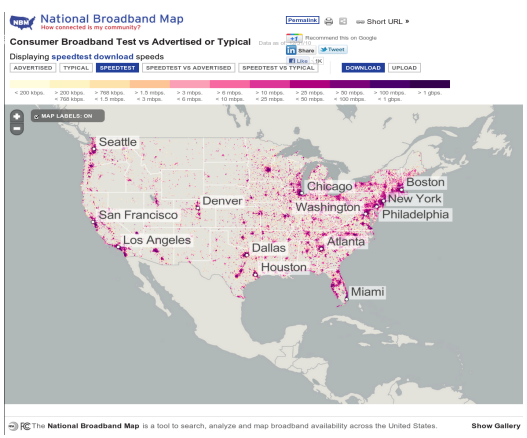
Sharing measurement data



Open data informs regulators

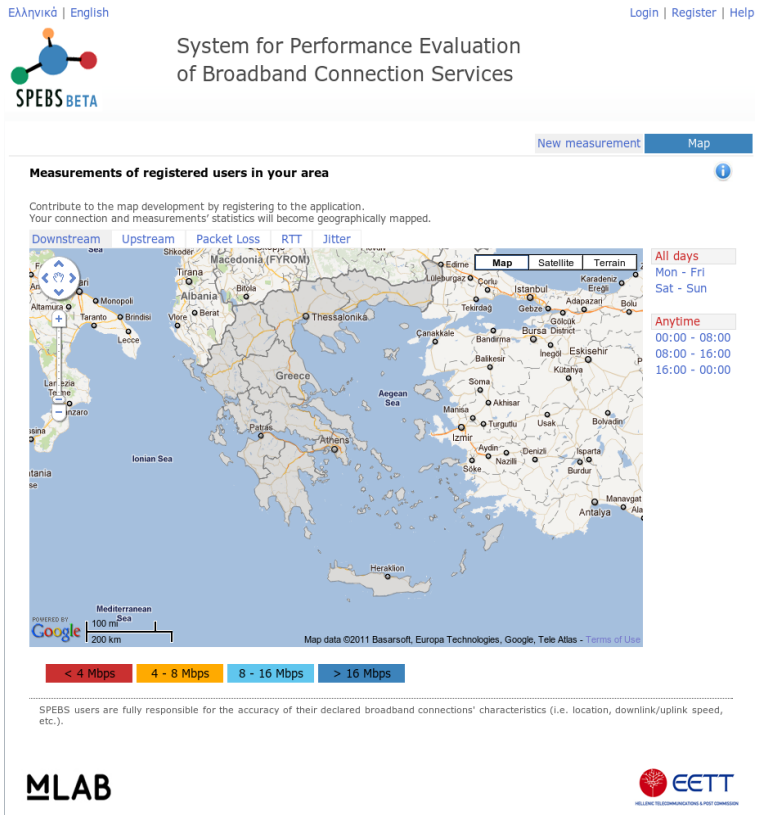
FCC broadband test & broadband map





First FCC broadband report based on open M-Lab data

EETT broadband test & broadband map



... and much more ongoing

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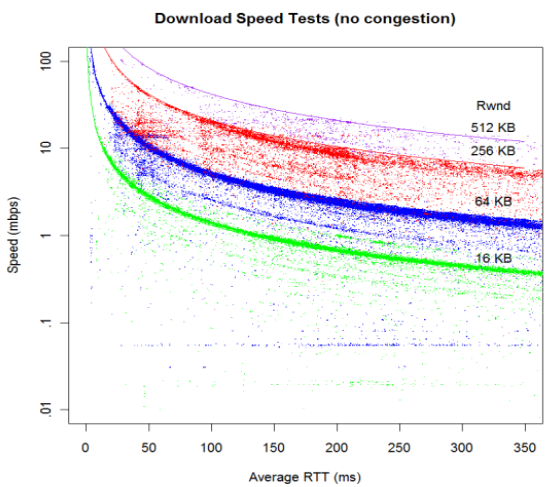
Open data empowers researchers

