

Whitepaper

Meeting the Growing Demand for Broadband

Executive Summary

Global IP traffic is expected to quadruple by 2014. **We're at a significant moment in the evolution of broadband.** The rise of the connected consumer has sparked an explosion in mobile devices like smartphones and tablets, as well as connected appliances and devices in the home, from televisions to smart meters. Consumers are rapidly changing the way they consume media and this new media landscape requires faster broadband connections at home and on the road. What does all this mean for broadband service providers?

This whitepaper explores the key trends in broadband today, including traffic trends, connected devices, mobile broadband, and over the top (OTT) content. In addition, the paper discusses the implications of increased traffic on broadband service providers, particularly the unique challenges and opportunities facing carriers in the increasingly connected world.

Demand for High Speed Internet

Global economic downturn or not, demand for high speed Internet has been growing. According to Cisco's 2010 report, "Cisco Visual Networking Index (VNI) Forecast, 2009-2014," global IP traffic will quadruple by 2014 and is on pace to exceed 767 exabytes (or three-quarters of a zettabyte) by 2014. Putting that in perspective, Cisco wrote that

the average monthly traffic in 2014 will be equivalent to 32 million people continuously streaming Avatar in 3D for the entire month.



Figure 1 shows Cisco's forecasted consumer Internet traffic from 2009 to 2014. Overall, consumer Internet traffic will grow at a compound annual growth rate (CAGR) of 36 percent during this period.

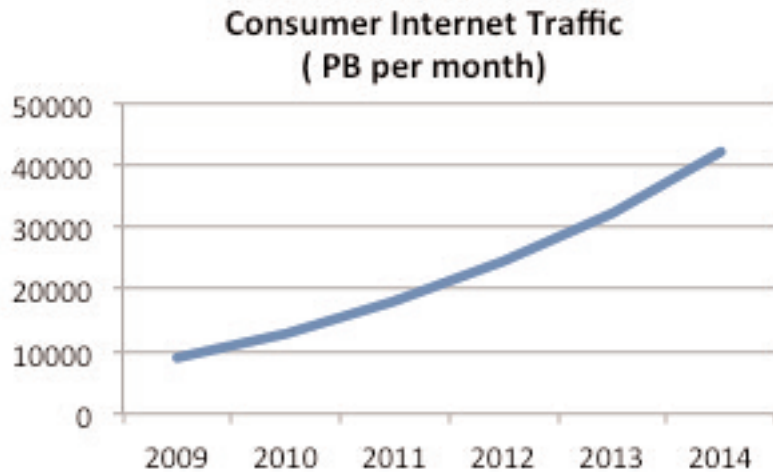


Figure 1

The growing demand for broadband will continue to be driven by a combination of consumer technology trends, including:

- Rise of connected devices in the home
- Explosion of over-the-top (OTT) Internet video
- Internet Everywhere: Growth of mobile broadband

Trend 1: Rise of Connected Devices in the Home

Worldwide, people are increasingly connecting to the Internet through an assortment of devices including computers, phones, game consoles, set top boxes, televisions, and tablets. The growing popularity of these Internet-enabled devices is changing how consumers engage with media. We've entered a new era of the 'Connected Consumer'.

By connecting the television to the Internet, consumers can access a wide range of premium video content from catch-up TV content to on-demand movies. As such, the television transforms into a multi-function online entertainment and communication platform.

In their report *Connected Living Room: Web-enabled TVs and Blu-ray Players*, research firm Parks Associates forecasts that **worldwide sales of Internet-connectable HDTVs, Blu-ray players, game consoles, and digital video players** such as Roku and Apple TV **will QUADRUPLE between 2010 and 2015**. Sales of Internet-enabled TV devices will reach nearly 350 million units by 2015.

