
Broadband in America

Where It Is and Where It Is Going

(According to Broadband Service Providers)

Preliminary Report Prepared for the Staff of the
FCC's Omnibus Broadband Initiative

By
Robert C. Atkinson
&
Ivy E. Schultz

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Columbia Institute
for Tele-Information

Columbia Institute for Tele-Information

1A Uris Hall, Columbia Business School

3022 Broadway

New York, NY 10027

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CITI, as an institution, does not author or publish articles or reports. Therefore, we, as the authors, are responsible for the content of this report. The present report is the preliminary installment of the information collected. In a subsequent report we may analyze the data further and provide aggregate trends in collaboration with some of our CITI colleagues.

Robert C. Atkinson

Robert C. Atkinson
Director of Policy Research

Ivy E. Schultz

Ivy E. Schultz
Manager of Research Assistants

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Project Background

The staff of the FCC's Omnibus Broadband Initiative (also known as the National Broadband Plan Task Force) asked the Columbia Institute for Tele-Information (CITI) to conduct an independent analysis of publicly announced broadband network deployments (both new and upgraded networks) of companies in the United States, for the purpose of informing the FCC's efforts in developing its National Broadband Plan. On August 6, the FCC announced that CITI had agreed to undertake the analysis project.¹

Two members of CITI's management staff, Bob Atkinson and Ivy Schultz, undertook the project. They worked independently of the FCC and conducted the project with CITI's research resources and without any project funding from the FCC or any other organization. As a result, the project arrangements ensure the independence and integrity for the work product.

As requested by the FCC, the project encompassed a comprehensive examination and analysis of companies' announcements and similar public information, industry analysts' reports, and other relevant data to measure and assess broadband plans. For purposes of the project, the FCC specified that "broadband" would be defined for wireline as "ADSL equivalents" and "advanced", and for wireless as "2G equivalents" and "advanced." In addition, the project would assess the current state of backbone facilities.

Also at the FCC's request, the report included an assessment of where broadband deployments will be 3 – 5 years in the future and a comparison of results with previously released plans that are in progress or complete.

The research for this project focused on three specific areas as requested by the FCC, each of which is addressed as a section in this report:

Listing of All Publicly Announced Broadband Plans, sorted both (1) by company and (2) by technology (e.g. DSL, cable, fiber (FTTx), fixed wireless, wireless, satellite), with a description of relevant details, such as (1) general details of the plan, including company, technology, and timeline, (2) expected capital outlays and operating expenditures, (3) expected deployment/coverage footprint, (4) expected broadband performance and quality, and (5) expected ARPU (Average Revenue Per User).

Comparison of All Publicly Announced Broadband Plans, based upon the Listing of All Publicly Available Broadband Plans, a comparison of what was projected at the time that a broadband plan was announced to what has resulted to date for each of the publicly announced broadband plans across the identified variables. This looks backwards at what was announced at the time the plan was established and then compares the announcement with the outcomes of completed plans and the current status for those plans still in progress.

¹ FCC Press Release, http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-292598A1.pdf.

Future Projection: An analysis of where the publicly announced broadband plans which are yet to be commenced or still in progress will be in 3-5 years, including LTE, WiMAX, DOCSIS 3.0, backbone, etc. This should include a summary of analyst projections and a “lessons learned” component.

General Research Methodology

Since the FCC’s request was for a review the state of broadband in America based on what the broadband service providers have publicly announced, researchers assigned to this project collected data primarily from: service providers’ public reports and statements; reports by investment analysts and research firms (which are generally based on information obtained from the service providers themselves); news reports quoting the service providers; and, information compiled by industry trade associations from their member companies. Consequently, we did not develop independent data or evaluate the validity of the data reported by the service providers and we did not use academic, government or other studies regarding the state of broadband that have already been made available to the FCC staff.

For competitive reasons and to comply with securities laws regarding disclosure of material information, publicly traded broadband service providers are very reluctant to release detailed information about their future plans regarding broadband deployments and their financial forecasts. Small private companies are similarly reticent to provide information about their future plans, even to their trade associations.

The public and anyone with relevant information were and are invited to submit additional information and data to a dedicated email address: CITI-broadband@gsb.columbia.edu.

Executive Summary

One principal conclusion that can be drawn from this report is that by 2013-4, broadband service providers expect to be able to serve about 95%² of U.S. homes with at least a low speed of wired broadband service and they expect to offer to about 90% of homes advertised speeds of 50 mbps downstream.³ Service providers expect to provide many homes with access to these higher speeds by 2011-2012.⁴ Wireless broadband service providers expect to offer wireless access at advertised speeds ranging up to 12 mbps downstream (but more likely 5 mbps or less due to capacity sharing) to about 94% of the population by 2013. In addition to several wireless broadband choices, the majority of American homes will have the choice of two wired broadband services. Upstream speeds for wired and wireless services will generally be significantly lower than downstream.

A second conclusion that can be drawn is that a significant number of U.S. homes, perhaps five to ten million (which represent 4.5 to 9 percent of households)⁵, will have significantly inferior choices in broadband: most of these homes will have wireless or wired service broadband available only at speeds substantially lower than the speeds available to the rest of the country. Some of these homes will have no choice except satellite broadband, which has some performance attributes that make it less satisfactory for many applications than a terrestrial broadband service.

A third conclusion to be drawn is that adoption of broadband service will continue to lag substantially behind the availability of broadband for the foreseeable future. Investment analysts forecast that about 69% of households will subscribe to wired broadband by 2015, and that 53% of the population will subscribe to wireless broadband services by 2013.⁶

Analyst forecasts and service provider expectations do not take into account the effect of various broadband stimulus programs or any changes in government policies that may affect deployment or adoption. They also do not consider the possible effects of substantial price reductions that might stimulate greater adoption of broadband by price-sensitive customers.

Broadband coverage

Wireline Coverage: Industry researchers estimate that fiber to the home (FTTH) was available to about 17 million homes (homes passed) in mid 2009.⁷ Verizon has announced that it will deploy FTTH systems

² See Section 3, p. 59.

³ See Section 3: Uncompleted Broadband Plans, p. 51.

⁴ See Section 3: Uncompleted Broadband Plans, p. 51.

⁵ See Section 3, p. 59.

⁶ See Section 3, p. 60.

⁷ M. C. Render, "North American FTTH/FTTP Status," *RVA LLC*, 2009, at 2.

<http://www.ftthcouncil.org/sites/default/files/RVAFTTHPreso092809forrelease.pdf>.

capable of serving 17 million locations by 2010.⁸ A number of other smaller companies, including small rural telephone companies, will be covering additional homes with FTTH. AT&T has announced it will offer DSL from fiber-fed cabinets (fiber to the neighborhood: FTTN-DSL) to 30 million homes by 2011.⁹ AT&T currently offers advertised speeds of up to 18 megabits per second downstream¹⁰ (although the actual speed can be much lower), with increases possible as bonding allows doubling total speeds on DSL. Therefore, if just these two largest telephone companies' achieve their goals, at least 50 million homes will be able to receive advertised speeds of 10 megabits per second or more downstream within the next two years. Other telephone companies will be providing additional similar offerings in their service areas.

Broadband service is currently available from cable companies to 92% of households according to a research firm that tracks the cable industry.¹¹ Cable broadband is being upgraded to the DOCSIS 3.0 standard¹² and is becoming widely available at advertised speeds as high as 50 mbps downstream (with one firm advertising 101 megabit speeds).¹³ Comcast, the largest cable company addressing nearly half the United States, expects to cover nearly all its 50.6 million homes passed¹⁴ by 2010. One analyst believes DOCSIS 3.0 will be available by 2013 to "nearly all"¹⁵ the homes covered today by cable modem services.¹⁶ That would be about 92% of 112 million households, or 103 million homes.

Wireless Coverage: A number of wireless broadband service providers expect to deploy Long Term Evolution (LTE) and WiMAX technologies (so-called "4G" wireless services) between 2010 and 2013 and, if successful, bring multi-megabits speeds to a majority of U.S. homes and population.¹⁷ The wireless services offer shared bandwidth, so the speeds obtained by users will be dependent on actual traffic loads at each cell-site, and in particular on how many users are simultaneously using bandwidth-intensive applications, such as watching video on wireless Internet connections. As one example, by 2013 Verizon expects that LTE will provide subscribers with 4 to 12 mbps downloads in a deployment planned to reach all of its covered population (at the end of 2008, Verizon's network covered 288 million people¹⁸ or 94% of the U.S. population).¹⁹ Other wireless companies cover a smaller share of the population. Entrepreneurial and independent Wireless Internet Service Providers (WISPs) provide WiMAX-type services to at least 2 million customers²⁰ in rural areas, including many areas not covered by the national wireless companies.

⁸ See Section 3: Uncompleted Broadband Plans, p. 53.

⁹ See Section 3: Uncompleted Broadband Plans, p. 51.

¹⁰ See Section 1: 1.1 Technology, p. 17.

¹¹ See Section 1: 1.3 Expected Deployment/Coverage Footprint, p. 28.

¹² DOCSIS is a standard developed by Cable Labs and stands for "Data Over Cable Service Interface Specification"

¹³ See Section 1: 1.1 Technology, p. 21.

¹⁴ See Appendix A.

¹⁵ See Section 1: 1.3 Expected Deployment/Coverage Footprint, p. 25

¹⁶ See Section 1: 1.3 Expected Deployment/Coverage Footprint, p. 25

¹⁷ See Section 3, p. 52.

¹⁸ Verizon Communications, "2008 Annual Report," *Verizon Communications Inc.*, 2009, at 9.

¹⁹ See Section 1: 1.1 Technology, p. 24.

²⁰ See Section 1: 1.1 Technology, p. 24.

Satellite Coverage: Satellite broadband is available at almost any location in the country that has an unimpeded line-of-sight to the southern sky and therefore can provide broadband service to the most remote and difficult-to-serve locations. However, the current satellite services have relatively low speeds and latency problems, and cost more than terrestrial broadband services. Two new satellites with greater capacity are expected to become operational beginning in 2011, with the operators announcing that each satellite will be capable of providing 2-10 mbps²¹ service. Transmission rates may average 5 megabits per second downstream by 2011,²² but the bandwidth available to each user will vary inversely with the actual traffic load as overall bandwidth is shared among all users.

Broadband Transmission Rates

Faster Wireline Transmission Rates: Most U.S. homes will be served by advertised “50 megabit per second” speed options within the next few years from at least one supplier, as cable is expected to cover nearly its entire footprint (92% of households) with DOCSIS 3.0²³ and telcos expand FTTH services. DSL/fiber hybrids, called “fiber to the node,” currently are advertised as providing “up to 18 mbps²⁴” downstream by AT&T. DSL bonding, now in commercial deployment, will allow doubling speeds. Including hybrid fiber-DSL (FTTN-DSL) and bonded DSL, 60 to 70 million homes will have a choice of providers for advertised speeds of 10 megabits downstream or higher.

Faster Wireless Speeds: Verizon indicates that its LTE deployment will be capable of delivering practical speeds of 4 to 12 mbps. However, wireless bandwidth is shared, and until the networks are tested under substantial load it is not clear whether speeds above 5 mbps can be obtained by more than a few subscribers at the same time.²⁵ The demand for wireless broadband bandwidth has been growing rapidly²⁶ and growth is expected to continue, especially if wireless broadband is used for video over the Internet. Future pricing arrangements for wireless broadband are likely to greatly affect how much video traffic and other bandwidth-intensive applications are carried on the wireless broadband networks.

Improved satellite broadband data rates: Satellites, like terrestrial wireless systems share the available bandwidth covered by each spot beam so the speed obtained by a user will depend on the simultaneous usage of other users. ViaSat expects to offer shared speeds of 2 to 10 megabits starting in 2011.²⁷

Upstream speeds: Most consumer broadband services are asymmetrical, with downstream speeds significantly faster than upstream speed.²⁸ FTTH offerings currently provide advertised upstream speeds

²¹ See Section 3: 3.3 Status of Broadband Satellite Plans, p. 57.

²² See Section 3: 3.3 Status of Broadband Satellite Plans, p. 57.

²³ See Section 1: 1.3 Expected Deployment/Coverage Footprint, p. 28.

²⁴ See Section 1: 1.1 Technology, p. 17.

²⁵ See Section 1: 1.1 Technology, p. 23

²⁶ AT&T’s mobile data traffic has increased nearly 50 times in the past three years, presumably largely due to the iPhone. M. Meeker et al., “Economy + Internet Trends,” *Morgan Stanley*, 2009, at 57, http://www.morganstanley.com/institutional/techresearch/pdfs/MS_Economy_Internet_Trends_102009_FINAL.pdf.

²⁷ See Section 2: Comparison of All Publicly Announced Broadband Plans, p. 48.

of around 20 mbps,²⁹ although fiber has the capacity for much higher speeds. DOCSIS 3.0 upstream is only in commercial in trials in the United States. Until upstream DOCSIS 3.0 is fully deployed, upstream cable speeds will be in the range of 768Kbps to 5mbps.³⁰

Broadband adoption

Approximately 63% of U.S. homes currently utilize a wireline broadband service, a figure that is expected to increase quite slowly to about 69% in 2014 due to market saturation at current pricing levels.³¹ Investment analysts estimate that 31% of Americans over the age of 14 currently use wireless broadband (broadband does not include Short Message Service “texting”). This figure is increasing rapidly and analysts expect wireless broadband adoption will probably pass 50% by 2013.

Many households and individuals will subscribe to both wireline and wireless broadband services, just as they subscribe to fixed and mobile voice telephone services. And just as some individuals have “cut the cord” and rely exclusively on a mobile telephone for voice services, some families and individuals may choose to go wireless-only for broadband.³²

The various broadband stimulus plans may influence these adoption forecasts through increased deployment of broadband to unserved areas and encouraging increased adoption of broadband services.

Backbones

Backbone bandwidth traffic volume and capacity will grow roughly at the same pace, with a leading network equipment firm forecasting growth in North American IP traffic of 39% (CAGR) from 2009 to 2013.³³ For the same period, capacity is forecast to increase by approximately 44% on major routes so that major route backbone capacity should keep up with demand and significant problems of backbone congestion on major routes are not expected. However, localized congestion may occur on lower capacity routes including connections to cell towers that experience rapid wireless broadband growth.

²⁸ See Appendix A.

²⁹ See Appendix A: Verizon.

³⁰ See footnote 38.

³¹ Since a computer is a prerequisite to utilizing a wired broadband service, it might be more accurate to measure adoption as a percentage of computer-equipped households rather than all households. As one investment analysts noted, “We estimate there are 67M broadband subscribers in the U.S., representing 60% of occupied households and ~70% of PC homes. Given broadband availability in roughly 90% of homes, normally distributing PC homes across broadband available homes puts real penetration at almost 80%.” UBS Investment Research, “Sorting Through the Digital Transition,” *UBS AG*, 2009, at 5.

³² See Section 3: Cutting the Cord, p. 60.

³³ See Section 3: Status of Internet Backbone, p. 53.

Capital spending

Service providers rarely break broadband out of their capital spending figures among their service offerings so it is difficult to isolate broadband-specific capital expenditures.³⁴ Much of the service providers' capital is invested in multi-purpose (or "converged") digital networks that carry voice, data (including broadband) and television services simultaneously.

Market researchers and investment analysts recently estimated that as much as two-thirds of current investments are being made to provide and expand wired and wireless broadband,³⁵ and the trend over the past few years has been growing.

Overall, total industry capital expenditures are forecast by analysts to be about \$60 billion for 2009. Capital expenditures are expected to decrease in the next few years into the mid-\$50 billion range annually as the major new infrastructure deployments come to an end and capital is devoted to expanding the capacity of the deployed systems rather than entirely new deployments.³⁶

With respect to broadband, capex for total broadband is \$30 billion in 2009, lower than it had been a year earlier. Looking forward, the capital investments in broadband infrastructure are expected to remain flat at approximately \$30 billion per year. At the same time, total capex in all the sectors (Telco, Cable, Wireless, Satellite, and WISP) is expected to decline from \$60 to \$54 billion.

³⁴ Such a break out would also be subject to allocation of capital among types of services for jointly used facilities, such as back office systems and backbone transport facilities that carry conventional telephone, wireless, broadband and video traffic.

³⁵ See Section 1: 1.4 Expected Capital Outlays/ Operating Expenditures, p. 28

³⁶ See Section 3: Total Capital Expenditures

Section 1: Listing of All Publicly Announced Broadband Plans

As a first step, the FCC asked for a list of all publicly announced broadband plans,

“...sorted both (1) by company and by (2) technology (e.g. DSL, cable, fiber (FTTx), fixed wireless, wireless, satellite), with a description of relevant details, such as (1) general details of the plan, including company, technology, and timeline, (2) expected capital outlays and operating expenditures, (3) expected deployment/coverage footprint, (4) expected broadband performance and quality, and (5) expected ARPUs.”

To find the details of broadband plans for publicly traded companies, our researchers examined companies’ investor relations websites, including their Annual Reports from 2004-2008, looked at earnings call transcripts for the three quarters of 2009, searched for investment analysts’ reports using the Thomson One database, and finally, used general web searches to obtain additional information.

Obtaining information about privately held companies was more difficult. Since many of the non-public companies are small cable, telephone, and wireless internet service provider (WISP) companies that tend to serve the more rural parts of the country, information was scarcest for the “unserved” and “underserved” populations. To obtain information about private companies or divisions of public companies, the researchers reviewed company websites, contacted relevant trade associations, and performed general web searches. Aggregated information about smaller companies was obtained from reports and surveys by cable, wireless, and telephone company trade associations.

Once the preliminary information was compiled, company-specific information was sent to the subject company asking for verification of the information gathered to that point. Responses were received from some companies and adjustments were made based on a company’s suggestion after confirming the accuracy of the additional information.

The complete database will be available online at www.citi.columbia.edu. The Appendix to this report contains company-by-company information extracted from the online database for 29 companies with publicly announced broadband plans. The information was sorted by company and by technology, where possible. We welcome further updates and additional information from any company involved in the provision of broadband services and will update the database accordingly.³⁷

³⁷ Updated and additional information should be sent to: CITI-broadband@gsb.columbia.edu.

The details of the database can be seen in the Appendix, which lists information, including details of current broadband deployments, for the following:

Company	Page	Company	Page
AT&T	A-2	MediaCom	A-23
CableOne	A-6	MetroPCS	A-24
Cablevision	A-7	OpenRange	A-25
CenturyLink	A-8	Qwest	A-26
Charter	A-9	RCN	A-27
Cincinnati Bell	A-10	Sprint Nextel	A-28
Clearwire	A-11	T-Mobile	A-31
Comcast	A-13	Time Warner Cable	A-32
Cox	A-14	Verizon	A-33
EchoStar Corp	A-15	ViaSat	A-37
Fairpoint	A-16	WildBlue	A-38
Frontier	A-17	Windstream	A-39
Gilat	A-18	WISP Industry	A-40
Hughes	A-19	OPATSCO	A-41
Insight	A-20	American Cable Assoc.	A-42
Knology	A-21	NTCA	A-43
Leap Wireless	A-22		

The following narrative broadly summarizes the information in the database with respect to six categories specified by the FCC:

- 1) Technology,
- 2) Timeline for Deployment,
- 3) Expected Deployment/Coverage Footprint,
- 4) Expected Capital Outlays/Operating expenditures,
- 5) Expected Broadband Performance and Quality,
- 6) Expected ARPUs.

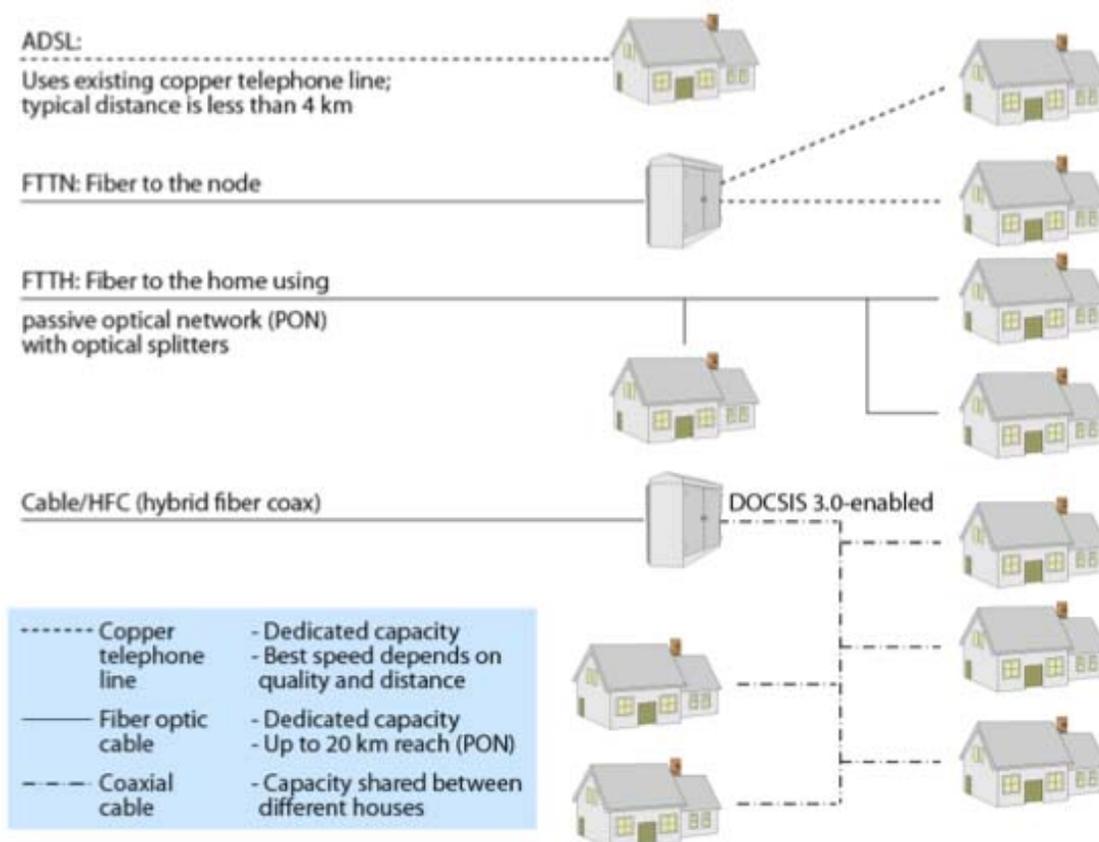
1.1 Technology

The Appendix can be sorted to show the wireline, cable, wireless, and satellite broadband providers and their plans. The following section briefly summarizes the information contained in the Appendix and the online database in terms of these sub-categories.

Wired Broadband

As this diagram shows, there are a number of different ways to provide broadband services over “wired” facilities:

FIGURE 1: TYPES OF BROADBAND SERVICES



Source: Forrester Research, The Shift from Broadband to Wideband, updated June 12, 2009³⁸

Wireline - Fiber: Most telephone companies utilize fiber optics for a significant portion of their distribution networks. Most use fiber to the node (FTTN)³⁹ and a few utilize fiber to the home (FTTH).⁴⁰

³⁸ D. Williams, “The Shift From Broadband To Wideband,” *Forrester Research Inc*, 2009, <http://www.forrester.com/Research/Document/0,7211,53419,00.html>.

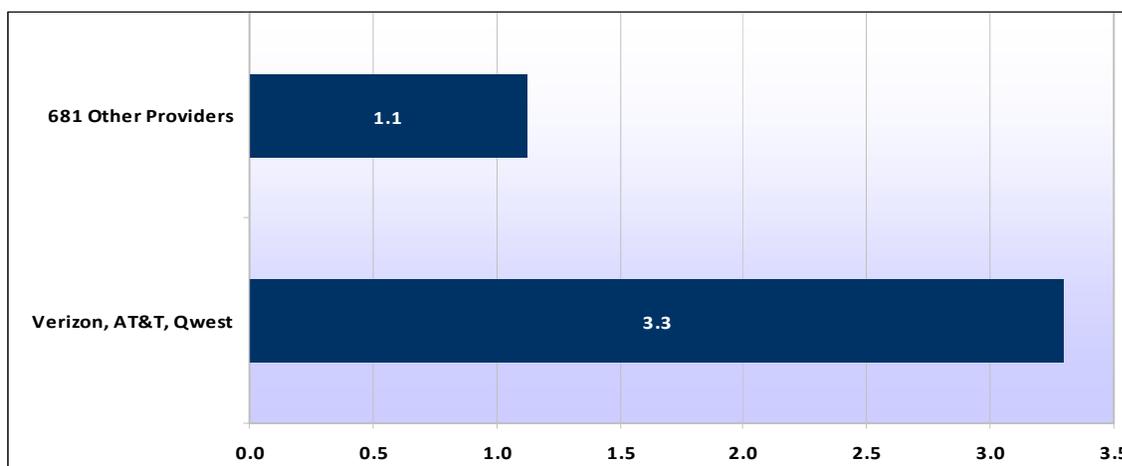
³⁹ Also referred to as Fiber to the Neighborhood.

