

# **The Case for Measurements from Home Network Gateways**

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# Goal: Measure Home Network Performance

## Your fears confirmed: "up to" broadband speeds are bogus

By Nate Anderson | Last updated 16 days ago

Broadband providers in the US have long hawked their wares in "up to" terms. You know—"up to" 10Mbps, where "up to" sits like a tiny pebble beside the huge font size of the raw number.

In reality, no one gets these speeds. That's not news to the techno-literate, of course, but a [new Federal Communications Commission report](#) (PDF) shines a



## Ofcom: Broadband ISPs are pulling a fast one

- Average speed 46% below that promised by ISPs
- Mandatory code and clear penalties vital, experts say

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**Graeme Wearden**

The Guardian, Tuesday 27 July 2010

[Article history](#)

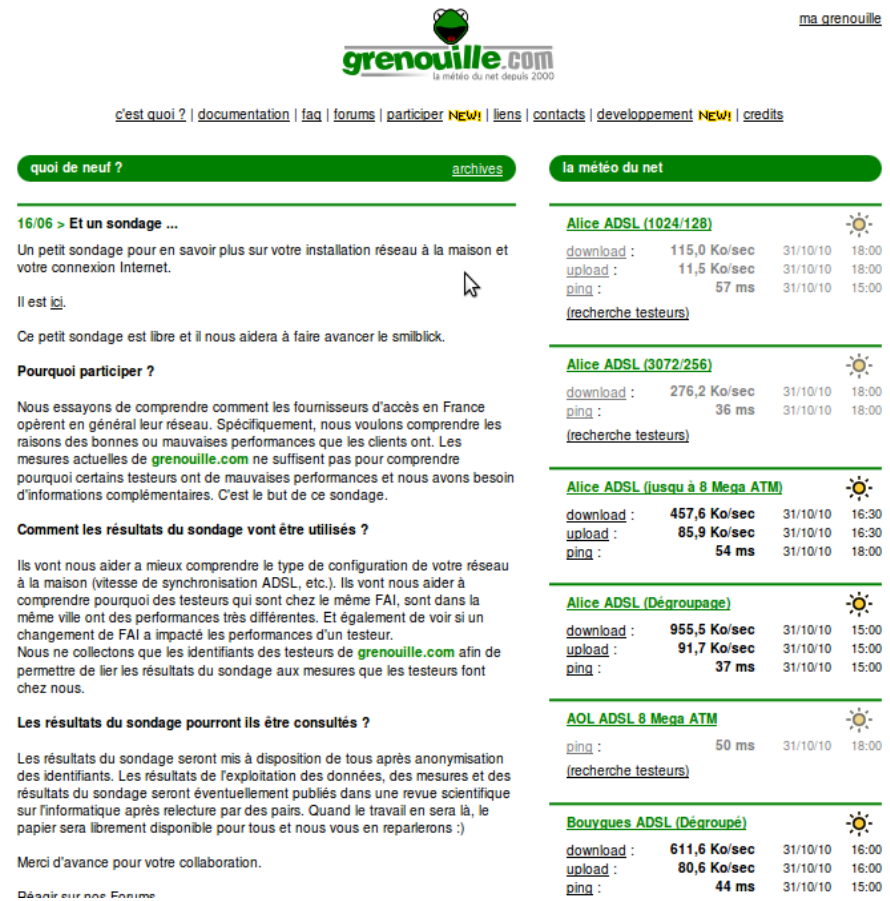
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## ACTUAL DOWNLOAD SPEEDS

As noted above, in 2009, average (mean) and median advertised download speeds were 7–8 Mbps, across technologies. However, FCC analysis shows that the median actual speed consumers experienced in the first half of 2009 was roughly 3 Mbps, while the average (mean) actual speed was approximately 4 Mbps. Therefore actual download speeds experienced by U.S. consumers appear to lag advertised speeds by roughly 50%.

