FEIBUSTECH

clear ▪ critical ▪ independent

HOME   BLOG   ABOUT   SERVICES   CONTACT   **RESEARCH BRIEF**

INTRODUCTION
BACKGROUND
CONTEXT
CONCLUSIONS

Home Network Innovation and the Broadband Experience

Today's home broadband connections are robust. Yet subscriber satisfaction is at an all-time low. ISPs can fix this perception gap, protect their subscriber base and revitalize growth. Here's how.

October 2018

Analyst: Mike Feibus

in association with
Qualcomm Technologies, Inc.

In the telecom world, integration often goes hand in hand with progress. As services mature, advancing microelectronics technology invariably affords Internet Service Providers (ISPs) the opportunity to bundle discrete capabilities into a single, integrated device. That can lower costs, simplify customer choice and reduce inventory headaches.

But just because you can integrate, doesn't necessarily mean you should. For integration to be successful, the technologies to be merged should be mature and stable, and progressing more or less in step with each other. That was the case for home gateways for more than a decade.

No longer. Broadband standards remain stable. But in-home networking is undergoing an explosion of innovation. And not a moment too soon. Because while the modem inside a three-year-old gateway is still state-of-the-art, the built-in Wi-Fi is obsolete, incapable of distributing that high-speed connection to all the devices on the home network.

As a result, the home gateway, which once served ISP's well, is quickly morphing into a liability, needlessly constraining ISPs' ability to adapt and deploy. When software capabilities accelerate, as they're doing now, it is more difficult to incorporate those advances into a complex, integrated platform. By focusing on the standalone device, they can implement the specific, targeted enhancement faster and more economically. Which means they can improve their customers' connectivity experiences sooner.

> *FeibusTech believes that today's home gateway is an albatross around the ISP's neck, and many don't even realize it. They don't understand that the bad Wi-Fi inside keeps subscribers from enjoying their state-of-the-art broadband. And subscribers don't understand that the problem isn't their internet connection. It's the bad Wi-Fi.*

If the integrated home gateway now amounts to less than the sum of its parts, then why does it still have such a dominant presence, continuing to handle both the broadband connection as well as the home network? Inertia, for one, can be a powerful force. And the lack of broadband competition for ISPs in many markets can make it even more difficult to drive a change in direction.

For another, the notion of integration connotes, to many, progress. As a result, unbundling can feel like taking a step back. But it isn't. At least, not in the case of the home gateway. It's more of an impediment to progress.

As well, gateways are typically inexpensive. Indeed, providing discrete modems and Wi-Fi likely will cost more – until you consider lower support costs and higher customer satisfaction that come with a well-managed network.

Decoupling broadband and the home network won't always be just about better Wi-Fi. In the next few years, for example, wireless technologies like 5G CPE and 60 GHz Wi-Fi for fixed wireless access could obsolete existing broadband connections in some markets, delivering far higher bandwidth at much lower cost than DOCSIS and DSL. That will mean lower barriers to entry, so ISPs will need to be proactive or risk facing new competition – even in neighborhoods for which they are the sole supplier today. In this time of disaggregation, with cellular and over-the-top streaming services eating into revenue for home phone service and pay TV, their other core businesses, ISPs aren't well-positioned to weather new broadband competition.

On the home network side, mesh Wi-Fi already is bringing a new level of sophistication, deftly managing traffic so the mushrooming number of devices get the bandwidth they need. ISPs need to understand this not a luxury service only some consumers will come to appreciate. To the contrary, these are capabilities consumers already demand. High-capacity LTE service outside the home has fundamentally changed what consumers expect from the networks inside.