⁴⁰ Also referred to as Fiber to the Premises (FTTP).

However, only AT&T and Verizon have announced detailed plans for fiber deployment. Verizon intends to pass 17 million homes with its FiOS FTTH by the end of 2010⁴¹ and AT&T plans to pass 30 million living units with its U-Verse service (a hybrid FTTN-DSL) by 2011.⁴²

There were approximately 14.9 million U.S. homes passed by fiber in March 2009.⁴³ While some companies are deploying both FTTH and FTTN broadband, Verizon has the largest share by far of FTTH subscriptions, with 3.1 million subscribers. AT&T and Qwest together have 200,000 FTTH subscribers, primarily in greenfield deployments to new housing developments⁴⁴ and another 681 companies have a total of 1.1 million FTTH subscribers.⁴⁵ Included in these 681 companies are small rural Tier 3 telephone companies that serve 7% of their collective 8 million subscribers (560,000 locations) with FTTH,⁴⁶ Tier 2 telephone companies, competitive local exchange carriers (CLECs), real estate developers, and public entities such as municipalities.

FIGURE 2: FTTH SUBSCRIPTIONS IN MILLIONS AS OF MARCH 30, 2009



Source: RVA LLC: Fiber-to-the-Home: North American Market Update, April 2009⁴⁷

⁴¹ Verizon Investor Relations, "Verizon to Discuss Plans to Divest Wireline Businesses in 14 States," *Verizon Communications Inc.*, 2009, http://investor.verizon.com/news/20090513/20090513_transcript.pdf at 4.

⁴² AT&T Public Relations, "AT&T to Invest More Than \$17 Billion in 2009 to Drive Economic Growth," *AT&T Inc.*, 2009, <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26597>.

⁴³ RVA, "Fiber-to-the-Home: North American Market Update," *RVA LLC*, 2009, at 6 http://www.ftthcouncil.org/sites/default/files/RVA.FTTH_.Apr09.060109.pdf.

⁴⁴ S. Buckley, "Fiber to the X: One size does not fit all," *FierceTelecom*, 2009, <http://www.fiercetelecom.com/special-reports/fiber-x-one-size-does-not-fit-all>.

⁴⁵ RVA maintains a database of hundreds (over 600) of FTTH providers throughout North America. RVA reports that they contact a large portion of these providers each year to get detailed information about their deployments. Their sample represents over 33% of all smaller providers each year.

⁴⁶ M. C. Render, "Who Will Build The Rest of America," *RVA LLC*, at 13, http://www.ftthcouncil.org/sites/default/files/Mike%20Render-Who_Will_Build_the_Rest_of_America.pdf.

⁴⁷ RVA, "Fiber-to-the-Home: North American Market Update," *RVA LLC*, 2009, at 14 http://www.ftthcouncil.org/sites/default/files/RVA.FTTH_.Apr09.060109.pdf.

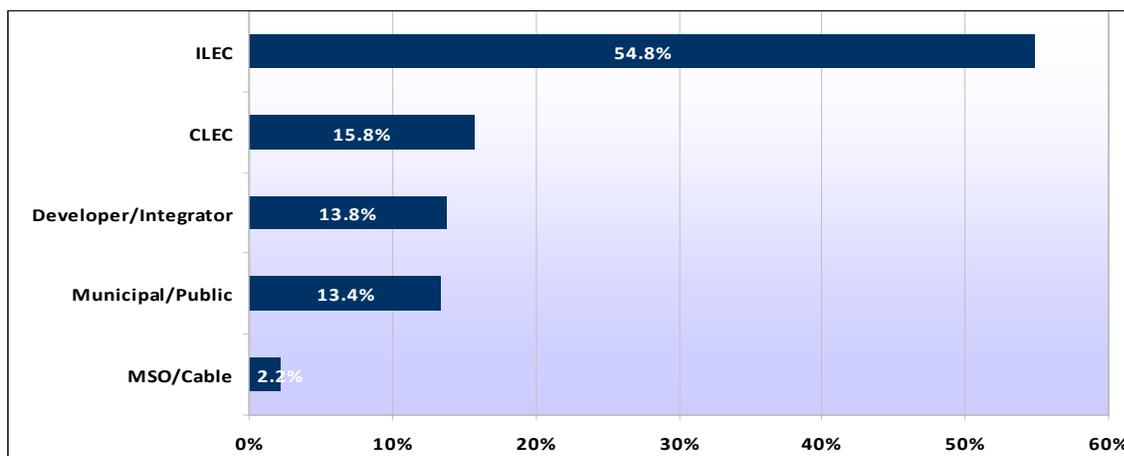
The next chart describes the non-RBOC providers of FTTH service in more detail. While the majority of non-RBOC FTTH service is provided by other telephone companies (ILECs), FTTH is also provided by facilities-based CLECs, developers, and municipalities. Perhaps most surprising is the commitment of the smallest, usually rural, telephone companies to fiber deployment. As the research firm noted,

“Both Verizon and the smaller Tier 3 ILECS say they intend to continue to build [fiber] at a fairly strong pace, even during 2009.”⁴⁸

The research firm explained that “drivers for the rural independent telcos [to deploy FTTH] include aging copper lines in need of replacement, the opportunity to deliver video given a more robust platform, a pioneering tradition, and in some cases, subsidies such as rural broadband loan programs and universal service funds.”⁴⁹

In addition to the “Tier 3” telephone companies, municipalities (particularly those in rural areas) have deployed FTTH systems, which are “...usually undertaken after private service providers have declined to upgrade their networks or build such systems.”⁵⁰ There are currently 57 public FTTH systems in the U.S., mostly in small rural towns.⁵¹ These systems have proven to be popular with consumers: “Nationwide, the take rates for retail municipal systems after one to four years of operation averages 54 percent.”⁵²

FIGURE 3: NORTH AMERICAN NON-RBOC FTTH SUBSCRIBERS



Source: RVA LLC: Municipal Fiber-to-the-Home Deployments Next Generation Broadband as a Municipal Utility, October, 2009⁵³

⁴⁸ Ibid. at 14, emphasis added.

⁴⁹ Ibid.

⁵⁰ D. St. John, “Municipal Fiber to the Home Deployments: Next Generation Broadband as a Municipal Utility,” *FTTH Council*, 2009, at 1, <http://www.baller.com/pdfs/MuniFiberNetsOct09.pdf>.

⁵¹ For the list of the 57 municipalities, see *ibid* at 5.

⁵² *Ibid.* at 3.

⁵³ *Ibid.* at 2.

The following table shows that Verizon’s FTTH “FiOS,” (and similar FTTH services offered by others) offers the highest speeds compared to the DSL services generally offered by other major wireline telephone companies:

TABLE 1: TELCO WIRELINE BROADBAND AVAILABILITY

Carriers	Millions of Homes Passed 2009YE	Highest downstream Speed Offered Currently
AT&T	22	18 mbps
Verizon	15	50 mbps
Qwest	3	40 mbps
Others	6	10-20 mbps
Note: Speeds vary by market		

Source: Goldman Sachs Global Investment Research, Americas: Communication Services, September 8, 2009

FTTH currently provides upstream speeds of up to 20 mbps⁵⁴, although fiber can provide much higher speeds.

Wireline - DSL: DSL utilizes the traditional copper telephone wires to deliver a broadband signal to customers’ homes. Because DSL broadband transmission rates are inversely related to the length of the copper wires, for many years telephone companies have been deploying fiber optics to an electronic node in a neighborhood and connecting to relatively short distance copper wires at that point. So, in many cases, DSL service is provided by a hybrid fiber-copper architecture (FTTN-DSL).

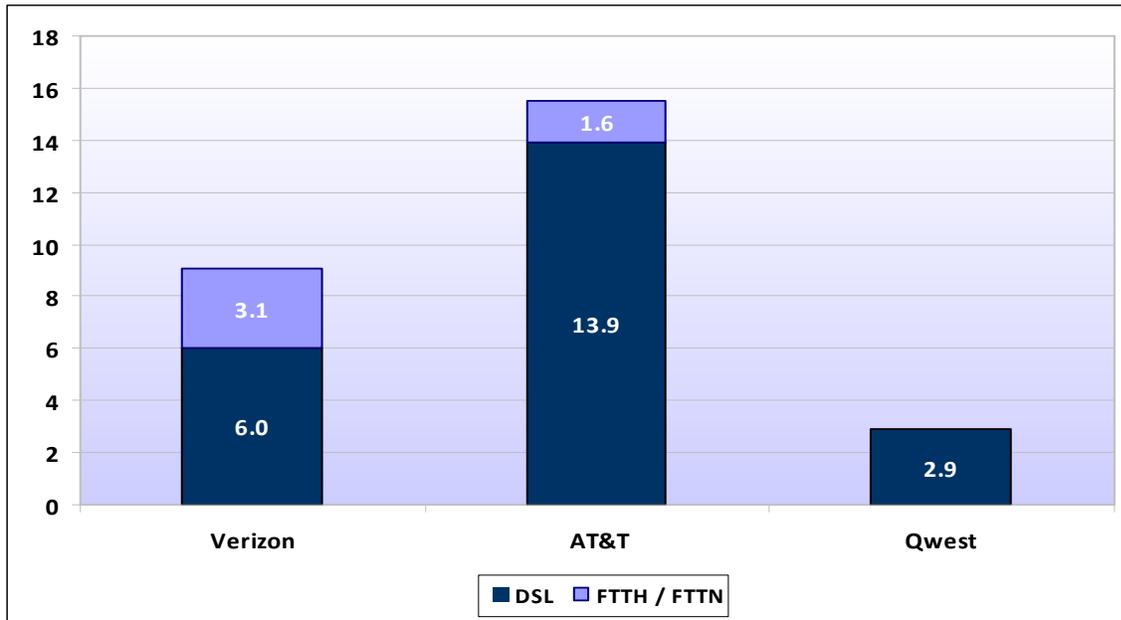
The speed of DSL has also increased, particularly over relatively short distances, such as from a neighborhood fiber node. For example, VDSL2 used with FTTN can support speeds in the 20-50 mbps range.⁵⁵ While most local exchange telephone companies, including the smallest and most rural, offer DSL service in their service areas, only the larger publicly-traded companies have made what can be characterized as “announcements” about their DSL plans. The following telephone companies have made such announcements: AT&T, CenturyLink (CenturyTel/ Embarq), Cincinnati Bell, Qwest, Verizon, and Windstream Communications.

The following chart shows the number of data subscriptions for the large regional telephone companies (often referred to as the RBOCs). For its wireline subscriptions, Verizon has a much larger proportion (almost one third) of FTTH subscriptions compared to DSL subscriptions. By contrast, AT&T has a majority of DSL subscriptions, with a much smaller percentage of FTTH subscriptions. The third RBOC, Qwest, has 2.9 million DSL subscriptions.

⁵⁴ See Appendix A: Verizon.

⁵⁵ Light Reading, “Report: Very High Speed DSL (VDSL2) could drive copper higher long term,” *Resource Investor*, 2009, <http://www.resourceinvestor.com/News/2009/7/Pages/Report-Very-High-Speed-DSL-VDSL2-could-drive-copper-higher-long-term.aspx>.

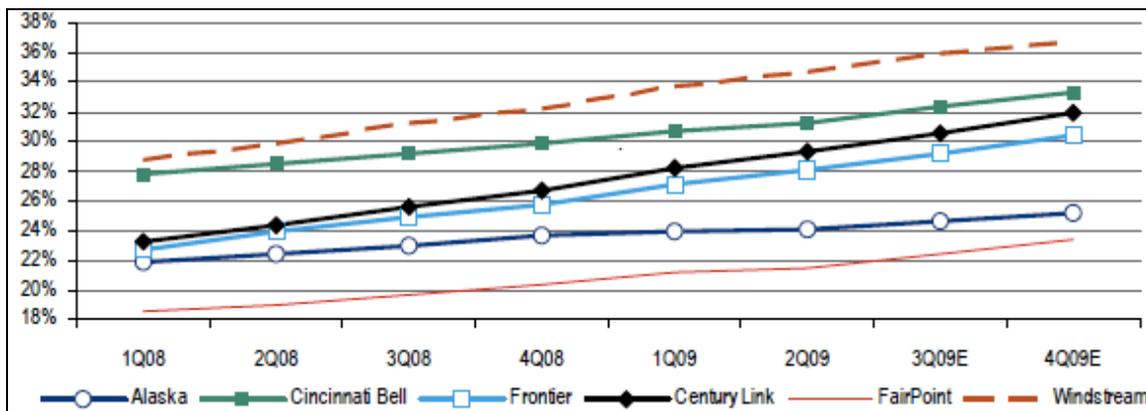
FIGURE 4: RBOC DATA SUBSCRIPTIONS AS OF 2Q'09



Source: Company Annual Reports, Quarterly Earnings Reports

The graph below shows DSL penetration for the larger Tier 2, mostly rural, telcos. Penetration has steadily increased in the areas served by these companies, with DSL broadband expected to reach 30% of their access lines by the fourth quarter of 2009.

FIGURE 5: RURAL TELCOS: DSL PENETRATION OF TOTAL ACCESS LINES (1Q08 - 4Q09E)



Source: Bank of America Merrill Lynch, 3Q09 Telecom results preview and model book - Duck & cover, Oct. 14, 2009 at 22.

Interestingly, one investment analyst found that broadband penetration as a percentage of total subscribers is 30.5% for rural telephone companies compared to 27.7% with Verizon, AT&T and Qwest.⁵⁶ This analyst attributed the difference to rural carriers generally facing lower cable penetration and a less competitive environment than the major telephone companies. The analyst also pointed out that the rural carriers may have less growth potential than the urban carriers because of lower personal computer penetration in rural homes.

The smallest telephone companies represented by the National Telephone Cooperative Association (NTCA) also have a high penetration of broadband lines in their rural areas. NCTA reported that:

“...our survey results showed that respondents were offering broadband service in excess of 768 kbps to 83% of their customers. Applying that number to our estimate of 3.5 million access lines give 2.9 million broadband lines served by NTCA member companies.”⁵⁷

Cable: Cable television companies have been significant providers of broadband internet access services for many years and currently provide internet access to 37% of households (versus 29% for telco broadband).⁵⁸ They generally use hybrid fiber-coax architecture: fiber optics brings cable services to a neighborhood node at which point connections are made to coaxial cables that serve the customers' premises. In contrast to telecommunication companies' FTTH and FTTN, clusters of hybrid fiber-coax users share the capacity of each node so speeds vary depending on the simultaneous use by others served by the same node.⁵⁹ Theoretically, most cable broadband systems are currently capable of providing download speeds of at least 10 mbps.⁶⁰

⁵⁶ Morgan Stanley Research, “Telecom Services,” *Morgan Stanley*, 2009, at 42.

⁵⁷ Data provided from NTCA to CITI, 2009. NTCA also noted that “the margin of error could potentially be fairly large.”

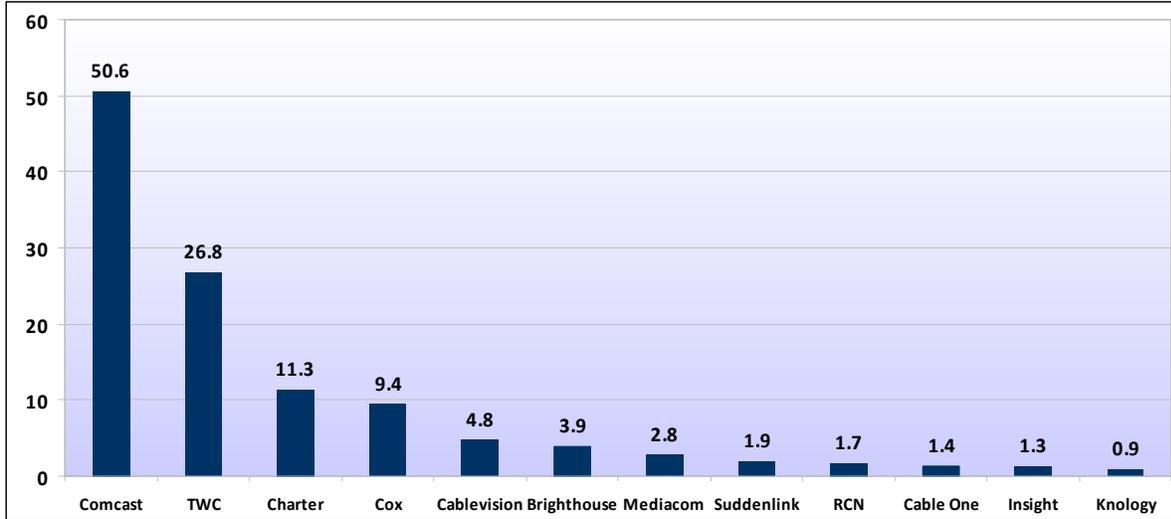
⁵⁸ J. Armstrong et al., “Americas: Communications Services,” *The Goldman Sachs Group Inc*, 2009 at 15.

⁵⁹ D. Williams, “The Shift from Broadband to Wideband,” *Forrester Research Inc*, 2009, <http://www.forrester.com/Research/Document/0,7211,53419,00.html>.

⁶⁰ *Ibid*.

As the following chart illustrates, the top five cable Multiple System Operators (MSOs) clearly dominate in number of passed homes.

FIGURE 6: HOMES PASSED BY CABLE COMPANIES



Source: Company Annual Reports, Quarterly Earnings Reports, Analyst Report

The major MSOs can currently supply broadband services to all or to nearly all of the homes that they pass, as illustrated by this table:

TABLE 2: CABLE BROADBAND DEPLOYMENT AND HOMES PASSED

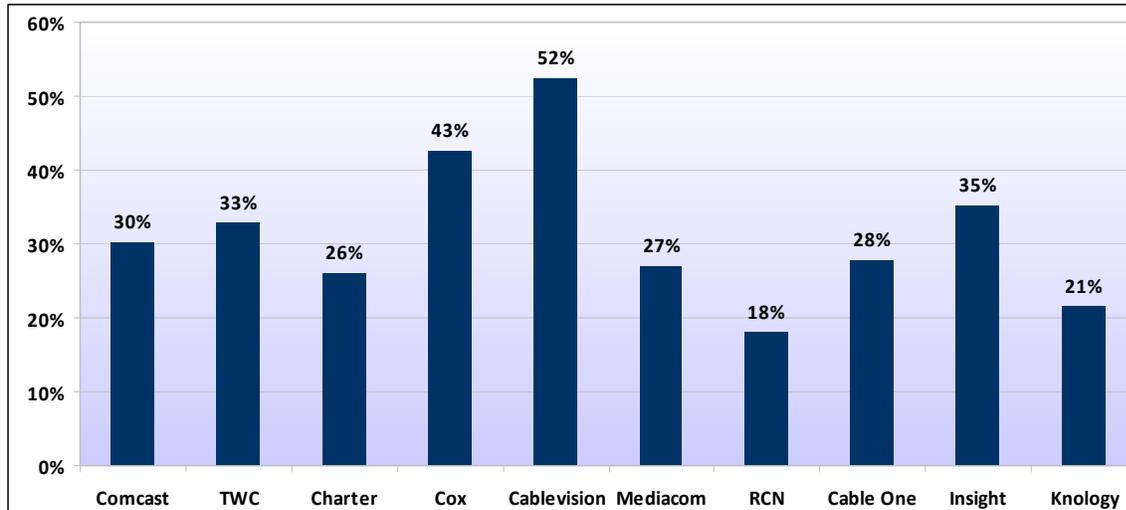
Company	Cable Broadband Deployment (as of March 31, 2009)	Homes Passed (millions)
Cablevision	100%	4.8
Mediacom	100%	2.8
Time Warner Cable	99.5%	26.8
Comcast	99.4%	50.6
Charter	94.9%	11.3

Source: Stifel Nicolaus Investment Banking presentation to Pennsylvania Telephone Association, July 20, 2009,⁶¹ company filings, company press releases

⁶¹ F. Gallagher, without title, *Stifel Nicolaus Corp*, 2009, at 4, [http://www.patel.org/Convention/2009/Stifel%20Nicolaus%20Presentation%20\(PTA%202009\).pdf](http://www.patel.org/Convention/2009/Stifel%20Nicolaus%20Presentation%20(PTA%202009).pdf)

The following chart describes the percentage of the homes passed which currently take broadband services from the ten largest cable companies:

FIGURE 7: MSOS BROADBAND SUBSCRIPTION PENETRATION OF HOMES PASSED (MOST CURRENT NUMBERS, 2008 OR 2Q 2009)



Sources: Companies' 2008 annual reports, companies' second quarter 2009 reports, analyst reports

Cable companies that have announced future broadband plans include: Cablevision, Charter Communication, Comcast, Cox Communications, Knology, RCN, and Time Warner Cable. Many cable companies are currently in the process of upgrading from DOCSIS 2.0 or 1.1 to DOCSIS 3.0 protocols. Cable broadband upgraded to DOCSIS 3.0 is becoming widely available today at advertised speeds as high as 50 megabits downstream (with one firm advertising 101 megabit speeds⁶²).

Having done the fiber build-outs to customers' neighborhoods over the past 10-15 years, upgrading to the DOCSIS 3.0 broadband standard is a relatively quick and inexpensive task for cable companies compared to the telcos' current infrastructure deployments of FTTH or FTTN. For example Charter has indicated that the cost of upgrading its network to DOCSIS 3.0 (including the cable modem termination system and routing gear in its network but not new cable modems at customer premises) will be about \$8 to \$10 per customer."⁶³ An investment analyst recently estimated that the cost of DOCSIS 3.0

⁶² T. Spangler, "Cablevision To Blast Out 101-mbps Internet Service", *Multichannel News*, 2009, http://www.multichannel.com/article/210164-Cablevision_To_Blast_Out_101_mbps_Internet_Service.php?rssid=20059&q=Cablevision+To+Blast+Out+101-mbps+Internet+Service.

⁶³ D. Williams, "The Shift From Broadband To Wideband," *Forrester Research Inc*, 2009, <http://www.forrester.com/Research/Document/0,7211,53419,00.html>.

upgrade is \$15 per home passed.⁶⁴ The total amount to deploy DOCSIS 3.0 to a home, including the modem at the customer's premises, has been estimated at a range of \$70 to \$100.⁶⁵

Cable companies' DOCSIS 3.0 upstream deployment schedules are not yet set, with U.S. commercial deployments beginning in 2010. CableLabs⁶⁶ has stated that at some time in the future it will not certify cable modem termination systems (CMTS) as compliant with DOCSIS 3.0 without upstream bonding. However, it is certifying downstream-only systems at this time.⁶⁷

When deployed, DOCSIS 3.0 upstream speeds will generally be in the tens of megabits. Comcast is currently trialing 120 mbps DOCSIS 3.0 upstream which will be shared amongst users so each user will obtain significantly lower speeds. Comcast is currently offering a top upstream speed of 10 mbps to complement its fastest 50 mbps downstream service.⁶⁸ Other than Comcast, upstream speeds are in the range of 768 Kbps to 5 mbps in the fastest tier offered by other major cable companies.⁶⁹

With respect to upgrading the downstream broadband to DOCSIS 3.0, Comcast plans to reach 80% of its footprint by the end of 2009 and 100% by 2010⁷⁰. Cox plans coverage of DOCSIS 3.0 to two thirds of its footprint by 2010.⁷¹ Knology is planning to "implement DOCSIS 3.0 on a market-by-market basis as the competitive situation dictates".⁷² Time Warner Cable launched DOCSIS 3.0 in New York City in the summer of 2009, with service now in Manhattan (below 79th Street), Staten Island, and Queens. The company reports that coverage of the New York City footprint will be completed by spring 2010.⁷³

In addition to the large MSO cable companies, many smaller, usually rural, cable companies are deploying broadband. The American Cable Association (ACA), which represents over 900 small, independent cable companies, reported that it has 803 members who have deployed "some form of high-speed internet service."⁷⁴ The ACA did not report on types or speeds of services or numbers of

⁶⁴ S. Flannery and B. Swinburne, "U.S. Cable, Satellite, Telecom 3Q09 / '09 / '10 Outlook," *Morgan Stanley Research*, 2009, at 22.