# Take One: Grenouille (France)

- Over 20,000 users across major ISPs, geographical regions
- Latency and throughput study from end hosts



The screenshot shows the website [ma.grenouille.com](http://ma.grenouille.com). The page features a navigation menu with links like 'c'est quoi?', 'documentation', 'faq', 'forums', 'participer', 'liens', 'contacts', 'developpement', and 'credits'. The main content area is divided into two columns. The left column contains a survey titled '16/06 > Et un sondage ...' with text explaining the purpose of the survey and asking for participation. The right column displays performance test results for various ISPs, including 'Alice ADSL (1024/128)', 'Alice ADSL (3072/256)', 'Alice ADSL (jusqu'à 8 Mega ATM)', 'Alice ADSL (Dégroupage)', 'AOL ADSL 8 Mega ATM', and 'Bouygues ADSL (Dégroupage)'. Each test result includes download and upload speeds in Ko/sec, ping times in ms, and test dates/times.

**ma.grenouille.com**  
la météo du net depuis 2000

[c'est quoi ?](#) | [documentation](#) | [faq](#) | [forums](#) | [participer](#) **NEW!** | [liens](#) | [contacts](#) | [developpement](#) **NEW!** | [credits](#)

**quoi de neuf ?** [archives](#)

**16/06 > Et un sondage ...**

Un petit sondage pour en savoir plus sur votre installation réseau à la maison et votre connexion Internet.

Il est [ici](#).

Ce petit sondage est libre et il nous aidera à faire avancer le smilbick.

**Pourquoi participer ?**

Nous essayons de comprendre comment les fournisseurs d'accès en France opèrent en général leur réseau. Spécifiquement, nous voulons comprendre les raisons des bonnes ou mauvaises performances que les clients ont. Les mesures actuelles de **grenouille.com** ne suffisent pas pour comprendre pourquoi certains testeurs ont de mauvaises performances et nous avons besoin d'informations complémentaires. C'est le but de ce sondage.

**Comment les résultats du sondage vont être utilisés ?**

Ils vont nous aider à mieux comprendre le type de configuration de votre réseau à la maison (vitesse de synchronisation ADSL, etc.). Ils vont nous aider à comprendre pourquoi des testeurs qui sont chez le même FAI, sont dans la même ville ont des performances très différentes. Et également de voir si un changement de FAI a impacté les performances d'un testeur. Nous ne collectons que les identifiants des testeurs de **grenouille.com** afin de permettre de lier les résultats du sondage aux mesures que les testeurs font chez nous.

**Les résultats du sondage pourront ils être consultés ?**

Les résultats du sondage seront mis à disposition de tous après anonymisation des identifiants. Les résultats de l'exploitation des données, des mesures et des résultats du sondage seront éventuellement publiés dans une revue scientifique sur l'informatique après relecture par des pairs. Quand le travail en sera là, le papier sera librement disponible pour tous et nous vous en reparlerons :)

Merci d'avance pour votre collaboration.

Désolé sur nos forums

**la météo du net**

**Alice ADSL (1024/128)** ☀️

download :	115,0 Ko/sec	31/10/10	18:00
upload :	11,5 Ko/sec	31/10/10	18:00
ping :	57 ms	31/10/10	15:00

[recherche testeurs](#)

**Alice ADSL (3072/256)** ☀️

download :	276,2 Ko/sec	31/10/10	18:00
ping :	36 ms	31/10/10	18:00

[recherche testeurs](#)

**Alice ADSL (jusqu'à 8 Mega ATM)** ☀️

download :	457,6 Ko/sec	31/10/10	16:30
upload :	85,9 Ko/sec	31/10/10	16:30
ping :	54 ms	31/10/10	18:00

**Alice ADSL (Dégroupage)** ☀️

download :	955,5 Ko/sec	31/10/10	15:00
upload :	91,7 Ko/sec	31/10/10	15:00
ping :	37 ms	31/10/10	15:00