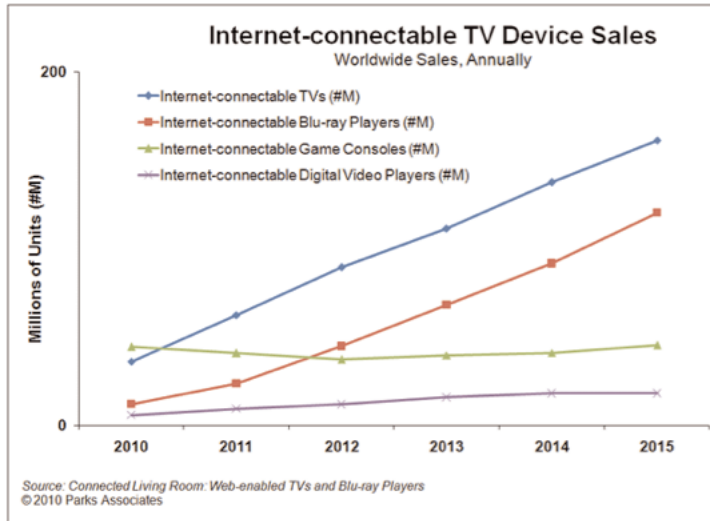


Figure 2

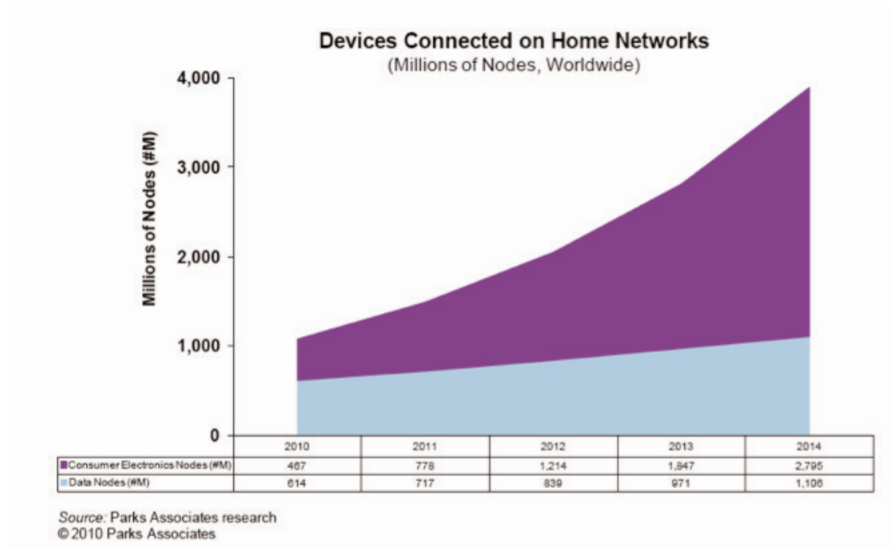


Figure 3

According to TDG Research, 74 percent of new home network buyers rank 'Connecting the TV to the Internet' as an important home network application. This need for connectivity is driving CE manufacturers to enable their products with Wi-Fi technology.

According to InStat, "the next five years will see an increase in the number of Wi-Fi enabled devices, from over 550 million in 2009 to nearly 1.7 billion in 2015."

This explosion of Internet-enabled devices is fueling demand for increased Internet bandwidth. Consumers will continue to look for faster broadband speeds from carriers in order to support the multitude of applications, including multiple HD video streams, data, and voice.

Trend 2: Explosion of Over-the-Top (OTT) Internet Video

As the Internet now reaches set-top boxes, televisions and gaming consoles, consumers are rushing to embrace alternative video services, such as Google, Netflix, Pandora, AppleTV, Hulu. These over the top (OTT) video services let consumers enhance or break free from traditional broadcast services. And data shows that **video is indeed the killer app for the Internet**. For example, 1 million Apple TVs sold in Q4 2010 and Netflix has over 16.9 million subscribers, 66% stream video.

According to Cisco’s 2010 VNI Forecast , Internet video will approach 40 percent of consumer Internet traffic by the end of 2010 (not including the amount of video exchanged through P2P file sharing). In fact, the combination of all forms of **video will exceed 90 percent of all global consumer Internet traffic by 2014**, and nearly half of this will be high-definition video.

As shown in Figure 4, Internet video to the television display will grow from just over 0.1 exabyte a month in 2009 to over 4 exabytes a month in 2014, representing a compound annual growth rate (CAGR) of 107 percent during this period.

