THE SMART HOME REPORT 2019:

How Optimization, Security, and Personalization are Shaping Smart Home 2.0

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ABSTRACT:

First came the connected home. Next came Smart Home 1.0, as consumers began to adopt, use, and become accustomed to connected smart devices.

We are now on the verge of Smart Home 2.0, as devices and software work together seamlessly to understand human and household context and generate hyper-personalized experiences.

The Smart Home 2.0 will be powered by a cloud-based, Artificial Intelligence-driven framework to deliver unprecedented optimization, personalization, and cybersecurity for consumers—and true differentiation of their home internet product for Internet Service Providers.

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Introduction

1 The connected home ecosystem is coming. In 2019, Plume households had an average of 18 Wi-Fi connected devices. Plume CTO Bill Mc Farland predicts this number to exceed 31 by 2022. This explosion of smart home devices means that it is no longer just computers, phones, tablets, and the occasional digital assistant running on home Wi-Fi networks; these networks will be powering each and every device that will run and sustain homes worldwide now and in the future.

2 The Smart Home ecosystem is rapidly diversifying. Plume data show that during the second half of 2018, Apple's share of connected devices in the home declined by more than 12%, while Amazon, Samsung, and Google all grew their share by double digits.

3 As reliance on Smart Home technology grows, so too will consumer need for flawless in-home Wi-Fi. Plume analysis of support call data over the course of a year from one major North American ISP found that one in four consumer complaints arise from the network not working well enough in the home. And, as the number of devices in the home increases, so too do call rates.

4 Optimization of the home-Wi-Fi network is not just good for consumers; it's good for ISPs too. Optimizing the home Wi-Fi network can address some of the specific circumstances that engender the most nagging consumer complaints like dead zones, lag time during peak hours, or interference.

5 Consumers are readily embracing the advantages of Smart Home 2.0, but with it comes unprecedented vulnerability. Protecting privacy and cybersecurity will become an important selling point for broadband providers. The most robust digital security applications will be cloud-based and Artificial Intelligence (AI)-driven to be able to quickly, efficiently, and automatically detect and isolate threats.

6 A growing number of Internet Service Providers in the U.S., Canada, and Europe are leveraging OpenSync to deliver truly differentiated Smart Home Services. Wi-Fi supported by OpenSync (an open-source silicon-to-service framework announced in 2018 by Samsung, Comcast, Bell Canada, Liberty Global, and Plume) optimizes Wi-Fi within the home, provides a robust set of privacy and security features, and allows consumers to personalize their Wi-Fi experience, truly delivering on the promise of Smart Home 2.0.

Towards Smart Home 2.0

The connected home revolution is not coming; it's here.

These days, it feels like almost everyone has a piece of smart home technology—whether that's a smart TV, streaming device, thermostat, doorbell, security system, or speaker with a voice assistant, like Google Home or Amazon Echo. The smart home's rise has happened in a very short amount of time: the first Nest thermostat, arguably the device that brought the idea of the "smart home" to the mainstream, launched in October 2011. That same year, Apple introduced the world to Siri, the first widespread virtual assistant. Since then, the market for smart home devices and voice control has been rapidly expanding.

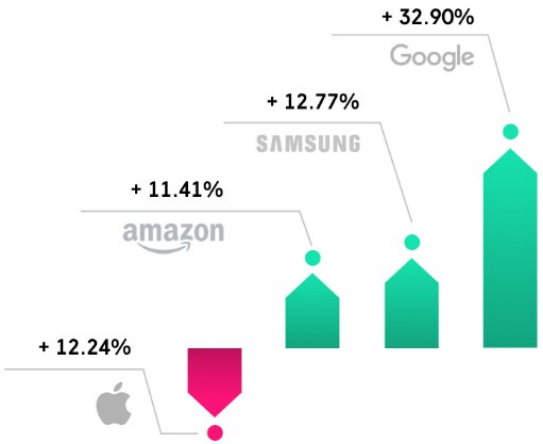
In 2017, the Horowitz *State of Consumer Technology 2017* report revealed that 17% of consumers owned a smart speaker with a voice assistant (such as a Google Home or Amazon Echo); a recent 2019 Consumer Technology Association survey revealed that today, 31% of consumers own a smart speaker with a voice assistant. Furthermore, the Consumer Technology Association study revealed that seven in ten U.S. households (69%) has at least one connected device, and 18% own more than one.

All this smart home technology has been a game-changer for consumers. Over the past several years, consumers have developed an insatiable appetite for on-demand entertainment content through connected screens. They have become accustomed to managing household tasks and chores, whether it's preheating their Wi-Fi-enabled oven while commuting home for the evening, automating their home's heating and cooling based on family patterns, or keeping up-to-date grocery lists, through the sound of their voice. This boom in smart home technologies, connected devices and Wi-Fi-powered services and apps continues to create opportunities that were unforeseeable just a few years ago. Security devices like Wi-Fi-connected cameras, for example, are no longer just to protect prized possessions or supervise nannies, but to remotely feed treats to beloved pets. Today's new car buyer would be hard-pressed to find a new vehicle that can't be started with a tap of an app.

Exponential growth in smart home technologies means enormous opportunities for players on all sides of the consumer technology ecosystem.

The connected home ecosystem is rapidly evolving, evidenced by the diversification of devices in the home. According to Plume, the leading Smart Home Services platform provider, Apple has and continues to command the largest share of the more than 100 million connected devices in the U.S. utilizing Plume's cloud platform (40%). However, during the second half of 2018, that share declined by more than 12%, while Amazon, Samsung, and Google all grew their share by double digits.

Popularity trends of connected devices among Plume member households in the US.

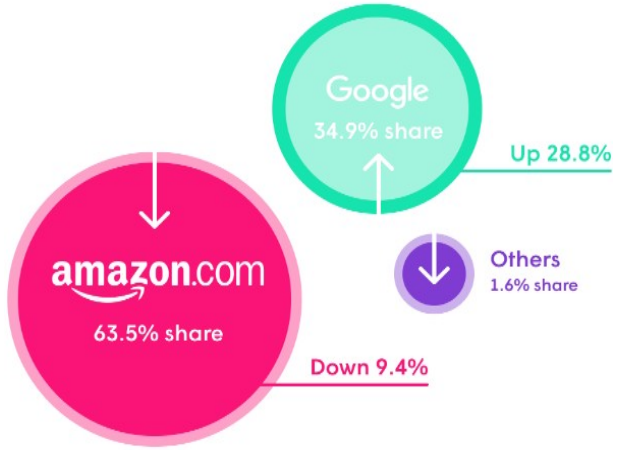


Based on a sample of Plume member households across the U.S. from July through December 2018

In the digital assistant space alone, the market is extremely dynamic. Plume data on the share of Amazon's voice-assisted devices compared to Google devices underscores this: In 2018 Amazon commanded a 73% share in Plume households. A mere 6 months later Amazon's share declined by almost 10% and Google's share increased by almost 30%.