When in-home connectivity doesn't meet their needs, most consumers don't care whether the culprit is their broadband connection or the Wi-Fi network. Because they don't distinguish between the two. When either is lacking, they invariably blame their ISP. So it is no accident that customer satisfaction rates for ISPs have reached all-time lows, and that ISPs as an industry consistently rank at or near the bottom of cross-industry satisfaction surveys.
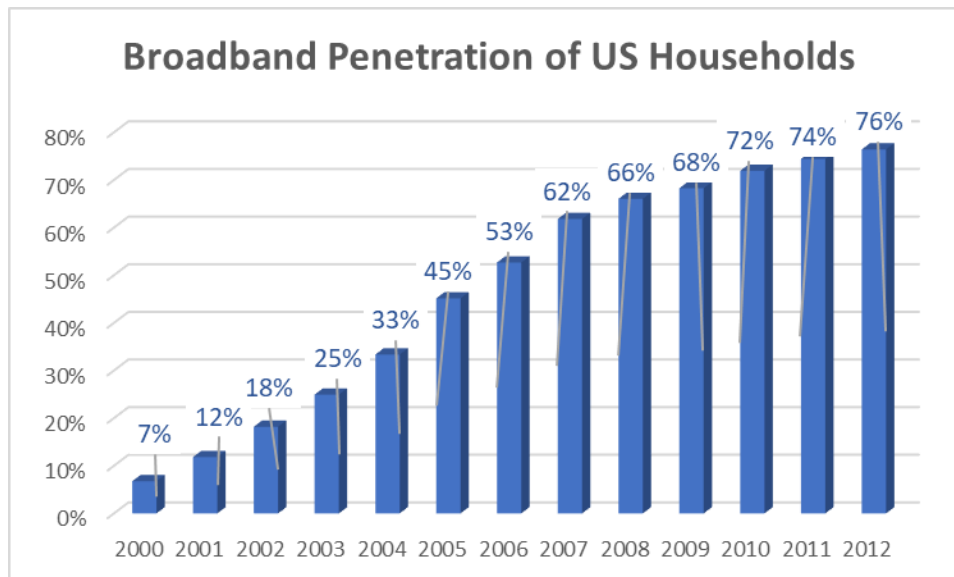
Clearly, time is getting short for ISPs to break up the home gateway, because further delays will put ISPs at an ever-greater risk of lower customer satisfaction rates, a higher support burden, and – worse – an exodus of customers to more agile alternatives.

Produced in association with wireless pioneer Qualcomm, whose innovations helped enabled the whole-home Wi-Fi segment, this FeibusTech Market Brief is designed to give ISPs a better understanding of the rapidly-evolving home broadband market, help them better identify sign posts that signal further change and offer guidance for how to develop the best strategy to respond to consumers' needs. And, perhaps most importantly, the brief will help them understand why dis-integration will help them to be better prepared, from a technical perspective, to compete in this age of disaggregation.

FT

FEIBUSTECH

clear ▪ critical ▪ independent

HOME   BLOG   ABOUT   SERVICES   CONTACT   **RESEARCH BRIEF**

INTRODUCTION
BACKGROUND
CONTEXT
CONCLUSIONS

In the Beginning

Home gateways didn't make much sense when broadband first began to take off 15 years ago. The most common consumer setup at the time was a single desktop computer plugged directly into a jack on the back of the cable or DSL modem.

Broadband adoption got a big jump on Wi-Fi in the US consumer market. In 2003, a quarter of US households subscribed to DSL or cable – nearly four times the number that subscribed just three years earlier. But routers and wireless access points were few and far between – mostly because there was little available to connect to them. Phones didn't yet come with Wi-Fi. Tablets didn't yet exist. Nor did smart TVs, connected thermostats, Wi-Fi light bulbs or other connected home appliances. Not even game consoles had integrated Wi-Fi yet.

Broadband Penetration of US Households

Year	Penetration
2000	7%
2001	12%
2002	18%
2003	25%
2004	33%
2005	45%
2006	53%
2007	62%
2008	66%
2009	68%
2010	72%
2011	74%
2012	76%

Source: FeibusTech, International Telecom Union, US Census

The lion's share of the limited Wi-Fi connections at the time were made using laptops. According to FeibusTech, only one in four PCs sold in 2003 were laptops – and PC makers were only just beginning to show interest in integrating Wi-Fi in them. Early adopters who ventured into Wi-Fi connectivity did so by inserting add-in cards into now-extinct mobile add-in slots.