Consumer Internet Video to TV, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Category (PB per Month)							
Gaming Consoles Streaming Video	47	112	277	488	776	1,063	86%
Internet-Enabled TVs	1	5	27	108	316	686	285%
Internet-Enabled non-SP STBs	3	10	25	49	88	141	110%
Internet-Enabled SP STBs	47	118	343	799	1,417	2,062	113%
PC-TV Connections	5	11	24	40	61	84	73%
Placeshifting—Standalone	3	7	15	18	28	40	67%
By Geography (PB per Month)							
North America	54	128	365	749	1,288	1,833	103%
Western Europe	29	79	190	378	672	1,010	103%
Asia Pacific	11	25	77	208	423	739	133%
Japan	11	26	65	128	209	303	93%
Latin America	0	1	4	12	32	76	177%
Central Eastern Europe	1	3	9	24	54	101	152%
Middle East and Africa	0	1	2	4	8	13	107%
Total (PB per Month)							
Consumer Video to TV	107	263	711	1,502	2,686	4,075	107%

Source: Cisco VNI, 2010

Figure 4

Access to premium on-demand video via the Internet is already leading to the demise of the traditional brick-and-mortar video rental store. And it's not just on demand content. **Worldwide, roughly 150 million unique viewers watch live video streams over the Internet each month.** And this viewership is projected to more than double by 2014, hitting 321 million monthly viewers.

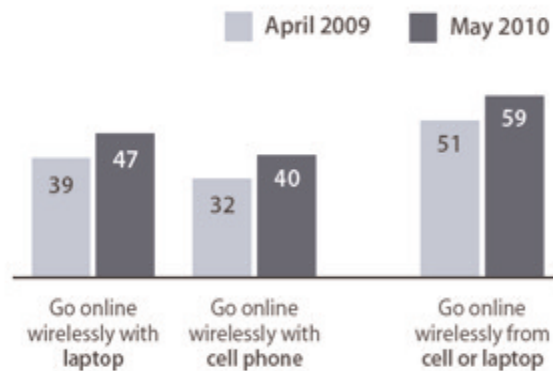
The rise in OTT content will drive cable broadcasters and service providers to blend OTT content with their services and work with online video publishers, DRM, and adaptive streaming companies. The pressure on the cable industry to find new models is strong, particularly, as a Rasmussen Reports survey found that 72% of adults who go online at least once a week say the Internet is a better value for the dollar than cable TV.

Trend 3: Internet Everywhere: Growth of Mobile Broadband

Within a short time, the Internet has permanently transformed how we communicate, find information, connect with friends, shop, and more. And a new class of devices enable us to shed the wires of the desktop computer for the convenience of anywhere/anytime mobility. More and more users are turning to smart phones, tablets, laptops, and other mobile devices to access their social networks, online games, video, information, and more. According to a Pew Research Center survey, six in ten Americans went online wirelessly using a laptop or cell phone in 2010, compared with 51% of Americans in 2009.

Wireless internet use, 2009-2010

The % of all adults who do the following



Source: Pew Research Center's Internet & American Life Project, April 29-May 30, 2010 Tracking Survey. N=2,252 adults 18 and older. Cell phone wireless users include those who use email on a cell phone; use the internet on a cell phone; or use instant messaging on a cell phone.

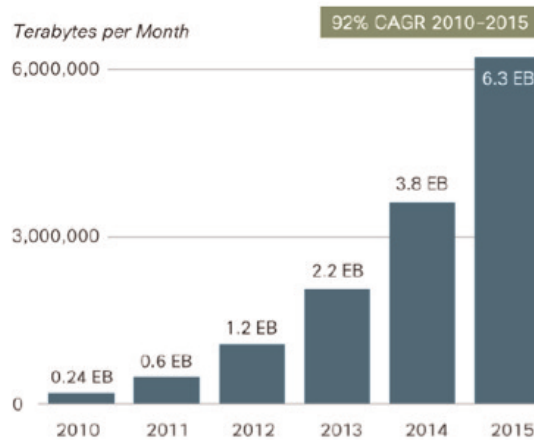


Figure 5

The skyrocketing use of mobile devices and applications is fueling an insatiable demand for mobile broadband and bandwidth. A Cisco VNI report from February 2011 documented mobile broadband's impressive rise :

