



Gigabit Broadband Access: Status, Forecasts and Observations

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Outline

- Status of Broadband in the U.S.
- Status of Gigabit Access
- The Players and their Motivation
- Drivers and Constraints
- Trends and Forecasts

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Status of Broadband in the U.S.

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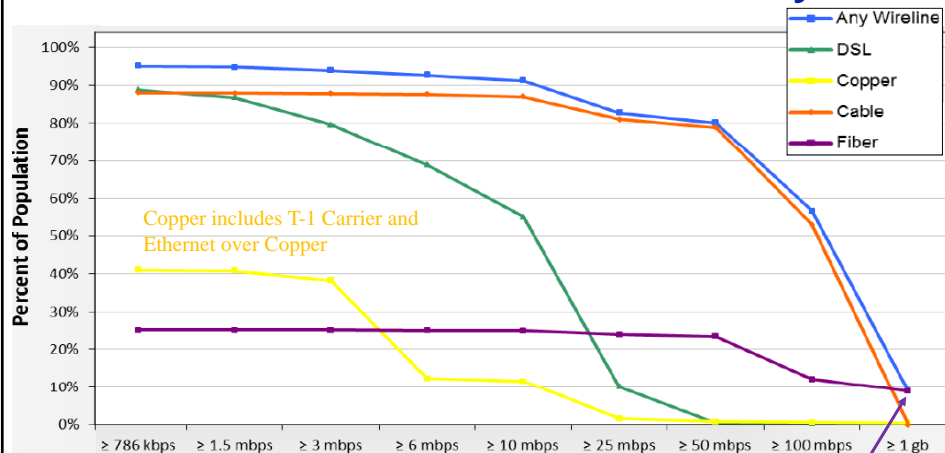
Major U.S. Wireline Broadband Access Providers

- Former Telecom Operators
 - AT&T – Mostly DSL and FTTN (U-verse)
 - Verizon – Mostly DSL and FTTH (FioS)
 - CenturyLink – Mostly DSL and FTTN
- Cable Television Providers
 - Comcast - HFC
 - Time Warner Cable - HFC
 - Cox - HFC
 - Charter - HFC

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U.S. Wireline Broadband Availability



Because of reporting issues, 1 gb data point grossly overstates reality; actual is probably under 1%.

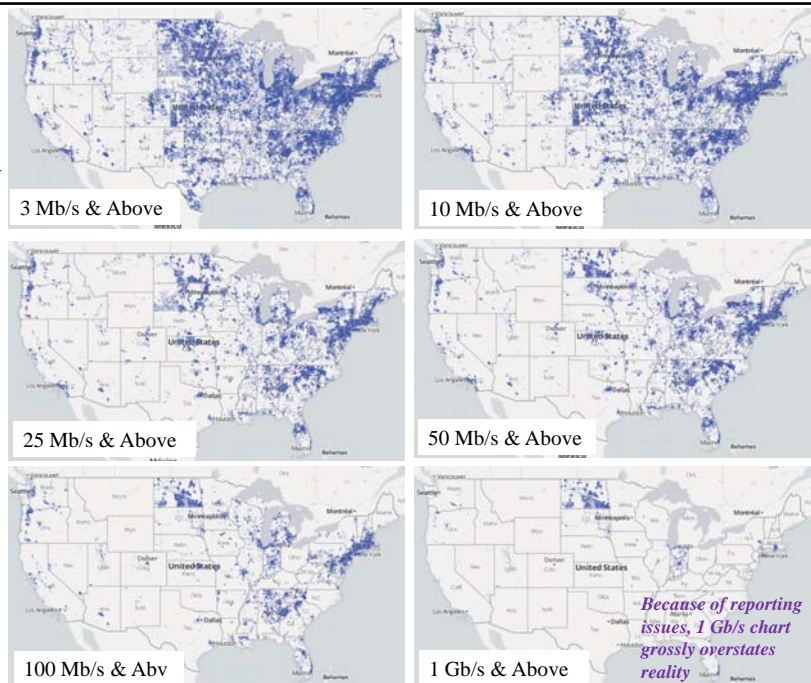
Source: NTIA's State Broadband Initiative,
<http://www.broadbandmap.gov/speed>
 Data as of June 2013, Report published February 2014