⁶⁵ S. Higginbotham, "DOCSIS 3.0: Coming Soon to a Cableco Near You," *The GigaOM Network*, 2009, <http://gigaom.com/2009/04/30/docsis-30-coming-soon-to-an-isp-near-you/>.

⁶⁶ Cable Television Laboratories, Inc. is a non-profit research and development consortium that specifies the DOCSIS standards.

⁶⁷ CableLabs, "CableLabs® Announces Tiered Test Program for DOCSIS® 3.0," *Cable Television Laboratories Inc.*, 2009, http://www.cablelabs.com/news/newsletter/SPECS/AprilMay_2007/index.html.

⁶⁸ D. Williams, "The Shift From Broadband To Wideband," *Forrester Research Inc*, 2009, <http://www.forrester.com/Research/Document/0,7211,53419,00.html>.

⁶⁹ *Ibid.*

⁷⁰ Seeking Alpha Transcripts, "Comcast Corporation Q2 2009 Earnings Call Transcript," *Seeking Alpha*, 2009, <http://seekingalpha.com/article/154406-comcast-corporation-q2-2009-earnings-call-transcript>.

⁷¹ D. Deliman, "Cox Delivers 50 mbps Downloads to Lafayette, Louisiana," *Cox Communications Inc*, 2009 <http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MzI1fENoaWxkSUQ9LTF8VHlwZT0z&t=1>.

⁷² Seeking Alpha Transcripts, "Knology, Inc. Q4 2008 Earnings Call Transcript," *Seeking Alpha*, 2009, <http://seekingalpha.com/article/121605-knology-inc-q4-2008-earnings-call-transcript>.

⁷³ M. Robuck, "Time Warner Cable climbs aboard DOCSIS 3.0 bandwagon," *CedMagazine.com*, 2009, <http://www.cedmagazine.com/News-TWC-DOCSIS-bandwagon-092409.aspx>.

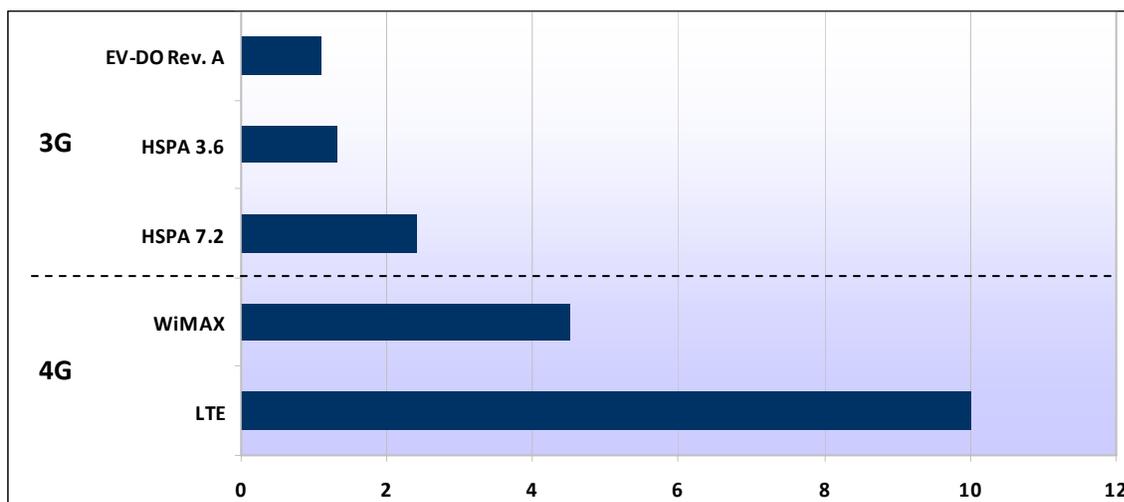
⁷⁴ Data provided by American Cable Association to CITI, 2009.

homes passed or customers subscribing to broadband. An ACA survey found that four additional companies have plans to deploy high-speed internet service within a year and 36 companies have no plans to deploy high-speed internet service. During a telephone interview, an expert on the cable industry’s broadband coverage estimated that the small rural telephone companies are capable of providing broadband service to 75% of the homes they collectively pass.⁷⁵

Wireless: A range of wireless broadband technologies are currently in use by the various cellular telephone companies. Second generation (2G and 2.5G) digital technology was the first to support internet access and that second generation is being rapidly supplanted by third generation (3G) wireless even as preparations are being made for the deployment of 4G.

The next chart indicates the expected average downstream speeds for the various 3G and 4G technologies.

FIGURE 8: EXPECTED DOWNSTREAM SPEEDS OF 3G AND 4G WIRELESS BROADBAND (MBPS)



Source: BofA Merrill Lynch Global Research estimates, company filings and presentations. Speeds are based on company commentary and marketing material and may differ from user experiences, which are impacted by number of users, distance from cell site, and topography among other factors. Theoretical speeds are higher.

Adapted From: Bank of America Merrill Lynch, 4G Footrace – Carriers refine deployment plans, Sept. 30, 2009 at 6.

However, as explained in the source note above, wireless bandwidth is shared, and until the networks are tested under substantial load it is not clear whether speeds above 5 megabits can be obtained by more than a few subscribers at the same time.⁷⁶

⁷⁵ Interview with SNL Kagan, Oct, 7, 2009.

⁷⁶ S. Flannery and B. Swinburne, “U.S. Cable, Satellite, Telecom 3Q09 / ’09 / ’10 Outlook,” *Morgan Stanley Research*, 2009 at 17: “4G wireless networks offer a major step-function in wireless broadband capabilities – 3G today typically 0.5-1.5mbps – WiMAX to initially deliver 2-4mbps – LTE likely to deliver 3-6mbps”.

A number of new wireless broadband technologies are in various stages of deployment, planning and testing. Major companies that have made broadband wireless announcements include AT&T Wireless, Cablevision, CenturyLink (the merged CenturyTel/Embarq), Cincinnati Bell, Clearwire, Comcast, Cox Communications, Frontier Communications, MetroPCS, Sprint, T-Mobile and Verizon. Significant initiatives include the deployment of “4G” wireless systems that are expected to provide relatively high speed broadband services with download speeds in the 4 – 12 mbps range, as long as systems aren’t overloaded with too many subscribers using bandwidth-intensive applications.⁷⁷

4G includes “Long Term Evolution” (LTE) for cellular telephone systems. It is currently being tested and is projected to reach 25 to 30 markets by 2010. By 2013 Verizon, currently the largest wireless service provider, expects to cover all of its POPs— over 90% of the population— with LTE.⁷⁸ Another 4G technology is known broadly as “WiMAX”. One early national company using WiMAX (Clearwire) plans to launch 4G service in 25 markets and be capable of serving 30 million people by the end of 2009.⁷⁹

Hundreds of smaller Wireless Internet Service Providers (WISPs) have deployed wireless (mostly WiMAX) internet service in rural areas and it is expected that they will continue the deployments. However, many of these WISP companies are small private ventures and tend to be secretive about their deployment plans.⁸⁰ The 350 members of the WISP Association—far from the total number of WISPs— provide fixed broadband wireless services to over 2 million locations.⁸¹

Not all WISPs are small, independent, local businesses. OpenRange is effectively a national WISP funded in part by a \$267 million Broadband Access Loan from the Department of Agriculture and \$100 million of private investment. It plans to use WiMAX to initially serve 6 million people in 546 communities in 17 states⁸² and recently began offering its first services with a \$38.95 per month broadband service.⁸³

⁷⁷ Verizon reports a range of download speeds from 8-12mbps, and Clearwire’s WiMax will offer up to 6mbps. See: K. Brown, “Verizon: LTE speed will be 8–12 mbps,” *One Touch Intelligence LLC*, 2009, <http://www.onetrak.com/Uploads/scott/WIRELESSTRAK%20-%20July%202009.pdf>.

⁷⁸ S. Ragan, “Verizon: LTE confirmed on conference call – billions spent on network,” *The Tech Herald*, 2009, <http://www.thetechherald.com/article.php/200934/4266/Verizon-LTE-confirmed-on-conference-call-%E2%80%93-billions-spent-on-network>.

And: P. Goldstein, “Verizon’s Melone details 4G plans for backhaul, antennas and backup power,” *FierceWireless*, 2009, <http://www.fiercewireless.com/story/verizons-melone-stresses-collaboration-4g/2009-09-22>.

⁷⁹ Clearwire Corporation Investor Relations, “Clearwire Reports Second Quarter 2009 Results,” *Clearwire Corporation*, 2009, <http://investors.clearwire.com/phoenix.zhtml?c=198722&p=irol-newsArticle&ID=1319734&highlight=>.

⁸⁰ An association of WISPs has published a map and directory which indicates where some WISPs are currently offering services. See: WISP, “Welcome to WISP Directory,” *wispdirectory.com*, http://www.wispdirectory.com/index.php?option=com_mtree&task=viewlink&link_id=300&Itemid=53.

⁸¹ Filing of WISPA in FCC GN Docket 09-51, 2009, at 1-2.

⁸² Open Range Communications, “Open Range Communications Secures \$374 Million to Deploy Wireless Broadband Services to 546 Rural Communities,” *Open Range Communications*, 2009, http://www.openrangecomm.com/pr/pr_022009.html.

⁸³ Open Range Communications, “Perfect Package – High Speed Internet, Digital Phone, and E-Mail,” *Open Range Communications*, 2009, <http://www.openrangecomm.com/packages.html>.

Satellite: Broadband services to residences and small businesses via communications satellites are offered by EchoStar, Gilat, Hughes, ViaSat, and WildBlue.⁸⁴ The most attractive attribute of satellite broadband is that it is available in almost any location in the United States that has electrical power and a line-of-sight to the southern sky where satellites are “parked” in geostationary orbits over the equator. However, the latency caused by the time required sending a signal to the satellites and back means that satellites are less satisfactory than terrestrial broadband services for latency-sensitive applications such as voice telephony and interactive gaming.

Satellite broadband is also more expensive than terrestrial broadband services: in addition to paying a monthly subscription charge that can be twice the cost of typical terrestrial services, the user must also purchase a satellite “dish” at prices that range from \$149.95 to \$299.99.

A new generation of two-way High Throughput (HT) satellites is being built for launch beginning in early 2011. These new spot beam satellites will have 100 gbps of capacity, which is 18-25 times the capacity of satellites that were launched just a few years ago.⁸⁵

1.2 Timeline for Broadband Plans

For competitive reasons and to comply with securities laws dealing with disclosures of material information, most companies are reticent about releasing details of the timing of their future broadband deployment plans. Where investment analysts have made forecasts for the major companies’ deployment plans (a matter of great interest to investors), the companies themselves have not verified the analysts’ forecasts. To the extent companies do make announcements, the plans typically do not extend past 2011, and mostly only cover the next year.

Known details of public plans and timelines are summarized in the following discussion on “Expected Deployment.” The Appendix and the discussion of analyst projections in Section 3 of this report also provide insights into deployment timelines.

1.3 Expected Deployment/Coverage Footprint

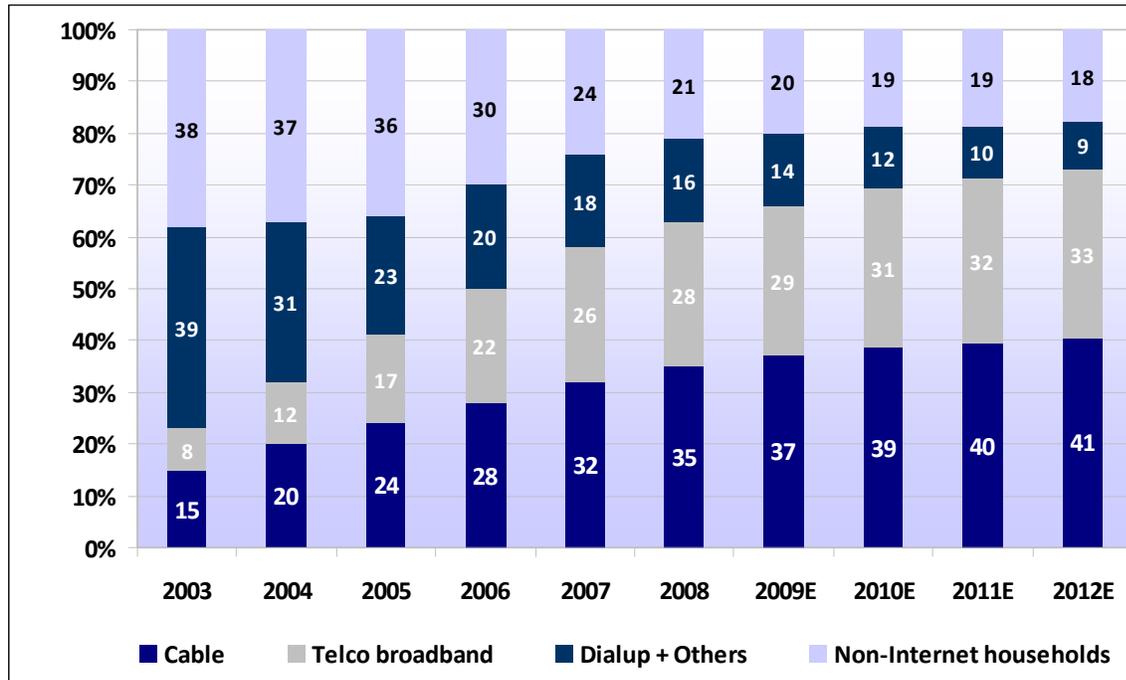
Investment analysts and other research firms estimate current (mid-2009) wireline broadband penetration at 66% of all U.S. households, with 29% by telecommunications companies and 37% by cable companies.⁸⁶ As this chart illustrates, by such estimates approximately 20% of U.S. households do not have any internet access and 14% access the internet with dial-up telephone service:

⁸⁴ WildBlue has been acquired by ViaSat.

⁸⁵ F. Valle, “Satellite Broadband Revolution: How The Latest Ka-Band Systems Will Change The Rules Of The Industry. An Interpretation of the Technological Trajectory,” *Springer Science+Business Media*, 2009, <http://www.springerlink.com/content/x0x51281h3520202/fulltext.pdf>.

⁸⁶ Leichtman Research Group, “Under 650,000 add broadband in the second quarter of 2009,” *Leichtman Research Group Inc*, 2009, at 2, <http://www.leichtmanresearch.com/press/081709release.pdf>. Leichtman estimates 69,902,289 total broadband subscribers at end of 2Q 2009, which is roughly 60% of U.S. households.

FIGURE 9: INTERNET PENETRATION OF U.S. HOUSEHOLDS



Adapted from: Goldman Sachs Global Investment Research, Americas: Communications, Sept. 8, 2009 at 15.

Companies do not provide detailed information about their deployment plans and coverage footprints. Rather, press releases and other sorts of announcements generally list percentages of footprint covered, additional customers, and additional geographic areas to be served. Investment analysts have noted that,

“Within the telcos, Verizon has the most aggressive plan to upgrade 50% of their footprint to FTTH (fiber to the home) by 2010, which enables broadband speeds up to 50 mbps, along with a robust video product. AT&T also has a FTTN (fiber to the node) video/broadband plan to reach 60% of its footprint by 2011 and the company has talked about pushing coverage to 80% longer term. For the RLECs (e.g., Qwest, Embarq, Frontier), the focus has been more on broadband upgrades so far although this could potentially change with IPTV costs trending down over time.”⁸⁷

The following are examples of the coverage details provided in the broadband deployment announcements noted in the Appendix:

AT&T U-verse: Plans to pass 30 million living units in 2011.⁸⁸

⁸⁷ M. Wienkes, “Fears “Over the top”? Early stage broadband video investing across Tech, Media & Telecom,” *The Goldman Sachs Group Inc*, 2009, at 17.

⁸⁸ AT&T, “AT&T to Invest More Than \$17 Billion in 2009 to Drive Economic Growth,” *AT&T Inc*, 2009, <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26597>.

AT&T Wireless: “AT&T’s 3G mobile broadband network is now available in nearly 350 U.S. major metropolitan areas, with about 20 additional metro areas planned for deployment in 2009.” “Deployment of about 2,100 new cell sites across the country.” “To support its HSPA+ deployment, AT&T is going ‘hard and heavy’ bringing fiber to cell sites. The company has approximately 40% of its cell sites nationally wired with fiber but these are concentrated in metro areas that generate closer to 60%+ of the company’s traffic. The company is targeting 100% of cell sites with HSPA+ by 2H2011.”⁸⁹

CenturyLink: “The merged company will offer retail broadband Internet access service to 100 percent of its broadband eligible access lines within three years of the Transaction Closing Date.”⁹⁰

Clearwire: “30 million covered population with 4G service by the end of 2009⁹¹ up to 120 million subscribers by the end of 2010.”⁹² Chicago, Dallas and Philadelphia are expected to launch 4Q. Charlotte, Seattle and Honolulu are expected to be converted to WiMAX in 4Q.

Comcast DOCSIS 3.0: Hoping to reach 80% of homes passed by the end of 2009 (equivalent to 40 million homes and businesses passed), 100% by 2010.⁹³ Comcast wireless (service provided by Clearwire) was launched in Portland in June and the company is planning to extend service to Chicago, Philadelphia, Washington state area, and others before the end of 2009.⁹⁴

OpenRange: Plans to extend service to 546 rural communities in several states. At the end of the five year project, the company plans to cover six million people.⁹⁵

Verizon: Plans to have FiOS coverage in about 70% of its telecom footprint subsequent to the Frontier transaction.⁹⁶

⁸⁹ D. W. Barden et al., “‘Bandwidth anywhere’ coming together with 4G, U-verse” *Bank of America Merrill Lynch*, 2009, at 6.

⁹⁰ It is not clear if 100% coverage includes resale of satellite.

⁹¹ Clearwire Corporation Investor Relations, “Clearwire Reports Second Quarter 2009 Results,” *Clearwire Corporation*, 2009, <http://investors.clearwire.com/phoenix.zhtml?c=198722&p=irol-newsArticle&ID=1319734&highlight=>.

⁹² *Ibid.*

⁹³ Seeking Alpha Transcripts, “Comcast Corporation Q2 2009 Earnings Call Transcript,” Seeking Alpha, 2009, <http://seekingalpha.com/article/154406-comcast-corporation-q2-2009-earnings-call-transcript>.

⁹⁴ Los Angeles Times, “Comcast to launch wireless broadband today,” *Los Angeles Times*, 2009, <http://articles.latimes.com/2009/jun/30/business/fi-comcast-wimax30>.

⁹⁵ Open Range Communications, “Open Range Communications Secures \$374 Million to Deploy Wireless Broadband Services to 546 Rural Communities,” *Open Range Communications*, 2009, http://www.openrangecomm.com/pr/pr_022009.html.

⁹⁶ Thomson StreetEvents, “VZ - Verizon at Oppenheimer & Co. Communications, Technology &

Small Telcos: “Both Verizon and smaller Tier 3 ILECs say they intend to continue to build [FTTH] at a fairly strong pace, even during 2009.”⁹⁷

Satellite: Most satellite broadband communications companies cover the contiguous 48 states and some offer coverage of Alaska, Hawaii, and Puerto Rico as well. ViaSat claims that the ViaSat-1, one of the new generation of High Throughput satellites scheduled to be operational in 2011 will have the capacity to serve around 2 million subscribers across the country.⁹⁸

Cable: One analyst expects DOCSIS 3.0 will be available by 2013 to “nearly all”⁹⁹ the 92%¹⁰⁰ of U.S. homes servable today by cable modems.

1.4 Expected Capital Outlays

Overall Capex

In 2008, the telecommunications service providers, including telephone, wireless and cable companies invested about \$62.8 billion.¹⁰¹ Table 3 illustrates the breakdown of this total among six industry sectors:

Internet Conference,” *Thomson Reuters StreetEvents*, 2009, at 3,
http://investor.verizon.com/news/20090811/20090811_transcript.pdf.

⁹⁷ RVA, “Fiber-to-the-Home: North American Market Update,” *RVA LLC*, 2009, at 14
http://www.ftthcouncil.org/sites/default/files/RVA.FTTH_.Apr09.060109.pdf.

⁹⁸ ViaSat, “ViaSat Conference Call to Discuss ViaSat-1 Contract,” *ViaSat Inc*, 2008,
<http://investors.viasat.com/eventdetail.cfm?eventid=48902>.

⁹⁹ T. McElgunn, “DOCSIS 3.0 Deployment Forecast,” *Pike & Fischer*, 2009,
<http://www.broadbandadvisoryservices.com/researchReportsBriefsInd.asp?repld=662>.

¹⁰⁰ Nationally, 92% of U.S. homes today could obtain broadband service from cable TV companies, according to the cable industry’s trade association. See: NCTA, “Industry Data,” *National Cable & Telecommunications Association*, 2009, <http://www.ncta.com/Statistics.aspx>.

The research firm SNL Kagan that developed this number explained in a telephone interview with CITI researchers on October 6, 2009 that it has very accurate data with respect to all the large multiple system operators that typically serve the non-rural areas. Most of these large firms, which passed a total of 110 million homes at year-end 2008, can provide broadband service to 100% or nearly 100% of the homes they pass and account for 89% in the 92% figure. However, information about the broadband capabilities of the small independent cable companies that typically serve rural areas is both less available and less reliable so, based some surveys and their knowledge of the cable industry, the research firm assumes that these small companies, which account for the remaining 3% in the 92%, can provide broadband service to only 75% of the homes they pass in their combined services areas.

¹⁰¹ Skyline believes that its research “accounts for about 98% of the total U.S. telecommunications public network infrastructure capital expenditures.” Skyline Marketing Group, Capex Report–2008 Annual Report at 16.

TABLE 3: AGGREGATE CAPEX 2008 - \$62.8 B

	\$ Billion	Percent
RBOC Wireline	25.12	40%
Other Telco Wireline	2.51	4%
Cable MSOs	11.30	18%
CLECs	1.25	2%
IXC ¹⁰²	1.25	2%
Wireless	21.35	34%
Total	62.78	100%

Adapted from: Skyline Marketing Group, Capex Report: 2008 Annual Report, Exhibit 4

Note: Does not include spectrum license auction payments.

In 2009, total company capital expenditures for the major telcos, major cable companies, and major wireless companies, of which broadband capital is only a part, is expected by investment analysts to be as follows:

TABLE 4: TOTAL CAPITAL EXPENDITURES OF LARGEST COMPANIES (\$ BILLIONS)

	2008	2009
Telco	26,283	21,060
Cable	13,148	11,817
Wireless	19,520	18,597
Total	58,951	51,474

Source: Average of analyst data provided to CITI, *Telco:* AT&T (excluding wireless), Verizon (excluding wireless), Qwest; *Cable:* Comcast, Time Warner, Cox, Cablevision, Charter, Mediacom, and Insight. *Wireless:* AT&T, Verizon, Sprint, T-Mobile.

Note: Does not include spectrum license auction payments.

These totals will be increased by 6-18%, depending on the sector, in Section 3 of this report to account for the smaller companies not included in the financial analysts' coverage of publicly-held companies.

Telco: In 2008 telco companies covered by analysts had a total capital expenditure of \$26 billion. This total includes the wireline broadband expenditures for AT&T, Verizon and Qwest. In 2009, the wireline capital expenditures are estimated at \$21 billion.

Cable: Total cable industry capex for 2008 was estimated at \$14.6 billion by the National Cable and Telecommunications Association (NCTA),¹⁰³ about \$1.5 billion more than the capital expenditures of the largest MSOs noted in Table 4 above. The NCTA numbers are higher than those of the financial analysts, partly because they also include smaller cable operators' investments.

¹⁰² Companies included in this category (providers of wholesale and retail interexchange services) were: Level 3, Global Crossing, Qwest Long Distance, Sprint Long Distance

¹⁰³ NCTA, "Cable Industry Capital Expenditures 1996 – 2008," *National Cable & Telecommunications Association*, 2009, <http://www.ncta.com/Stats/InfrastructureExpense.aspx>, citing SNL Kagan.