- Global mobile data traffic grew 2.6-fold in 2010, nearly tripling for the third year in a row
- Mobile data traffic in 2010 was three times the size of the entire global Internet in 2000
- Mobile video traffic accounted for 49.8 percent of total mobile data traffic at the end of 2010, and will account for 52.8 percent of traffic by the end of 2011.
- Average smartphone usage doubled in 2010. The average amount of traffic per smartphone in 2010 was 79 MB per month, up from 35 MB per month in 2009.

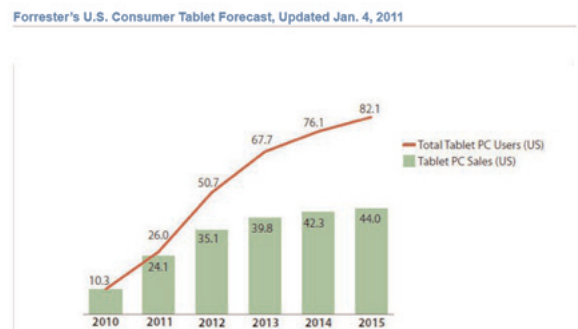
Overall mobile data traffic is expected to grow to 6.3 exabytes (6,606,028 terabytes) per month by 2015, a 26-fold increase over 2010 [Figure 6]. And mobile data traffic will grow at a CAGR of 92 percent from 2010 to 2015.



Source: Cisco VNI Mobile, 2011

Figure 6

Forrester Research dubbed Apple's iPad tablet 'a game changer,' and projects that US consumer tablet sales (led by the iPad) will double in 2011 to 24.1 million units, and exceed 80 million by 2015 [Figure 7].



Source: Forrester Research eReader Forecast, 2010 to 2015 (US)
Note: All numbers in millions of US adults

Source: Forrester Research

Figure 7

When we analyze mobile data traffic by content type, we see that mobile video dominates. In fact, Cisco predicts that mobile video will generate 66 percent of all mobile data traffic by 2015 [Figure 8]. Of course, bear in mind that mobile video has much higher bit rates than other mobile content types.

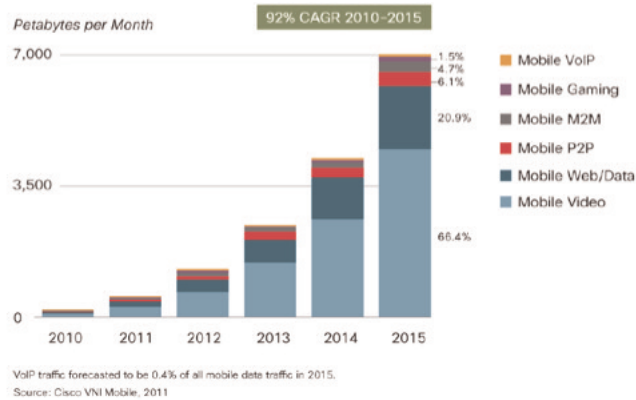


Figure 8

Increased Traffic and the Implications for Service Providers

What do these increases in fixed and mobile broadband data mean for carriers? How can providers harness the mobile and video waves? In this section, we'll cover the unique challenges and opportunities facing carriers in the increasingly connected world.

The Challenges

As expected, a surging pressure for broadband bandwidth and services presents several challenges for the broadband provider, including:

Challenge 1: Greater Strain on the Network

As data traffic continues to rise dramatically around the world, it puts significant strain on network bandwidth. Core, middle mile, and last mile providers experience physical limits of their wired connections, and network congestion. Access points can become overwhelmed from large bursts of traffic, lowering connection speeds and quality of service. For example, with video, network capacity issues can result in frequent buffering delays and fragmented audio. Network engineers and technology professionals are tasked with ensuring that network congestion doesn't choke off consumer service.