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U.S. Wireline Broadband Availability

Data as of June 2013, Report published February 2014



Source: NTIA's State Broadband Initiative, broadbandmap.gov/speed Copyright © 2014, Technology Futures, Inc. 7

Verizon FiOS Internet			Download 1 HD Movie	Upload 200 Photos	Monthly Price
	15/5 Mbps	Great for everyday browsing, email, shopping and social networking.	44.4 Minutes (5GB)	6.7 Minutes (250MB)	\$49 ⁹⁹ /mo <small>for 1 year. \$59.99/mo. for months 13-24 plus taxes, fees & equip. charges with 2-yr. agmt.</small> Check Availability
	50/25 Mbps	Upload and download in a flash. Plus, play games and stream videos virtually lag-free—ideal for watching Redbox Instant Titles.	13.3 Minutes (5GB)	1.3 Minutes (250MB)	\$59 ⁹⁹ /mo <small>for 1 year. \$79.99/mo. for months 13-24 plus taxes, fees & equip. charges with 2-yr. agmt.</small> Check Availability
	75/35 Mbps	The gold standard in computing speeds. Perfect for households that enjoy streaming content on the Internet on multiple devices at the same time.	8.9 Minutes (5GB)	58 Seconds (250MB)	\$69 ⁹⁹ /mo <small>for 1 year. \$89.99/mo. for months 13-24 plus taxes, fees & equip. charges with 2-yr. agmt.</small> Check Availability
	150/65 Mbps	Premiere speed for serious Internet users. Multiple devices doing intense activities all at once are no match for this speed.	4.4 Minutes (5GB)	31 Seconds (250MB)	\$129 ⁹⁹ /mo <small>for 2 years plus taxes, fees & equip. charges with 2-yr. agmt.</small> Check Availability
	300/65 Mbps	Rocket fuel for multiple hardcore Internet users. Connect all your devices and push them to their limits.	2.2 Minutes (5GB)	31 Seconds (250MB)	\$209 ⁹⁹ /mo <small>plus taxes & fees with 2-yr. agmt.</small> Check Availability
	500/100 Mbps	The ultimate in supersonic speed. We're talking lots of users and lots of devices downloading, uploading, streaming, and sharing files—all at the same time.	1.4 Minutes (5GB)	20 Seconds (250MB)	\$299 ⁹⁹ /mo <small>plus taxes & fees with 2-yr. agmt.</small> Check Availability

Verizon FiOS Broadband Tiers as of Jun 15, 2014 (Fiber to the Home)

available in certain areas

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XFINITY® Internet from Comcast

Comcast Cable Television Broadband
Tiers as of Jun 15, 2014
(Hybrid Fiber Coax)

XFINITY Internet

PACKAGE	DOWNLOAD SPEEDS UP TO	EXTRAS	PRICE
Extreme 150 Learn More	150 Mbps	Download speeds now 150 Mbps! Access to 1 million WiFi hotspots at no extra cost	ONLINE EXCLUSIVE! \$89⁹⁹/mo for the first 12 months Select offer Details and Restrictions
Blast! Learn More	105 Mbps	Blast! speeds now 2x as fast! Access to 1 million WiFi hotspots at no extra cost	ONLINE EXCLUSIVE! \$59⁹⁹/mo for the first 12 months Select offer Details and Restrictions
Performance Learn More	25 Mbps	Access to 1 million WiFi hotspots at no extra cost	ONLINE EXCLUSIVE! \$39⁹⁹/mo for the first 12 months Select offer Details and Restrictions

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AT&T U-verse® High Speed Internet