**AOL ADSL 8 Mega ATM** ☀️

ping :	50 ms	31/10/10	18:00
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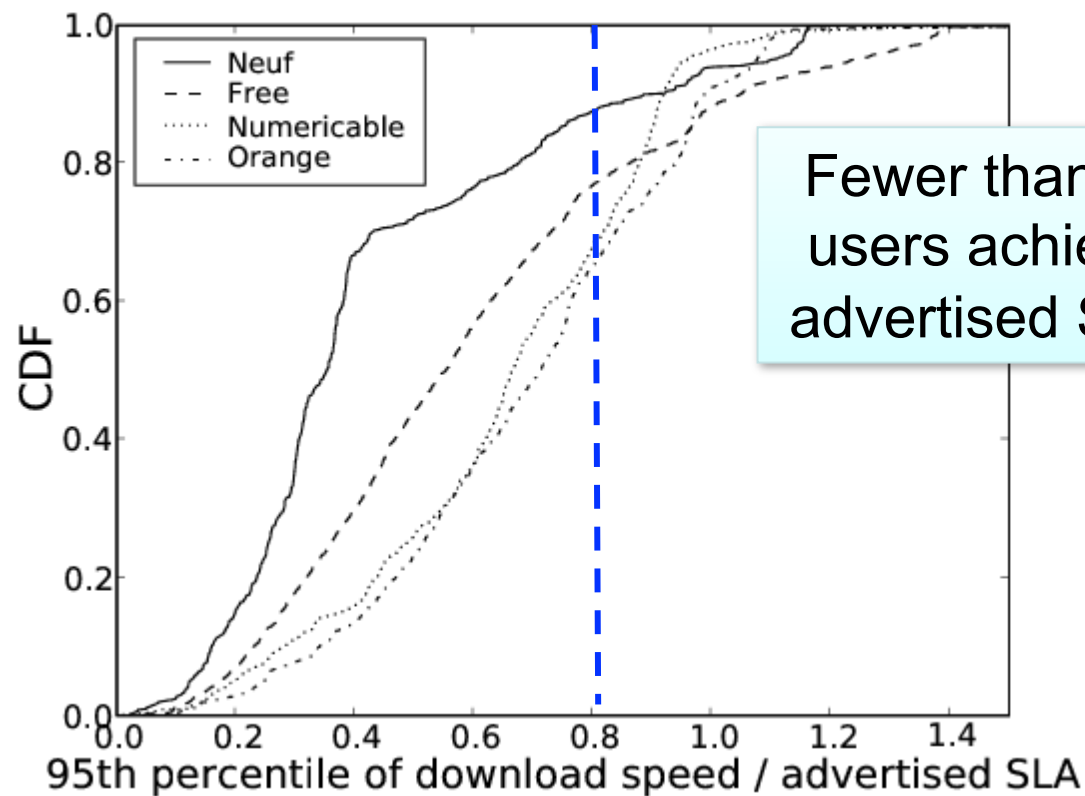
[recherche testeurs](#)

**Bouygues ADSL (Dégroupage)** ☀️

download :	611,6 Ko/sec	31/10/10	16:00
upload :	80,6 Ko/sec	31/10/10	16:00
ping :	44 ms	31/10/10	15:00

# Hosts See Variable Performance

- Gap between plan rate and achieved rates
- **But, how much is due to ISP vs. other effects?**



Fewer than half of the users achieve 80% of advertised SLA. Why?

# Problem: Confounding Factors

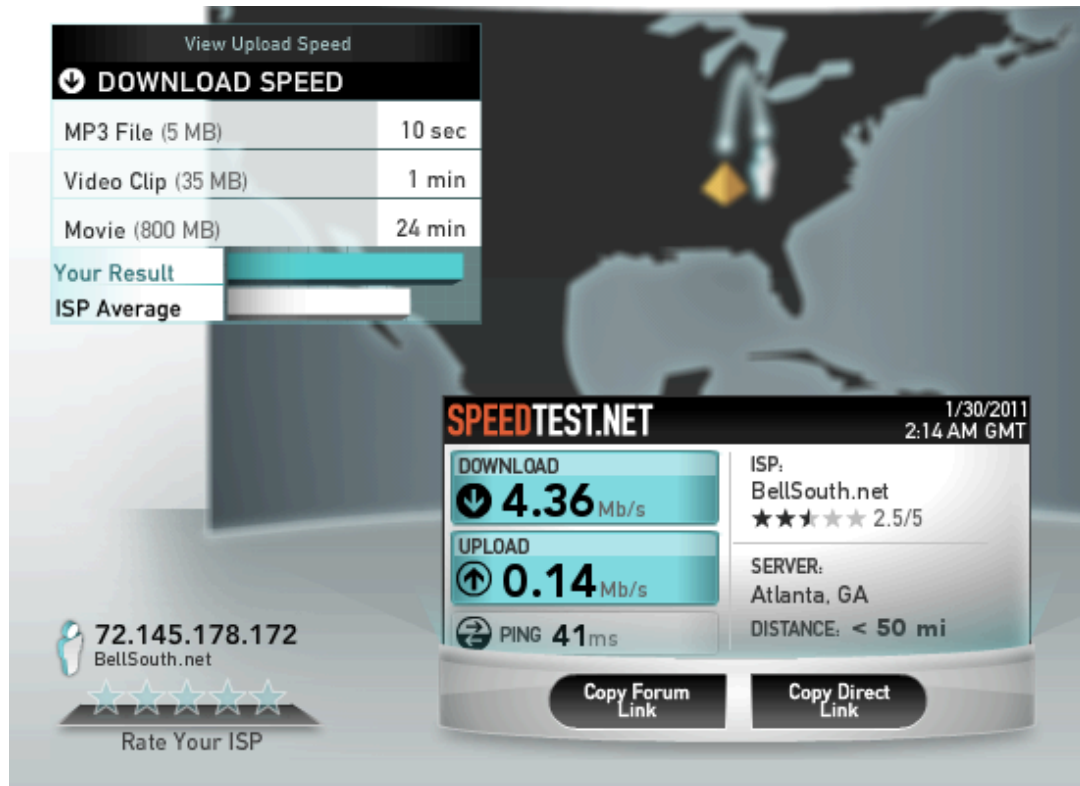
Network bandwidth measurements (?): Upload 430 Kbit/sec, Download 4.8 Mbit/sec