Wireless: Wireless companies spent \$19.5 billion in 2008 and \$18.5 billion in 2009. These capex totals do not include spectrum license fees. There has been a significant drop off in capex during the year, partly due to the economic downturn. These figures cover the largest four companies in the sector: AT&T, Verizon, Sprint, and T-Mobile. AT&T and Verizon alone spent \$13.5 billion. Clearwire stated that it would spend between \$1.5 and \$1.9 billion to deploy its 4G network in 2009.¹⁰⁴

Broadband Capex

How much of this investment goes towards broadband? AT&T recently estimated that:

“Approximately two-thirds of AT&T's 2009 investment will extend and enhance the company's wireless and wired broadband networks to provide more coverage, speed and capacity.”¹⁰⁵

The following table illustrates how the major telephone companies have shifted wireline capital from their “legacy” telephone networks to wired broadband, with broadband capex expected to reach nearly 60% of total wireline capex in 2011.

TABLE 5: RBOC WIRED BROADBAND CAPEX (\$ BILLION)

Network	2006	2007	2008	2009E	2010E	2011E
Legacy	16.3	15.2	13.0	10.5	10.5	10.0
Broadband	7.2	10.7	11.9	11.5	12.5	14.0
Total	23.5	25.9	24.9	22.0	23.0	24.0
% broadband	30.6%	41.3%	47.8%	52.3%	54.3%	58.3%

Adapted from: Skyline Marketing Group, Capex Report: 2008 Annual Report, at Exhibit 14 and text at 18, 20, 23.

¹⁰⁴ Wireless Week, “Clearwire Defies Skeptics, Plans Hefty Capex in 2009”

<http://www.wirelessweek.com/News/2009/03/Clearwire-Defies-Skeptics,-Plans-Hefty-CapEx-in-2009/>

¹⁰⁵ AT&T, “AT&T to Invest More Than \$17 Billion in 2009 to Drive Economic Growth,” *AT&T Inc.*, 2009,

<http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26597>. AT&T’s estimate of two-thirds is consistent with the observation of a market research firm that “broadband remains the primary capex driver” for 2008-09 because,

“Wireline and wireless carriers alike are stepping up their network investments to make highspeed Internet connections, and associated triple-play bundles, available to a greater portion of their customers.”

The firm added that, “...there has been a pronounced shift in capex towards new, broadband platforms, and away from narrowband systems.” Skyline Marketing Group, CapEx Report–2008 Annual Report at 1.

The Appendix includes information on broadband-related capital expenditures. The following are examples by company:

AT&T plans to spend “\$17 billion to \$18 billion capital expenditures in 2009.”¹⁰⁶ “Capital expenditures in the wireline segment, which represented 69.4% of our capital expenditures, increased 2.5% in 2008, primarily due to the continued deployment of our U-verse services.”¹⁰⁷ In January 2009 AT&T’s CEO announced that the company would reduce its U-Verse deployment in 2009 by one-third by shifting its goal of passing 30 million homes by the end of 2010 to the end of 2011. The company’s overall capital expenditures were only being reduced by 15%.¹⁰⁸

Sprint said that: “Wireless capital expenditures were \$227 million in the second quarter of 2009, compared to almost \$200 million in the first quarter of 2009 and almost \$400 million spent in the second quarter of 2008. The year-over-year decrease in wireless capital spending reflects reduced capacity needs due to fewer subscribers. The company continues to invest capital in the quality and performance of its networks.”¹⁰⁹

Comcast: Compared to Q2/08, direct costs for high speed Internet declined 14% in Q2/09, total capital expenditures decreased 14% to 1.1 billion. The company expects capex to “modestly increase” during second half of year as they expand deployment of Wi-Band.¹¹⁰ In Q4/08 projections, it was forecast that the company would invest approximately \$400 to \$500 million of capital in DOCSIS 3.0 and All-Digital¹¹¹ projects.¹¹²

Verizon’s total capital expenditures totaled roughly \$17 billion USD in 2008. The company’s executive vice president and chief technology officer Richard Lynch noted that LTE network costs would be within the company’s overall program as spending shifts from older technologies to new strategic

¹⁰⁶ AT&T, “AT&T to Invest More Than \$17 Billion in 2009 to Drive Economic Growth,” *AT&T Inc.*, 2009, <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26597>.

¹⁰⁷ AT&T, “Strong Wireless Growth, Continued Cost Discipline, Solid Free Cash Flow Highlight AT&T’s Second-Quarter Results,” *AT&T Inc.*, 2009, <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26961>.

¹⁰⁸ T. Spangler, “AT&T To Cut Capital Spending In 2009,” *Multichannel News*, 2009, http://www.multichannel.com/article/189778-AT_T_To_Cut_Capital_Spending_In_2009.php.

¹⁰⁹ Sprint Nextel, “Sprint Nextel Reports Second Quarter 2009 Results,” *Sprint Nextel Corp.*, 2009, http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-newsArticle_newsroom&ID=1313470&highlight=.

¹¹⁰ Seeking Alpha Transcripts, “Comcast Corporation Q2 2009 Earnings Call Transcript,” *Seeking Alpha*, 2009, <http://seekingalpha.com/article/154406-comcast-corporation-q2-2009-earnings-call-transcript>.

¹¹¹ T. Spangler, “Comcast’s Project Cavalry: The March of 28 Million DTAs,” *Multichannel News*, 2009, http://www.multichannel.com/blog/BIT_RATE/13129-Comcast_s_Project_Cavalry_The_March_of_28_Million_DTAs.php.

¹¹² Seeking Alpha Transcripts, “Comcast Corporation Q4 2008 Earnings Call Transcript,” *Seeking Alpha*, 2009, <http://seekingalpha.com/article/121299-comcast-corporation-q4-2008-earnings-call-transcript>.

initiatives, such as LTE.¹¹³ In September 2009, Verizon's Chairman and CEO said "Our capital intensity on [FIOS] will start to drop significantly over the next two or three years."¹¹⁴

Satellite: Satellite communication companies such as ViaSat Inc. (ViaSat-1) and Hughes Communications, Inc. (Jupiter) are planning to launch new satellites in 2011 (ViaSat-1) and 2012 (Jupiter), respectively. Satellite construction, launch and insurance can cost upwards of \$400 million per satellite.¹¹⁵

RBOCs: According to an investment analyst, "We estimate Bell wireline capital spending will total about \$23.1 billion in FY09, down about 14% Y/Y from \$26.8 in FY08. The largest culprits being AT&T's 1 year delay of U-verse deployment, the lack of Y/Y longhaul network upgrade spending and economic conditions."¹¹⁶

Rural Telcos: The same investment analysts said, "We project 3Q09 capital expenditure at 14% of revenues, for our covered rural wireline carriers, about 9bps above 3Q08 results due to economic conditions and growth capex. Generally, we expect the bulk of capex to be directed toward existing network maintenance, with carriers focused on expanding the availability of DSL services and meeting success-based investment requirements."¹¹⁷

1.5 Expected Broadband Performance/Quality

Most broadband service providers describe their broadband performance in terms of upstream and downstream speed. Speed claims, however, are difficult to verify and companies have different numbers in terms of advertised, actual, throughput, and average speeds. The advertised and theoretical speed capabilities of the various technologies have been broadly described in the previous discussion of each technology.

The Appendix includes information such as the following, which provides some indication about performance expectations. Some examples include:

AT&T wireless: "...theoretical peak speeds of 7.2mbps. Typical real-world downlink and uplink speeds experienced by customers with upgraded 3G will be less than the theoretical peak and will vary

¹¹³ Verizon Public Relations, "Verizon Wireless Fosters Global LTE Ecosystem as Verizon CTO Dick Lynch Announces Deployment Plans," *Verizon Communications Inc.*, 2009,

<http://investor.verizon.com/news/view.aspx?NewsID=969>.

¹¹⁴ Verizon Public Relations, "Verizon at Goldman Sachs Communacopia Conference New York," Verizon Communications Inc., 2009, http://investor.verizon.com/news/20090917/20090917_transcript.pdf at 4.

¹¹⁵ P. B. Selding, "ViaSat to Buy WildBlue for \$568 Million," *Space News*, 2009, http://www.spacenews.com/archive/archive08/kabandside_0114.html.

¹¹⁶ Bank of America Merrill Lynch, "3Q09 Telecom results preview and model book – Duck & cover," *Bank of America Merrill Lynch*, 2009, p.19.

¹¹⁷ *Ibid*, p.23.

based on a number of factors, including location, device, and overall traffic on the local network at a given time.”¹¹⁸

Verizon FiOS: Speeds of 50mbps downstream and 20mbps upstream.¹¹⁹

Comcast DOCSIS: Comcast offers speeds up to 50mbps downstream and up to 10mbps upstream.

Satellite: Download speeds are typically five to six times faster than satellite upload speeds and range from 512kbps to 1.5 mbps downstream and 100kbps – 300kbps upstream.¹²⁰

Overcoming latency and signal loss due to precipitation have been major performance and quality obstacles for satellite providers. Geostationary satellite communications experience latency due to the long distances the signal must travel to geostationary orbit and back to earth. The total signal delay, including latency in the connecting terrestrial networks, can be as much as 500-900 milliseconds or more, making some applications unusable (interactive gaming) or difficult (two-way voice or video conference conversation). However, latency is typically not noticed by the user during basic internet use (web browsing, E-mail). Satellite communications are also affected by moisture and various forms of precipitation (rain or snow), a condition called “rain fade” or “snow fade.”

1.6 ARPU (Average Revenue per User)

The ARPUs for various providers are noted in the Appendix and are summarized below with respect to the various technologies employed. Although the ARPUs have been listed across technologies, in a manner consistent with the rest of this report, it should be noted that the price for broadband service varies by market and by speed of the service so ARPU does not necessarily reflect prices paid any individual consumer.

Telco DSL: Overall telco broadband (DSL and fiber) ARPU was estimated to be \$36.¹²¹ The range of ARPUs, in the cases for which data was available, spans a low of \$32.42 for Fairpoint, through \$39.61 for AT&T.

Telco Fiber: Presently, fiber to the home is mainly provided by Verizon with its FiOS service. Unfortunately, Verizon has not disclosed FiOS broadband ARPU. (Verizon reported its overall FiOS ARPU, which includes the television service, at \$135 for 2Q09.)

¹¹⁸ AT&T Public Relations, “AT&T Sees Significant Rise in Wi-Fi Hotspot Connections during Second Quarter,” *AT&T Inc.*, 2009, <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26975>.

¹¹⁹ Verizon Investor Relations, “2008 Annual Report,” *Verizon Communications Inc.*, 2009, http://investor.verizon.com/financial/annual/2008/downloads/08_vz_ar.pdf at 9.

¹²⁰ WildBlue, “Packages & Pricing”, *WildBlue Communications, Inc.*, 2009, <http://www.wildbluesales.com/wbsor.php?REQix=ID10>.

¹²¹ UBS Investment Research, “Telecommunications and Pay TV,” *UBS AG*, 2009, at 7.

Cable Modem: For broadband service over cable networks the average ARPU is approximately \$41.¹²² However, ARPUs range from \$36.72 for Mediacom to \$42.05 for Comcast. Other cable companies' ARPUs include \$41.41 for Charter, 41.60 for Time Warner, and \$38.49 for Cablevision.¹²³

Wireless: The average mobile wireless data ARPU in the second quarter of 2009 was 29% of total ARPU or \$13.73 (among the largest four carriers).¹²⁴ Data revenue per user was \$14.57 and \$14.96 for AT&T and Verizon, respectively, and \$9.90 for T-Mobile USA in that period.¹²⁵

ARPU for fixed wireless broadband is broadly comparable to DSL ARPU. Clearwire, the leading WiMAX service provider, had ARPU of \$39.26 in the second quarter of 2008, rising to \$39.47 in the second quarter of 2009.¹²⁶ A "national WISP," OpenRange, has inaugurated 4G service with a \$38.95 offering.

We estimate that the smaller rural independent WISPs generate an ARPU of approximately \$30 per month. This estimate was derived through a combination of telephone interviews with two WISPs, pricing available on the websites of a few other WISPs, and a calculation based upon the reported margin of one such provider, which tended to support our other assumptions.

In addition to a monthly subscription price, some wireless broadband pricing plans sometimes include a usage limit or "cap" which, if exceeded, leads to additional usage charges.

TABLE 6: TYPICAL WIRELESS BROADBAND PRICING PLANS

	Clearwire	Comcast (CLWR network)	Verizon	AT&T	Sprint	T-Mobile
Advertised Service	4G WiMAX 3-6mbps	4G WiMAX 4mbps (local) 3G 1.4mbps (national)	3G National (CDMA) 0.6 - 1.4mbps	3G National (GSM) 0.7- 1.7mbps	3G National (CDMA) 0.6 - 1.4mbps	3G National (GSM) 0.7-1.7mbps
Basic Plan	\$35/month 4mbps & 2GB/month cap	~\$30/month (bundled price) 4G Local, no cap	\$39.99 / mo Includes 250MB	\$40 / mo Includes 200MB		

¹²² Ibid, at 9.

¹²³ Goldman Sachs Investment Research, "Americas: Communication Services," *The Goldman Sachs Group*, 2009, at 31, 35 and 46.

¹²⁴ Morgan Stanley Research, "Telecom Services," *Morgan Stanley*, 2009, at 53.

¹²⁵ Ibid.

¹²⁶ Morgan Stanley Research, "Clearwire Corp.," *Morgan Stanley*, 2009, at 3.

Advanced Plan	\$45/month Unlimited Use	~\$50 / mo (bundled price) 4G/3G Nat, no cap	\$59.99 / mo Includes 5GB	\$60 / mo Includes 5GB	\$59.99 Includes 5GB	\$59.99 Includes 5GB
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Source: Company data, Morgan Stanley Research estimates, Cable and Satellite U.S. *Cable, Satellite, Telecom 3Q09 / '09 / '10 Outlook*, Oct. 21, 2009

Satellite: Hughes Communications' ARPU was \$70 in the second quarter of 2009 up from \$68 in the same period in 2008, with full year 2008 ARPU at \$65.¹²⁷ The following table summarizes satellite broadband rates:

TABLE 7: SATELLITE INTERNET BROADBAND RATES

Company	Hardware W/O Installation	Download Speeds * (Subject To Volume Caps)		
		Lowest	Medium	Highest
HughesNet	\$249.99 After Rebate	1.0mbps	1.2mbps	1.6mbps
		\$ 59.99	\$ 69.99	\$ 79.99
StarBand	\$299.9 After Rebate	500kbps	1.0mbps	1.5mbps
		\$ 49.99	\$ 69.99	\$ 99.99
WildBlue	\$149.95	512kbps	1.0mbps	1.5mbps
		\$ 49.95	\$ 69.95	\$ 79.95

* Typical upload speeds are roughly 15%-20% of download speeds

Source: Company websites

Bundles: It is worth noting that many broadband services are sold in “bundles” along with voice and television (the so-called “Triple Play”). Examples of bundles are illustrated in the following Pricing Appendix.

¹²⁷ Seeking Alpha Transcripts, “Hughes Communications Inc. Q2 2009 Earnings Call Transcript,” *Seeking Alpha*, 2009, <http://seekingalpha.com/article/154496-hughes-communications-inc-q2-2009-earnings-call-transcript>.

Pricing Appendix

TABLE 8: BUNDLED PRICING EXAMPLES IN URBAN AND RURAL MARKETS

Urban Markets

New York	Internet Speed (down/up)	Video Channels	Total Price
RCN	3 Mb / 768 Mb	180+ HD	\$106.39
Verizon FiOS	25 Mb / 15 Mb	320 + HD	\$110.43
TWC	10 Mb / 512 Kb	350+ HD	\$120.80
Cablevision	15 Mb / 2 Mb	230+ HD	\$111.05
			Average \$112.17

Philadelphia	Internet Speed (down/up)	Video Channels	Total Price
Comcast	12 Mb / 2Mb	80 + HD	\$132.44
Verizon FiOS	15 Mb / 5 Mb	250+ HD	\$115.43
RCN	3 Mb / 384 Kb	192+ HD	\$101.39
			Average \$116.42

Chicago	Internet Speed (down/up)	Video Channels	Total Price
Comcast	12 Mb / 2Mb	80 + HD	\$132.44
AT&T	6Mb / 1Mb	up to 230	\$128.45
RCN	3 Mb / 384 Kb	192+ HD	\$111.39
			Average \$124.09

Dallas	Internet Speed (down/up)	Video Channels	Total Price
Comcast	12 Mb / 2Mb	80 + HD	\$132.44
Charter	5 Mb / 512 Kb	100+	\$124.42
TWC	7 Mb / 512 Kb	215+ HD	\$120.47
			Average \$124.45

Rural markets

Rural Alabama	Internet Speed (down/up)	Video Channels	Total Price
BrightHouse	7 Mb / 1 Mb	150+	\$124.40
Century Tel*	1.5 Mb / 512 kb	200+	\$125.83
Mediacom	8 Mb / 1 Mb	135	\$104.30

Rural Arizona	Internet Speed	Video Channels	Total Price
Frontier*	3 Mb / 384 Kb	200+	\$127.94
Cox	12 Mb / 1 Mb	250	\$128.44
			Average \$128.19

Notes: * video product is DISH resale; Total price for both Telco/Cable includes monthly regulatory fees of \$14.45.

Source: Goldman Sachs, Americas: Communication Services, September 2009, at 18.

TABLE 9: WIRED BROADBAND PRICING PLANS

	Verizon	AT&T	Comcast	Cablevision	Time Warner Cable	Qwest
Data Plans	Starter DSL (1mbps/384 Kbps):\$17.99/mo (2 yr agreement) \$19.99/mo (1 yr agreement, no home phone required)	DSL: FastAccess DSL Lite (AT&T HSI Basic): \$19.95 (768 Kpbs down)	Economy (Up to 1mbps down): \$24.95/mo	Optimum Online: \$49.95/mo (w/Broadcast Basic or for non-cable customers) or \$44.95/mo (with Family Cable and above); up to 15 mbps down	Road Runner Turbo (10 mbps down): \$59.90/mo	Qwest Connect Silver (1.5 mbps): \$30.00/mo internet only, after 12 months: \$49.99/mo, 2- yr commitment/Price for Life: \$39.99/mo
	Power DSL (3 mbps/768 Kbps): \$29.99/mo / \$29.99/mo	FastAccess DSL Ultra (AT&T HSI Express): \$25- 32.95/mo (1.5 mbps down/256 Kpbs up)	Performance (Up to 12 mbps down): \$42.95/mo	Optimum Online Boost: Optimum Online fee plus \$14.95/mo (without Optimum Voice) or \$9.95/mo (with Optimum Voice); up to 30 mbps down	Road Runner High Speed Online (7 mbps down): \$49.95/mo (\$47.95/mo with another service)	Qwest Connect Platinum (7 mbps): \$35.00/mo, after 12 months: \$59.99/mo, 2- yr commitment/Price for Life: \$46.99/mo
	Turbo DSL (7.1 mbps/768 Kbps): \$39.99/mo / \$39.99/mo	FastAccess DSL Extreme (AT&T HSI Internet Pro): \$30- 37.95/mo (3.0 mbps down/384 Kbps up)	Blast! (Up to 16 mbps down): \$52.95/mo	Optimum Online Ultra: Optimum Online fee plus \$55/mo or \$104.95/mo as a new customer without other services; up to 101 mbps down	Road Runner Basic (1.5 mbps down): \$34.95/mo (\$32.95/mo with another service)	Qwest Connect Titanium (12 mbps): \$45.00/mo, after 12 months: \$69.99/mo, 2- yr commitment/Price for Life: \$56.99/mo
	FiOS Fast (15 mbps/5 mbps): \$44.99/mo (\$54.99/mo w/o contract) FiOS Faster (25 mbps/15 mbps): \$64.99/mo / \$72.99 FiOS Fastest (50 mbps/20 mbps): \$139.95/mo / \$159.95	FastAccess DSL Extreme 6.0 (AT&T HSI Internet Elite): \$35-42.95/mo (6.0 mbps down/512 Kbps up)			Road Runner Lite (768 Kbps down): \$19.95/mo for 12 months	Qwest Connect Quantum (20 mbps): \$55.00/mo, after 12 months: \$79.99/mo, 2- yr commitment/Price for Life: \$69.99/mo
		U-verse: Max 18 (18 mbps/1.5 mbps): \$65/mo				
		Max (10 mbps/1.5 mbps): \$55/mo				
		Elite (6 mbps/1 mbps): \$43/mo				

		Pro (3 mbps/1 mbps): \$38/mo				
		Express (1.5 mbps/1 mbps): \$33/mo				
Data Promos	2yr contract includes price guarantee for life; 1yr includes 3 months free. Power and Turbo include free national Wi- Fi from VZ hot spots in hotels, public areas, etc. Free modem.	\$150 cash back after rebate when switching from cable to one of 3 fastest DSL speeds. Some markets and plans have an additional \$50 cash back incentive as well.	First six months of Performance at \$19.99/mo	Optimum Online \$29.95/mo for first 6 months with self-install Boost is free for first month when ordered online		W/basic phone service: save \$5.00/mo on Internet W/qualifying home phone pkg: save \$10/mo on Internet Dell Mini Netbook \$199 w/Platinum or higher (2 yr agreement)

Source: UBS Investment Research, Telecommunications and Pay TV - September 3, 2009

Section 2: Review of Publicly Announced Broadband Plans

As a second step after the preparation of the List of Announced Broadband Plans (now the Appendix), the FCC asked for,

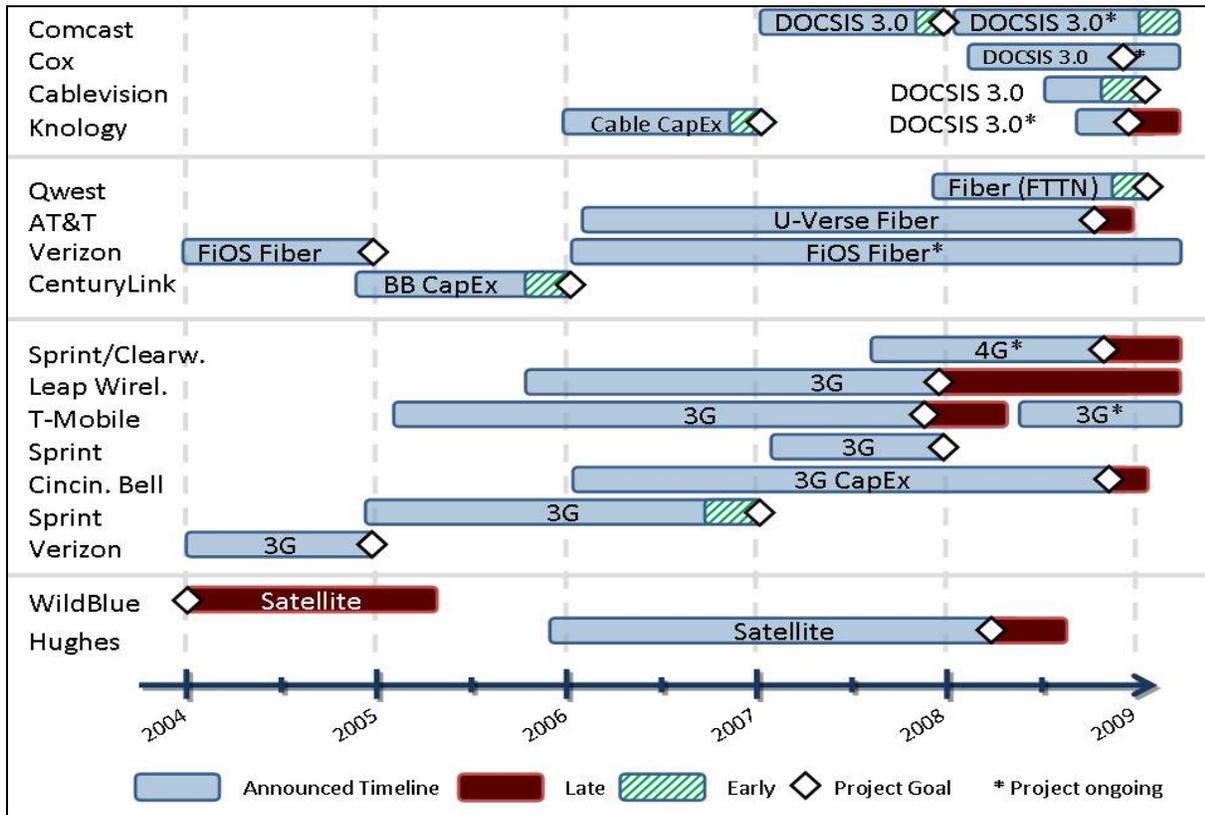
“... A document that compares what was projected at the time of a plan to what has resulted to date for each of the publicly announced broadband plans across the identified variables. This should look backwards at what was said at the time the plan was established to be compared against the outcomes of completed plans and the current status for those plans still in progress.”