D.Clark, S.Bauer et al. - MIT

Effects of receiver window on speed

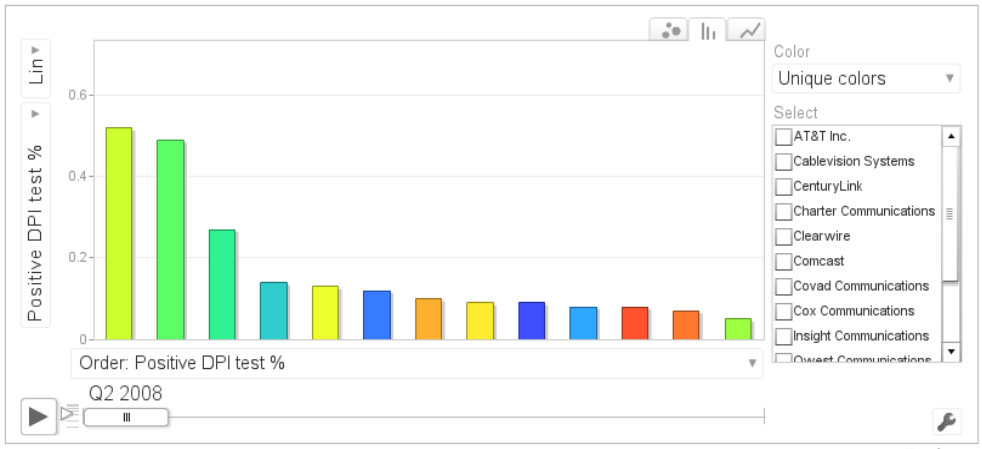


ISP	Upstream (%)	Dwnstrm. (%)
Comcast	**71.5** (34874)	**73.5** (28272)
Road Runner	6.5 (7923)	**63.9** (5870)
AT&T	10.1 (8808)	10.9 (7748)
Cox	**63** (5797)	**47.4** (4357)
MCI-Verizon	5.6 (8753)	8.4 (7733)

Table 1: Shaping detections: top-5 ISPs in terms of Shaper-Probe runs. For each ISP we show percentage of runs with detected shaping and number of total runs.

BitTorrent Throttling by US ISPs

Glasnost data, Q2 2008 - Q2 2010



M.Mueller - Syracuse Uni,

H. Asghari - Delft Uni

Deep Packet Inspection use and deployment

C.Dovrolis, P.Kanuparthy - Georgia Tech

Traffic Shaping and PowerBoost effect on speed

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An example of M-Lab data visualization