Challenge 2: Increased Support Requirements

Along with higher bandwidth demands, broadband service providers can expect an increased number of support calls. As consumers access Internet websites and cloud-based applications at greater rates, the potential for issues rises. **And no matter the source of the trouble from a down destination website to Flash compatibility issues the broadband service provider will inevitably receive the bulk of the support calls.**

As televisions, set top boxes, appliances and other devices are shipping with Ethernet ports, consumers of all technical levels will have questions on how to connect these devices to their home network, along with concerns about how the existing home network can support increased demands like HD video. Subscribers will need to increasingly interact with the home router to set up each new device connection. And consumers will again turn to the broadband service provider with questions related to their home network and connected devices.

Additionally, as the Internet becomes a critical part of daily life, end user tolerance shortens.

In the past, when the Internet went down, people simply waited until it came back up. As Internet access is now a necessity, people pick up the phone the second there's a problem. Consumer tolerance for quality is also changing. For example, when YouTube and Internet video were novelties, end users were more accepting of performance issues. As Internet video plays a greater part in home entertainment, customer expectations for video quality are at an all time high.

Challenge 3: Potential for Lower Satisfaction Rates

As mentioned above, consumer expectations for home broadband performance rise significantly as the Internet plays a larger role in communications, the home theater, and the home office/telecommuting lifestyles. This challenge is exacerbated by consumer price pressures and a general reluctance to upgrade to premium services. For example, some heavy data users may not recognize themselves as such and consequently stick with the lower, entry level service plans. These consumers may complain about a slow connection (particularly when trying to stream multiple HD videos or other high bandwidth applications), while also refusing to pay for the higher level service plan that would improve their experience.

Challenge 4: Increased Subscriber Churn

Any increase in customer dissatisfaction carries a greater chance of subscriber churn. In addition, broadband Internet service providers face a serious risk of losing customers because they do not offer a full service bundle voice, video/broadcast programming, and mobile voice/data services.

The Opportunities

With challenge, there is opportunity. And the very challenges described above give broadband service providers a compelling opportunity to help customers, differentiate themselves from the competition, and grow revenues.

Opportunity 1: Proactively Address Customer Issues

By recognizing the potential hurdles associated with increased broadband usage, service providers can implement multiple approaches to proactively address these issues and in the process, ensure higher customer satisfaction rates compared with the competition.

- **Focus on the home network: Broadband service providers need to recognize that their service doesn't end at the ONT or home router.** Consumers are less concerned with the broadband pipe connected to their home, but are focused on the applications it enables surfing the Web throughout the home, watching on-demand content in the den and bedroom, uploading large files to the office... Advanced broadband applications require an advanced router and home networking options.

Providers should deploy a broadband home router with the processing and memory power required to support multiple HD streams and more. Additionally, the router should offer a range of advanced LAN technologies, including wireless LAN (802.11b/g/n), Ethernet/Gigabit Ethernet, as well as technologies like MoCA and HPNA that distribute content over a home's existing coax cabling. With access to high performance networking options, consumers are more likely to take advantage of all the benefits that broadband offers. High bandwidth content and applications flow seamlessly from device to device, room to room. And subscribers will have higher satisfaction rates with their broadband services.
- **Offer self-diagnostics for the service and home network:** As home routers and their applications become more complex, special care must be taken to ensure the consumer experience does not become too complicated. According to a 2009 survey by ABI Research, **30 percent**

of respondents had trouble setting up their home network.

Integrated tools to troubleshoot problems and proactively monitor performance can minimize the challenge. In fact, the same ABI Research study found that more than half of these respondents believed that troubleshooting software would be 'extremely' or 'very' valuable.

Smart home routers can incorporate setup wizards and push messages and troubleshooting tips to end users when a problem occurs. Simple messages can include an error code and recommendations on how to fix the problem. Wireless routers may also incorporate a second open wireless network dedicated for wireless help. By offering more troubleshooting and self-help tools, these new routers can increase customer satisfaction with (and consequently, adoption of) new technologies, while lessening the burden on the carrier's own tech support groups.