To prepare the requested document, we examined each of the announced plans project-by-project to establish the first time that each project was announced and the time(s) that the original announcement was modified or updated. We then checked for information about the status of each announcement, particularly about completion or the degree of progress if still incomplete. We searched for information in the same manner as described in Section 1, which was by checking companies’ websites, investment analyst and consultant reports and by conducting searches on the Thomson One database and the internet. We also used news publications as a source for developments on broadband deployment announcements.

The result of this project-by-project review is the next chart (Figure 10) which shows the timeline for each company-announced plan and the extent to which it was completed on time, ahead of schedule, or late. If a company made two distinct announcements, each is treated as a separate program. This chart may provide some insights for judging the probability of companies’ on-time completion of similar projects in the future.

It appears that the type of project is probably the chief factor in predicting whether it is likely to be completed on time or not. This should not be surprising: small, easy projects are obviously more likely than difficult, complex ones to be completed as announced. Thus, for example, the cable industry’s upgrades from DOCSIS 2.0 to DOCSIS 3.0 are generally on or ahead of schedule because the upgrade is not a major physical construction project, does not require the deployment of new cables and the variables affecting the deployment are much more controllable by the cable company. In contrast, some of the “misses” have been in the deployment of entirely new infrastructures which are largely outside construction projects, heavily dependent on digging trenches for conduits, stringing cable on poles, or erecting towers for wireless systems, all tasks that are in turn dependent on government permits, topography, weather and all the other uncertainties associated with construction programs.

FIGURE 10: MAJOR BROADBAND DEPLOYMENTS: PERFORMANCE AGAINST ANNOUNCED COMPLETION DATES



Source: Section 2 text.

The focus of this Section is to understand whether telecommunication companies are generally able to meet the goals outlined in their own statements, or not. The review focused on the timeframe beginning in 2004-05 based on the judgment that those years marked a beginning of a “modern era” of broadband in terms of industry structure: the internet “bubble and bust” had passed and the AT&T-SBC and MCI-Verizon mergers and consolidation in the cable industry had largely been completed. Those years also mark the beginning of wireless companies as significant providers of “broadband data” service.

2004

Verizon announced at the end of 2003 that it planned to begin implementation of its new FiOS fiber to the home network in 2004 and pass one million homes by year-end. The company predicted that by

2005 it could increase that number to three million.¹²⁸ In 2005 Verizon reported that it reached that number.¹²⁹

At the beginning of 2004 Verizon also announced that it would implement wireless broadband access in two-thirds of its network, covering about 75 million people by the end of the year.¹³⁰ By December 2004, Verizon's 3G service was available to 75 million people including 20 major cities in the U.S.^{131 132}

CenturyLink (Century Tel, prior to the recent merger with Embarq in July 2009)¹³³ at the end of 2004 said it would invest heavily in its IP capabilities, announcing a \$350m investment for the following year.¹³⁴ It surpassed that amount, investing \$415m in 2005 and \$314m in 2006.¹³⁵

Sprint in its 2004 annual report announced that it would rollout EV-DO wireless 3G technology in the subsequent two years,¹³⁶ with coverage of major metropolitan areas in the U.S. by the end of 2005.¹³⁷ In its 2005 annual report Sprint confirmed capital expenditures of nearly \$ 1 billion for EV-DO deployment.¹³⁸ The coverage in September 2006 was 69 cities in the U.S. including major metropolitan areas, most of which were not publicly announced by Sprint before.¹³⁹

¹²⁸ Verizon Investor Relations, "Verizon Selects Vendors for Fiber to the Premises Project; Deployment and New Product Rollout Begin in 2004," *Verizon Communications Inc.*, 2003, <http://investor.verizon.com/news/view.aspx?NewsID=469>.

¹²⁹ Verizon Investor Relations, "Verizon Communications Reports Strong 4Q 2005 Results, Driven by Continued Growth in Wireless and Broadband," *Verizon Communications Inc.*, 2006, <http://investor.verizon.com/news/view.aspx?NewsID=718>.

¹³⁰ Verizon Investor Relations, "Verizon Wireless Makes Strides With Planned Broadband Access 3G Network Expansion," *Verizon Communications Inc.*, 2004, <http://investor.verizon.com/news/view.aspx?NewsID=498>.

¹³¹ B. Charny, "Sprint begins \$3 billion march to 3G," *CBS Interactive Inc.*, 2004, http://news.cnet.com/Sprint-begins-3-billion-march-to-3G/2100-1039_3-5480249.html?tag=lia;rcol

¹³² D. Dixon, "TV on Your Mobile Phone: Verizon Wireless V CAST (Samsung SCH-a890, 5/2005)", *Manifest Technology*, n/a, http://www.manifest-tech.com/ce_wireless/wireless_vcast.htm.

¹³³ S. Higginbotham, "Embarq and CenturyTel Merge, Become CenturyLink," *The GigaOM Network*, 2009, <http://gigaom.com/2009/07/01/embarq-and-centurytel-merge-become-centurylink/>.

¹³⁴ CenturyTel, "2004 ANNUAL REPORT," CenturyTel Inc., 2005, at 4, http://media.corporate-ir.net/media_files/irol/11/112635/annreports/04_annual_report.pdf.

¹³⁵ Verizon, "Annual Review 2006," *Verizon Communications Inc.*, 2007, at 4, <http://library.corporate-ir.net/library/11/112/112635/items/239821/CTLAnnualReview2006.pdf>

¹³⁶ Sprint Nextel, "Form 10-K," *Sprint Nextel Corp*, 2005, at 3, <http://ccbn.10kwizard.com/xml/download.php?repo=tenk&ipage=3328930&format=PDF>.

¹³⁷ A. Schiska-Lombard, "Sprint Begins Offering EV-DO-Ready Sprint PCS Connection Card(TM) by Sierra Wireless to Business Customers", *Sprint Nextel Corp*, 2005, http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-newsArticle_newsroom&ID=681282&highlight=

¹³⁸ Sprint Nextel, "Form 10-K," *Sprint Nextel Corp*, 2005, at 1, <http://ccbn.10kwizard.com/xml/download.php?repo=tenk&ipage=3548364&format=PDF>.

¹³⁹ EVDO Forums, "Sprint EVDO Rev A Coverage Sightings," *EVDO-Forums.com*, 2006, <http://www.evdoforums.com/thread3234.html>.

WildBlue Communications Inc. announced in April 2004¹⁴⁰ that its satellite broadband Internet service would roll out in June of 2005. This was the second time the company made this announcement: it was originally made in 2001 and service was supposed to have been available by mid-2002.¹⁴¹ Various issues caused them to delay the service, particularly the loss of funding which was influenced by the attacks on September 11, 2001¹⁴² as well as defects on the WildBlue-1 satellite.¹⁴³ In June 2005 WildBlue unveiled its satellite broadband Internet service three years late.¹⁴⁴

2005

Hughes Communications Inc. announced in December 2005 that the SPACEWAY-3 satellite would be launched in early 2007¹⁴⁵ and be ready for service in early 2008.¹⁴⁶ The satellite was launched in mid-2007 and became operational on April 8, 2008. The delay was due to an unrelated launch failure of another satellite that forced Hughes to find an alternate launch service.

Knology announced that it would invest \$7.5 million to upgrade its cable systems in Florida to support broadband services.¹⁴⁷ In 2006 the company had capital expenditures for new deployment and enhancements of equipment of more than \$12.5 million.¹⁴⁸

T-Mobile announced in May 2005 that it would roll out 3G networks in the second half on 2006 and serve its first customers in 2007.¹⁴⁹ T-Mobile planned to continue the rollout in 2008 and have it completed by 2009.¹⁵⁰ The company's actual rollout of 3G only began in May 2008, which was at least 5

¹⁴⁰ WildBlue News & Press Releases, "WildBlue Ready To Roll Out Its Satellite Internet Service In June," *wildblue.cc*, <http://www.wildblue.cc/wildbluenews.html>,

¹⁴¹ WildBlue News & Press Releases, "WildBlue Secures Low Cost, Fixed Price Contracts For Customer Premises Equipment," *wildblue.cc*, 2001, <http://www.wildblue.cc/2001pr.html>.

¹⁴² WildBlue Communications, "WildBlue History," *WildBlue Communications Inc*, 2007, at 9, http://satjournal.tcom.ohiou.edu/issue13/pdf/David_Brown_WildBlue.pdf.

¹⁴³ Dsl Reports, "Wild Blue Yonder," *dslreports.com*, 2004, <http://www.dslreports.com/shownews/58219>.

¹⁴⁴ P. Weiss, "Current Telecom Developments," *Wharton & Garrison LLP*, 2005, [http://www.paulweiss.com/files/Publication/a4182527-a24f-4827-9e73-](http://www.paulweiss.com/files/Publication/a4182527-a24f-4827-9e73-0c4403ded807/Presentation/PublicationAttachment/4490c85f-7055-4250-b5a9-34eaa04bde01/6-3-05.pdf)

[0c4403ded807/Presentation/PublicationAttachment/4490c85f-7055-4250-b5a9-34eaa04bde01/6-3-05.pdf](http://www.paulweiss.com/files/Publication/a4182527-a24f-4827-9e73-0c4403ded807/Presentation/PublicationAttachment/4490c85f-7055-4250-b5a9-34eaa04bde01/6-3-05.pdf).

¹⁴⁵ SpaceDaily, "Sea Launch Awarded Spaceway 3 Contract By Hughes Network Systems," *SpaceDaily.AFP*, 2005, http://www.spacedaily.com/reports/Sea_Launch_Awarded_Spaceway_3_Contract_By_Hughes_Network_Systems.html.

¹⁴⁶ R. Hoskins, "Hughes Initiates SPACEWAY 3 Satellite with First Commercial On-board Satellite Broadband Wireless Internet Traffic Switching and Routing," *Broadband Wireless Exchange Inc.*, 2008, <http://www.bbwxchange.com/pubs/2008/04/08/page1405-1664513.asp>.

¹⁴⁷ Knology, "Annual Report 2005", *Knology Inc*, 2006, at 26, <http://ccbn.10kwizard.com/xml/download.php?repo=tenk&ipage=4056803&format=PDF>.

¹⁴⁸ Knology, "Annual Report 2006", *Knology Inc*, 2007, at 52, <http://ccbn.10kwizard.com/xml/download.php?repo=tenk&ipage=4745211&format=PDF>.

¹⁴⁹ Joel, "T-Mobile 3G: Not Until 2007," *Gizmodo.com*, 2005, <http://gizmodo.com/105518/t+mobile-3g-not-until-2007>.

¹⁵⁰ mobilecommons, "T-Mobile USA 3G Network, USA," *Net Resources International*, 2006, <http://www.mobilecomms-technology.com/projects/tmobileusa/>.

months behind the scheduled year-end 2007.¹⁵¹ According to T-Mobile's latest announcement, the plan to have full 3G deployment by the end of 2009 is currently on track.¹⁵²

Leap Wireless announced in September 2005 that it planned to implement EV-DO 3G technology in 2006 investing about \$475m.¹⁵³ In the 2006 annual report it confirmed the roll-out of this technology with a completion goal of 2007.¹⁵⁴ In the company's annual report for 2008, it indicated that the rollout was not entirely completed.¹⁵⁵ In June 2009 the company successfully completed the 3G rollout throughout their entire service area.¹⁵⁶

2006

AT&T announced in June 2006 that it planned to reach 19 million households with its U-Verse FTTN-DSL system by the year 2008.¹⁵⁷ At the end of 2007 the company reduced its goal to 18 million homes passed by the end of 2008.¹⁵⁸ In January 2009 the company said that 17 million households were passed,¹⁵⁹ indicating that AT&T was behind the revised target by at least one million households.

Cincinnati Bell announced in its 2006 annual report that it would invest about \$30 million in 2007 to build up its 3G wireless network and to have 3G service operational in 2008.¹⁶⁰ The company spent \$11 million in 2007, maintaining the date for operational launch as 2008. Cincinnati Bell planned to spend an additional \$19 million in 2008 to complete the project.¹⁶¹ The actual spending on the 3G network in

¹⁵¹ O. Malik, "Finally, T-Mobile Launches a U.S. 3G Network," *The GigaOM Network*, 2008, <http://gigaom.com/2008/05/05/t-mobile-launches-us-3g-network/>.

¹⁵² R. Halevy, "T-Mobile Forges Ahead With 3G Rollout – Still No 3G BlackBerry...," *ContentNext Media Inc.*, 2009, <http://moconews.net/article/419-t-mobile-usa-rolls-out-super-fast-3g-in-parts-of-philadelphia/>.

¹⁵³ K. Atkins (Lead Media Relations), "Leap Unveils Mobile Data Strategy for Cricket and Jump Mobile at CTIA Wireless I.T. & Entertainment," *Leap Wireless International Inc*, 2005, <http://phx.corporate-ir.net/phoenix.zhtml?c=191722&p=irol-newsArticle&ID=760669&highlight=>.

¹⁵⁴ Leap Wireless, "Annual Report 2006", *Leap Wireless International Inc*, 2007, at 29, <http://ccbn.10kwizard.com/xml/download.php?repo=tenk&ipage=4714898&format=PDF>.

¹⁵⁵ Leap Wireless, "Annual Report 2008", *Leap Wireless International Inc*, 2009, at 4, <http://ccbn.10kwizard.com/xml/download.php?repo=tenk&ipage=6295822&format=PDF>.

¹⁵⁶ G. Lund (Media Relations), "Second Quarter Results," *Leap Wireless International Inc*, 2009, <http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MT11MjV8Q2hpbGRJRDR0tMXxUeXBIPtM=&t=1>.

¹⁵⁷ AT&T Investor Relations, "Company's Extensive DSL Network Expanded to Reach 95 Percent of State," *AT&T Inc.*, 2006, <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=22361>.

¹⁵⁸ P. D. Shapiro, "AT&T U-verse by the Numbers," *CableFAX Magazine*, 2007, <http://www.cable360.net/cablefaxmag/business/competition/telcos/26065.html>

¹⁵⁹ DSL Reports, "AT&T Slows U-Verse Build Out," *dslreports.com*, 2009, <http://www.dslreports.com/shownews/ATT-Slows-UVerse-Build-Out-100539>.

¹⁶⁰ Cincinnati Bell, "Annual Report 2006," *Cincinnati Bell Telephone Company, LLC*, 2007, at 115, <http://library.corporate-ir.net/library/11/111/111332/items/246974/2006AnnualReport.pdf>.

¹⁶¹ Cincinnati Bell, "Annual Report 2007," *Cincinnati Bell Telephone Company, LLC*, 2008, at 86, <http://library.corporate-ir.net/library/11/111/111332/items/294111/CincinnatiBellNPS10KWrap1.pdf>.

2008 was \$16 m.¹⁶² The 3G wireless network was deployed in the fourth quarter of 2008.¹⁶³ Apparently Cincinnati Bell managed to launch the 3G overlay within their schedule.

Knology stated in its 2006 annual report that it expected to invest \$30.4 million in 2007, of which \$7.3 million would be for new deployments and enhancements of infrastructure.¹⁶⁴ Investment came in below the announced amount, as \$28.8 million was spent of which \$9.1 million was for plant extensions and enhancements.¹⁶⁵

Verizon announced in early 2006 that it would have 3-4 million premises passed by the FiOS fiber optic service by the end of that year.¹⁶⁶ It also announced that it would have 18 million premises passed with fiber by the end of 2010.¹⁶⁷ In the second quarter of 2009 Verizon's fiber optic systems passed 13.4 million homes,¹⁶⁸ meaning that the company will have to pass another 4.6 million in the subsequent 18 months to hit the year end 2010 goal. Verizon has stated that it is on track with the announced deployment schedule.

2007

Sprint and Clearwire announced in July 2007 that they together planned to cover 100 million people with the joint-use WiMAX service by the end of 2008.¹⁶⁹ (Sprint provides its 4G services over Clearwire's network; Sprint's coverage is therefore based on Clearwire's deployments). Thus far, this goal was missed by at least one year: at the end of the fourth quarter of 2008 Sprint claimed to cover 49 million people,¹⁷⁰ meaning that the companies' coverage was about 50% short of their original announcement. Clearwire also stated in its 2007 annual report that it would have about 530,000 customers by the end

¹⁶² Cincinnati Bell, "Annual Report 2008," *Cincinnati Bell Telephone Company, LLC*, 2009, at 5, <http://library.corporate-ir.net/library/11/111/111332/items/294111/CincinnatiBellNPS10KWrap1.pdf>.

¹⁶³ Cincinnati Bell, "Annual Report 2008," *Cincinnati Bell Telephone Company, LLC*, 2009, at 3, <http://library.corporate-ir.net/library/11/111/111332/items/294111/CincinnatiBellNPS10KWrap1.pdf>.

¹⁶⁴ Knology, "Annual Report 2005," *Knology Inc*, 2006, at 52, <http://ccbn.10kwizard.com/xml/download.php?repo=tenk&ipage=4056803&format=PDF>.

¹⁶⁵ Knology, "Annual Report 2006," *Knology Inc*, 2007, at 52, <http://ccbn.10kwizard.com/xml/download.php?repo=tenk&ipage=4745211&format=PDF>.

¹⁶⁶ Verizon Investor Relations, "Verizon Vice Chairman Says Fast MCI Integration," *Verizon Communications Inc.*, 2006, <http://investor.verizon.com/news/view.aspx?NewsID=726>.

¹⁶⁷ Verizon Investor Relations, "Verizon Provides New Financial and Operational Details on its Fiber Network as Deployment Gains Momentum," *Verizon Communications Inc.*, 2006, <http://investor.verizon.com/news/view.aspx?NewsID=773>.

¹⁶⁸ Seeking Alpha Transcripts, "Verizon Communications Inc. Q2 2009 Earnings Call Transcript," *Seeking Alpha*, 2009, <http://seekingalpha.com/article/151577-verizon-communications-inc-q2-2009-earnings-call-transcript?page=-1>.

¹⁶⁹ Clearwire Investor Relations, "Sprint Nextel and Clearwire to Partner to Accelerate and Expand the Deployment of the First Nationwide Mobile Broadband Network Using WiMAX Technology," *Clearwire Communications, LLC*, 2007, <http://investors.clearwire.com/phoenix.zhtml?c=198722&p=irol-newsArticle&ID=1028160&highlight=>

¹⁷⁰ A. Hahn, "Houston Sprint Customers Enjoy Enhanced Network Coverage and Capacity," *Business Wire*, 2009, <http://www.reuters.com/article/pressRelease/idUS159956+23-Feb-2009+BW20090223>.

of year 2008. That goal was also not reached as the company reported 475,000 customers in its 2008 annual report.

In March 2009 the goal was reset to eight 4G equipped metropolitan areas by the end of 2009 and four more in 2010. This would be 60-80 million POPs by the end of 2009.¹⁷¹ The total covered population was supposed to have reached 120 million by the end of 2010 according to the 2009 revised plan.¹⁷² By October 2009 Clearwire had deployed 4G networks in: Atlanta, GA; Portland, OR; Las Vegas, NV; Salem, OR; Baltimore, MD; and Milledgeville, GA.¹⁷³ If the company deploys 4G networks in two more cities before the end of 2009, it will achieve its revised goals.

Sprint announced in early 2007 that it would have a majority of its footprint covered with 3G EV-DO Rev. A by the end of 2007¹⁷⁴ In the 2008 annual report, the company said that it had EV-DO Rev. A employed in 82% of its footprint, meeting the goal.¹⁷⁵

Comcast announced in 2007 that it would have DOCSIS 3.0 deployed in 20% of its footprint by the end of 2008.¹⁷⁶ Apparently it hit its target in 2008.¹⁸⁷

Qwest announced in the end of 2007 that it would have a fiber to the node (FTTN) deployment in 2008. The company planned to pass approximately 1.5 million households that year.¹⁷⁷ According to their annual report in 2008 Qwest exceeded its goal of fiber to the node deployment, covering 1.9 million potential customers.¹⁷⁸

2008

Cablevision announced in mid-2008 that it would have 20% of its network upgraded to DOCSIS 3.0 by the end of that year and complete coverage would be reached by mid- 2010.¹⁷⁹ The plan laid out a

¹⁷¹ eWeek.com, "Clearwire Sets More WiMax Rollouts," *Ziff Davis Enterprise Holdings Inc.*, 2009, <http://www.eweek.com/c/a/Mobile-and-Wireless/Clearwire-Sets-More-WiMax-Rollouts/>.

¹⁷² Ibidem.

¹⁷³ Clearwire Investor Relations, "2009 IR News," *Clearwire Communications, LLC*, 2009, <http://investors.clearwire.com/phoenix.zhtml?c=198722&p=irol-news&t=Search&nyo=0>.

¹⁷⁴ Sprint Nextel, "Annual Report 2006," *Sprint Nextel Corp*, 2007, at 2, <http://ccbn.10kwizard.com/xml/download.php?repo=tenk&ipage=4711888&format=PDF>.

¹⁷⁵ Sprint Nextel, "Annual Report 2007," *Sprint Nextel Corp*, 2008, at 3, <http://ccbn.10kwizard.com/xml/download.php?repo=tenk&ipage=5503453&format=PDF>.

¹⁷⁶ DSL Reports, "20% of Comcast Users To See DOCSIS 3.0 in 2008," *dslreports.com*, 2007, <http://www.dslreports.com/shownews/20-of-Comcast-Users-To-See-DOCSIS-30-in-2008-89821>.

¹⁷⁷ Qwest, "Annual Report 2007," *Qwest Communications International Inc.*, 2008, at 3, http://ww3.ics.adp.com/streetlink_data/dirq/annual/HTML2/qwest_ar2007_0003.htm.

¹⁷⁸ Qwest, "Annual Report 2008," *Qwest Communications International Inc.*, 2009, at 3, https://materials.proxyvote.com/Approved/749121/20090316/AR_36466/HTML2/qwest-ar2008_0004.htm.

¹⁷⁹ J. Baumgartner, "Cablevision Begins Wideband Assault," *United Business Media Limited*, 2008, http://www.lightreading.com/document.asp?doc_id=160511&site=cdn.

budget for the DOCSIS 3.0 and a WiFi rollout for the three-year period at \$315m.¹⁸⁰ (WiFi would be a free additional service to Cablevision's cable customers.) The build-out was planned to be completed by 2010.¹⁸¹ At the end of 2008 Cablevision claimed to have 52% of its footprint covered with DOCSIS 3.0¹⁸² meaning that its first goal of deployment was overachieved. By mid-2009 the WiFi service was deployed in New York's Rockland and Orange Counties, which represents approximately one-third of Cablevision's footprint.¹⁸³ In May 2009, Cablevision started its DOCSIS 3.0 service in the greater New York area, which accounts for most of its remaining footprint.¹⁸⁴ Therefore Cablevision was again ahead of schedule.

Charter announced in November 2008 that it would deploy DOCSIS 3.0 on a small scale within three months.¹⁸⁵ At the end of January 2009, it achieved this goal by deploying DOCSIS 3.0 service in the metropolitan area of St. Louis.¹⁸⁶ Although the scale was small, Charter kept to its original plan.

Comcast announced in the beginning of 2009 a new goal of full DOCSIS 3.0 deployment by year-end 2010. Comcast had already achieved to 35% coverage at the beginning of 2009 and aimed for 65% in the end of 2009.¹⁸⁷ By August 2009, Comcast had deployed DOCSIS 3.0 in 60% of their footprint, so it seems ahead of schedule in terms of achieving 65% by year-end.¹⁸⁸

Cox in March 2008 said that it planned to deploy DOCSIS 3.0 on a small scale by the end of that year. The company stated that its networks would be fully upgraded by the end of 2010.¹⁸⁹ The company had deployed DOCSIS 3.0 in the Arizona communities of Carefree, Rio Verde, Scottsdale, and Phoenix by

¹⁸⁰ Seeking Alpha, "Cablevision Q2 2008 Earnings Call Transcript," *Seeking Alpha*, 2008,

<http://seekingalpha.com/article/88345-cablevision-q2-2008-earnings-call-transcript?page=-1>.

¹⁸¹ TMCNews, "Cablevision plans wireless broadband network," *Technology Marketing Corp.*, 2008,

<http://www.tmcnet.com/usubmit/2008/05/08/3434956.htm>.

