

Gigabit Broadband, Interconnection propositions, and the Challenge of Managing Expectations

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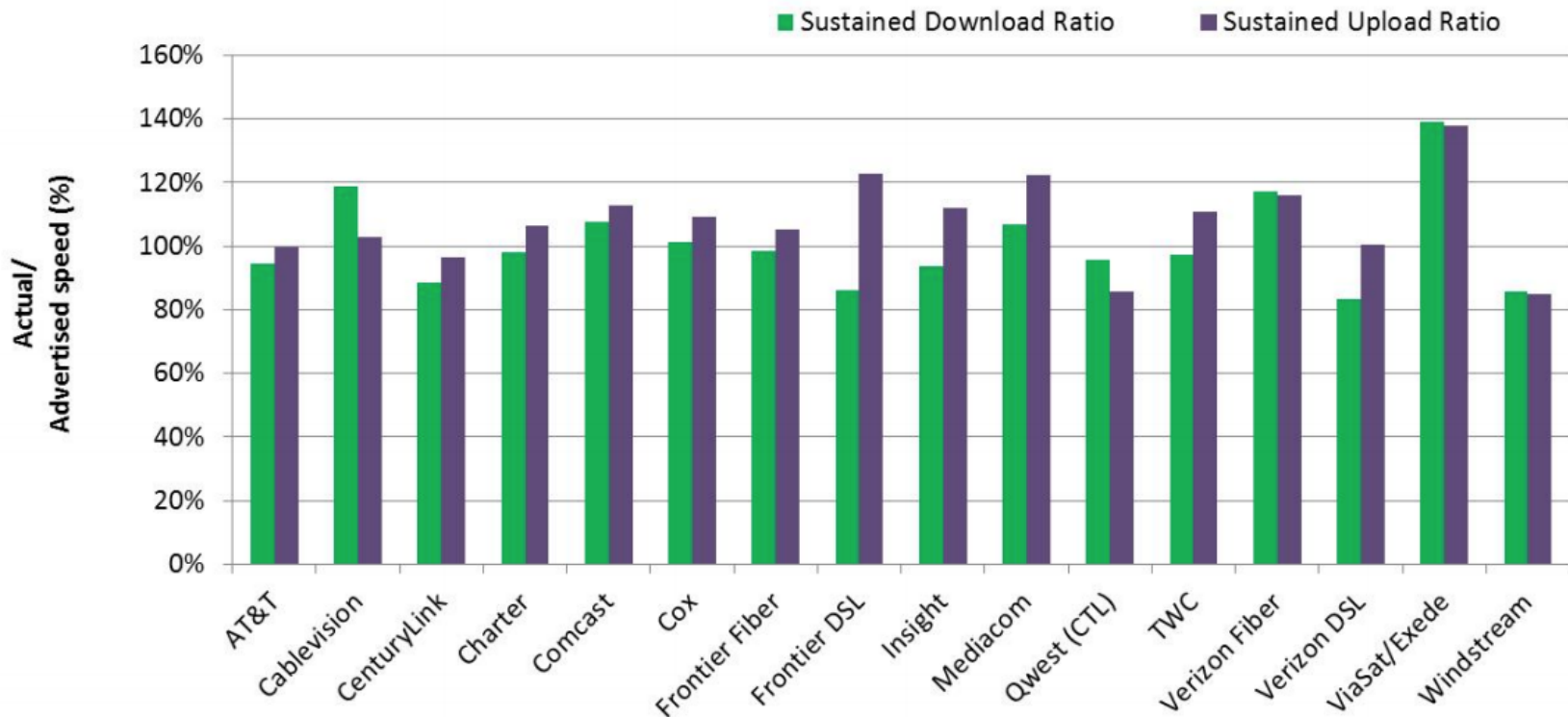
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How would Google Fiber's Gigabit Ethernet Product look in following FCC MBA chart?