3 Mbps PRO	DOWNSTREAM SPEEDS UP TO 3 Mbps YOUTUBE - 2MB MP3 - 5MB VIDEO - 4GB 0 SEC 05 SEC 1 MIN 1 HR 12 HRS	\$29⁹⁵/mo for 12 mos. with 1-year term req'd Check Availability
6 Mbps ELITE	DOWNSTREAM SPEEDS UP TO 6 Mbps YOUTUBE - 2MB MP3 - 5MB VIDEO - 4GB 0 SEC 05 SEC 1 MIN 1 HR 12 HRS	\$34⁹⁵/mo for 12 mos. with 1-year term req'd Check Availability
18 Mbps MAX PLUS	DOWNSTREAM SPEEDS UP TO 18 Mbps YOUTUBE - 2MB MP3 - 5MB VIDEO - 4GB 0 SEC 05 SEC 1 MIN 1 HR 12 HRS	\$44⁹⁵/mo for 12 mos. with 1-year term req'd Check Availability
45 Mbps POWER	DOWNSTREAM SPEEDS UP TO 45 Mbps YOUTUBE - 2MB MP3 - 5MB VIDEO - 4GB 0 SEC 05 SEC 1 MIN 1 HR 12 HRS	\$64⁹⁵/mo for 12 mos. with 1-year term req'd Check Availability

AT&T
U-verse
Broadband
Tiers as of
Jun 15, 2014
(Fiber to the
Node)

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Status of Gigabit Access

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Google fiber The latest news from the Google Fiber team.

WEDNESDAY, FEBRUARY 10, 2010

Experimenting with new ways to make broadband better, faster, and more available



Today **we announced** plans to build and test ultra high-speed broadband networks, delivering Internet speeds more than 100 times faster than what's available today to most Americans, over 1 gigabit per second fiber connections. As a first step, we're asking interested local governments to complete a **request for information**, which will help us determine where to build. Our goal is to experiment with new ways to help make broadband Internet access better, faster, and more widely available.

We're excited to see how consumers, small businesses, anchor institutions, and local governments will take advantage of ultra high-speed access to the Net. In the same way that the transition from dial-up to broadband made possible the emergence of online VoIP and video and countless other applications, we think that ultra high-speed bandwidth will lead to many new innovations – including streaming high-definition video content, remote data storage, distance learning, real-time multimedia collaboration, and others that we simply can't imagine yet.

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Official Blog

Insights from Googlers into our products, technology, and the Google culture



Ultra high-speed broadband is coming to Kansas City, Kansas

Posted: Wednesday, March 30, 2011

 27
 2,557
 4.9k

As part of our overall goal to make the web better for users, last year we [announced](#) a new project: to provide a community with Internet access more than 100 times faster than what most Americans have today. The response was overwhelming—nearly 1,100 cities felt the [need for speed](#)—and we were thrilled by the enthusiasm we saw across the country for better and faster web connections. Thank you to every community and individual that submitted a response, joined a rally, starred in a YouTube video or otherwise participated.

After a careful review, today we're very happy to announce that we will build our ultra high-speed network in [Kansas City, Kansas](#). We've signed a development agreement with the city, and we'll be working closely with local organizations, businesses and universities to bring a next-generation web experience to the community.



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Video US World Politics Entertainment Health MoneyW

By DARA KERR / CNET / November 14, 2012, 8:47 AM

Google Fiber 1 gigabit Internet launches in Kansas City

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Google announced Tuesday that it has started connecting people in Kansas City, Kan., to its ultra high-speed fiber-to-the-home Internet service. Acting as guinea pigs of sorts, these locals will be the first people in the world who get to test out Google's new service and decide whether it lives up to the hype.

Google Fiber serves up broadband speeds of 1 gigabits per second. By comparison, a recent report suggests that currently the [top Internet speed in the United States](#) is about 28.7 megabits per second.



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TUESDAY, APRIL 09, 2013

Google Fiber's Next Stop: Austin, Texas

...