Changing Popularity of Voice-Assisted Devices

September 2018 – March 2019

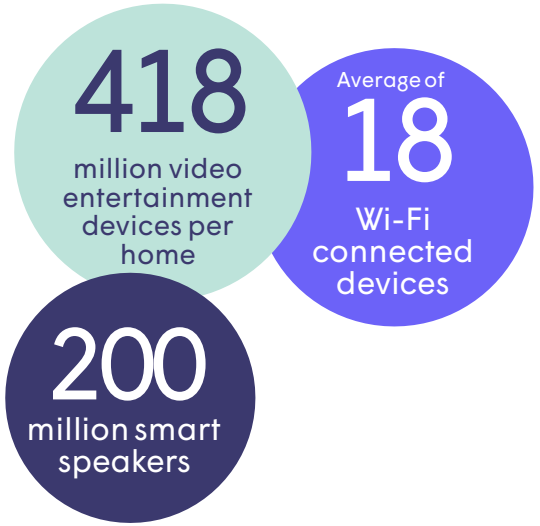


Based on a sample of Plume member households across the U.S. from Sep 1, 2018 to Mar 19, 2019

We are just getting started. The true promise of the smart home—Smart Home 2.0— is only now on the cusp of being realized.

According to the International Data Corporation (IDC), worldwide shipments of devices are projected to climb to 1.4 billion in 2025. Of these, about 418 million will be video entertainment devices, 308 billion will be home security devices, 200 million will be smart speakers, and another 471 million will be comprised of a variety of other connected devices ranging from smart watches to connected fitness machines (source: eMarketer). In 2019, Plume households had an average of 18 Wi-Fi connected devices. Plume CTO Bill McFarland predicts this number to exceed 31 by 2022 (source: Plume).

This explosion of smart home devices means that it is no longer just computers, phones, tablets, and the occasional digital assistant running on home Wi-Fi networks; these networks will be powering each and every device that will run and sustain homes worldwide now and in the future.



Without flawless, fast Wi-Fi that delivers a consistent connection throughout the home, the promise of the connected home— and consumer expectations driving smart device adoption— falls flat.

While the smart home capabilities consumers enjoy today have been transformative, from a technological standpoint they are still rather cumbersome. Devices are connected, but not necessarily to each other; experiences can be controlled, but not fully personalized; investments in technologies quickly become outdated and need to be updated or replaced. A few major players' platforms dominate the market, while new players are prevented from entering the field altogether.

The Smart Home 2.0 experience will be truly revolutionary, powered by what is essentially an operating system for the smart home that delivers highly personalized, AI-driven experiences to consumers and unprecedented visibility and tools for Internet Service Providers (ISPs) to support their customers' evolving smart home needs. Plume, offering the industry's first-ever software-based, AI-driven connected home platform in the cloud, is on the leading edge of Smart Home 2.0.

Home Broadband

The invisible, yet critical, role of home broadband in the smart home ecosystem presents an important opportunity for ISPs to super-serve their customers and differentiate their services in a highly commoditized environment.

Many of today's biggest ISPs, like Comcast and Charter in the United States, sold video (pay TV) as their core business for decades, way before broadband was widely deployed. Cable, satellite, and telco companies needed to compete against each other for video subscribers, and video services were fairly easy to differentiate. For example, some TV providers could provide more content overall or boast exclusive carriage of certain networks. Others could provide leading-edge technology, or a more robust video on demand (VOD) offering. All these product features and benefits were both tangible and immediately understood by consumers as they assessed their pay TV provider's value proposition and made decisions about which provider to pick.

Cable and telco companies began deploying home broadband internet starting in the early 2000s, and broadband penetration exploded exponentially from 1% in 2000 to 73% in February of 2019, according to the Pew Research Center (source: Pew). The more home broadband penetration grew, the more commoditized it became: Today, most consumers feel the internet is as indispensable to their home as electricity and running water.

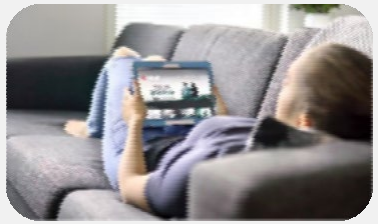
HOROWITZ Plume

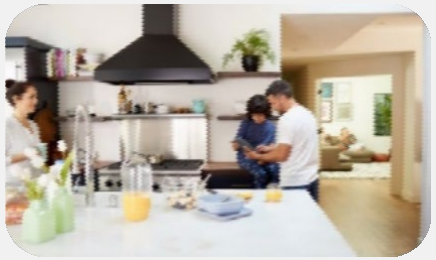
For many providers, home broadband has become the core business as traditional pay TV continues to shed subscribers. In July of 2018, Multichannel News reported that "Comcast, perhaps the most video-focused cable company over the past several decades, continued its shift toward a more broadband-centric mode" (source: Multichannel News).

The challenge for internet service providers like Comcast and others is that for most consumers, all that matters is that their home broadband works for what it needs to do. Though many consumers do not know how much bandwidth they really need to support all their internet connected devices, they generally believe that when it comes to the internet, more is better. Broadly speaking, consumers expect a 100 Mbps service to perform better for them than a 50 Mbps service, especially if they have a lot of devices on their home networks. But they do not expect one provider's 100 Mbps service to offer any significant advantage over the next provider's 100 Mbps service, assuming both companies are known to offer a relatively reliable internet service with few outages. This leaves ISPs to compete on speed and price alone, increasing bandwidth and, simultaneously, monthly subscription fees, as household demands increase. In short, there is little brand or product differentiation.

Today, more and more ISPs are recognizing that differentiation of their home broadband offerings is critical to subscriber growth and retention. For example, Comcast describes its xFi gateway as "a personalized home Wi-Fi experience" providing customers "unprecedented visibility and control over one of the most important technologies in their lives – with the fastest speeds, the best coverage, and ultimate in-home control" (source: Comcast). This marketing language signals a notable reframing of the Xfinity internet product, seemingly to shift perceptions of the broadband service from an undifferentiated commodity to a unique and premium product.

OpenSync is an open-source silicon-to-service framework announced in 2018 by Samsung, Comcast, Bell Canada, Liberty Global, and Plume. Coupled with RDK, OpenSync supports Comcast's xFi platform, delivering the differentiation and flexibility that Comcast is banking on to drive their broadband business moving forward. Plume describes OpenSync as a framework that provides "the critical building blocks to enable the complete smart home ecosystem to deliver data-rich, cloud-controlled services to broadband subscribers."





Features & Benefits

For internet service providers, shifting perceptions of their internet service from an undifferentiated commodity to a unique and differentiated product whose features and benefits are tangible to the consumer is critical, especially in anticipation of 5G and how it will shape home internet access and offerings.

Of course, the size of the pipe matters. As consumers shift towards the connected home, it will be equally important for providers to be able to identify and adapt to changing dynamics around the home, such as interference, usage, and congestion, to deliver the best possible experience to every device.

Differentiation of broadband services through robust service features will become more important to consumers as well as they consider their internet provider options.