And when subscribers do contact technical support, a router's diagnostic software can be utilized to quickly identify the problem. For example, when a customer calls in, tech support representatives can remotely check a router's CPU and memory utilization, percentage of Flash storage used and available, the number of NAT connections, and number of active processes. In addition, newer routers enable carriers to proactively keep tabs on router status, and automatically initiate corrective action should a router ever exceed preset thresholds for CPU, memory, etc.

- **Utilize CMS technologies for remote management:** By utilizing Component Management System (CMS) protocols, carriers can identify problems and potentially fix them remotely. Carriers can also push upgrades seamlessly. The applicable standards include: TR-069 CPE WAN Management and TR-142, TR-140, TR-135, TR-111, and TR-106 for LAN-Side Support.

Opportunity 2: Bundle Services

Carriers should sell value-add products and services that they know work seamlessly in their network, directly to their customers. Selling complementary products at a discount can increase customer satisfaction and goodwill. Another strategy is offering value-add services/products to those subscribers who upgrade to a higher bandwidth plan, consequently encouraging higher adoption rates for premium plans.

A 2009 study from Parks Associates found a direct correlation between service bundles and customer satisfaction. As shown in Figure 12, the number of services a subscriber has directly translates into satisfaction rates more services means higher satisfaction.

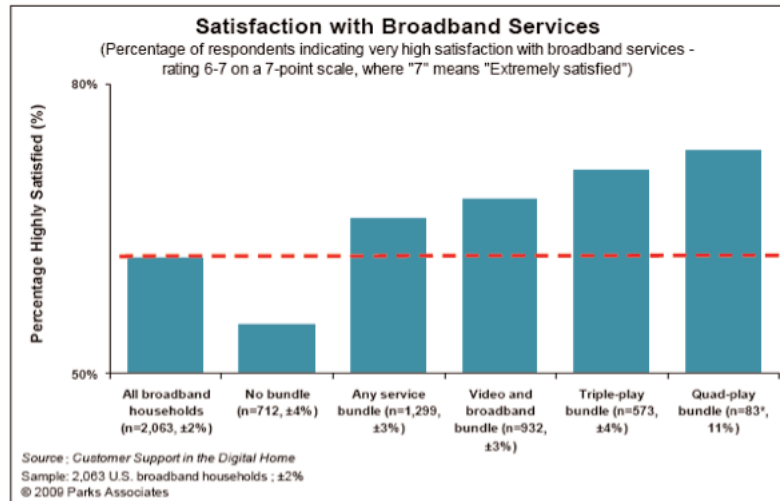


Figure 12

Bundling additional services beyond triple play voice/video/data services can also lead to higher satisfaction and retention rates.

Service providers can further differentiate their offerings through value-added applications and services (particularly as voice/video/data packages become more commonplace in the market). Enhanced entertainment, home control, and technical support applications create new revenue opportunities and increase customer satisfaction. Specific examples of value-add applications include:

- Access to exclusive online video or gaming content
- Home monitoring and security (i.e. monitor web cameras from the TV or laptop)
- Home automation (lights, heat, appliances)
- Video conferencing
- Online backup services
- Personal media management (photos, videos) and storage
- Enhanced technical support (chat, remote troubleshooting of devices and home network)

Opportunity 3: Offer Home Management Services

As shown above, consumers have expressed interest in home management/monitoring capabilities, and this interest will certainly grow as more 'smart' appliances enter the marketplace and consumer awareness

increases. As a result, service providers should be considering all the necessary technologies today, ensuring that the home router/network supports the multiple technologies required, such as:

- **Smart Grid Applications** (ZigBee): ZigBee Smart Energy from the non-profit ZigBee Alliance is one of the leading wireless HAN (Home Area Network) standards for smart grid applications. According to the alliance, more than 40 million smart meters are being installed around the world supporting ZigBee.
- **Home Health** (Bluetooth): Home health products are aimed at fitness monitoring, health and wellness, chronic disease management, aging independently, medication administration and other applications in the telehealth arena. Healthcare industry coalition, the Continua Health Alliance, has selected Bluetooth low energy (along with ZigBee) for the wireless technology in its product guidelines.
- **Home Control/Security** (Z-Wave): The Z-Wave Alliance developed Z-Wave, a wireless standard for centrally managing household electronics such as lights, security cameras, thermostats, motion detectors, garage door openers, pool and spa controls, sprinklers, home theaters, automated window treatments, and more.