Fast forward five years, and two-thirds of US households had broadband, much of the growth driven by the rapid proliferation of Wi-Fi. According to FeibusTech research, virtually all laptops and more than a third of phones in the market, which was exploding since the iPhone came to market the year before, featured built-in Wi-Fi. As well, the Nintendo Wii and Sony's PlayStation 3, the first wirelessly connected game consoles, helped stoke demand for Wi-Fi.

Consumers were largely happy with those early Wi-Fi deployments, for the simple reason that both network demands and consumer expectations were low. Consider that:

- Wireless internet in the home was a new capability, and consumers readily embraced the newfound ability to sit with their laptops in different spots around the house.

- Performance was good, because there was little contention for network bandwidth. Few connected homes had four or more devices on the network. Plus, the devices that were on the network connected far less frequently than today. In October 2008, Comcast reported median household high-speed internet usage was between 2GB and 3GB per month. In 2016, median usage had blossomed to 190GB per month, according to iGR Research.

- Very few devices were used for video streaming. At the time, Google was responsible for 16.5 percent of all internet traffic in the US, the single-highest source of data consumption. Not surprisingly, the single most common internet activity was web browsing.

- With the prospect of saving money on their cell phone bills, consumers were happy to have Wi-Fi at home as an alternative to cellular data. Consumers most commonly subscribed to data plans with usage capped at levels as low as 50MB per month, according to FeibusTech historical data. So they were relieved to surf the internet without fear of running up their phone bills.

Further, cellular carriers were just beginning to roll out 3G service across the country. So for most subscribers, data plans were not only pricey. They were also slow by comparison.

Growing Market, Stable Technology
Broadband modems and Wi-Fi routers were now becoming a natural target for integration. Penetration of broadband in US households was good – and growing steadily. And the desire for Wi-Fi connectivity to complement broadband subscriptions was also becoming pervasive.

Aside from the strong demand, what really gave integration a push was that the underlying technology was stabilizing. On the broadband side, the transmission protocols that would carry both cable and phone ISPs for much of the next decade were in place. The VDSL2 standard, which supports transmission speeds up to 350 Mbps, was first published in February 2006. Bonding effectively doubles throughput, so there was plenty of headroom.

The cable industry's DOCSIS 3.0 standard followed six months later. In North America, DOCSIS 3.0 provides throughput of 42.88 Mbps per channel, with no ceiling on the number of channels. So although there are practical limitations, there is no theoretical maximum.

On the home network side, the IEEE standard for 802.11n was published in 2009, though chipsets based on the standard began shipping in 2007. (The early chipsets were certified by the Wi-Fi Alliance as compliant with draft 2.0 of the 802.11n specification.) The 802.11n spec provided for raw bandwidth up to 600 Mbps, depending on configuration.

And so, with technology stable on both ends of the connection, the home gateway began to take off.

Not-So-Great Expectations

Heading into the 2010s, all seemed well. But over time, a problem began to develop, one that was virtually invisible to ISPs. Because while existing gateways adequately handled the traffic into and out of most households, wireless networks inside the home bogged down.

By 2012, the average number of connected devices in the home more than doubled, to seven (Source: GSMA). But the game console was the only one making real-time demands on the network, which was easy enough for an 802.11n Wi-Fi gateway to handle. Video consumption was on the rise, though most of the content was downloaded, not streamed.

By 2017, the number of connected devices in the home had more than tripled, to 24, according to the GSMA. On top of that, streaming content had now become pervasive across multiple devices during the so-called Internet Rush Hour, the period each evening when the entire family is home and watching video on streaming services and social media. Real-time entertainment was approaching three-fourths of all data consumed in the home. Suffice it to say, gateways with 802.11n Wi-Fi were no longer able to keep up.