Today, we're pleased to announce with Mayor Lee Leffingwell that Austin, Texas is becoming a Google Fiber city. It's a mecca for creativity and entrepreneurialism, with thriving artistic and tech communities, as well as the University of Texas and its new medical research hospital. We're sure these folks will do amazing things with gigabit access, and we feel very privileged to have been welcomed to their community.

Our goal is to start connecting homes in Austin by mid-2014. Customers there will have a similar **choice of products** as our customers in Kansas City: Gigabit Internet or Gigabit Internet plus our Google Fiber TV service with nearly 200 HD TV channels. We're still working out pricing details, but we expect them to be roughly similar to Kansas City. Also, as in Kansas City, we're going to offer

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statesman.com

Updated: 6:49 p.m. Tuesday, April 9, 2013 | Posted: 11:05 a.m. Tuesday, April 9, 2013

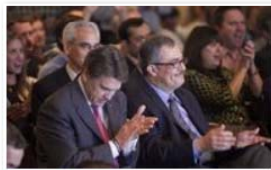
High-speed celebration: Austin lands super-fast Google Fiber network

Related

Here's your chance: [Click to sign up for notice of Google Fiber availability](#)

Got questions about Google Fiber? [Here are some answers](#) 

[AT&T, Time Warner say they'll step up to compete with Google Fiber](#)



Google Fiber coming to Austin, 04.09.13 

By [Brian Gaar](#), [Lori Hawkins](#) and [Kirk Ladendorf](#)


American-Statesman Staff

Austin took a glimpse into its future Tuesday through a looking glass supplied by Google Inc.

The governor showed up. The mayor was there. Local politicians, techies, entrepreneurs and community leaders all showed up at Brazos Hall downtown because they knew Google's super-fast Internet network — called Google Fiber — was being announced for Austin, and they thought that history was being made.

"The next big thing in Austin!" exclaimed Eugene Sepulveda, CEO of the Entrepreneurs Foundation of Central Texas, after he heard Google will build in Austin a 1 gigabit broadband network — a network that will be more than 100 times faster than today's typical broadband Internet access.











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AT&T to Deliver the First All Fiber 1 Gigabit Broadband Network to Austin

Austin's Fastest Internet Speeds; One of Many AT&T Technology Initiatives Planned to Keep City at Forefront of Innovation


Austin, Texas, October 01, 2013

Share:           


Austin, get ready to binge watch television and download shows in seconds, wipe out your online gaming opponents before they see you coming, and communicate with business associates through a high quality video conference call.

These benefits and more won't be "weird" in Austin as the city gears up for the fastest consumer broadband speeds it's ever seen.

AT&T* (NYSE:T) announced today it has begun deployment of a 100 percent fiber [Internet broadband network](#) in Austin that will deliver speeds up to 1 Gigabit per second. AT&T plans to begin delivering [AT&T U-verse®](#) with GigaPowerSM, the city's fastest Internet available to consumers, along with more advanced TV services and features, in December.



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AT&T's U-verse with GigaPower Lights Up Austin


City's Fastest Consumer Internet and an Enhanced TV Experience Goes Live Today

Austin, Texas, December 11, 2013

AT&T (NYSE:T) today is launching [U-verse](#) with GigaPower,* an all-fiber Internet network with the fastest speeds Austin consumers have ever experienced. It's available now to eligible Austinites at www.att.com/gigapower for as low as \$70 a month.**

With initial speeds of up to 300 Mbps, AT&T's U-verse with GigaPower offers upstream speeds 20 times faster than what's available today and enhanced TV to tens of thousands of Austinites. AT&T plans to continue the rollout to new areas of the city in 2014 and beyond.

AT&T plans to expand availability of U-verse with GigaPower beyond parts of Austin area neighborhoods like French Place, Mueller, Zilker and Onion Creek to even more residents and small businesses in 2014. Expansion plans will, in part, be influenced by the number of Austinites voting for their neighborhood at www.att.com/gigapower.



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Hey, Austin... it's here!
AT&T U-verse with
GigaPower

Introducing AT&T U-verse with GigaPower™ - delivering blazing fast internet, more advanced DVR, and the same great reliability.