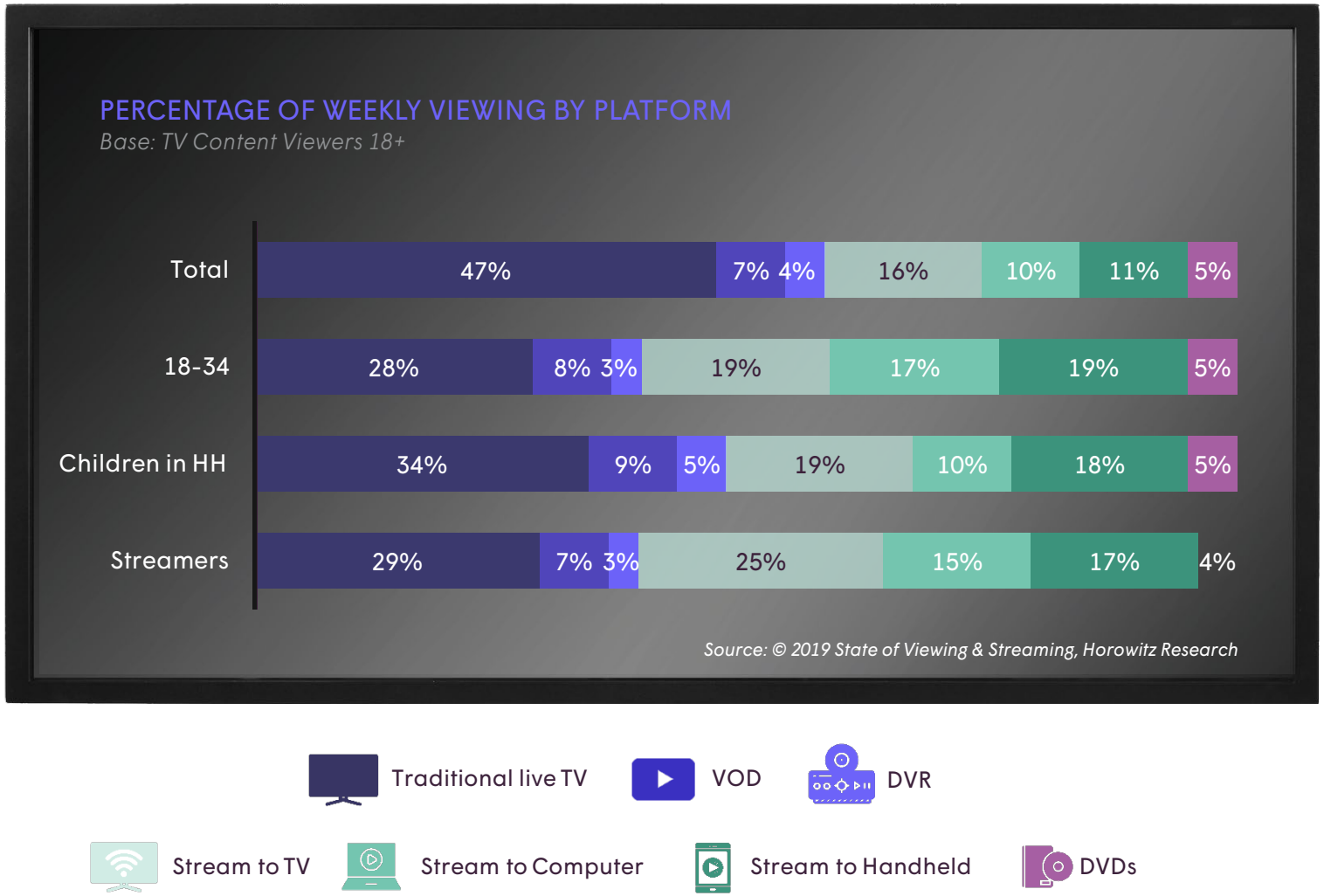
Traditionally, the most important number when it comes to home broadband is download speed: that's what consumers see when they look for when researching internet packages and that's what they refer to when talking about the internet speed in their home.

The demand for faster download speeds has come largely on the heels of the streaming revolution. Of course, streaming TV and entertainment content is responsible for the bulk of downlink bandwidth used.

HOROWITZ Plume

Horowitz's *State of Viewing and Streaming 2019* study found that consumers today are watching more full-length TV content than ever before—an average of 6.2 hours a day—much of that through streaming. In 2010, only 15% of TV content viewers streamed anything at all; today, almost 7 in 10 are streamers.

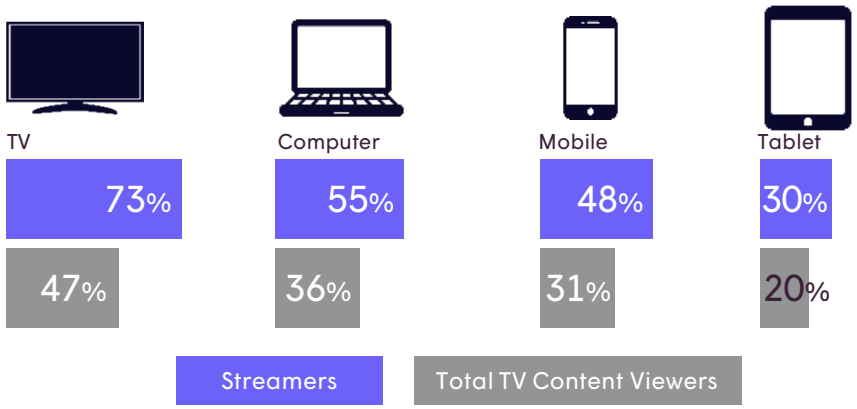
Consumers report spending an average of almost 4 out of every 10 hours of viewing time streaming (37%). Among self-identified streamers, that number increases to almost 6 out of every 10 hours (57%). Given the recent and anticipated launches of Disney+, Apple TV+, HBO Max, and NBC's Peacock, streaming's share of viewing will, no doubt, continue to grow in 2020.



Much ink has been spilled about how streaming is changing the viewing experience, that consumers are watching more content on mobile devices and that the old way of watching TV is dying. In fact, the *ability to stream to the TV* has played a tremendous role in driving streaming adoption. Horowitz data show that the TV set is the most popular screen used to stream full-length TV shows and movies, with 3 in 4 streamers saying they stream to a TV screen at least occasionally. In contrast, 55% use a computer, 48% use their mobile device, and 30% use a tablet to watch full length content at least occasionally. What this means is that the overall idea of watching TV is far from dead; it has just shifted delivery systems. In this new ecosystem, viewers increasingly expect that their experience streaming TV content to a TV set will be as seamless, high-quality, and lag-free as watching through a traditional cable or satellite TV service.

SCREENS USED TO STREAM

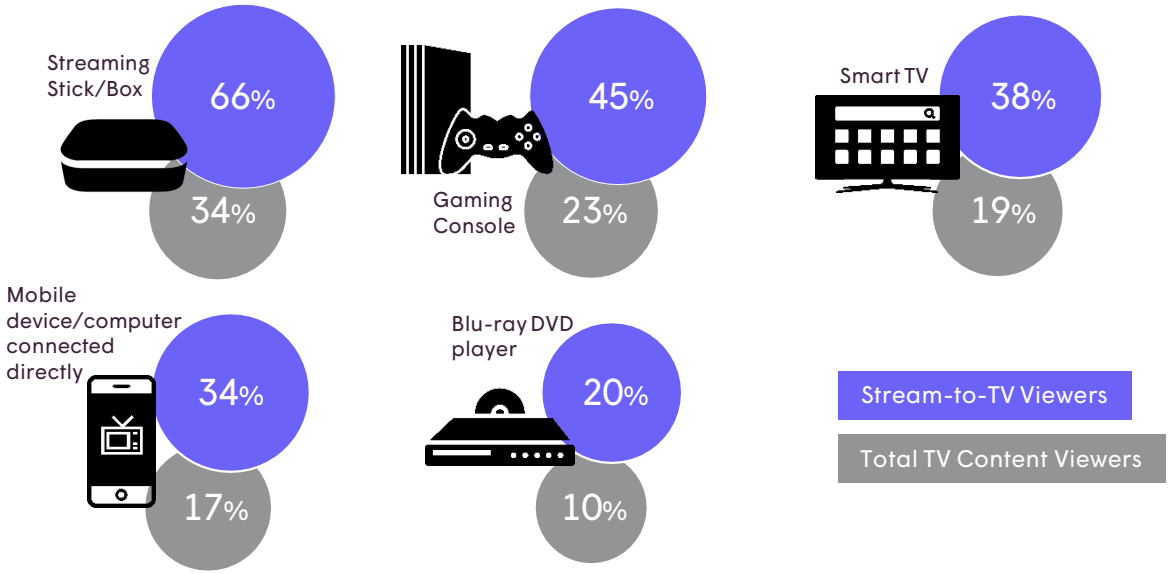
Base: TV Content Viewers 18+



The most popular way to stream to a TV is to use a streaming stick or box like an Amazon Fire TV Stick, a Roku, an Apple TV, or a Google Chromecast. Indeed, as of February 2019, nearly one-third of all Plume U.S. households have a streaming device connected to their Wi-Fi network. Data from Plume sheds additional insight into what is happening in those homes that stream using a stick or box. In households with a streaming device, Amazon and Roku are neck and neck in terms of share of usage, handily outperforming Apple TV and Google Chromecasts.