Device Ownership of a Typical Family of Four, 2012, 2017, 2022

2012	2017	2022
2 smartphones	4 smartphones	4 smartphones
2 laptops/computers	2 laptops	2 laptops
1 tablet	2 tablets	2 tablets
1 DSL/Cable/Fibre/Wifi Modem	1 connected television	3 connected television
1 printer/scanner	2 connected set-top boxes	3 connected set-top boxes
1 game console	1 network attached storage	2 eReaders
	2 eReaders	1 printer/scanner
	1 printer/scanner	1 smart metre
	1 game console	3 connected stereo systems
	1 smart metre	1 digital camera
	2 connected stereo systems	1 energy consumption display
	1 energy consumption display	2 connected cars
	1 internet connected car	7 smart light bulbs
	1 pair of connected sport shoes	3 connected sport devices
	1 pay as you drive device	5 internet connected power sockets
	1 network attached storage	1 weight scale
		1 eHealth device
		2 pay as you drive devices
		1 intelligent thermostat
		1 network attached storage
		4 home automation sensors

©GSMA www.gsma.com/connectedliving • connectedliving@gsma.com • @GSMA

Worse, consumers' expectations were rising as their experience at home deteriorated. Credit 4G/LTE for that. The now widely-proliferated 4G cellular technology has dramatically improved throughput, ensuring more smartphones get the bandwidth they need – when they need it. In addition, second-generation unlimited plans – some that even bundle subscriptions to Netflix and other streaming services – are training mobile subscribers to take anywhere/anytime video consumption for granted.

Except in the home, that is. According to a recent survey by Deloitte, 34 percent of Americans believe their 4G service is faster than their home connection, while only 21 percent said that home was faster. Similar results in Canada, where 25 percent thought 4G was faster, compared to 15 percent who said their broadband was faster.

Of course, those impressions fly in the face of reality. Late last year, [SpeedTest data](#) revealed average US broadband download speeds of 64.17 Mbps, 2.8 times faster than the [average mobile download speeds](#) of 22.69. Average upload speeds were 2.7 times faster.

So why the disparity between perception and reality? Quite simply, it's because smartphones, tablets and other devices are more likely to get the data they need for the task at hand on slower cellular networks than faster home networks. Because cellular networks by and large are better managed than home networks.

FT

FEIBUSTECH

clear ▪ critical ▪ independent

HOME   BLOG   ABOUT   SERVICES   CONTACT   **RESEARCH BRIEF**

INTRODUCTION
BACKGROUND
CONTEXT
CONCLUSIONS

Ominous Signposts

The perception gap may be one factor to help explain why customer satisfaction rates for internet service have been low – and continue to deteriorate.

Internet Service Providers and Subscription Television Service – often bundled by the same provider – have the lowest satisfaction rates of the 46 industries measured by the American Customer Satisfaction Index' annual survey of more than 250,000 US consumers. And it's falling further. This year, both services saw satisfaction rates drop 3.1 percent, to 62 percent.
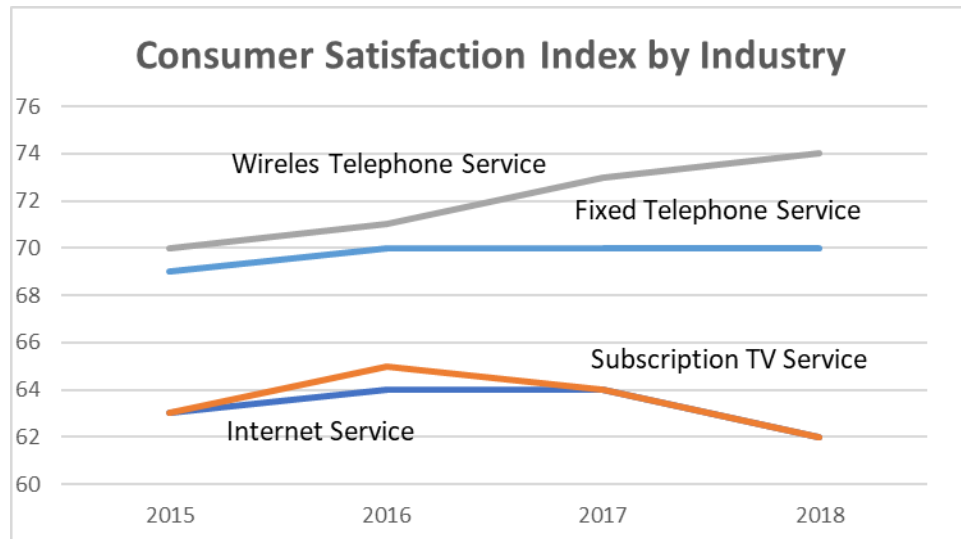
Source: American Consumer Satisfaction Index