See Chart 1 in <http://data.fcc.gov/download/measuring-broadband-america/2014/2014-Fixed-Measuring-Broadband-America-Report.pdf>

New York Office of Attorney General Inquiry Concerning Broadband Internet Speeds

Time Warner Cable Inc. (“TWC”) advertises Internet plans to New York customers at upload and download speeds of up to a specified rate (e.g., “10/1 Mbps”). It also advertises various premium options, such as its “Extreme” and “Ultimate” offerings, whereby for a higher monthly fee, the consumer is promised even higher speeds and better performance. For example, TWC’s higher priced “Ultimate 100” broadband service promises customers “ultra-fast speeds” that they may use to “[u]pload large files, enjoy power gaming and streaming multiple videos simultaneously.”¹

This Office is concerned that, for reasons substantially within TWC’s control, consumers may not be experiencing the speeds advertised. We are also concerned that those paying for premium options (“Ultimate 300” and “Extreme”) may not experience proportional increases in experienced speeds.




http://internethealthtest.org/

Test Again











Your Results

Average Speed 95.45 Mbps

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Advanced

Tata	 108.87 Mbps	 140.85 Mbps
GTT	 43.78 Mbps	 62.78 Mbps
Zayo	 107.90 Mbps	 125.47 Mbps
Level 3	 111.12 Mbps	 124.07 Mbps
Cogent	 105.61 Mbps	 140.97 Mbps

Why performance expectations of regulators, users, edge providers matter

- Potential to delay or disrupt deployment of very high-speed broadband
- **Current measurements tools / techniques are not adequate in a gigabit broadband world**
- **Current performance expectations are not appropriate during the transition to a gigabit broadband world**

Gigabit broadband performance propositions

What are reasonable expectations for gigabit broadband?

- Prop #1: Gbps everywhere
- Prop #2: Gbps island
- Prop #3: Gbps in aggregate only
- Prop #4: Gbps somewhere
- Prop #5: Growing toward Gbps paths

Prop 1: Gigabit everywhere

- Average ~ 1Gbps, consistently, end-to-end
- This would sustain today's expectations, but would be very expensive.

"Even if our Fiber network and your devices are fully capable of achieving 1Gig speeds, **Google cannot ensure that you will receive 1Gig speeds from end to end.** Once your communication leaves the Fiber network, it might encounter segments of the Internet providing slower service—often due to heavy traffic or substantial rerouting delays—at any time. It is our hope that overall Internet performance will improve over time."

Prop 2: Gigabit Islands

- Average ~ 1Gbps, consistently, but only in access network.
- Does not meet existing performance expectations
- Since not e2e, is this valuable? YES.
 - Gbps access is what we can measure today, and what we are deploying. Google Fiber, etc. Have to start somewhere.
 - Gbps Islands are valuable. Lots of local traffic. Universities, communities.