http://measurementlab.net/visualization

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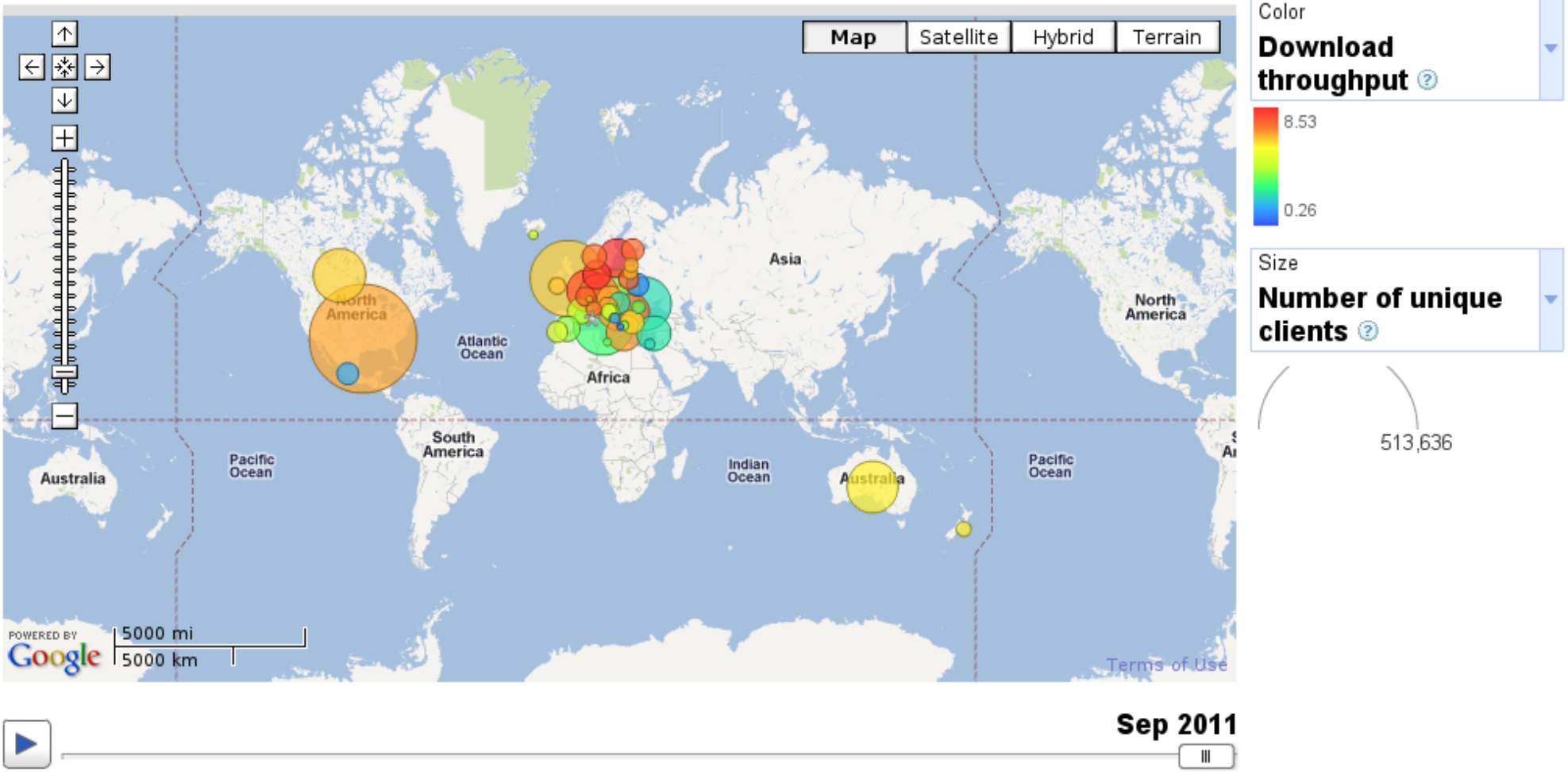
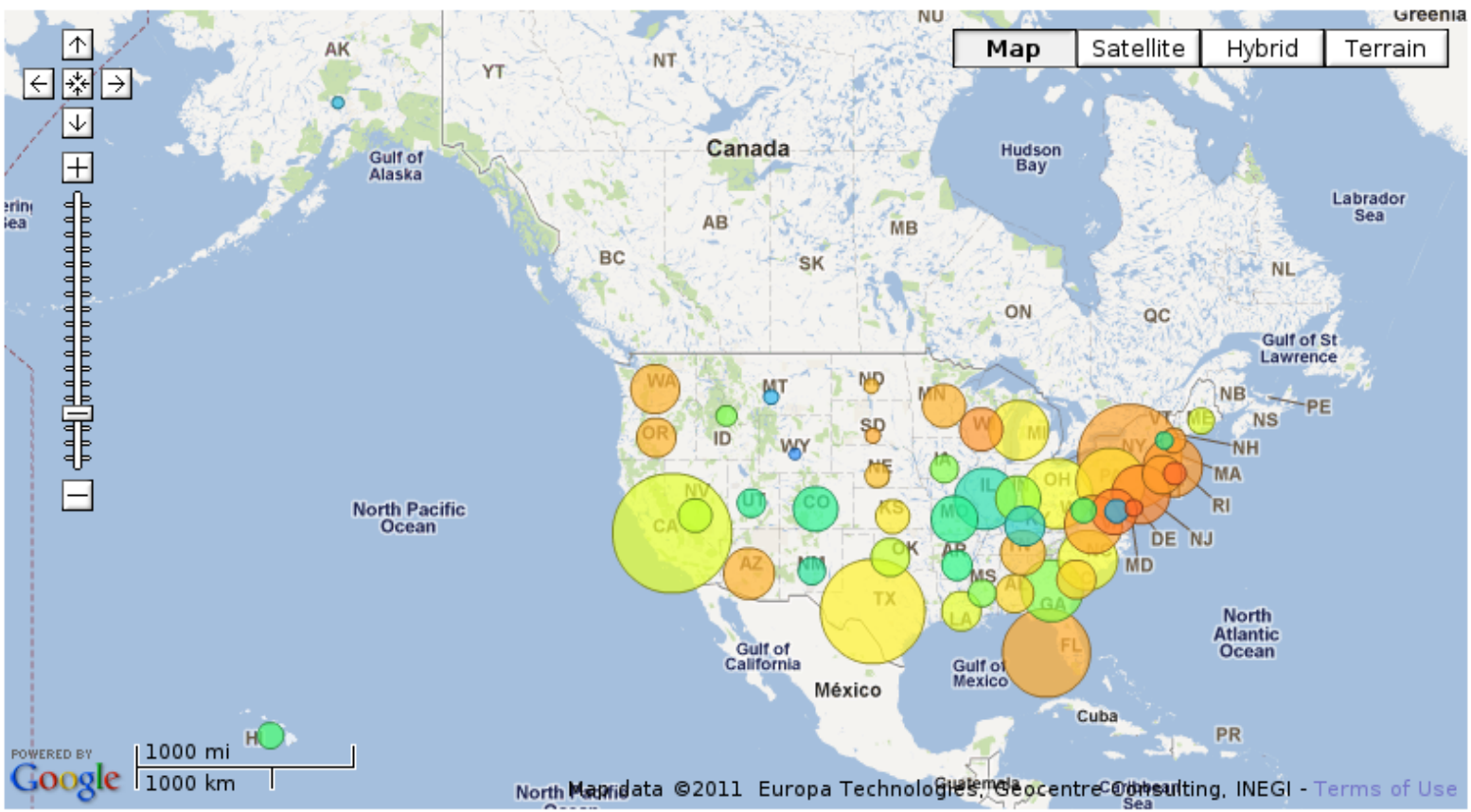
Download throughput worldwide