In contrast, Wireless Telephone Service and Video Streaming Service enjoy satisfaction rates of 74 percent and 75 percent, respectively. Further, cellular satisfaction is higher than last year, by 1.4 percentage points. (This was the first ACSI included video streaming in the survey, so no historical data is available.)

Satisfaction rates for Fixed Telephone Service held steady at 70 percent, higher than fixed internet and TV – but still not enough to stave off falling subscription rates. Indeed, the number of subscriptions in the US has fallen every year but one since 2000, according to the World Bank.

Internet service subscriptions are still growing, but nowhere near fast enough to make up for declining TV and phone subscribers.

Wi-Fi to the Rescue
Broadband technology remains relatively stable – not surprising, given that the protocols now in use provide plenty of headroom for faster broadband speeds. Meantime, Wi-Fi has needed to evolve to address the changing makeup of home networks. And, as you'll see, it has. Unfortunately, most homes still are not benefiting from the improvements.

The 802.11ac standard, which was published in late 2013, was conceived to enable multiple high-definition video streams in the house. Channels were faster and wider. Plus, technologies like multi-user MIMO dramatically increased the number of devices that could be supported at once.

In addition, Qualcomm enabled the whole-home Wi-Fi market with self-organizing network, or SON, technology, which gave network providers new ways to optimize data traffic.

The network continues to evolve, with more and more devices concentrated into smaller and smaller places. Of course, Wi-Fi is evolving to handle higher-volume traffic. New 802.11ax routers are just starting to appear on the market, and ISPs would do well to plan to incorporate this high-density, high-capacity technology into their hardware plans.

Why So Unhappy?
With all the new Wi-Fi technology available to meet today's market needs, then why are so many broadband consumers still so unhappy?

One big reason is that you can't fix problems if you don't grasp what's causing them. Indeed, most consumers don't distinguish between the roles that their broadband connection and wireless home network play in their connectivity experiences. So they don't understand that upgrading to a whole-home Wi-Fi solution likely will cure their network ills.

Another is that, by the force of inertia, many ISPs are prolonging the issue by continuing to ship home gateways with inadequate Wi-Fi capabilities. This is a major source of the issue, as more consumers get Wi-Fi from their ISP than any other source.

Even when consumers set out to solve their network deficiencies on their own, the retail experience seldom points them to the best router for their situation. What they need to improve their poor connectivity experience is whole-home Wi-Fi. But those systems can be pricey, and the positioning doesn't always convey top-shelf network performance as clearly as do high-end gaming routers.

Indeed, some consumers mistakenly interpret the raw bandwidth claims used to position high-end gaming routers as beneficial for their situation. But those routers are designed to deliver top performance to a single device for online game play, often at the expense of other devices on the network.