DEVICES FREQUENTLY USED WHEN STREAMING TO THE TV SET

Base: TV Content Viewers 18+

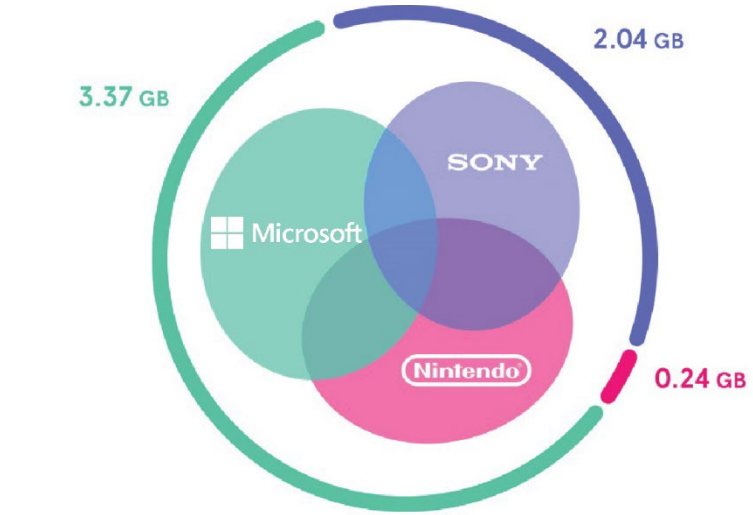


Source: © 2019 State of Viewing & Streaming, Horowitz Research

While streaming devices are the main way consumers stream, they are not the only way.

According to Horowitz, gaming consoles are the second most popular devices consumers use to stream to the TV set. A look at Plume households with gaming consoles illustrates the impact of streaming on bandwidth consumption. Penetration of Microsoft, Sony, and Nintendo gaming consoles are relatively on par but the *volume of content* downloaded by brand varies widely, with Nintendo consoles downloading a mere 0.24GB on average, and Microsoft and Sony consoles downloading 3.37GB and 2.04GB on average, per day.

The major difference between these three brands of gaming consoles is that the Microsoft Xbox and Sony PlayStation consoles are designed to be entertainment hubs in addition to gaming devices. Even at its launch back in 2013, the Sony PlayStation 4 supported all major video streaming services including Netflix, Hulu, Amazon Instant Video, Crackle, Crunchyroll, Epix, Vudu, and even more video and music streaming services. Sony even had its own streaming service, PlayStation Vue, which is shutting down in January 2020. In contrast, Nintendo's consoles are designed primarily as gaming devices, with streaming as a secondary function. In fact, Nintendo's Switch does not yet support Netflix, which, according to Horowitz, commands the lion's share—1 in every 3 hours, on average— of streaming time.



Average daily download

Console brand ownership

Based on a sample of Plume member households across the U.S. during Q1 2019

Consumers are more familiar with the concept of download speeds, but the shift to the connected home is driving a substantial increase in upload traffic.

Data gathered from Plume homes in 2018 and 2019 shows that upload traffic grew nearly 9% more than download traffic over the same period. The increased upload demand is being driven by upload-centric smart home devices like home security cameras and those nanny cams and treat-dispensing pet cams. As consumers continue building out their smart home ecosystem, the demands on upload speeds will continue growing—and so will consumer awareness and understanding of upload speed.

The bottom line: All this increased broadband activity means the burden on consumers' home Wi-Fi networks will grow exponentially, transforming their needs and expectations of their Wi-Fi service provider. In turn, features beyond speed will become increasingly critical for a seamless connected home experience, creating the opportunity for providers to transform home internet from a commodity into a highly differentiated product.

Smart home devices dominate uplink demand

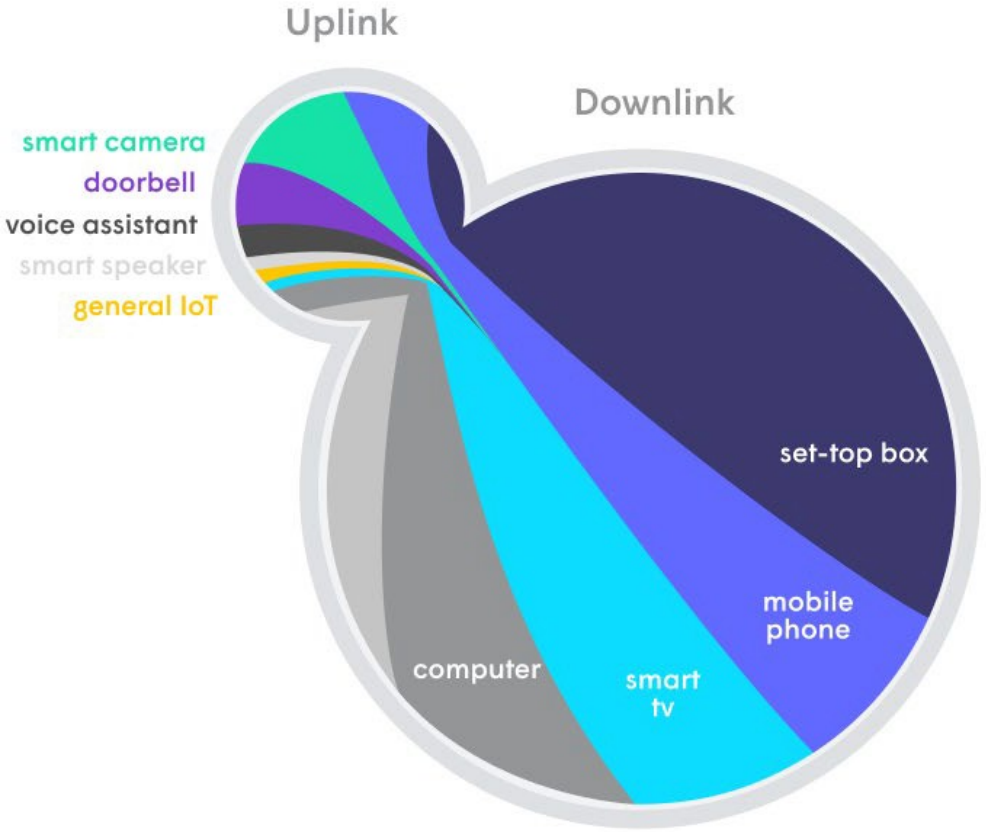


Chart based on anonymized data from U.S. Plume member households during 2019.