Order a double or triple play and get a **FREE Samsung Galaxy Tab 2 10.1!**

[Check Availability](#)

Introducing AT&T U-verse with GigaPowerSM



Blazing fast Internet speeds for Austin!

We're proud to introduce the next generation of U-verse. We're investing heavily in Austin to install a 100% fiber network, delivered straight to the home.




- 300Mbps download and upload speeds
- Free upgrade to speeds up to 1Gbps in 2014*
- Plus our fastest in-home Wi-Fi speeds

* Free Speed Upgrade Offer: Available to customers ordering qualifying U-verse with GigaPower service offers during promotional period.

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1 Gig Fiber Internet Service

NOW AVAILABLE IN AUSTIN!

With Power 1000 Internet from Grande Communications, you will experience 1 Gbps upload and download speeds to power your entire home for only \$64.99 per month. [Enter your address below to see if you qualify.](#)



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PRESS RELEASE

Feb. 20, 2014, 12:00 p.m. EST

Time Warner Cable Bringing Incredibly Faster Internet Plans across Its Entire Austin Service Area

Ultimate Plan Will Feature Top Download Speed of 300 Mbps



AUSTIN, Texas, Feb 20, 2014 (BUSINESS WIRE) -- Time

Warner Cable customers will soon receive incredibly faster

Internet speeds across the company's entire Austin service area. The fastest offering, Ultimate, will deliver download speeds up to 300 Megabits per second — more than six times faster than the current top speed of 50 Mbps. Five of its six Internet plans will feature significantly faster download and upload speeds.

Customers who subscribe to Time Warner Cable Internet will begin receiving faster speeds this summer and all residential customers in the Austin area will have access to complimentary new speeds by the fall of 2014. Time Warner Cable will be the only provider to offer super-fast Internet speeds to all of its residential customers in the Austin market.

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Multichannel

BROADBAND

Google Fiber Capturing 75% Of Homes Passed In KC: Study

ISP Having Success In Lower Income Areas, Bernstein Research Says

5/06/2014 9:30 AM Eastern



By Jeff Baumgartner

Follow @thebauminator



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Google Fiber is capturing about 75% of homes passed in the Kansas City area, according to a recent door-to-door survey of about 350 homes commissioned by Bernstein Research.

“[T]he penetration measured by our survey was much higher than we had expected,” Bernstein Research analyst Carlos Kirjner wrote in research note issued Tuesday.

...

While Google Fiber appears to be capturing three-fourths of homes passed in medium-to-high income neighborhoods, the survey also showed that Google's penetration reached nearly 30% on lower income areas.

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How Kansas City scored the biggest technological coup of the century

KANSAS CITY MARCH 31, 2014 by MEGAN BANNISTER & JORDAN PASCALE

It's been three years since Google's officially announced Fiber would come to Kansas City, Kan. This is the first in a two-part series examining the impact of Google Fiber on Kansas City. The second part, focusing on the present and future use of Fiber, can be found [here](#).



The Kansas City, Kan., city hall lights up with Google's colors following its live announcement.

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Other Gigabit Players

- Traditional Broadband Providers
 - Burlington, VT – Burlington Telecom
 - Springfield, VT – Vermontel
 - Omaha, NE – CenturyLink
 - Minneapolis, MN – US Internet

Source: CostQuest Associates, Inc.

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Other Gigabit Players

- Utilities
 - Chattanooga, TN – Community-owned EPB
 - Lafayette, LA – Lafayette Utility Services Fiber
 - Morristown, TN – Morristown Utilities Service FiberNet
 - Tullahoma, TN – Tullahoma Utilities Board
 - Cedar Falls, IA – Cedar Falls Utilities
 - Rural Central Missouri – Co-Mo Electric Coop

Source: CostQuest Associates, Inc.