ISPs increasingly are grasping the myriad benefits of offering whole-home Wi-Fi as part of their broadband services. Some are starting to deliver home gateways with the built-in Wi-Fi disabled so they can bundle mesh service. And as their gateway inventories dwindle, they are starting to restock with a higher percentage of standalone modems, which make it easier to offer packages with mesh systems.

Early returns for those packages are very promising. ISPs report a dramatic decline in the support burden as well as higher satisfaction levels. Early returns from some ISPs suggest they are lowering churn, which can be the costliest outcome from having broadband subscribers saddled with bad Wi-Fi. Some say they may are examining whether they might one day be able to trim the size of their service fleets, which could mean lower capital expenditures down the road as well as lower operating costs.

Of course, the broadband side of the equation is set to evolve as well – but at its own pace, decoupled from the progress of in-home networking capabilities. Coming innovations in mmWave technologies like 60GHz Wi-Fi and 5G CPE are poised to give ISPs opportunities to offer new, higher-speed services to existing subscribers – and even reach into new areas that are not possible to serve today, due to cost constraints.

FT

FEIBUSTECH

clear • critical • independent

HOME   BLOG   ABOUT   SERVICES   CONTACT   RESEARCH BRIEF

INTRODUCTION
BACKGROUND
CONTEXT
CONCLUSIONS

It's tough to be an internet service provider these days. Two of their three core businesses – pay TV and fixed phone service – are losing ground to cheaper, better online services. Broadband subscriptions continue to grow, but at a rate that's nowhere near fast enough to make up for the loss of the other services.

Of greater concern is that customer satisfaction rates for broadband service are at historic lows – ironically, even though connectivity is markedly faster than for the far more highly-rated mobile phone carriers. ISPs have been too slow, perhaps, to grasp that poor satisfaction for many customers has little to do with the raw speed of the internet connection. Rather, it is the poor state of the wireless network inside the home.

Sadly, consumers blame their internet service for the subpar experience, regardless of whether it is the ISPs providing Wi-Fi through a home gateway or whether they themselves installed an aftermarket router to handle network traffic.

The good news is that ISPs can solve this today, by getting proactive about the state of their subscribers' home network. They need to ensure that households trending toward double-digit connected devices – including several that are used regularly for streaming video – are equipped with modern, whole-home mesh platforms. These systems help to ensure that all devices in the home get the service they need, when and where they need it.

Wireless pioneer Qualcomm has been a leader in bringing innovations to Wi-Fi home networks that enabled 4G cellular networks to deftly handle heavy data traffic in densely-populated areas. Qualcomm's ecosystem partners are helping ISPs swiftly move into the whole-home space, growing revenue, lowering support costs and improving customer satisfaction as a result.

In addition to boosting customer satisfaction, mesh platforms also serve as a much-needed vehicle for increasing average revenue per user, or ARPU. ISPs that have begun to offer mesh network bundles find they can charge several dollars per month to rent the equipment, and another few dollars a month for manageability services that help keep the home network secure and running optimally. The support burden for subscribers with mesh is also proving to be markedly lower.

Some ISPs have been slow to offer whole-home bundles – and one big reason is the subtle drag the home gateway puts on innovation. Orders and inventories of those home gateways, with obsolete Wi-Fi implementations, tends to make it more difficult to make better, more modern decisions for what equipment to provide their subscribers.

Indeed, some early adopters of mesh among the ISP community are disabling the Wi-Fi in their home gateways and shipping them as part of their packages. As the new mesh bundles prove successful, the ISPs are beginning to restock their inventories with a much higher proportion of modems – effectively dis-aggregating the broadband from the home network.

The dis-aggregation will help the ISPs bring 802.11ax and other new wireless networking technologies to their customers faster. Of course, it will also help them to be more agile as new broadband innovations like 5G CPE and 60 GHz fixed wireless access become available as well.

FT

FEIBUSTECH

clear ▪ critical ▪ independent

FeibusTech
P.O. Box 25685
Scottsdale, AZ 85255
www.feibustech.com
+1-480-922-3244