Your Uplink: We measured your uplink's sending bandwidth at 430 Kbit/sec. This level of bandwidth works well for many users.

During this test, the applet observed one reordered packet.

Your Downlink: We measured your downlink's receiving bandwidth at 4.8 Mbit/sec. This level of bandwidth works well for many users.

During this test, the applet observed 8 reordered packets.



## From Gateway

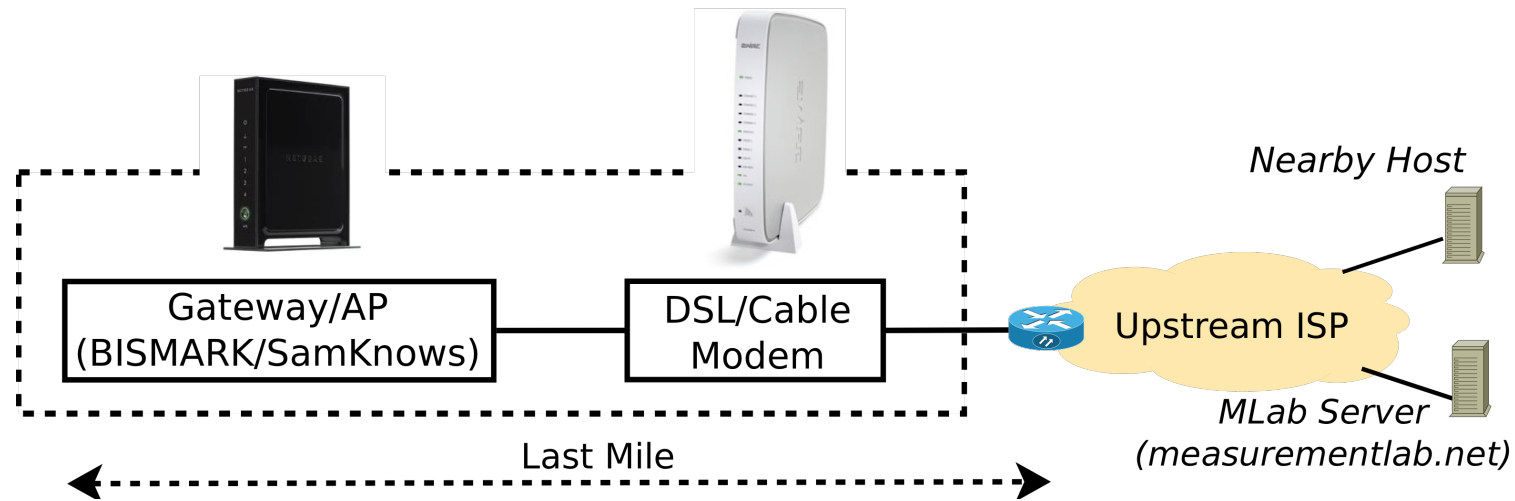
Downstream

Upstream

5.62 Mbit/s

452 Kbits/s

# BISMark: A View from the Gateway



- Periodic measurements to last mile and end-to-end
- Measure directly at the gateway device
- Adjust for confounding factors

# BISMark

- Deploy programmable gateways in homes
- NoxBox deployment: up to 35 around Atlanta
- SamKnows deployment: about 10,000 around the U.S.