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Other Gigabit Players

- Cities and Others
 - Bristol VA/TN – Bristol Tennessee Essential Services
 - Chicago, IL – Gigabit Squared
 - San Francisco, CA – SONIC.net
 - Lawrence, KS – Wicked Broadband
 - Wilson, NC – City-owned Greenlight
 - Melrose, MN – Arvig (local ISP)
 - Gig-U – Gainesville, FL; Orono, ME; Lansing, MI

Source: CostQuest Associates, Inc.

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AT&T EYES 100 U.S. CITIES AND MUNICIPALITIES FOR ULTRA-FAST FIBER

The increasing popularity of streaming video, online gaming, cloud-based business services, and the growing need to have multiple devices connected to your home Internet at one time continue to drive the need for speed. AT&T's new ultra-fast fiber network — delivering speeds up to 1 Gbps* — offers you the speed you need to keep all of those devices humming.



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By **Sun-Times** | Get In Touch: [@suntimes](https://twitter.com/suntimes) | staff@suntimes.com

Business - May 23, 2014 8:07 am

Cox plans gigabit Internet speeds in 3 cities

ATLANTA (AP) — Cable company Cox Communications says it plans to boost Internet download speeds to 1 gigabit per second starting in Phoenix, Las Vegas and Omaha, Nebraska, late this year. That is dozens of times faster than typical broadband plans.

The move will bring its service in line with [Google's fiber](#) rollout in cities such as Kansas City and Provo, Utah, and Austin, Texas; and an [AT&T](#) rollout in Austin.

Cox also said it plans to add 1 Gbps Internet speed to any new residential construction project in its footprint nationwide in places such as San Diego; Providence, Rhode Island; Orange County, California; Baton Rouge, Louisiana; and Tucson, Arizona.

It plans to spread the faster rate to the rest of its service area by the end of 2016.


The company also plans to double the most popular tiers of Internet service for all its customers this year — boosting those with 25 Mbps to 50 Mbps and those with 50 Mbps to 100 Mbps. The two tiers represent 70 percent of all Cox's customers.

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Official Blog


Insights from Googlers into our products, technology, and the Google culture




Exploring new cities for Google Fiber

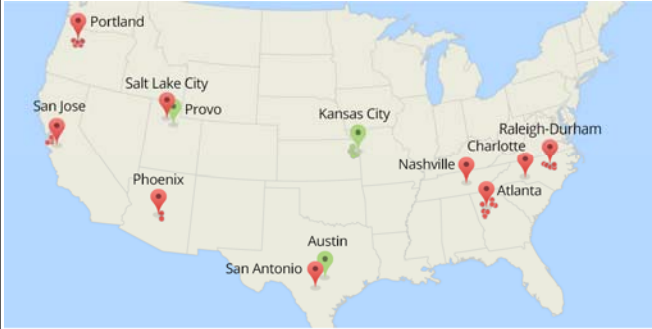
Posted: Wednesday, February 19, 2014



 9.4k

 Tweet 1,836

 Like 13k

Over the last few years, gigabit Internet has moved from idea to reality, with [dozens of communities](#) (PDF) working hard to build networks with speeds 100 times faster than what most of us live with today. People are hungrier than



 current Google Fiber cities
 potential Google Fiber cities



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The Players and Their Motivations



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The Players

- **Google** – Experiment, Motivate Operators & Gov't, Capture End Users, Cloud Efficiency, Serious Operator?
- **FTTN Telcos** – Stay competitive in Broadband with minimal investment
- **FTTP Telcos** – Leverage existing network
- **Cable TV** – Leverage existing network
- **Government** – Competition for jobs, status and business
- **Content Producers** – Access to end users
- **Consumers** – Need for speed vs. cost

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Possible Google Strategies

- Experiment (as advertised)
- Motivate Operators and Government (as suspected)
- Expand, but only as far as it takes to get what it wants
- Become a major or dominant operator

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BROADBAND

Google Fiber Capturing 75% Of Homes Passed In KC: Study

ISP Having Success In Lower Income Areas, Bernstein Research Says

5/06/2014 9:30 AM Eastern



By: Jeff Baumgartner

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26



23



18

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Kirjner and Bernstein Research do not share the view that Google Fiber is a merely an experiment, a regulatory ploy, or a way to motivate incumbent ISPs to upgrade their networks and ramp up speeds. Instead, they believe Google's aim is to build a competitive, profitable, fixed network covering a significant portion of U.S. homes.