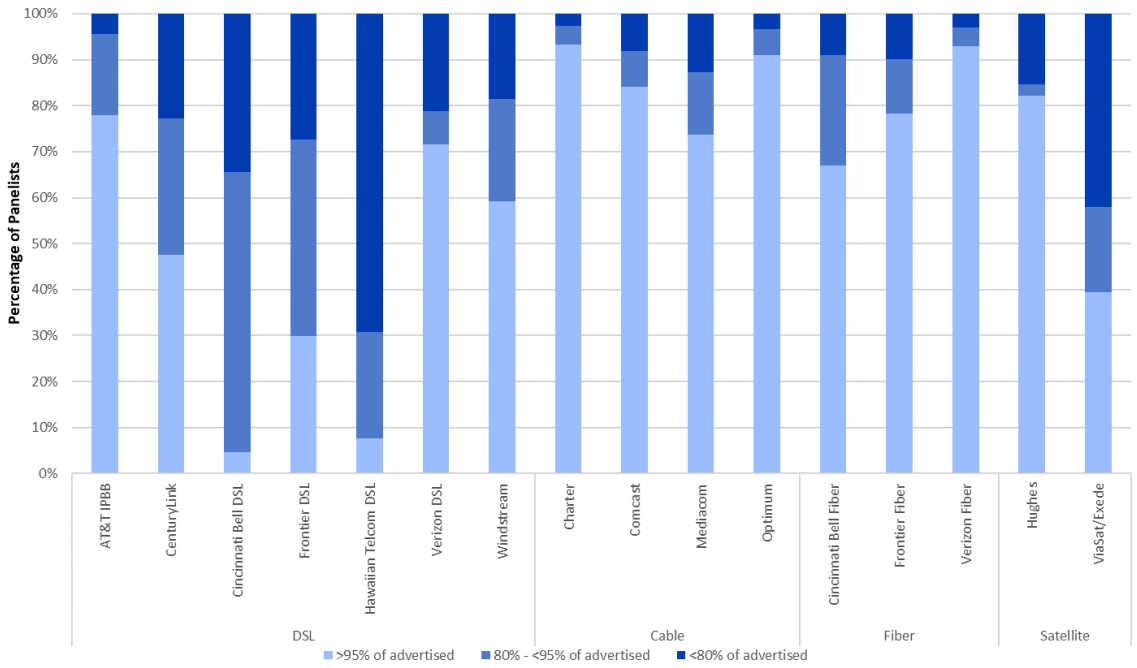
Optimization

Optimization of the home Wi-Fi network drives higher customer satisfaction, requires fewer resources, and improves retention.

The American Customer Satisfaction Index 2019 survey found that 31% of American consumers are dissatisfied with their internet service reliability (source: allconnect). In Horowitz's State of Pay TV, OTT, and SVOD 2019, 76% of consumers say they are satisfied or very satisfied with both the speed and the reliability of their broadband service and 10% are dissatisfied.

The performance of Wi-Fi in the home is a causal factor in customer satisfaction and dissatisfaction. Ongoing issues with in-home Wi-Fi reliability leads to a call to the ISP for technical support, a technician visit to try to resolve the issue and, if the issue remains unresolved, potential defection to a different provider. Given a choice, consumers cannot be expected to stay with an internet provider who does not provide them with the quality of service they expect and need.

In most cases, the ISP's broadband internet connection to the home is quite stable and reliable. The Federal Communications Commission (FCC)'s *Measuring Fixed Broadband - Eighth Report*, released in December of 2018, found that "the median download speeds experienced by most ISPs' subscribers nearly met or exceeded the advertised download speed," as illustrated in this chart:



The problems arise with the Wi-Fi network inside the home. The FCC notes in its report:

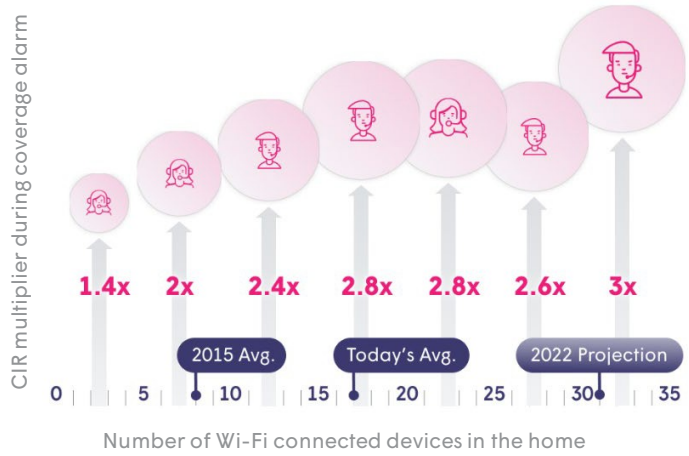
"A consumer's home network, rather than the ISP's network, may be the bottleneck with respect to network congestion. We measure the performance of the ISP's service delivered to the consumer's home network, but this connection is often shared simultaneously among multiple users and applications within the home. In-home networks, which typically include Wi-Fi, may not have sufficient capacities to support peak loads." (source: FCC)

Optimization of the home network can decrease customer service load.

As illustrated by Plume's recent analysis of call data over the course of a year from one major north American ISP, consumer complaints arise not from a complete network outage, but from the network not working well enough in the home, like poor coverage, high congestion, or being unstable. These are issues that will no doubt get aggrevated as more devices place increased demands on the home network. Another analysis of data from households that rely on the Plume platform confirms this: Call-in rates to ISPs about Wi-Fi coverage increase as the number of devices in the home increases.

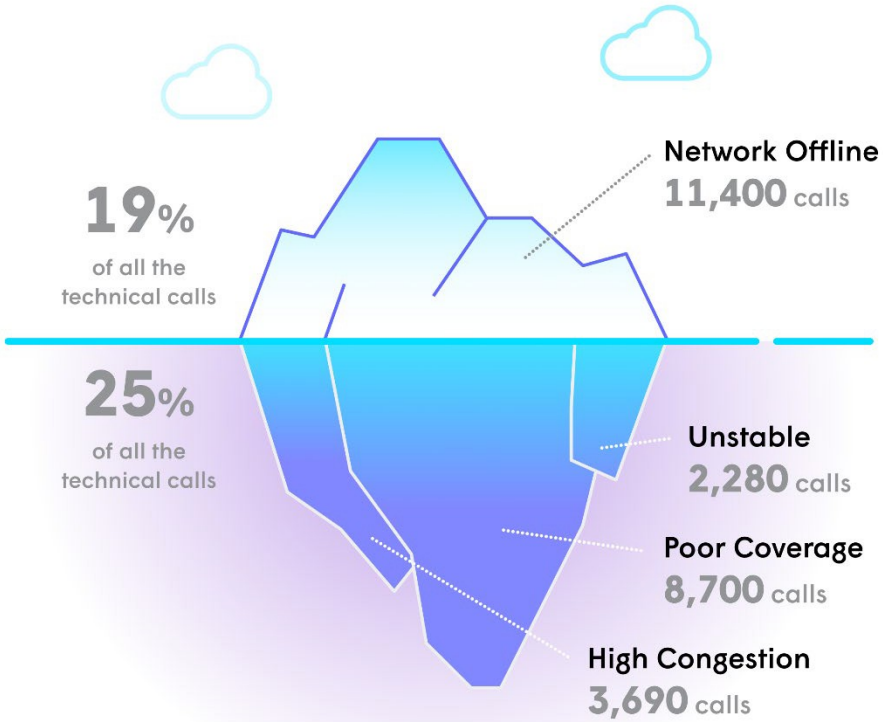
Impact of Device Count on Call-in-Rate (CIR)

For coverage alarm vs. no coverage alarm



The visible and invisible issues that trigger customer calls

Call volume sampled over a 1-year period



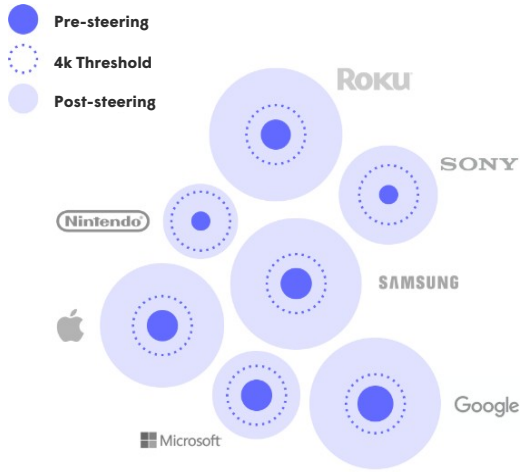
Based on anonymized data taken from a major North American ISP powered by the Plume Cloud.