NoxBox



Netgear

# Why a Gateway?

- Observes all traffic passing through network
- Can isolate individual factors affecting network performance
  - Wireless
  - Cross traffic
  - Load on measurement host
  - End-to-end path
  - Configuration and hardware
- Can isolate user behavior



# Effect #1: Buffering

- Buffering appears in various places along path
- Numbers depend on where/how measurements are taken

Netalyzr

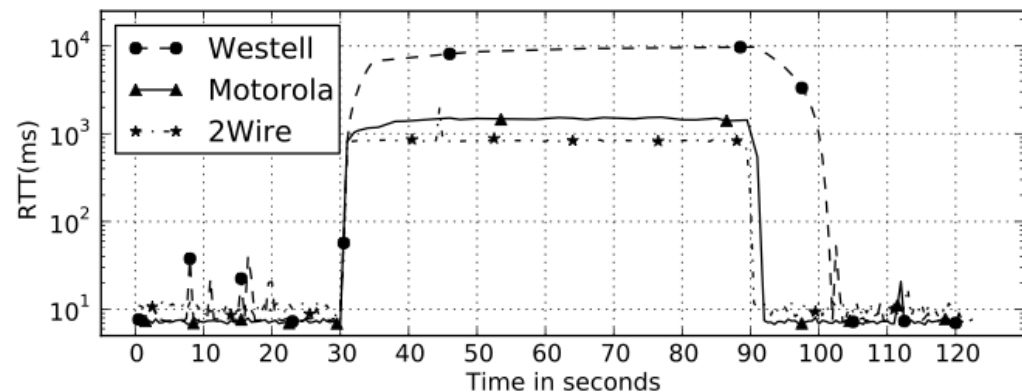
Westell Modem

Network buffer measurements (?): Uplink 7000 ms, Downlink 1300 ms

Motorola Modem

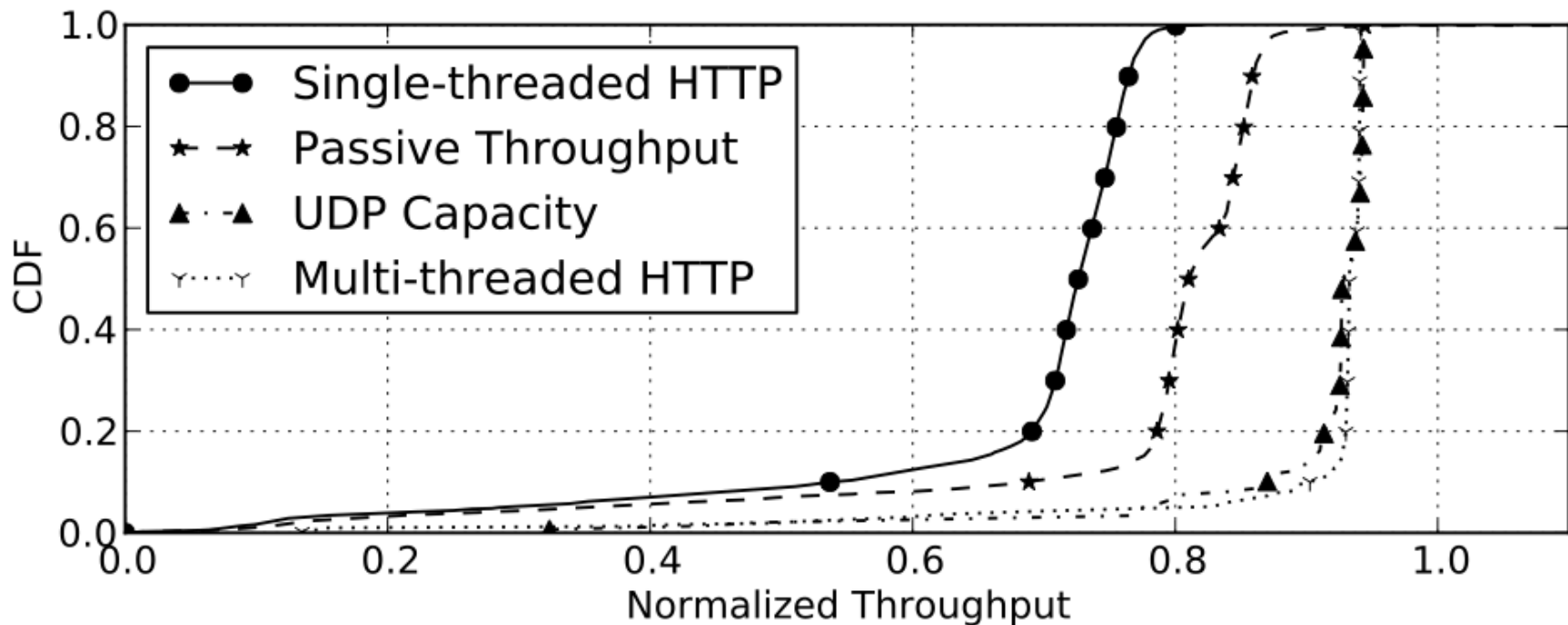
Network buffer measurements (?): Uplink 1200 ms, Downlink 130 ms