"We believe that with these penetrations, Kansas City and markets with similar deployment economics would be very profitable to Google," Kirjner wrote. "[U]nlike consensus, which dismisses Google Fiber, [we] think Google's chances of success are material."

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Broadband Forecasts

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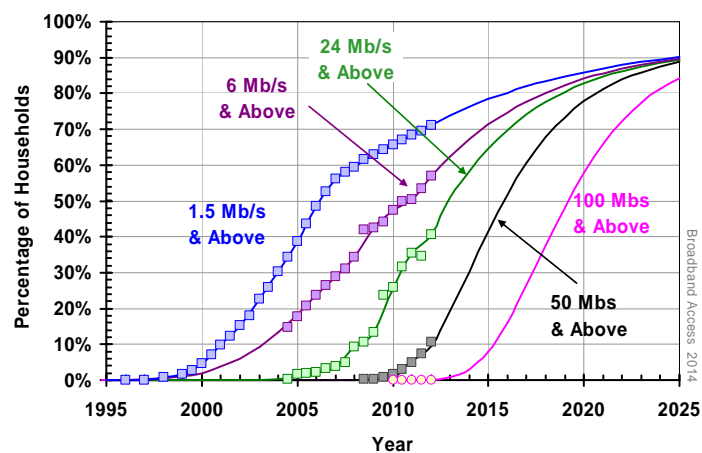
Broadband Generations, Traditional TFI Data Rate Categories

Nominal	Range
1.5 Mb/s	Less than 3 Mb/s
6 Mb/s	At least 3 Mb/s and less than 10 Mb/s
24 Mb/s	At least 10 Mb/s and less than 25 Mb/s
50 Mb/s	At least 25 Mb/s and less than 100 Mb/s
100 Mb/s	At least 100 Mb/s

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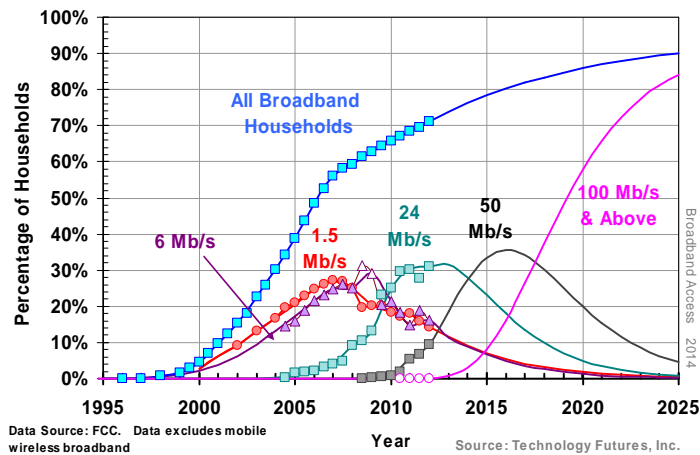
Technology Substitutions



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Resulting Lifecycles



Lifecycle (t) =
Substitution (t) – Next Substitution (t)

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Adding Another Generation

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Drivers and Constraints for Gigabit Access

Drivers

- Video and UHDTV
- New Applications
- Performance for Cloud-Based Computing
- Control of Customer Access
- Access to Customer Data
- Competitive Forces
- Government
- Improved Operational Models and Technology

Constraints

- Cost
- Willingness to Pay
- Don't need that much bandwidth
- Government and Competitive Roadblocks

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Constant Percentage Rate of Advance