Plume can help ISPs optimize the in-home network.

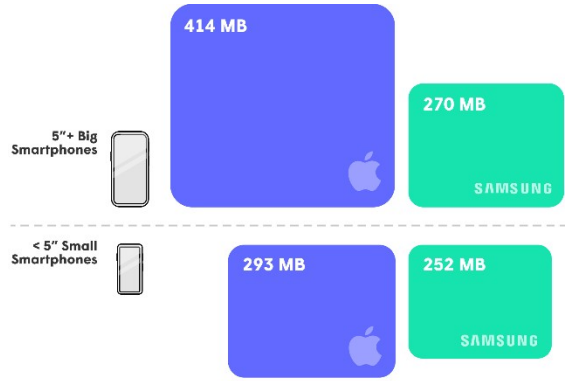
Plume offers solutions to ISPs to optimize the home Wi-Fi network and address some of the specific circumstances that engender the most nagging consumer complaints.

For example, Plume's Wi-Fi steering capability provides ISPs with ways to seamlessly direct different devices to the ideal access point within the home based on artificial intelligence, factoring in how to optimize the network regardless of how many devices or how much bandwidth they are using at the same time.
It works: this analysis of data from Plume-powered households shows that performance on selected video streaming devices improved 4-fold thanks to Plume's client-steering solution. From the consumer perspective, this kind of optimization can mean the difference between streaming a 4K movie flawlessly or getting the spinning circle of doom— and an unsatisfied customer.

By way of example, Plume knows exactly which when, and how devices are being used. An analysis of Plume data finds that screens larger than 5" consume 26% more data than their smaller screen counterparts, and that Apple's big screen users consume 53% more data than Samsung's. This kind of data allows for Plume's Wi-Fi steering, based in the Plume Cloud, to intelligently direct the right amount of Wi-Fi from the optimal access point to the right devices— like to those larger-screened Apple phones that appeal to video-oriented consumers.



Based on selected video streaming devices performing below the 4k threshold in U.S. Plume-powered households during June 2019



Based on a sample of Plume member households across the U.S. from Feb 1, 2019 to April 30, 2019.

*Avg. daily data consumption

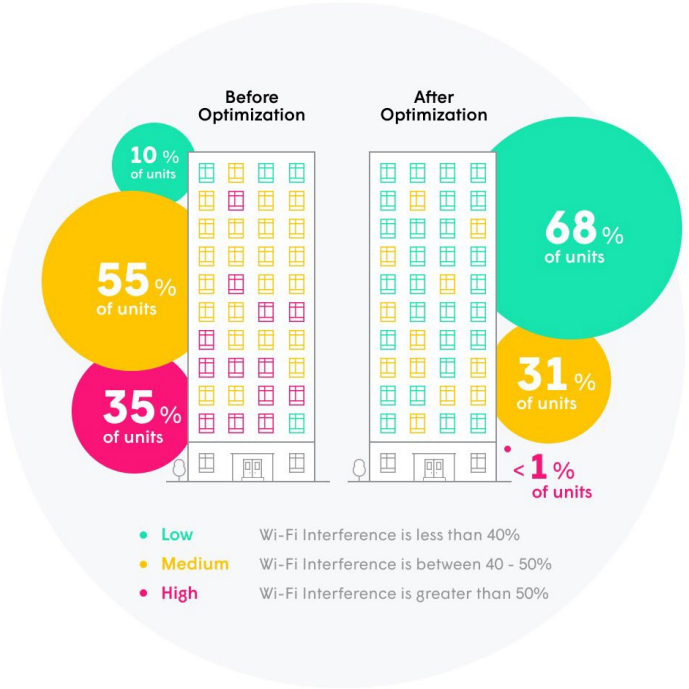
Peak periods and interference are invisible threats to the home Wi-Fi experience.

As noted by the FCC, Wi-Fi can slow during peak hours, leading to things like streamed TV shows buffering during family viewing time on weeknights. This is caused by interference—other signals outside of the home Wi-Fi network disrupting the functionality of the network—and can be particularly challenging in apartments and condos, where there is a high number of networks on the same channel. Through Topology Optimization technology (addressing and refining the backhaul network), Band and Client Steering (enacting seamless transitions as people and needs shift around the home), and Airtime Control (which constantly measures and coordinates channel and bandwidth selection), Plume can virtually eliminate the impact of interference: Plume analyzed data taken from 30 multi-dwelling units (MDUs), both before and after applying Plume's Wi-Fi optimization. Prior to optimization, over 1 in 3 (35%) of apartments suffered from high interference, dropping to less than 1% of apartments after optimization.

Dead zones are another weak point from the consumer experience.

Another common complaint from consumers is that they have "dead zones" in their home: places in their home where internet service can be spotty or weaker even when it works perfectly in other areas of the home. This is particularly challenging in older buildings with cement, plaster, or brick construction, or in larger homes. The Wi-Fi signal from one centralized router is not likely to effectively reach the entire home. Wi-Fi extenders and mesh systems can help somewhat but are less than ideal. In fact, in some cases they can essentially reduce the home network's overall capacity by introducing self-interference. Routers or access points integrated with OpenSync means access to Plume's Adaptive Wi-Fi, artificial-intelligence powered, cloud-controlled Wi-Fi that continuously adapts to the needs of the home based on the devices being used, the demands on the network, and where in the home the Wi-Fi is most needed at the time.

Interference improvements after building-wide Plume optimization



Based on anonymized data taken from a major North American ISP operating on the Plume Cloud. Measurements were taken 30 days before and 30 days after Wi-Fi optimization.

Data Security and Privacy

Consumers are more concerned about their digital security than ever— and will look to their provider to protect them and their households.

Forbes consumer tech contributor Mary Meehan notes that "Data privacy has become one of the defining social and cultural issues of our era… business needs to start thinking now about how to counteract the fear and distrust flooding the marketplace" (source: Forbes). Indeed, Pew Research Center found that most U.S. adults feel they have little or no control over how companies (81%) and the government (84%) use their personal information. A recent survey by Wunderman Thompson Data found that 6 in 10 (58%) U.S. respondents are very concerned about the privacy and security of their personal information and data, but only 18% say they are "very diligent" in protecting it (source: Mediapost).

