The Case for Measurements from Home Network Gateways

Nick Feamster, Srikanth Sundaresan, Walter de Donato, Renata Teixeira
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

Graeme Wearden
The Guardian, Tuesday 27 July 2010
Article history

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

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

Network bandwidth measurements (2): 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

<table>
<thead>
<tr>
<th></th>
<th>Downstream</th>
<th>Upstream</th>
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<tbody>
<tr>
<td></td>
<td>5.62 Mbit/s</td>
<td>452 Kbits/s</td>
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BellSouth.net

Rate Your ISP
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.
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

Westell Modem
- Network buffer measurements (2): Uplink 7000 ms, Downlink 1300 ms

Morotola Modem
- Network buffer measurements (2): Uplink 1200 ms, Downlink 130 ms

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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

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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?