¹⁸² Multichannel News, "Cablevision To Blast Out 101-mbps Internet Service," *Reed Business Information*, 2009,

http://www.multichannel.com/article/210164-Cablevision_To_Blast_Out_101_mbps_Internet_Service.php.

¹⁸³ Cablevision Investor Relations, "Cablevision's Optimum WiFi Arrives in Rockland and Orange Counties," *CSC Holdings Inc.*, 2009, <http://www.cablevision.com/about/news/article.jsp?d=072209>.

¹⁸⁴ M. Robuck (CED), "Cablevision pushes DOCSIS 3.0 needle to 101 mbps," *Advantage Business Media*, 2009,

<http://www.cedmagazine.com/News-Cablevision-DOCSIS30-101-mbps-042809.aspx>.

¹⁸⁵ DSL Reports, "Charter DOCSIS 3.0 Within Months," *dslreports.com*, 2008,

<http://www.dslreports.com/shownews/Charter-DOCSIS-30-Within-Months-98946>.

¹⁸⁶ A. Lamont, "Charter Launches Fastest Residential Internet Service", *Charter Communications Inc.*, 2009,

[http://phx.corporate-ir.net/phoenix.zhtml?c=112298&p=irol-newsArticle&ID=1249700&highlight=Charter launches](http://phx.corporate-ir.net/phoenix.zhtml?c=112298&p=irol-newsArticle&ID=1249700&highlight=Charter%20launches).

¹⁸⁷ Seeking Alpha Transcript, "Comcast Corporation Q1 2009 Earnings Call Transcript," *Seeking Alpha*, 2009,

<http://seekingalpha.com/article/134349-comcast-corporation-q1-2009-earnings-call-transcript?page=-1>.

¹⁸⁸ T. Spangler, "Comcast Ups DOCSIS 3.0 Target To 40 Million Premises In 2009," *Reed Business Information*, 2009,

[http://www.multichannel.com/article/326698-](http://www.multichannel.com/article/326698-Comcast_Ups_DOCSIS_3_0_Target_To_40_Million_Premises_In_2009.php)

[Comcast_Ups_DOCSIS_3_0_Target_To_40_Million_Premises_In_2009.php](http://www.multichannel.com/article/326698-Comcast_Ups_DOCSIS_3_0_Target_To_40_Million_Premises_In_2009.php).

¹⁸⁹ J. Baumgartner, "Teeing Up Docsis 3.0," *United Business Media Limited*, 2008,

http://www.lightreading.com/document.asp?site=cdn&doc_id=148909&page_number=2.

August 2008.¹⁹⁰ Cox also reiterated that the full deployment will be achieved by the end of 2010. That indicated that it is working on schedule or just slightly behind the original announcement.

Knology announced DOCSIS 3.0 plans in November 2008. It planned to have 20% of its networks upgraded to DOCSIS 3.0 by year-end 2008, 50% by 2009 and full deployment by 2010.¹⁹¹ In February 2009 the company announced a revised, perhaps more aggressive plan: it planned to have 65% of the network upgraded by the end of 2009, but apparently none of the DOCSIS 3.0 deployment originally expected to occur in 2008 happened.¹⁹² Hence it is behind its original plans, but plans to increase its pace so that it can reach the original goal ahead of schedule.

Time Warner Cable announced in 2008 that it would deploy DOCSIS 3.0 during 2009 selectively.¹⁹³ By the end of September 2009 the company had deployed the technology in parts of New York City.¹⁹⁴

ViaSat, Inc. announced in January 2008 plans to build and launch ViaSat-1 as its next generation 100gbps High Throughput satellite¹⁹⁵ capable of providing users with download speeds of 2-10mbps or perhaps more.¹⁹⁶ ViaSat announced it had executed the construction contract with Space Systems/Loral on January 7, 2008. The satellite is expected to be launched in early 2011.

¹⁹⁰ Cox Investor Relations, "Cox Expands DOCSIS 3.0 Reach to Arizona," *Cox Communications Inc.*, 2009, <http://cox.mediaroom.com/index.php?s=43&item=442>.

¹⁹¹ J. Baumgartner, "Knology Calls Wideband Play," *United Business Media Limited*, 2008, http://www.lightreading.com/blog.asp?blog_sectionid=419&site=cdn&doc_id=168387.

¹⁹² J. Baumgartner, "Knology Goes on the Offensive," *United Business Media Limited*, 2009, http://www.lightreading.com/document.asp?site=cdn&doc_id=172415.

¹⁹³ N. Anderson, "No data caps, no DOCSIS 3.0? TWC's math doesn't add up," *Condé Nast Digital*, 2009, <http://arstechnica.com/tech-policy/news/2009/04/twc-without-data-caps-internet-upgrades-now-in-doubt.ars>.

¹⁹⁴ K. Bode, "Time Warner Cable (Finally) Launches DOCSIS 3.0," *dslreports.com*, 2009, <http://www.dslreports.com/shownews/Time-Warner-Cable-Finally-Launches-DOCSIS-30-104626>.

¹⁹⁵ Spacemart, "ViaSat-1 To Transform North American Satellite Broadband Market," *Space.TV Corporation*, 2008, http://www.spacemart.com/reports/ViaSat_1_To_Transform_North_American_Satellite_Broadband_Market_999.html.

¹⁹⁶ ViaSat, "ViaSat-1 to Transform North American Satellite Broadband Market," *ViaSat, Inc.*, 2008, <http://www.viasat.com/news/viasat1-transform-north-american-satellite-broadband-market>.

Section 3: Future Projections

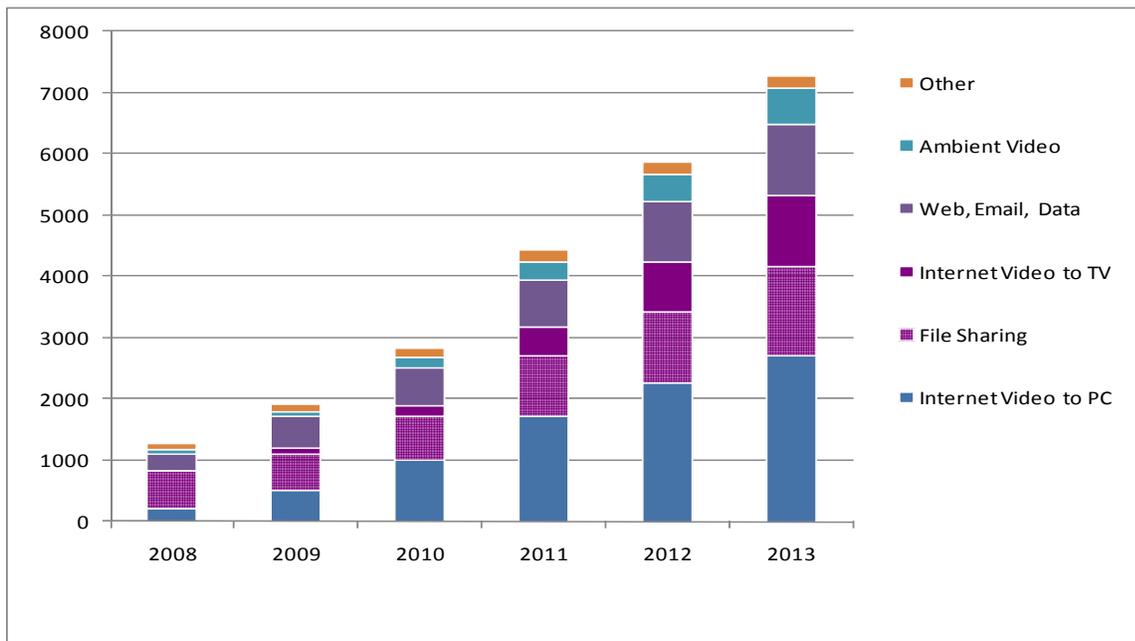
As a third element of its request, the FCC asked for a review of situations

“...where the publicly announced broadband plans yet to be commenced or still in progress will be 3-5 years in the future, including LTE, WiMAX, DOCSIS 3.0, backbone, etc. This should include a summary of analyst projections and a ‘lessons learned’ component.”

This portion of the report responds to the FCC’s request in five subsections: 1) a review of each company’s announced but uncompleted broadband plans; 2) the status of internet “backbones”; 3) the status of broadband satellites; 4) a summary of investment analysts’ projections; and 5) some observations about “lessons learned.”

Projections about the future of broadband require assumptions about the growth of the population and number of households, assumptions about wired and wireless broadband deployment and then assumptions regarding broadband adoption in terms of wired broadband households and wireless broadband users. Another important underpinning of broadband forecasts is assumptions about the growth of the broadband capacity utilized by each broadband user. As the following graph illustrates, the most rapid growth is expected in three categories of internet usage: 1) Internet video to PC; 2) file sharing; and 3) internet video to TV.

FIGURE 11: NORTH AMERICAN CONSUMER INTERNET TRAFFIC (Petabits/Month)

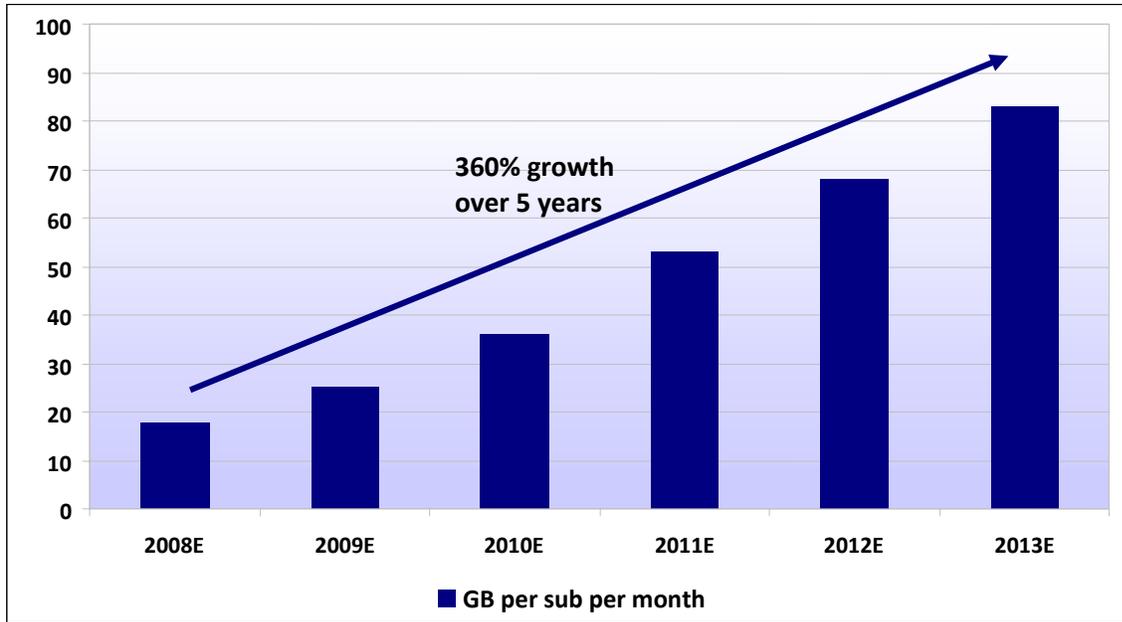


Source: Cisco Visual Networking Index; Morgan Stanley Research estimates. Note: Data is for North America, limited to non-mobile consumer usage

Adapted from Morgan Stanley Research, U.S. Cable, Satellite, Telecom 3Q09 Outlook, Oct. 21, 2009 at 17.

At a more granular level, these increases in overall internet usage translate into rapidly growing per subscriber volumes, as illustrated by this graph:

FIGURE 12: ESTIMATED U.S. CONSUMER INTERNET USE

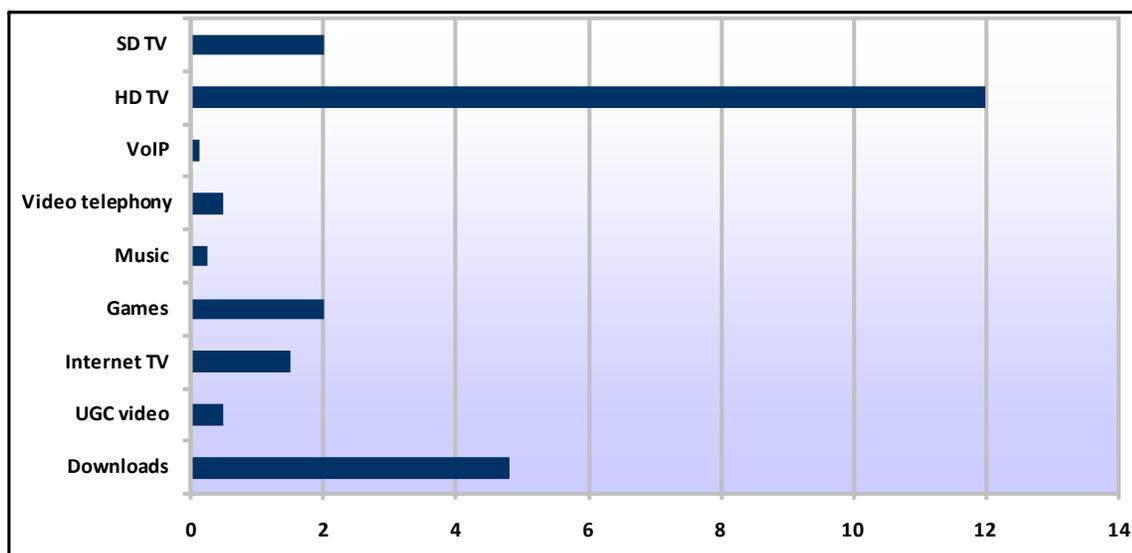


Adapted from Morgan Stanley Research, U.S. Cable, Satellite, Telecom 3Q09 Outlook, Oct. 21, 2009 at 17.

The following graph demonstrates how some internet activities require vastly more broadband capacity than others. Television and other video applications will require the highest transmission rates in the future. While there may be improvements in compression codecs over the next years, analysts assume that the typical speed used for standard definition television (SD TV) will be 2 mbps per stream in 2013 while high definition television (HD TV) will require between 9 and 19 mbps with 12 mbps typical. More standard internet activities, including non-real time activities, peer-to-peer file sharing, handling e-mail attachments or publishing photos to social networks, do not require a particular high speed level but benefit from ever-higher speeds.¹⁹⁷

¹⁹⁷ I. Fogg, "Home Broadband Bandwidth Requirements", *Forrester Research*, 2008, http://www.forrester.com/rb/Research/home_broadband_bandwidth_requirements/q/id/52075/t/2?action=5 at 2.

FIGURE 13: TYPICAL SPEEDS (IN MBPS) THAT INTERNET ACTIVITIES AND IPTV WILL REQUIRE IN 2013



Adapted from Forrester Research, Home Broadband Bandwidth Requirements, Sept. 9, 2008 at 2.

3.1 Uncompleted Broadband Plans

The table below lists the announced broadband deployment plans described in the previous section and included in the Appendix which are still underway. The table includes the status of plans deploying the newer technologies: Fiber, DOCSIS 3.0, and Wireless 4G.

TABLE 10: UNCOMPLETED BROADBAND PLANS

Company	Technology	Plan
AT&T	U-Verse: Fiber/DSL	2011: pass 30 million living units. ¹⁹⁸
Cincinnati Bell	FTTH	Launched in 2009, no additional information
Verizon	FTTH	Plans to have FiOS coverage in about 70% of its telecom footprint subsequent to the Frontier transaction. ¹⁹⁹
Comcast	DOCSIS 3.0	Hoping to reach 80% by end of 2009 (40m homes and businesses passed), 100% by 2010. ²⁰⁰

¹⁹⁸ AT&T Public Relations, "AT&T to Invest More Than \$17 Billion in 2009 to Drive Economic Growth," *AT&T Inc.*, 2009, <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26597>.

¹⁹⁹ J. Killian, "Verizon at Oppenheimer Conference," *Verizon Communications Inc.*, 2009, http://investor.verizon.com/news/20090811/20090811_transcript.pdf.

²⁰⁰ Seeking Alpha Transcripts, "Comcast Corporation Q2 2009 Earnings Call Transcript" *Seeking Alpha*, 2009, <http://seekingalpha.com/article/154406-comcast-corporation-q2-2009-earnings-call-transcript>.

Knology	DOCSIS 3.0	Continuing to enable markets for DOCSIS 3.0 deployment – Will implement DOCSIS 3.0 on a market-by-market basis as the competitive situation dictates. ²⁰¹
Mediacom	DOCSIS 3.0	In a position to offer services [DOCSIS 3.0] in approximately 50% of its footprint by year end from a network standpoint but will be actively marketing this service to about half of the 2.8m available homes. ²⁰²
Time Warner Cable	DOCSIS 3.0	Remainder of NYC and additional DOCSIS 3.0 markets will be in 2010. ²⁰³
Clearwire	Wireless -- CLEAR™ 4G service: WiMAX	2009: launch 4G service in 10 additional markets; 30m POPs across 25 markets by YE2009. ²⁰⁴ 2010: 80 markets, 120 million subscribers; The company is targeting 120m covered POPs by YE2010. ²⁰⁵
MetroPCS	4G	4G will be deployed in latter half of 2010. ²⁰⁶
Sprint	Dual-Mode 3G/4G	Plans to deploy Sprint 4G service in many markets in 2009, including: Atlanta, Honolulu, Charlotte, Las Vegas, Chicago, Philadelphia, Dallas, Portland, Fort Worth, Seattle. It will continue to add markets in 2010. ²⁰⁷
T-Mobile	Enhanced 3G	Plans to launch HSPA 7.2 technology in conjunction with its initiative to push coverage to 200m POPs by YE2009 and 220m POPs by YE 2010. ²⁰⁸
AT&T	4G	2010: begin LTE trials 2011: expected completion of upgrades; begin deploying LTE. ²⁰⁹

²⁰¹ Seeking Alpha Transcripts, "Knology Inc. Q4 2008 Earnings Call Transcript" *Seeking Alpha*, 2009, <http://seekingalpha.com/article/121605-knology-inc-q4-2008-earnings-call-transcript>.

²⁰² Seeking Alpha Transcripts, "Mediacom Communications Corporation Q2 2009 Earnings Call Transcript;" *Seeking Alpha*, 2009, <http://seekingalpha.com/article/154751-mediacom-communications-corporation-q2-2009-earnings-call-transcript?page=-1>.

²⁰³ K. Bode, "Still Waiting On Time Warner Cable DOCSIS 3.0," *dslreports.com*, 2009, <http://www.dslreports.com/shownews/Still-Waiting-On-Time-Warner-Cable-DOCSIS-30-103220>.

²⁰⁴ Merrill Lynch, "Wireline & Wireless Telecom Services", *Bank of America Merrill Lynch*, 2009

²⁰⁵ Clearwire Media Relations, "Clearwire Transforms Wi-Fi Devices with the CLEAR Spot Personal Hotspot Accessory," *Clearwire Corp*, 2009, <http://newsroom.clearwire.com/phoenix.zhtml?c=214419&p=irol-newsArticle&ID=1271811&highlight>.

²⁰⁶ G. Krakow, "MetroPCS Planning 4G Network," 2009, *thestreet.com* <http://www.thestreet.com/story/10467737/metropcs-planning-4g-network.html>.

²⁰⁷ S. Vinge-Walsh, "Sprint Extends 4G Leadership by Announcing Next U.S. Markets to Experience Sprint 4G," *Sprint*, 2009, http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-newsArticle_newsroom&ID=1269807.

²⁰⁸ Morgan Stanley Research, *Morgan Stanley*, 2009.

²⁰⁹ AT&T Public Relations, "AT&T Sees Significant Rise in Wi-Fi Hotspot Connections during Second Quarter", *AT&T Inc.*, 2009, <http://www.att.com/gen/pressroom?pid=4800&cdvn=news&newsarticleid=26975>.

Verizon	4G	Verizon expects to pass just over 17 million homes with FiOS by the end of 2010 equaling a total of 18 million homes or nearly 70% FiOS coverage. ²¹⁰
OpenRange	4G –WiMAX	Serve 546 rural communities in 17 states. Six million people should be covered when the project is finished (over five years). ²¹¹

Note: Charter and Insight have plans to expand DOCSIS 3.0 service, but have not announced details of their deployment plans

3.2 Status of Internet Backbone

Because “backbone” systems have not been discussed in the previous two sections of this report, the requested analysis of “backbone” in this section requires some background.

An essential component of broadband services, whether wired or wireless, are the so-called backbone networks that are effectively the core “superhighways” of the internet. Backbones are typically multiple optical fibers bundled into cables with the capacity of each fiber measured by optical carrier or “OC”. An OC-3 line is capable of transmitting 155 mbps while an OC-48 can transmit 2.48 gbps. State of the art technology today is OC-768 or 40 gbps per fiber with 100 gbps on the verge of general deployment.

Major backbone capacity providers in the U.S. include AT&T, Cogent, Global Crossing, Level 3, Sprint, and Verizon.²¹²

Cisco Systems²¹³ and TeleGeography²¹⁴ estimate that the U.S. internet backbone will grow at about 40% per year. The University of Minnesota’s MINTS estimates a higher growth rate of 50%-60%.²¹⁵ In addition to growing volumes from wireline broadband customers, wireless traffic is also growing rapidly and is expected to dramatically increase when 4G networks are deployed.

As the following chart illustrates, backbone connections with huge capacities are needed between major cities where the population density is high and business activity is strong.

²¹⁰ Verizon Investor Relations, “Verizon to Discuss Plans to Divest Wireline Businesses in 14 States,” *Verizon Communications Inc.*, 2009, http://investor.verizon.com/news/20090513/20090513_transcript.pdf at 4.

²¹¹ Open Range, “Open Range Communications Secures \$374 Million to Deploy Wireless Broadband Services to 546 Rural Communities,” *Open Range Communications Inc.*, 2009, <http://www.openrangecomm.com/markets.html>.

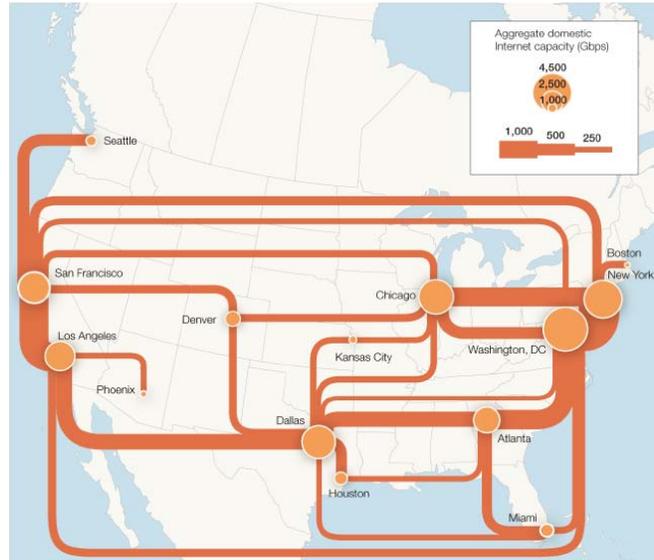
²¹² TeleGeography Research, “Global Internet Geography United States,” *PriMetrica Inc.*, 2009, <http://www.telegeography.com/ee/dm/gig2010/42148.php>.

²¹³ Cisco Systems, “Cisco Visual Networking Index: Forecast and Methodology 2008-2013,” *Cisco Systems Inc.*, 2009, http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-481360_ns827_Networking_Solutions_White_Paper.html.

²¹⁴ TeleGeography Research, “Global Internet Geography United States,” *PriMetrica Inc.*, 2009, <http://www.telegeography.com/ee/dm/gig2010/42148.php>.

²¹⁵ Andrew Odlyzko, “Minnesota Internet Traffic Studies (MINTS),” *University of Minnesota*, 2007, <http://www.dtc.umn.edu/mints/home.php>.