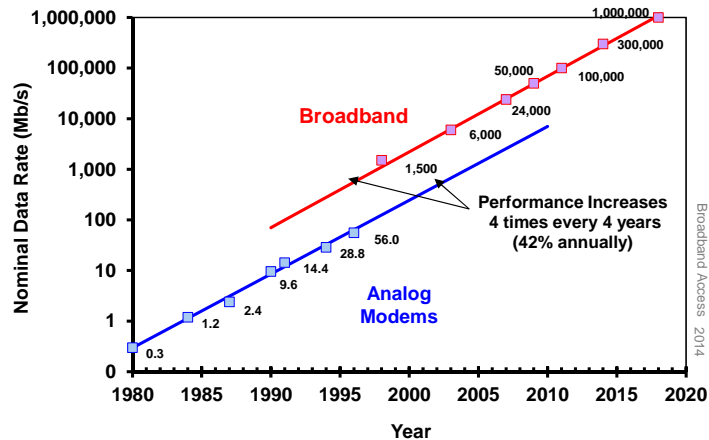
- Most new technologies progress this way
- Rates will continue if:
 - The improvement is technically possible
 - Basic approach remains the same
 - Demand, utility, need continue

From TFI's Technology Forecasting Seminar

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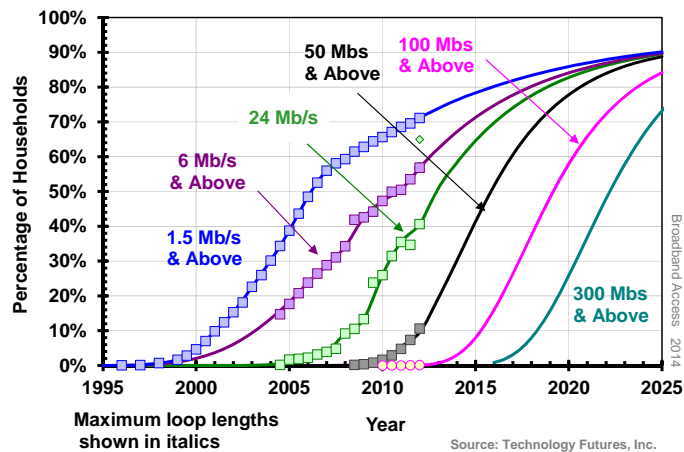
Trend in Residential Access Data Rates



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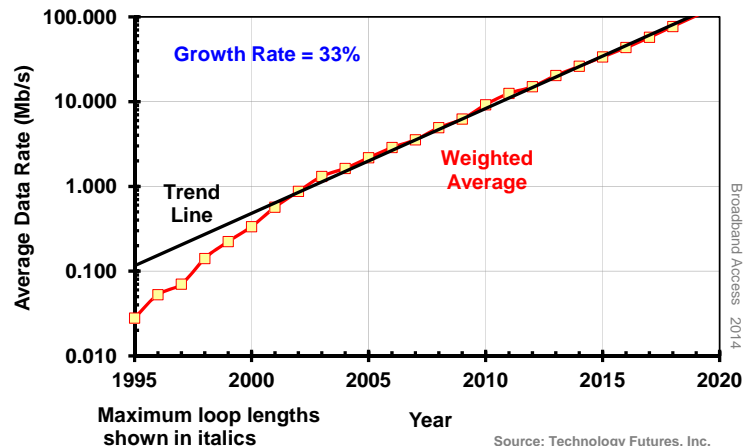
Technology Substitutions Adding Next Step (300 Mb/s)



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Resulting Average Data Rate



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Summary and Conclusions

- 1 Gb/s is not widely available...yet
- 300 Mb/s vs 1 Gb/s is a marketing issue...for now
- Customers don't really need either...but they will
- Whether it's 300 Mb/s or 1 Gb/s, it's the new standard for industry and consumers
- These rates put great pressure on FTTN telcos
- These rates require increased investment by FTTP telcos and cable TV...but very manageable

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A stylized graphic of a bridge with two main arches, rendered in light blue and pink. The bridge spans the width of the page, with the company name and contact information placed on it.

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Your Bridge to the Future

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