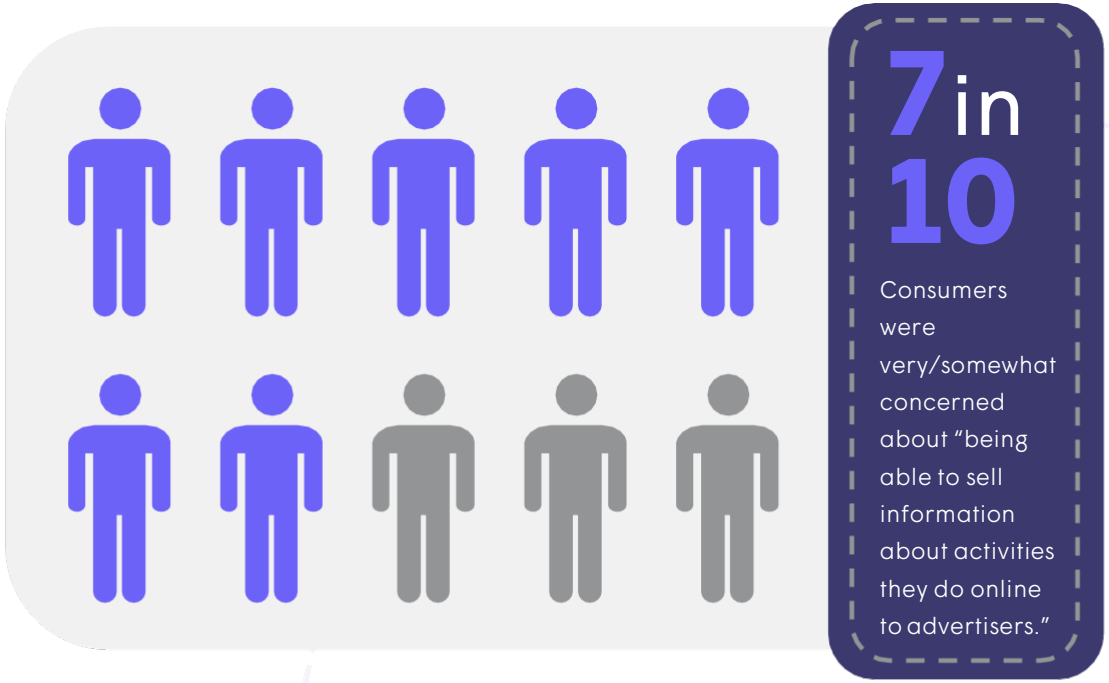
Connected home and other Internet of Things (IoT) devices worry consumers. Two in three (63%) people surveyed in an international study by Consumers International and the Internet Society said they find connected devices 'creepy' in the way they collect data about people and their behaviors. While addressable advertising holds a lot of promise for the future, consumers are wary: 37% of social media users say that when they see ads in their social media feeds that are clearly targeted to them based on their search history, they find it intrusive (Horowitz, State of Consumer Engagement 2019).

For many consumers, the threat of "Big Brother" weighs heavily on their decisions. Their security concerns are serious enough to deter almost a third (28%) of people who do not own smart devices from buying one (source: The Internet Society).

These concerns are not unfounded. Major data breaches— like Marriott's, which impacted 500 million customers and compromised sensitive information like passport numbers, and Equifax's, which impacted 143 million consumers and compromised social security numbers and credit card information— made headlines and caused widespread anxiety for consumers already afraid of identity theft and other security threats. The recent hack of a Ring Camera in the bedroom of an 8-year old girl and other similar Ring incidents (source: Washington Post, CBS Philly) strike at the core of parental fears for their children's safety in the digital world.

Consumers expect the companies they do business with to help protect them.

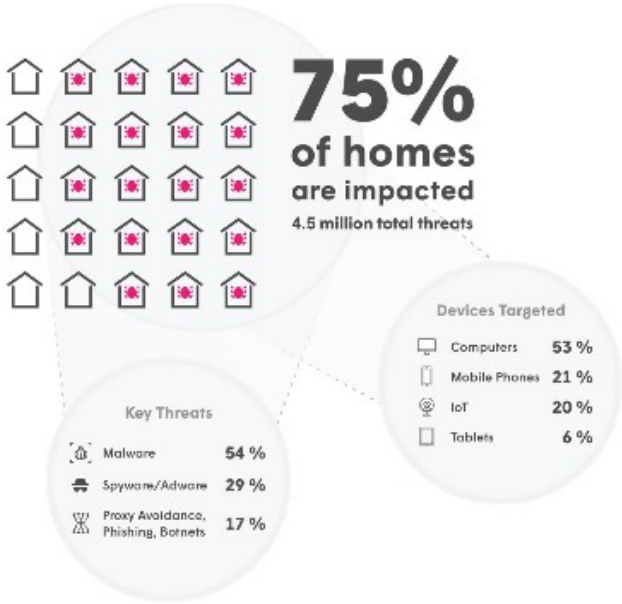
As consumers become more anxious about internet security, they look to the companies they do business with to be their partners in protection, especially as IoT technologies (including connected home devices) proliferate. A 2017 survey conducted by PricewaterhouseCoopers found that a full 92% of consumers agreed that "companies must be proactive about data protection", and 55% felt that AI/IoT technologies are a big threat to their privacy and security. Notably, the same survey found that media and entertainment, information technology, and telecom companies are among the least trustworthy types of companies/industries, according to consumers. Similarly, in 2017, Horowitz found that a full 7 in 10 consumers were very/somewhat concerned about their internet company, specifically, "being able to sell information about the activities they do online to advertisers."



Top-of-the-line consumer data protection and privacy are critical for customer retention.

A recent survey conducted by Cisco found that 48% of consumers had "switched companies or providers over their data policies or data sharing practices" (source: Cisco), underscoring the fact that having features in place to help consumers protect their privacy and cybersecurity will become an important selling point for broadband providers—and an invaluable feature for their customers. For example, Plume's platform has AI-based Whole-Home Device Protection that guards the home's connected devices from visiting known malicious destinations and from infection from malware, spyware, ransomware and phishing attacks. It has IP-based Intrusion Detection and Blocking that stops outside attackers from gaining access to home networks and notifies users of any attacks on exposed devices. It has Behavioral Analysis and Anomaly Detection, which uses machine learning to understand normal IoT device activity and develop a whitelist of allowable behaviors to identify and even block anomalies. It has Remediation and Isolation, which automatically blocks connections and quarantines devices with high-severity anomalies to prevent the spread of malicious code.

With Plume's Network-wide Security Dashboard, ISPs can analyze what is going on in the home network through various lenses, including by activity, time period, and geographic distribution, to be able to respond quickly to infrastructure threats. Through these technologies Plume's platform was able to identify and neutralize 4.5 million individual threats from April through June 2019 alone. A massive 75% of households had threats blocked, with malware and spyware topping the charts. The largest device categories targeted were computers and mobile phones. IoT devices, including streaming boxes, Wi-Fi speakers, and TVs were attacked almost 1 million times.



Based on anonymized data from Plume member households from April through June 2019.