FIGURE 14: MAJOR INTERNET BACKBONE ROUTES IN THE U.S. (>250 GBPS)



Source: TeleGeography Research, 2009

The bandwidth used in the largest 30 intercity connections in the U.S. grew at a compound annual growth rate (CAGR) of 38% during the period from 2002 to 2009, with some routes growing as much as 90%.²¹⁶ There is no reason to doubt that growth will continue and, with the increase of video and other bandwidth-intensive applications, the growth rate of capacity used could increase. Data concerning the highest capacity backbone routes indicates that these critical routes have sufficient capacity at present: the following table indicates that average traffic and peak traffic volumes on major routes are below the amount of available bandwidth:

TABLE 11: 20 HIGHEST CAPACITY U.S. DOMESTIC INTERNET ROUTES. 2007–2009 (GBPS)

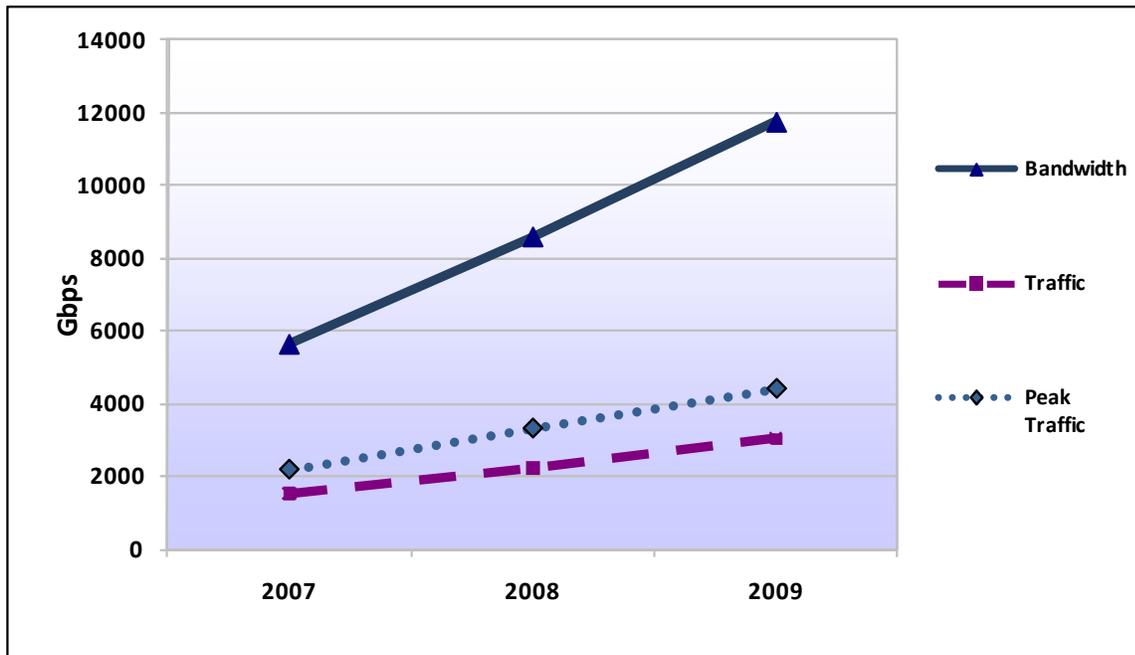
2007			2008			2009		
Band-width	Average Traffic	Peak Traffic	Band-width	Average Traffic	Peak Traffic	Band-width	Average Traffic	Peak Traffic
5,650	1,525	2,182	8,608	2,227	3,308	11,767	3,039	4,393

Source: TeleGeography Research, 2009

As illustrated below, in aggregate, peak traffic is currently (2009) 37% of total available bandwidth on the 20 highest capacity U.S. routes.

²¹⁶ TeleGeography Research, “Global Internet Geography United States,” *PriMetrica Inc.*, 2009, <http://www.telegeography.com/ee/dm/gig2010/42148.php>.

FIGURE 15: 20 HIGHEST CAPACITY U.S. DOMESTIC INTERNET ROUTES. 2007–2009 (GBPS)



Adapted from: TeleGeography Research, 2009

Furthermore, from 2007-2009, according to the research firm, available backbone bandwidth grew at a CAGR of 44%, slightly exceeding the growth rate of traffic (41%) and peak traffic (42%). As summarized below, a review of the upgrade and deployment plans of various backbone operators indicates that additional backbone capacity will be brought on-line during the next few years.

AT&T finished a backbone network upgrade to OC-768 in 2008. That implies a transmission speed of 40 gbps in 80,000 miles of its network infrastructure. The company is testing data transmissions at rates of 100 gbps, which will be the next stage of network upgrade.²¹⁷

Global Crossing operates approximately 18,000 miles of fiber optic internet backbone in North America (including Canada). It provides transfer speeds between 2.5 and 10 gbps.²¹⁸ The company says that it plans to invest most of its capital expenditure into the extension and upgrade of its existing

²¹⁷ AT&T Media Relations, "AT&T Completes Next-Generation IP/MPLS Backbone Network, World's Largest Deployment of 40-Gigabit Connectivity-Company Researchers Continue to Drive Future Network Evolution with Record-Setting 17 Terabit-Per-Second Capacity Test," *AT&T Inc.*, 2008, <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26230>.

²¹⁸ Global Crossing, "Annual Report 2008," *Global Crossing*, 2009, http://files.shareholder.com/downloads/GLBC/735860427x0x286672/6EDF05BF-0783-4433-B21C-5D97DFDD1F85/GLBC_2008_AR.pdf at 21.

network.²¹⁹ The capital expenditures in 2008 were mainly driven by acquisitions of other companies (\$192 million).²²⁰

Level 3 invested \$155 million into network upgrades in the first half of 2009.²²¹ The company plans to focus its capital expenditure on new equipment in the future. Recent upgrades and deployments were made in New York, Seattle, and Tennessee.²²² The company operates 27,000 route miles of cable with its newest deployments operating at 40 gbps.²²³

Qwest is one of the largest backbone operators as well as one of the largest regional telephone companies providing telephone service in much of the West other than California. Its backbone reaches across the U.S. and is available in almost every state. Currently its backbone operates at transmission rates of 40 gbps but the speed will be upgraded to 100 gbps during 2009 and 2010.²²⁴

Verizon currently operates its backbone at 40 gbps and is planning to upgrade to 100 gbps beginning in 2009.²²⁵

XO is currently operating a backbone network of 18,000 miles operating at 10 gbps.²²⁶ It is currently undertaking many enhancement projects including a deployment of 1.6 terabits - capable systems on selected inter-city routes.²²⁷ Recent investment in network upgrades and new deployments totaled \$450 million.²²⁸

From the backbone developments described above, it would be reasonable to conclude that the internet backbone in the U.S. is expanding at a pace that should keep up with expected demand over the next few years, provided that there is no huge and unexpected increase in usage patterns. With 78%

²¹⁹ Global Crossing, "Annual Report 2008," *Global Crossing*, 2009, http://files.shareholder.com/downloads/GLBC/735860427x0x286672/6EDF05BF-0783-4433-B21C-5D97DFDD1F85/GLBC_2008_AR.pdf at. 24.

²²⁰ Ibid.

²²¹ Level 3 Communications Public Relations, "Quarterly Report," *Level 3 Communications LLC.*, 2009, <http://files.shareholder.com/downloads/LVLT/740502237x0xS1104659-09-48275/794323/filing.pdf> at 26.

²²² Level 3 Communications Public Relations, "Level 3 Expands Operations in Upstate New York," *Level 3 Communications LLC.*, 2009, <http://www.level3.com/index.cfm?pageID=491&PR=772>.

²²³ Level 3 Communications Public Relations, "Our Network," *Level 3 Communications LLC.*, 2009, <http://www.level3.com/index.cfm?pageID=242>.

²²⁴ C. A. Tyler, "Qwest Positions its National Network for Fastest-Available Ethernet Technology," *Qwest Communications International Inc.*, 2009, <http://news.qwest.com/QwestNetworkEnhancements>.

²²⁵ Verizon Investor Relations, "Global Network," *Verizon Communications Inc.*, 2009, <http://www.verizonbusiness.com/about/network>.

²²⁶ XO Communications, "Network Details," *XO Communications*, 2009, <http://www.xo.com/about/network/Pages/details.aspx>.

²²⁷ XO Communications, "Annual Report (2008)," *XO Communications*, 2009, http://www.xo.com/SiteCollectionDocuments/about-xo/investor-relations/Annual_Reports/XO_2008_10K.pdf at 3.

²²⁸ XO Communications, "About XO Overview," *XO Communications*, 2009, <http://www.xo.com/about/Pages/overview.aspx>.

of backbone traffic consisting of peer-to-peer connections and video streaming,²²⁹ increasing video traffic should not be an unanticipated development.

Wireless traffic is also likely to place increased demand on the backbones. For example, AT&T has reported explosive growth (nearly 5,000% in the past 3 years) in its wireless data traffic, presumably due to the iPhone²³⁰ and wireless carriers have asked for bids to provide fiber optic connections to 7,500 of 17,000 cell sites in Qwest's operating area.²³¹ On the other hand, wireless traffic will at least partly substitute existing wired traffic rather than being completely additive.

As upgrading backbone facilities requires 6-18 months,²³² the backbone providers should be able to react reasonably quickly to accommodate unexpected demand.

3.3 Status of Broadband Satellite Plans

The future of consumer satellite broadband Internet will be dominated by a new generation of high throughput (HT) satellites that are being built for ViaSat and Hughes Communications. The companies expect to launch these new satellites in the first quarters of 2011 and 2012, respectively. These new satellites are expected to lower the cost per bit of delivering satellite broadband service.²³³

ViaSat expects to offer advertised speeds of 2-10 mbps²³⁴ and have the capacity to serve as many as 2 million homes²³⁵ while Hughes is suggesting that it will offer advertised speeds in the 5-25 mbps range and will presumably be able to serve a similar number of homes. However, the relatively poor broadband performance of the current generation of satellites might suggest that the expectations for the next generation are optimistic until proven otherwise.

²²⁹ See the first chart in this Section 3. See also, G. Kim, "Wireless is Key for Broadband Access Demand and Supply," *Technology Marketing Corporation*, 2009, <http://4g-wirelessevolution.tmcnet.com/wimax/topics/wimax/articles/55281-wireless-key-broadband-access-demand-supply.htm>.

²³⁰ Morgan Stanley Research, "Economy + Internet Trends," *Morgan Stanley*, 2009, http://www.morganstanley.com/institutional/techresearch/pdfs/MS_Economy_Internet_Trends_102009_FINAL.pdf at 57.

²³¹ S. Carew, "Rpt-Update 2-Interview: Qwest 2010 capex flat, fiber as bigger pa," *Reuters*, 2009, <http://www.reuters.com/article/technology-media-telco-SP/idUSN2046085120091021?pageNumber=2&virtualBrandChannel=11604>.

²³² K. Papagiannaki, N. Taft et al., "Long-Term Forecasting of Internet Backbone Traffic," *IEEE Transactions on neural networks*, 2005, <http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=01510713>.

²³³ Hughes Communications, "Conference Call to Discuss the Launch of 100gbps High Throughput Satellite in 2012," *Hughes Communications Inc.*, 2009, http://www.hughes.com/HUGHES/Doc/0/NIJU69S0U56KJ3381689D3KO47/HUGH_Transcript_20090617.pdf at 5.

²³⁴ ViaSat, "Demo of Next Generation Satellite Broadband Service with Highest Speeds Ever at Satellite," *ViaSat Inc.*, 2009, <http://www.viasat.com/news/demo-next-generation-satellite-broadband-service-highest-speeds-ever-satellite-2009>.

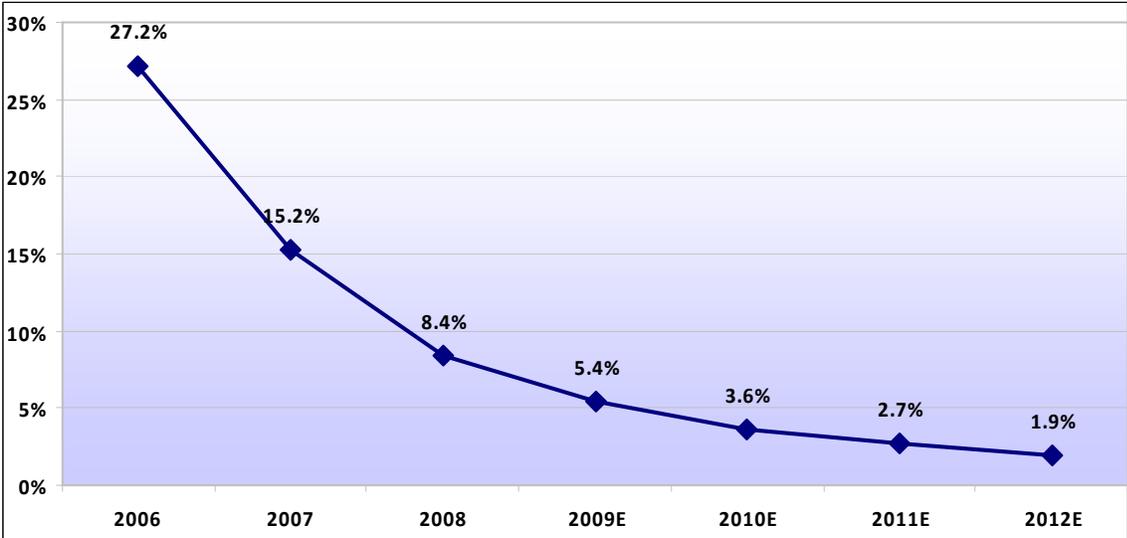
²³⁵ ViaSat, "ViaSat Conference Call to Discuss ViaSat-1 Contract," *ViaSat Inc.*, 2008, http://www.alacra.com/alacra/help/sample_ccbn.pdf.

ViaSat expects to offer the higher download speeds it anticipates from the new satellite at the same pricing tiers it charges for substantially slower speeds on the current satellite: the speed of the lowest priced tier will increase from 0.5 to 2.0 mbps but the price is expected to remain the same, about \$50.

3.4 Summary of Analyst Projections

An important consideration in investment analysts' forecasts has been the consistent slowing in the rate of broadband adoption in the past few years. This is generally attributed to market saturation compounded by overall weak consumer spending. A recent forecast of wired broadband growth predicts that growth will drop to less than 2% by 2012:

FIGURE 16: WIRED BROADBAND SUBSCRIBER GROWTH

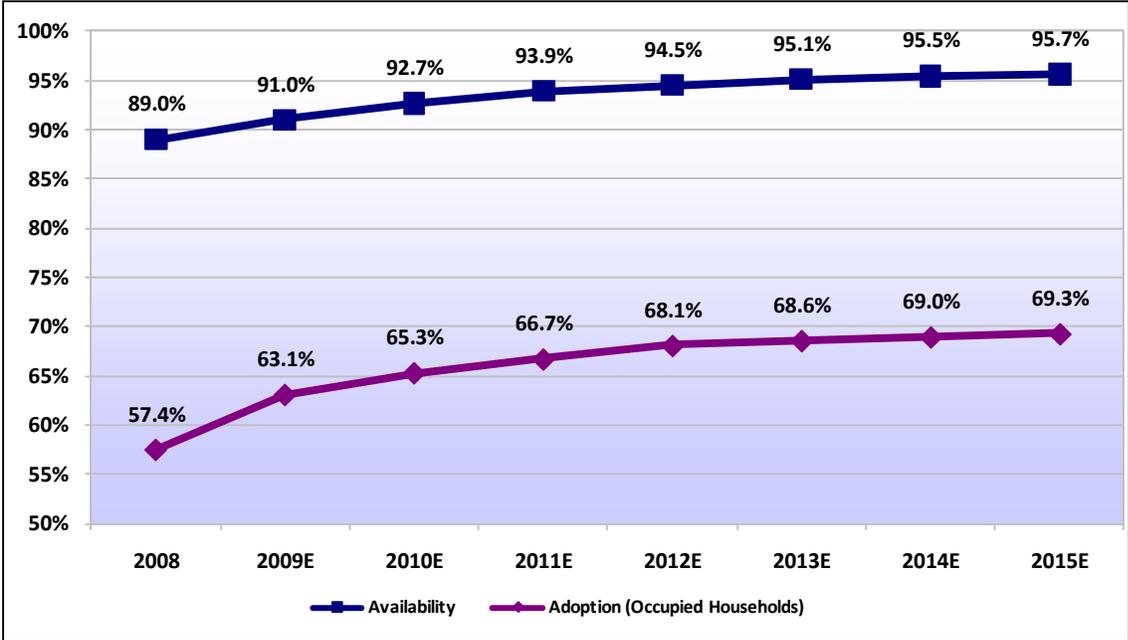


Adapted from UBS Investment Research, *Sorting Through the Digital Transition*, Sept. 3, 2009 at 6.

Overall Broadband Availability and Adoption

The next chart averages the expectations of a number of investment analysts' forecasts and indicates that the analysts expect that wired broadband internet access availability will plateau and reach about 95% of homes in the United States by 2015 while more than 69% of households will subscribe by 2015.

FIGURE 17: WIRELINE BROADBAND AVAILABILITY AND ADOPTION (IN PERCENTAGE OF U.S. HOUSEHOLDS)



Source: Average of analysts’ data provided to CITI.²³⁶

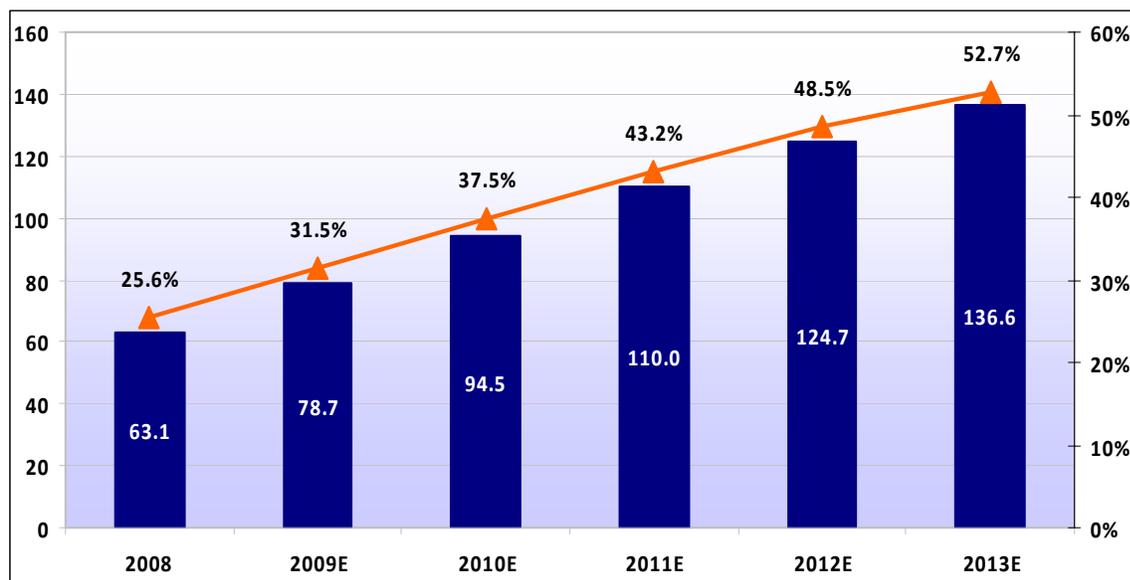
Because wireless broadband is much lower on the growth curve than wired broadband, analysts expect much stronger growth for wireless broadband over the next five years, with continued strong adoption of 3G wireless broadband services. A fast initial ramp-up adoption of 4G is also expected as it becomes available. As a result, as reflected in the next chart, the average of analysts’ expectations is that 53% of the U.S. population over the age of 14²³⁷ will utilize a 3G or 4G wireless broadband service by the end of 2013.²³⁸ Overall, the total number of U.S. users of mobile broadband services will grow from 78.7 million in 2009 to 136.6 million in 2013 (about a 74% increase) and wireless broadband revenues are expected to grow by about 65% from \$13.9 billion to \$22.6 billion in the timeframe.

²³⁶ The number of U.S. Households is based on the most current data from the U.S. Census Bureau. In 2007, there were 112,377,977 households. See: U.S. Census Bureau, America’s Families and Living Arrangements: 2007, September, 2009. The number of households from 2007 was grown at a rate of approximately 1.00949%. The CAGR is an average of analyst forecasts provided to CITI.

²³⁷ Analysts forecast the number of wireless broadband subscribers. We then assumed that persons under the age of 14 would generally not be broadband subscribers.

²³⁸ Short Message Service users are not considered broadband users: while both broadband and SMS are counted as “data” revenue, SMS does not require the high transmission rates that characterize “broadband.”

FIGURE 18: WIRELESS BROADBAND PENETRATION (IN MILLIONS OF USERS AND PENETRATION AS PERCENTAGE OF U.S. POPULATION AGED 14 AND OLDER)



Source: Average of analyst data provided to CITI, Jupiter U.S. Wireless Data Access Forecast 2008-2013, and population from U.S. Census.²³⁹

Note: Users include cell phones and a small number of laptop wireless cards but excludes SMS.

Wireless and Wired Interplay: Cutting the Cord?

Many individuals who utilize a wireline broadband service at home will also subscribe to a wireless broadband service for internet access away from the home or office. It is also likely that some people will utilize wireless broadband as their only means of internet access at home or away from home, just as a growing number of individuals have “cut the cord” and only have a mobile device for voice telephone service. One investment firm believes that it has observed “the early stages of wireless displacement” of slow speed wired broadband services by wireless services that provide comparably low speeds.²⁴⁰

The question, of course, is whether wireless broadband might displace wired broadband to the degree that wireless continues to significantly displace fixed voice telephone lines? Some analysts believe that wireless broadband is likely to be more complementary than a significant substitute for wired broadband since wireless will not match wired speeds in most cases. These analysts expect wireless substitution to have a relatively minor impact on wired broadband adoption for the following reasons:

²³⁹ See U.S. Census population forecast for “U.S. population aged 14 and older” at <http://www.census.gov/population/www/projections/downloadablefiles.html>

²⁴⁰ Morgan Stanley Research, “Telecom Services 2Q Trend Tracker,” *Morgan Stanley*, 2009, at 37. However, this firm estimates that only 5% of broadband households will be wireless-only within the next five years. Morgan Stanley Research, U.S. Cable, Satellite Telecom: 3Q09/’09/’10 Outlook, Oct. 21, 2009, slide 17.

“From a consumer perspective, important differences between wireless substitution in voice and data:

- (1) Wireless speeds may not become a perfect substitute for wired, considering (a) rapidly growing usage needs (+360% per-user growth over 5 yrs) and (b) the fact that wireline networks will soon operate at 50 – 100 mbps
- (2) People most willing to pay for a wireless data plan are likely heavy internet users, a group unlikely to cut the cord
- (3) Propagation issues may limit indoor wireless quality
- (4) Multi-user HHs likely to find better wireline economics

We expect wireless to be largely complementary, with wireless substitution in broadband to reach only ~5% of households within 5 yrs.”²⁴¹

ARPU and Pricing Trends

Telcos have an average broadband ARPU of approximately \$31 compared to cable MSOs’ broadband ARPU of over \$40, with the difference generally attributed to cable’s greater proportion of higher-speed service.²⁴² Some analysts expect cable broadband prices to drift lower, perhaps to the \$35 range by 2012.²⁴³ Other analysts expect telco and cable pricing to remain relatively flat, with any price reductions being offset by customers migrating to higher speed and higher price tiers so that ARPU will remain relatively unchanged. One analyst wrote,

“We believe [wired] data ARPU will show longer-term increases of about 1% in the aggregate, reflecting a complex balance by which companies tier data plans in order to expand the market as much as possible, but still create a large enough difference in tiers to force higher-end users on to the maximum bandwidth plans.”²⁴⁴

²⁴¹ Morgan Stanley Research, “U.S. Cable, Satellite, Telecom 3Q09 Outlook”, *Morgan Stanley*, 2009, at 17.

Another analyst agrees with this outlook, saying:

“Similar to substitution in the wireless voice market, technology on wireless data will evolve to make it more of a competitive threat to wired broadband. We believe that speed differentials will mean that the degree of substitution that has happened in voice will be difficult to replicate in broadband. We forecast about 16 million laptop cards in the market by 2014, with a large portion of these complementing wired connections, as opposed to replacing them.”

Goldman Sachs Global Investment Research, “Americas: Telecommunications,” *The Goldman Sachs Group*, 2009, at 17.

²⁴² UBS Investment Research, “Telecommunications and Pay TV,” *UBS AG*, 2009, at 7.

²⁴³ Morgan Stanley Research, “Cable/Satellite Industry View: Cautious Defense Not the Best Offense in ’09,” *Morgan Stanley*, 2009, at 12.

²⁴⁴ Goldman Sachs Global Investment Research, “Americas: Telecommunications,” *The Goldman Sachs Group*, 2009, at 16.