BISMark



# Effect #2: Measurement Technique

- Throughput measurements yield variable results
- Single-threaded HTTP varies across users/ access links (likely due to interleaving)

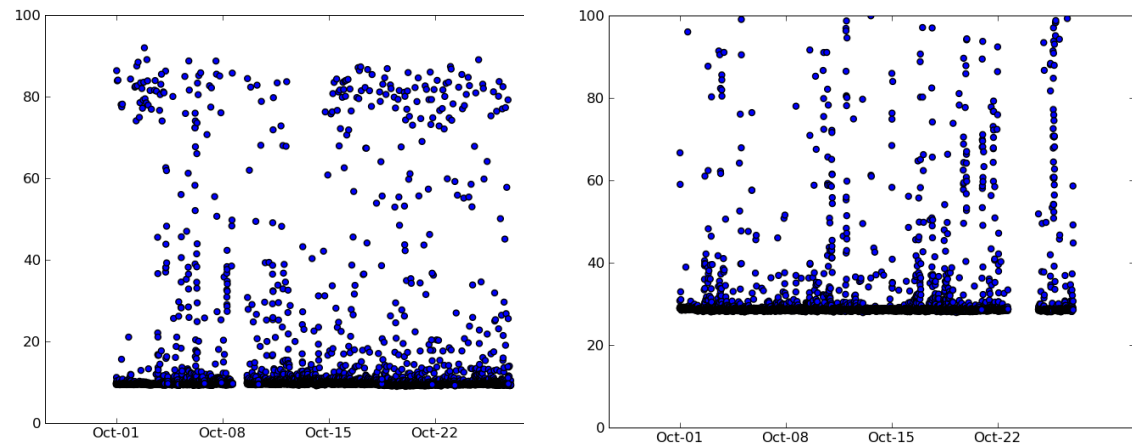


# Effect #3: Interleaving

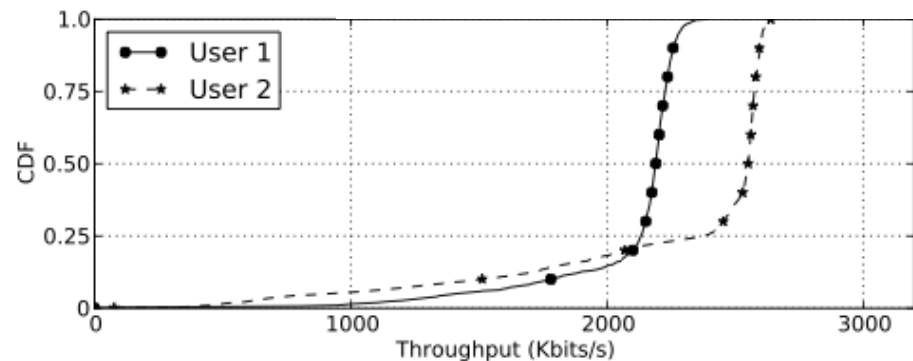
- Interleaving on a DSL link can affect both last-mile latency and throughput

Netalyzr

Network latency measurements (?): Latency: 34ms Loss: 0.5%



BISMark



# Also Studying User Behavior

- Network activity
  - Applications used
  - Time active on network
  - Behavior in response to network activity
- Other activity
  - Presence in home
  - Motion within the home

# More Questions

- Does application affect performance?
- How do different factors affect performance
  - Latency, ISP, service plan
- Better statistical tools to analyze current data
- What would you like to know/measure?