Bear in mind that industry and standard developments are evolving. Service providers should consider keeping their home router platform as flexible as possible so it can be upgraded down the road to keep up with changing standards. For example, a plug-in USB technology stick can add support for ZigBee, Z-Wave, or any other emerging smart grid, home health, and home control technology.

Model

To minimize operational and capital costs, service providers should consider deploying a single home router device that can support multiple deployment models, such as fiber to the home or fiber to the curb network architectures. With this approach, there's just one SKU to manage, one product for customer service to learn, and less inventory to handle. This same strategy was a strength for Southwest Airlines, who relied on one type of plane for years to keep things simple. It is cheaper and easier to train pilots and mechanics to work on just one type of plane.

Opportunity 5: Change how Broadband is Marketed

Service providers should look to new approaches for marketing and selling their broadband services. Usage-based pricing plans should be considered. As Michael Wolf wrote in GigaOM's 2011 Connected Consumer Forecast: "What

exactly will Comcast and other carriers do to fend off OTT services clogging their networks? First off, expect them to continue exploring usage-based broadband...there's a chance that end-users who are heavy users of broadband video streaming, for example, could see higher fees in the future, particularly since the recent net neutrality ruling by the FCC doesn't prevent it."

New marketing approaches that focus on end user experience and application performance can help compel subscribers to upgrade to the higher tiered plans. **Consumers need to be educated on how raw broadband speeds equate to bandwidth consumed in their applications.** For example, how many devices can stream Netflix videos at the same time? What's the time difference to upload 50 photos across the service plans? How long does it take to download an HD video? Such examples communicate the direct benefits to consumers and should be a focal point of any upgrade messaging.

Opportunity 6: Focus on Wireless

As discussed earlier in this paper, mobile broadband and wireless connectivity are among the hottest technology trends. Broadband service providers can benefit from incorporating wireless technology in several ways:

- **WLAN 802.11b/g/n:** The broadband home router should offer consumers the convenience of an integrated WiFi access point. In particular, the new Wireless N standard offers theoretical throughput speeds up to 300 Mbps for the fastest wireless performance to date.
- **4G LTE (Long Term Evolution):** 4G home/SOHO routers are beginning to hit the market. 4G LTE's high speed, high quality fixed wireless broadband connection can bridge the broadband divide facing rural areas, where it has not been cost-effective to deploy fiber or copper-based broadband services.
- **Femtocell:** Femtocell technology can give subscribers mobile connectivity in their home. Subscribers can use their regular GSM/CDMA cell phones in their home, and the femtocell routes these calls over the wired broadband connection.

Conclusion

Over the coming years, advanced mobile devices and Internet-ready platforms will spark an increased demand for online video, cloud-based applications and more. As devices and applications grow in sophistication, so will the added pressures for bandwidth and content delivery. For the broadband service provider, this surging pressure for broadband puts a greater strain on the network, along with challenge to meet rising consumer expectations for their broadband performance. But along with these challenges, the increases in fixed and mobile broadband data give broadband service providers a compelling opportunity to help customers, differentiate themselves from the competition, and grow revenues.

About Actiontec

Actiontec Electronics develops broadband connectivity and broadband-powered solutions that simplify and enrich the digital life – delivering a unified experience that encompasses communications, entertainment, home management, and more. Actiontec offerings range from the market's broadest selection of IPTV-capable broadband home gateways for bringing IP-based video services into the home, to DSL modems, wireless networking devices, routers and digital entertainment devices. The company's carrier-class products are easy to install, manage, and use, and are sold through retail channels and broadband service providers. The company is committed to protecting the environment through energy efficient products and other green-friendly practices. Founded in 1993, Actiontec is headquartered in Sunnyvale, CA, and maintains branch offices in Colorado Springs, CO; Shanghai, China; and Taipei, Taiwan.

Appendix: Resources and References

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