Another investment analyst, who had previously forecast declining wired broadband prices re-evaluated the situation:

“But we are now more bullish on broadband pricing:

- 2010 should represent an inflection point with a turnaround in the price deflation we have seen
- Exponential growth in per-subscriber data usage ensures rising value delivered to consumer
- Stable duopolies structure should ensure rational pricing, and we believe that 4G wireless is unlikely to disrupt wireline market in medium-term”²⁴⁵

These varied expectations are reflected in the following tables which forecasts rising ARPU at two major cable companies and slowly falling ARPU at a third, Cablevision, which is concentrated in the New York City area where it faces strong competition from Verizon’s FiOS service as well as RCN, a cable “overbuilder” and a number of other competitive service providers. It is also worth noting that Cablevision has driven industry-high penetration of 52%²⁴⁶ in its metro New York service areas with prices that generate an ARPU below other operators’, implying consumer price sensitivity.

TABLE 12: CABLE COMPANY BROADBAND ARPU

Company	2009E	2010E	2011E	2012E
Time Warner	\$41.54	\$42.03	\$42.56	\$43.05
Comcast	\$42.04	\$42.18	\$42.41	\$42.71
Cablevision	\$38.06	\$37.64	\$37.34	\$37.14

Source: Goldman Sachs Investment Research, Americas: Communication Services, Sept. 8, 2009.

Broadband ARPU for the major telephone companies reflects their relative mixes of low speed and high speed services, with ARPU stable and higher at Verizon due to a higher proportion of higher revenue, higher speed FTTH services.

TABLE 13: TELCO COMPANY BROADBAND ARPU

Company	2009E	2010E	2011E	2012E
AT&T	\$25.60	\$25.40	\$25.20	\$24.90
Verizon	\$33.30	\$33.10	\$33.10	\$33.00
Qwest	\$32.50	\$31.80	\$31.20	\$30.50

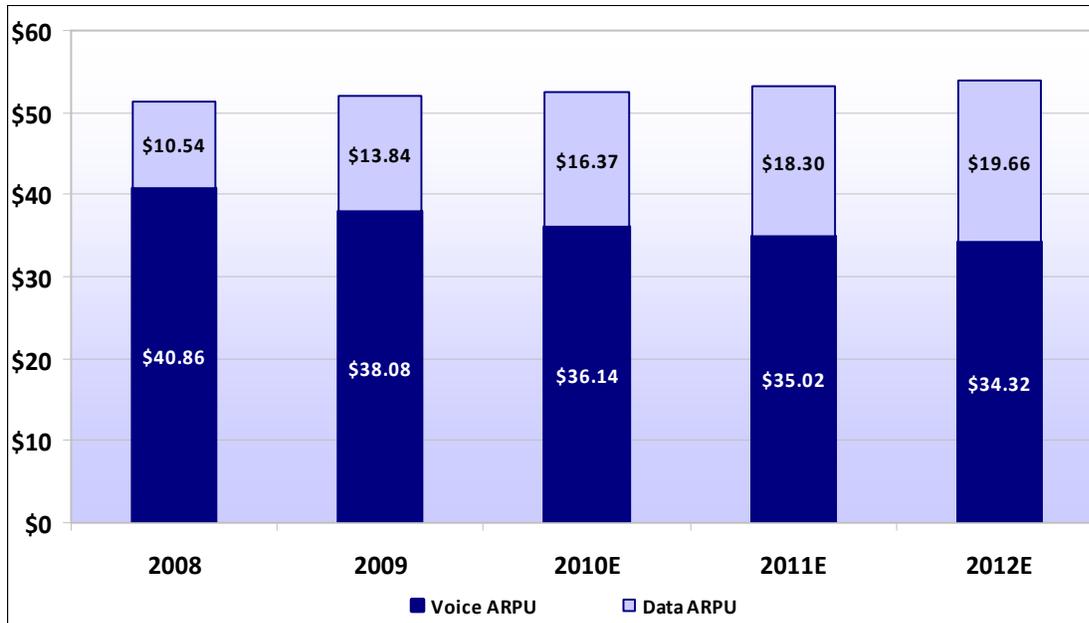
Source: UBS Research, Consumer Model

²⁴⁵ Morgan Stanley Research, “U.S. Cable, Satellite, Telecom 3Q09 Outlook,” *Morgan Stanley*, 2009, at 14.

²⁴⁶ See Table 7.

Wireless: Analysts expect broadband data service to become an increasing proportion of wireless carriers' overall ARPU, as wireless broadband becomes increasingly important to users and can (service providers hope) be priced on a more usage-sensitive basis than the flat rate "bucket plans" that apply to voice services. The following graph highlights analysts' expectation that total wireless ARPU will remain relatively flat in the low \$50's per month, with data ARPU rising to 36.4% from 20.5% of the total ARPU in five years.

FIGURE 19: AVERAGE VOICE AND DATA ARPUS



Published by: Goldman Sachs Global Investment Research, Americas: Communications Services, Sept. 8, 2009 at 23.

As one analyst noted, the subsidization by service providers of relatively expensive “smartphone” handset devices allows the service provider to increase ARPU in the long-run by unleashing the high demand for mobile broadband services:

“With postpaid subscriber growth stalling, carriers refocus on making the average consumer spend more. For most, the uptake is centered on wireless data, and driving adoption of texting, internet browsing, application downloading and beyond. But, the entry point to this is smartphone deployment, penetrating the mass markets with devices that unlock the data opportunity. Carriers have aggressively subsidized these phones, in exchange for two-year contracts. We believe the subsidy trend remains upwards, which has had an impact on margins, but bolsters the longer-term ARPU opportunity.”²⁴⁷

Capital Expenditures

The following table, the first two years of which are provided in Table 4 (Section 1) above, forecasts overall capex for the leading telecom, cable, and wireless companies that are followed by investment analysts, and as such, they represent less than 100% of future capital expenditures in the sectors.

TABLE 14: TOTAL CAPITAL EXPENDITURES FOR MAJOR SERVICE PROVIDERS (\$ BILLION)

	2008	2009E	2010E	2011E	2012E	2013E	2014E	2015E
Cable	13,148	11,817	12,109	12,237	12,476	12,818	12,969	12,986
Telco	26,283	21,060	19,353	17,458	16,790	16,462	16,248	16,143
Wireless	19,520	18,597	17,990	17,449	17,251	17,140	17,070	17,036
Total	58,951	51,474	49,452	47,144	46,517	46,420	46,287	46,166

Source: Average of analyst data provided to CITI, *Telcos:* AT&T (excluding wireless), Verizon (excluding wireless), Qwest; *Cable MSOs:* Comcast, Time Warner, Cox, Cablevision, Charter, Mediacom, and Insight; *Wireless:* AT&T, Verizon, Sprint, T-Mobile.

Note: Investment analysts provide forecasts for telco and wireless up to 2011. Beyond that year, the capex for telco and wireless companies is estimated using an averaged growth rate.²⁴⁸

This table shows a predicted sharp decrease in total capital expenditures from 2008 to 2011 and smaller declines in the following years. The steepest decline is for telcos, and a smaller decline for cable and wireless companies. After 2011, analysts assume that capex will remain relatively constant.

The analysts’ forecasts of very slowly declining (relatively flat) capex after 2011 may be overstated for a number of reasons. For example, the slow decline in capital is inconsistent with the notion that the major parts of construction programs for telcos and cable companies should be largely completed by the

²⁴⁷ Goldman Sachs Global Investment Research, “America: Telecommunications,” *The Goldman Sachs Group*, 2009, at 21.

²⁴⁸ A weighted average is used, giving 60% weight to the last year’s growth rate, and 20% weight to each of the two earlier years’ growth rates.

end of 2011.²⁴⁹ Assuming that there is no new “breakthrough” technology that makes existing technologies obsolete and uncompetitive, lower capital expenses for telco and cable companies would be expected. Lower capital expenses would also be expected if DSL can continue as a viable broadband technology so that telcos using DSL can postpone deployment of FTTH.

There is support for the idea that improvements in DSL technology will keep pace with customer demand for faster transmission speeds, meaning that telcos currently utilizing a hybrid of FTTN with DSL will not be forced to abandon this architecture for a full-fiber FTTH. Two recent developments have extended the life of this FTTN-DSL architecture and pushed back the time when operators would need to replace the copper twisted pairs with fiber optics to each customer’s premises. First, the steep and steady losses of basic telephone line customers have made more twisted pairs available for DSL services. Second, new technologies that allow “bonding” the twisted pairs permit much higher transmission speeds, perhaps as high as 50 mbps.

Broadband Capex

We are now ready to determine the capital investment that should be attributed to broadband. To obtain an estimate for the US broadband investment, we had to make several adjustments.

First, the analysts’ capex numbers had to be somewhat inflated because they did not include all of the industry but only the major companies, typically accounting for about 80-90% of a sector.²⁵⁰

Second, we allocated a certain portion of industry capex to broadband as described in the footnotes in the following chart.

²⁴⁹ Therefore, analysts’ assumptions for telco and cable companies’ capital expenditures in the out years (2012-2015) may be overstated.

²⁵⁰ For telcos and wireless companies we used the companies’ share of market by subscriber and for cable companies, we used the share by revenue. The large telcos (AT&T, Verizon and Qwest) accounted for 81.4% of subscribers, so the total capex was increased by 18.6% to account for the smaller telcos’ capital. Similarly, the 82.4% aggregate share for the seven cable companies (Comcast, Time Warner, Cox, Cablevision, Charter, Mediacom, and Insight) resulted in a 17.6% increase to account for small cable companies’ investments. For wireless, the four wireless providers (AT&T, Verizon, Sprint and T-Mobile) and the 94.3% share for resulted in a 5.7% adjustment for small companies. See: Eli M. Noam, *Media Ownership and Concentration in America*, at 72, 236, 247, 2009.

TABLE 15: TOTAL CAPEX AND BROADBAND CAPEX BY SECTOR

BROADBAND CAPEX (in millions)	2008	2009E	2010E	2011E	2012E	2013E	2014E	2015E
Major Telco Wireline Capex	26,283	21,060	19,353	17,458	16,755	16,420	16,203	16,095
Total Telco Capex	32,289	25,872	23,775	21,447	20,583	20,172	19,905	19,773
% Broadband ²⁵¹	48%	52%	54%	58%	62%	62%	62%	62%
Telco Wireline Broadband	15,499	13,454	12,839	12,439	12,762	12,506	12,341	12,259
Major Cable Capex	13,148	11,817	12,109	12,237	12,476	12,818	12,969	12,986
Total Cable Capex	15,956	14,342	14,695	14,851	15,140	15,556	15,739	15,760
% Broadband ^{252 253}	30.0%	30.0%	30.0%	25.0% ²⁵³	25.0%	20.0% ²⁵³	20.0%	20.0%
Cable Broadband	4,787	4,302	4,408	3,713	3,785	3,111	3,148	3,152
Major Wireless Capex	19,520	18,597	17,990	17,449	17,251	17,140	17,070	17,036
Total Wireless Capex	20,700	19,721	19,077	18,504	18,294	18,176	18,102	18,066
%Broadband ²⁵⁴	50.0%	60.0%	64.0%	68.0%	73.0%	78.0%	81.0%	85.0%
Wireless Broadband	10,350	11,833	12,210	12,583	13,354	14,177	14,663	15,356
Satellite Broadband	200	200	200	300	400	400	200	300
WISP Broadband²⁵⁵	199	219	241	265	292	321	353	388
TOTAL CAPEX	69,344	60,354	57,989	55,367	54,709	54,624	54,300	54,287
TOTAL BROADBAND CAPEX	31,035	30,008	29,898	29,300	30,593	30,516	30,705	31,455

Source: Average of analyst data provided to CITI, with adjustments as described in the accompanying text. *Telco:* AT&T (excluding wireless), Verizon (excluding wireless), Qwest; *Cable:* Comcast, Time Warner, Cox, Cablevision, Charter, Mediacom, and Insight; *Wireless:* AT&T, Verizon, Sprint, T-Mobile.

²⁵¹ Based on Skyline' Marketing data from 2008-2011. Skyline Marketing Group, Capex Report: 2008 Annual Report at exhibit 14; 2012 – 2015 estimated.

²⁵² Based on costs to upgrade the networks to DOCSIS 3.0 in 2009 at \$100 cost per home passed, which includes the cost of DOCSIS 3.0 cable modems, estimate by Pike & Fisher. See the GigaOM Network: <http://gigaom.com/2009/04/30/docsis-30-coming-soon-to-an-isp-near-you/>

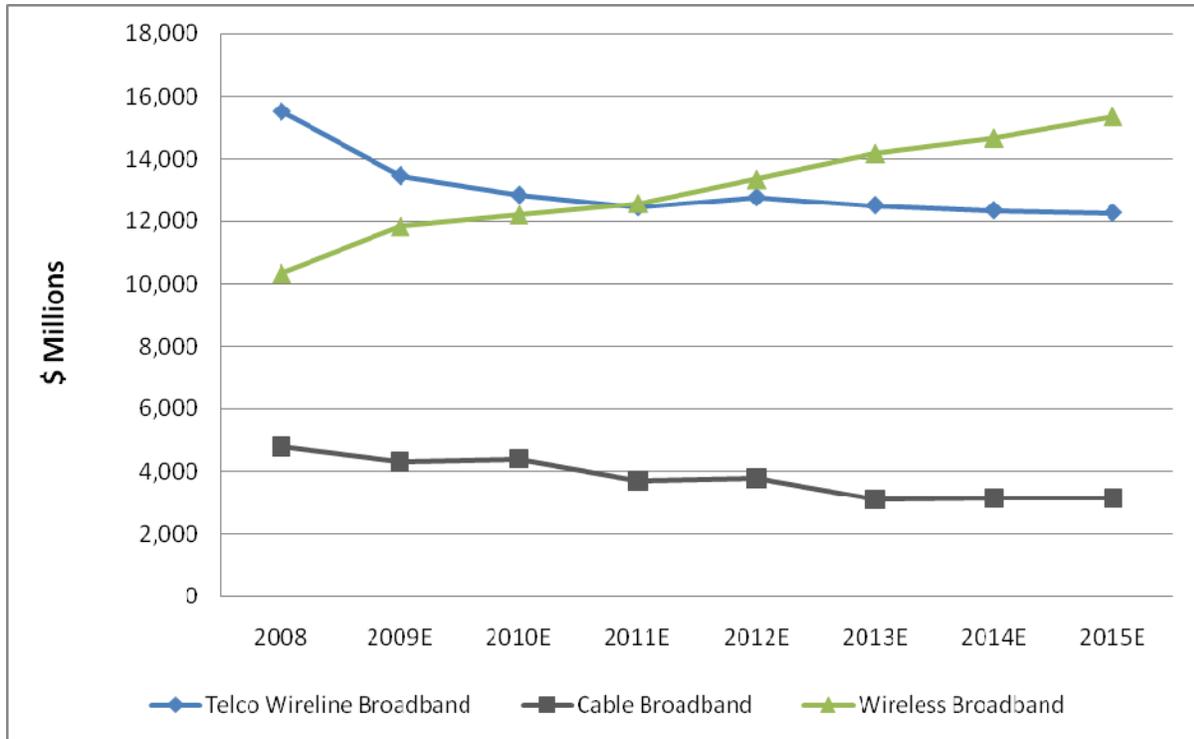
²⁵³ Broadband cable capex has been lowered to 25% and then to 20% to reflect what we think are reasonable bottom line numbers as we believe that the investment analysts' overall capex projected numbers may be too high, as explained in the text.

²⁵⁴ The allocation of wireless broadband capex is estimated at 60% in 2009. This is based on AT&T's statement that "...approximately two-thirds of AT&T's 2009 investment will extend and enhance the company's wireless and wired broadband networks" (see note 105). The increase in subsequent years assumes that 4G investment is for "broadband."

²⁵⁵ This estimate is based on \$570,000 per system, which the average dollar value of the grants from the Department of Agriculture's RUS 2008 Community Connect Broadband Grants for wireless internet service providers. The number of new systems is assumed to be 10% of the 350 WISPA members, increased 10% per year.

The following graph illustrates the analysts' forecasts, as adjusted from Table 15, reflecting the industry investment rationale described above.

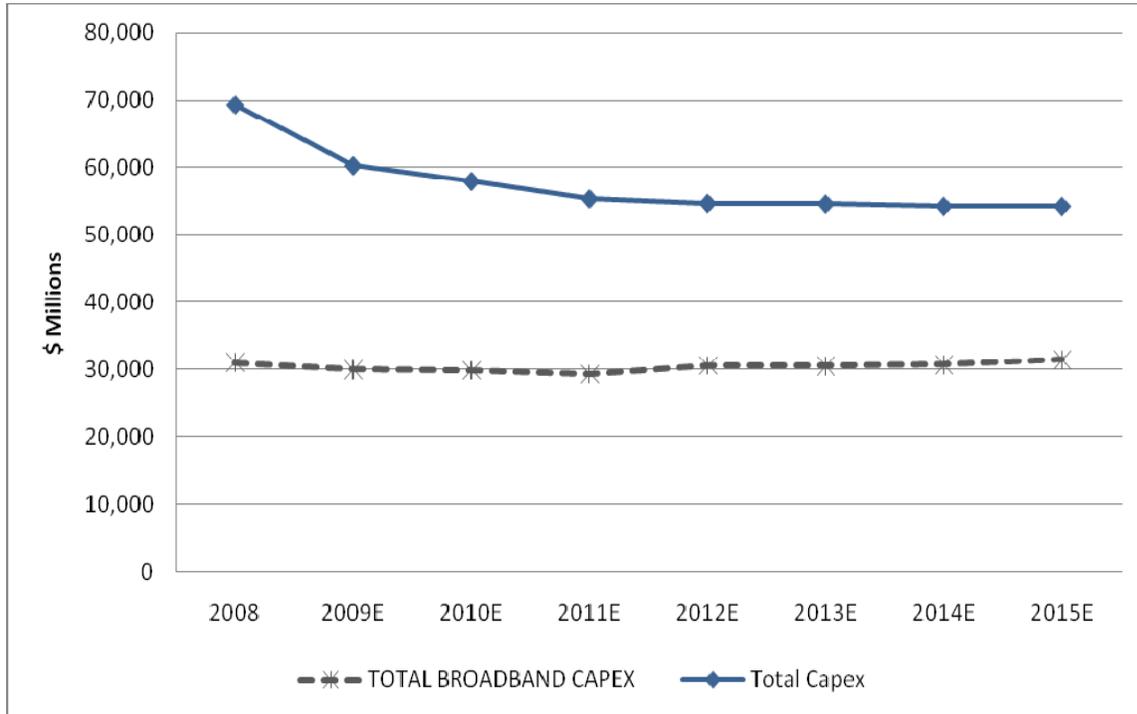
FIGURE 20: INDUSTRY SECTORS' BROADBAND CAPEX



Source: Average of analyst data provided to CITI, *Telco*: AT&T (excluding wireless), Verizon (excluding wireless), Qwest; *Cable*: Comcast, Time Warner, Cox, Cablevision, Charter, Mediacom, and Insight; *Wireless*: AT&T, Verizon, Sprint, T-Mobile.

The next graph illustrates the total industry and total broadband investment based on Table 15.

FIGURE 21: TOTAL CAPEX AND TOTAL BROADBAND CAPEX



Source: Average of analyst data provided to CITI, and estimates. *Telco:* AT&T (excluding wireless), Verizon (excluding wireless), Qwest; *Cable:* Comcast, Time Warner, Cox, Cablevision, Charter, Mediacom, and Insight; *Wireless:* AT&T, Verizon, Sprint, T-Mobile.

There are several observations that can be drawn from Table 15 and the two graphs above.

1. The analysts’ assumptions as reflected in the relative flatness of total capex and total broadband capex from 2011 do not take into account the cyclical nature of network deployments. It may well be that the years 2011-2015 will be the low points in the current cycle since most of the major upgrades should be completed in the 2009-2010 timeframe, particularly in the wireline sector.
2. Wireless broadband will account for the largest share of broadband capex in the future.
3. Cable capex, in contrast, will be intermediate and constant, and its overall share in broadband investments will be declining in the next 5 years.
4. Telco wireline capex will decline as major construction programs end, assuming that other large telcos do not turn to major FTTH upgrades.
5. Overall, broadband capex is high, at about \$30 billion per year, which is about \$100 per capita, or \$300 per household. Over the six years 2010-2015, this will account for \$182 billion of additional investment. Adding previous investments in broadband over the past five years, and

also including the payments for spectrum licenses, would suggest that network operators will spend several hundreds of billions of dollars for broadband infrastructure in a ten year period. Add to that the user segment, where households and organizations have also invested in higher powered computers and modems, and WiFi routers,²⁵⁶ we can conclude that as a society, we have spent or are about to spend well over a trillion dollars in a decade on broadband.

6. The future investments trend is relatively flat, suggesting that the new infrastructure will not be the main area of growth in terms of investments. Rather, new investment will be driven on the provider side by increasing the speed and capacity of the existing infrastructure and on the consumer side by substantial investment in edge segments, applications, and content that are empowered by broadband.

3.5 Observations (or “Lessons Learned”) about the Data

- There may be more broadband investment and deployment and more adoption than the conventional wisdom and investment analysts estimate, particularly in rural areas where the major problems exist. This is because small “Tier 3” telephone companies, municipal networks, small rural cable companies and WISPs generally don’t report or publicize their broadband deployment and adoption data and investment analysts do not cover these companies. As noted in this report, there are 2 million WISP customers, 2.9 million telephone co-op broadband customers, and 150,000 municipal FTTH customers (a total of about 5 million customers from those sectors), nearly all of whom are in rural areas and they may not have been counted in various adoption estimates. The “broadband mapping” program being undertaken as part of the overall broadband stimulus program will count rural broadband users and non-users more accurately.
- Determination of broadband investment and deployment plans can be challenging for several reasons. While much of the data from various sources is broadly consistent, some of the key factors and variables are inconsistent and can affect the current assessments as well as forecasts. For example, a key factor in measuring and forecasting wired broadband is the number of U.S. homes and the assumed growth rates of those factors: “all homes” may be an appropriate metric for determining broadband coverage but “occupied homes” may be more appropriate for determining “adoption.” Overlap among homes passed between broadband service providers is a further complication.
- Service providers’ claims for broadband speeds should be taken with great skepticism since the actual speed obtained by consumers is generally dependent on a number of variables so that the

²⁵⁶ This estimate is based on 70 million personal desktop and portable computer shipments over a ten year period, and an average price of \$800 per computer during that time. See: TMCnet, “IDC Reports PC Market Slowdown for 2009,” Dec. 2008, <http://it.tmcnet.com/topics/it/articles/46872-idc-reports-pc-market-slowdown-2009.htm> and USA Today, “PC prices should stay low even with the release of Windows 7,” Oct. 2009, http://www.usatoday.com/tech/news/2009-10-12-pc-prices-remain-low_N.htm

claimed speed is likely to be achieved in the rare instances when all the variables are most favorable. Because service providers are engaged in a “speed competition” rather than price competition, they have an incentive to make optimistic claims for broadband speeds.

- Broadband deployments in terms of household penetrations are at the end stage of the normal “S” shaped growth curve: economically sustainable deployments are largely in place and will be completed within the next 3-5 years when availability reaches 95% of households. Most new investment will be spent on increasing broadband capacity and speed in currently served areas.
- Additional deployment of wired broadband infrastructure to remaining unserved areas will be difficult and expensive. Subsidies or governmental policy changes might improve the economic attractiveness of deploying wired broadband in these areas. Satellite or terrestrial wireless may be able to fill the gap, providing broadband to most of the remaining unserved households although at slower transmission rates than will be available to most homes through wired broadband services. The higher price of satellite service poses problems that might require a government mechanism of support if the goal is to make the cost of satellite service reasonably comparable to terrestrial services for low income households.
- Broadband adoption is at a lower point on the same “S” shaped growth curve than deployments so there is a greater opportunity for additional adoption. Broadband adoption is likely to exhibit high price elasticity but service providers seem reluctant to compete purely on price and instead prefer to compete on such non-price factors as “speed” which can lead to higher ARPUs but lower adoptions.
- The growth of online video usage represents the most significant challenge (and opportunity) to broadband service providers. Much of the new investment in broadband facilities is related to meeting video-induced demand.
- Telecommunications infrastructure industries tend to be concentrated due to economies of scale. Broadband service providers are no different: there are likely to be only a few broadband companies in most markets and greater competition purely at the infrastructure level seems unlikely, while more concentration is possible.