Personalization

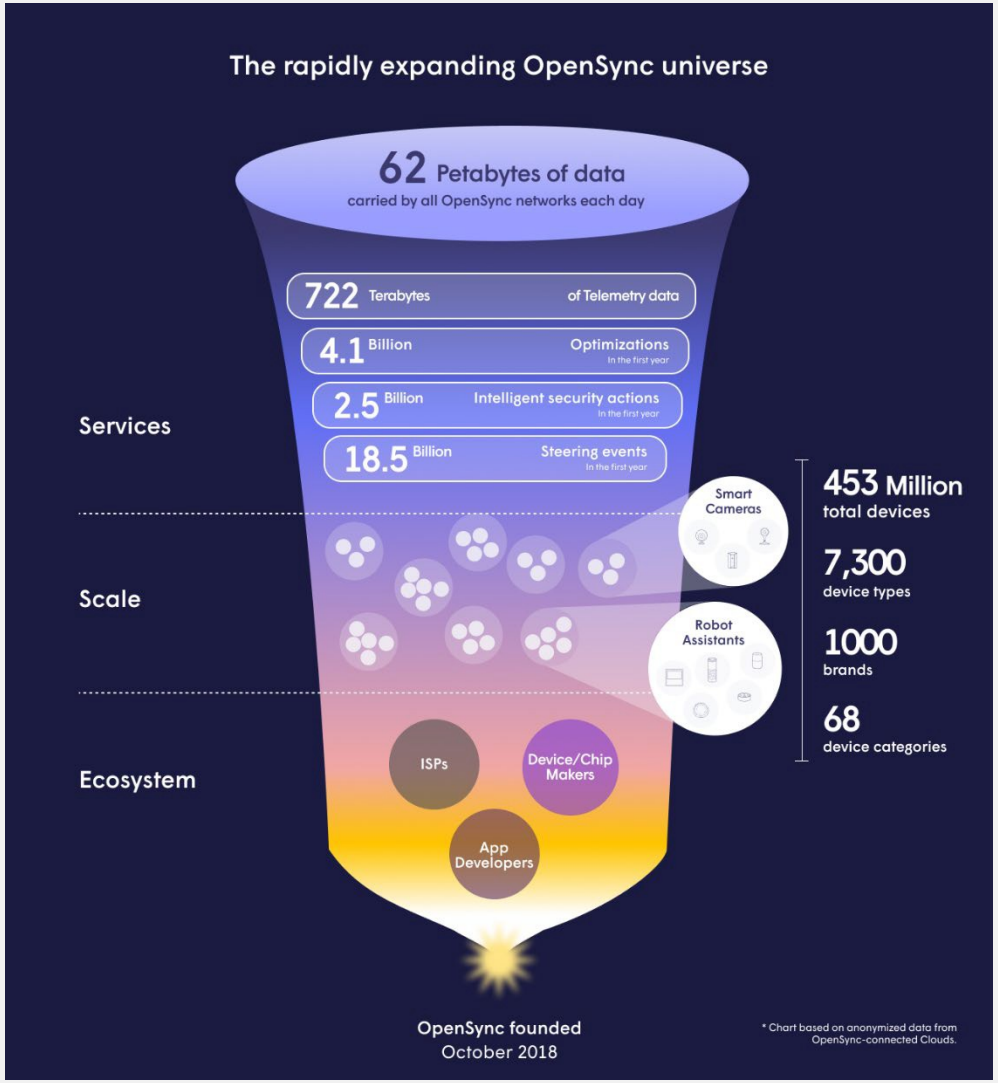
Through an OpenSync-supported Wi-Fi platform, today's broadband providers can transform the consumer Wi-Fi experience and, in turn, make their product and brand stand out with the stickier, sexier features and benefits of Smart Home 2.0.

Being able to personalize the in-home Wi-Fi experience puts consumers in the driver's seat, transforming Wi-Fi from an intangible utility to a premium technology product with palpable value to consumers. *Telecompetitor* journalist Joan Engebretson recently quoted Matt Strauss, Comcast's Executive Vice President of Xfinity Services, as saying the company has a "strategy to 'redefine broadband' by transforming the television into a 'dashboard for the digital home.'" (source: Telecompetitor). In a press release from September 2019 announcing the release of Comcast's Flex product, a device designed to serve the growing number of internet-only subscribers who have cut the cable cord, Strauss provided additional insight into the company's new strategy: "Xfinity Flex will deepen our relationship with a certain segment of our Internet customers and provide them with real value…we can offer these customers an affordable, flexible, and differentiated platform that includes thousands of free movies and shows for online streaming, an integrated guide for accessing their favorite apps and connected home devices, and the ease of navigating and managing all of it with our voice remote." (source: Comcast).

Beyond the speed of the internet service and the optimization of the home network, Wi-Fi platforms that are enabled by the OpenSync framework or underscored by Plume boast various features that allow consumers to personalize their experience. They can manage the Wi-Fi service from multiple devices, easily change settings like passwords and parental controls, monitor activity across devices, assign permissions based on profiles or devices, and troubleshoot their Wi-Fi connection. They can also deliver a robust suite of privacy and security solutions (source: Armstrongonewire).

As this graphic illustrates, in just one short year, OpenSync's reach has grown dramatically.

Around 50% of homes in U.S. and Canada are running on OpenSync, 2 of the top 3 European ISPs have deployed it, and OpenSync is distributed by the top CPE silicon vendors. Sixty-two petabytes of data are carried through OpenSync networks a day, through some 453 million devices (as of October 2019; as of December 2019, that number increased to over 500 million). And, Multichannel News reported in October of 2019 that Charter, the U.S.'s second-largest fixed broadband provider, will also be adopting the OpenSync open-source framework. With a cascading list of major ISPs and device makers already adopting OpenSync - including Samsung, Comcast, Liberty Global, Bell Canada, J:COM and NCTC affiliates - the current potential footprint is nearly 200 million homes and continued strong growth is forecast through 2020.



Conclusion

In a rapidly evolving smart home and IoT ecosystem, ISPs will need to be nimble to keep up with the pace of change.

The rollout of 5G and the marketing hype that has been accompanying it places increased pressure and urgency on internet providers to differentiate their service and create a premium experience in order to maintain and grow market share. Moreover, as Kevin Westcott, Vice Chairman and U.S. telecommunications, media, and entertainment leader of Deloitte LLP noted in their *2020 Telecommunications, Media, and Entertainment Outlook*, "telecommunications firms and enterprises are still trying to determine what the 'killer apps' for 5G will be. With the advent of 5G, we're likely to see new kinds of apps we've never considered before."

It is already anticipated that 5G— and all future "next-generation" internet connectivity services that follow, such as the "10G" service that U.S. cable companies are developing— will change the way consumers use broadband in the home, whether it be through the adoption of augmented and virtual reality content and services, digital health tools, educational tools, improved telecommuting, or new and improved digital shopping experiences. It is also already anticipated that 5G will usher in a host of new security concerns. For example, a report produced in October 2019 by the NIS Cooperation Group for the European Union Member States outlined several cybersecurity concerns about 5G (source: Techcrunch) and, also in October of 2019, Techcrunch reported that "Security researchers at Purdue University and the University of Iowa have found close to a dozen vulnerabilities" of the 5G network. (source: Techcrunch).

As these yet-undeveloped tools and apps are introduced to the marketplace, consumers' home internet usage, needs, and expectations will continue to evolve, and today's most sophisticated points of differentiation for broadband will quickly become tomorrow's baseline expectations. The most important promise internet providers can make to their consumers is that they have the infrastructure in place— a platform approach like the OpenSync framework— to be nimble, keep up with the pace of change and truly deliver on the opportunity that Smart Home 2.0 presents.

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About

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Plume®

Plume is the creator of the world's first Smart Home Services Platform. As the only open and hardware-independent solution, Plume enables the curation and delivery of new services rapidly and at massive scale. The Plume service bundle which includes Plume Adaptive WiFi™, HomePass®, and AI Security™ is managed by the Plume Cloud, a data- and AI-driven cloud controller currently running the largest software-defined network in the world. Plume leverages OpenSync™, an open-source framework which integrates into a broad set of silicon & platform SDKs for connection to the Plume Cloud. Plume's smart home service and back-end product suites are proven to help communications service providers around the globe deliver on the promise of fast and reliable internet throughout the home, while increasing ARPU, improving NPS, and reducing call-in rates, truck rolls, and subscriber churn.

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