Download throughput in the US



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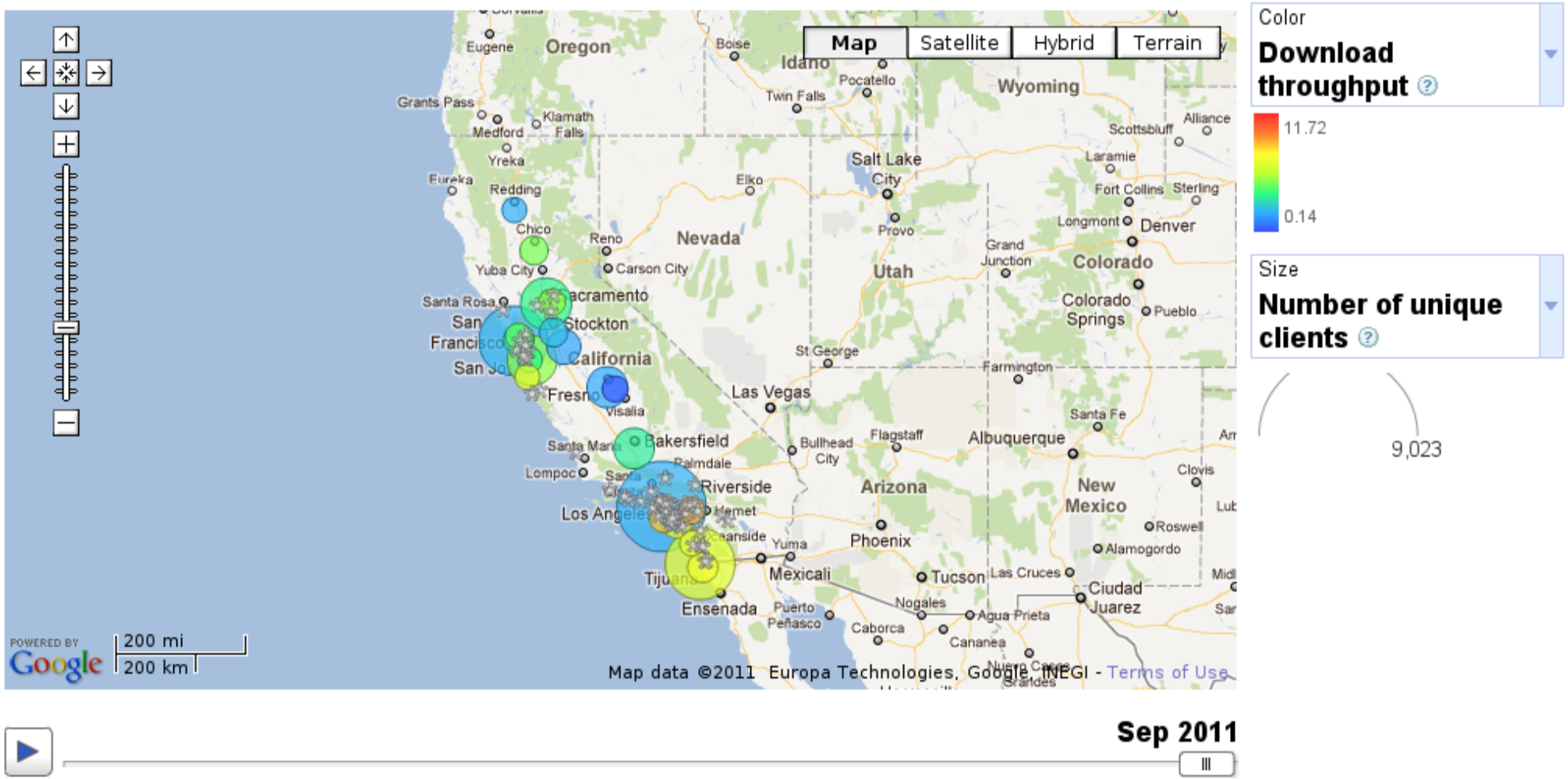
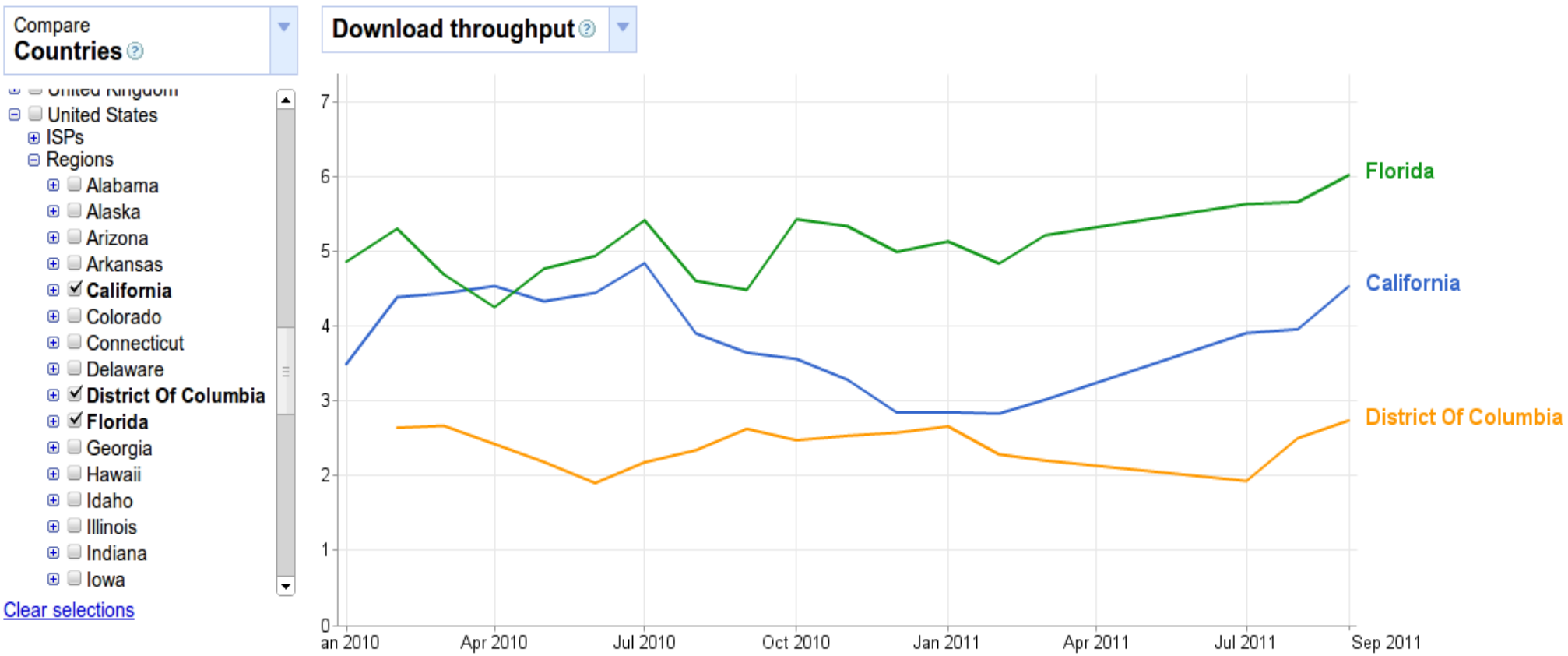
Download throughput in CA