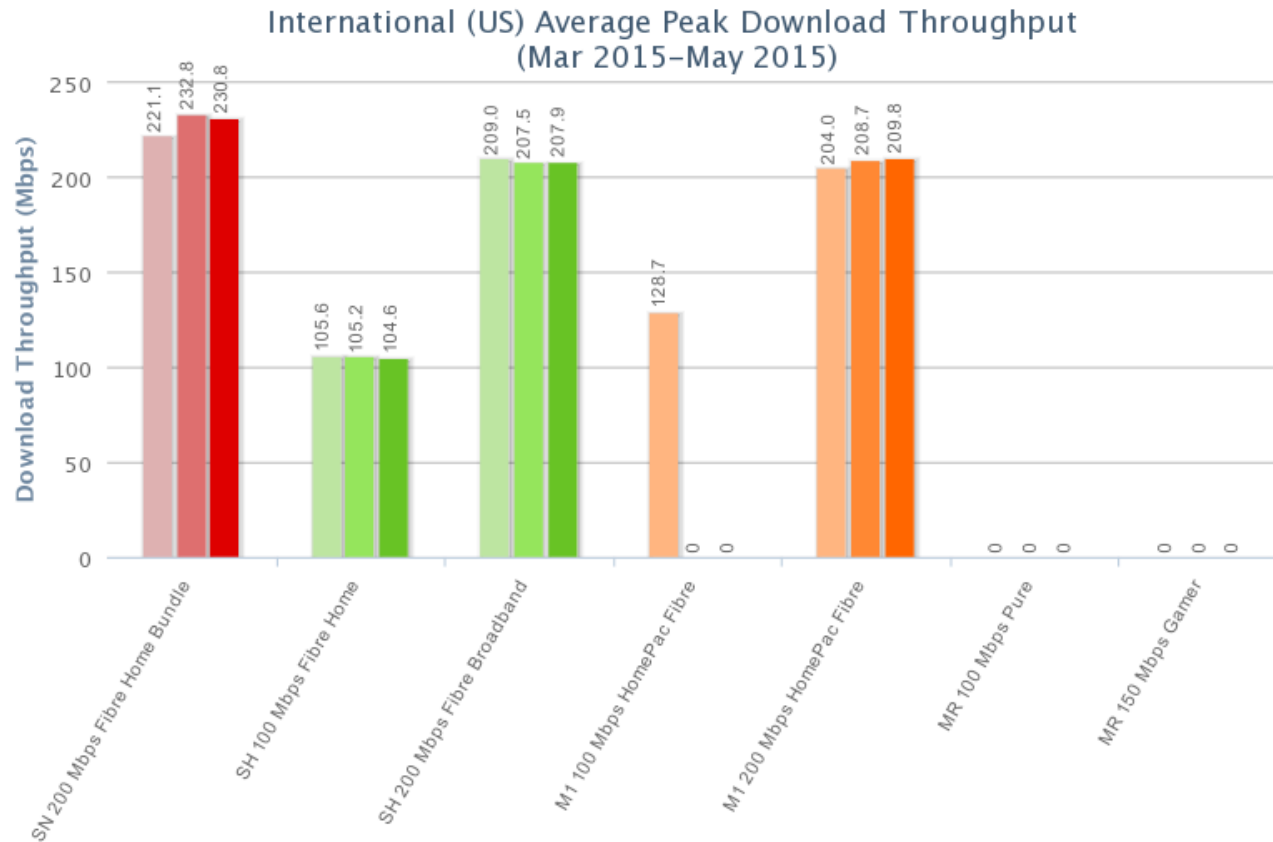
Prop 3: Gigabit in aggregate only

- No individual Gbps flows, but Gbps in aggregate (all users in household, etc.)
- Does not meet existing performance expectations

Prop 4: Gigabit somewhere

- Gbps to select popular locations or apps (Netflix, Google, etc.)
- Does not meet existing performance expectations

Broadband speeds from Singapore to USA



Prop 5: Growing to Gigabit paths

- Ramping demand and capacity efficiently
 - Interconnection agreement include bilateral commitments and notification requirements to scale capacity with actual traffic

Policy

Nuanced policy: raise all ships but applaud Gigabit islands

- Policy should embrace diversity, while still ensuring everyone has at least minimal access.
 - Not everyone needs Gbps, but some do; and over time, the minimum that everyone does need will increase.
- Shift from focusing on peak, to concerns about minimal access

Encourage end-to-end, multilateral dialog

- Don't dumb down debate to make it simple. Gigabit broadband is complicated.
- Learn from cases (Singapore living the future? Kansas City?)

Existing performance
expectations

Regulatory Expectations

- Actual speeds should closely match advertised speeds on access networks.
- Some level of consistent performance should be maintained across time.
- Performance to sites beyond the access network matters (and is currently inadequate at times) but concrete expectations have not yet been established.

Consumer expectations

- Consistently good quality of experience to popular services, particularly video, gaming and web browsing should be possible.
- Should be able to conduct speed measurements to on-net and off-net locations (though still relatively nearby) and achieve good results relative to access network advertised speed.

Edge provider expectations

- Should be able to provide consistently good quality of experience to end-users.
- Improving quality to an increasing number of end users over time should be possible.