Download throughput over time



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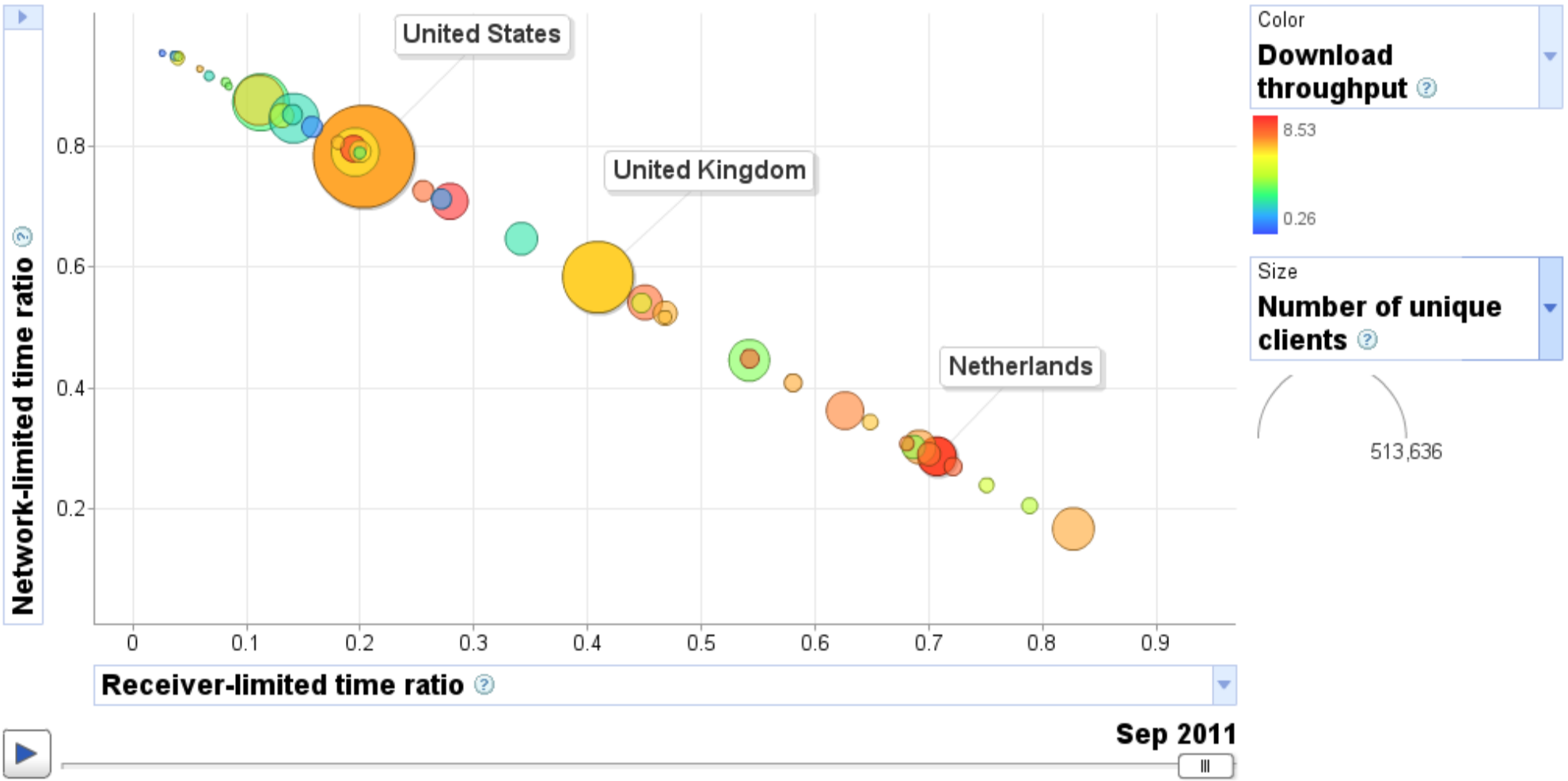
Network-limited vs. client-limited tests



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What's next? - *GET INVOLVED!*

- **More servers, better global coverage**
  - You can provide **new servers** to the platform.
  - European broadband performance study by SamKnows for European Commission.
- **More tools, new measurements**
  - You can develop **new tools** (client- and/or server-side).
- **More data analysis and visualization**
  - You can **analyze collected** data and share your results with the Internet community. (Google research grants)
  - You can provide resources for data hosting and sharing.
- **More partnerships with regulators**

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Questions?

More information at
www.measurementlab.net

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