WHITE PAPER

OPEN FOR BUSINESS: FUTURE FLEXIBILITY FOR SMART HOME SERVICES

A Parks Associates Whitepaper Developed for Calix

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COMPETITION HEATS UP FOR CONNECTED HOME SERVICES

With the rise of the Internet of Things (IoT) in the residential sector, many players across verticals are making strong moves to become the trusted advisor in the connected home and capture new value through smart home services. Broadband service providers can look to these smart home services as a way to leverage their existing assets to develop new revenue streams and differentiate from competitors.

Most importantly, smart home services can help stave off commoditization by fortifying their brand value as a service provider beyond merely providing a pipe.

With sales of connected consumer devices – including smart home, connected health, mobile, and connected entertainment products – set to exceed 520 million units by 2022, industry players are looking to a variety of uses cases for smart home services to leverage their existing assets.

Partnerships with device makers and other connected companies are making it easier than ever to bring smart home services to market, but if past efforts have taught the industry anything, the ability to pivot quickly toward new opportunities is paramount.

A future-flexible platform is a critical component for success in the IoT. While it can be a heavy lift for service providers to develop and maintain on their own, vendors are emerging to meet this need. In particular, vendors are offering new turnkey solutions to serve the varied use cases consumers are responding to today, with the built-in flexibility to deliver on tomorrow's demands as well.

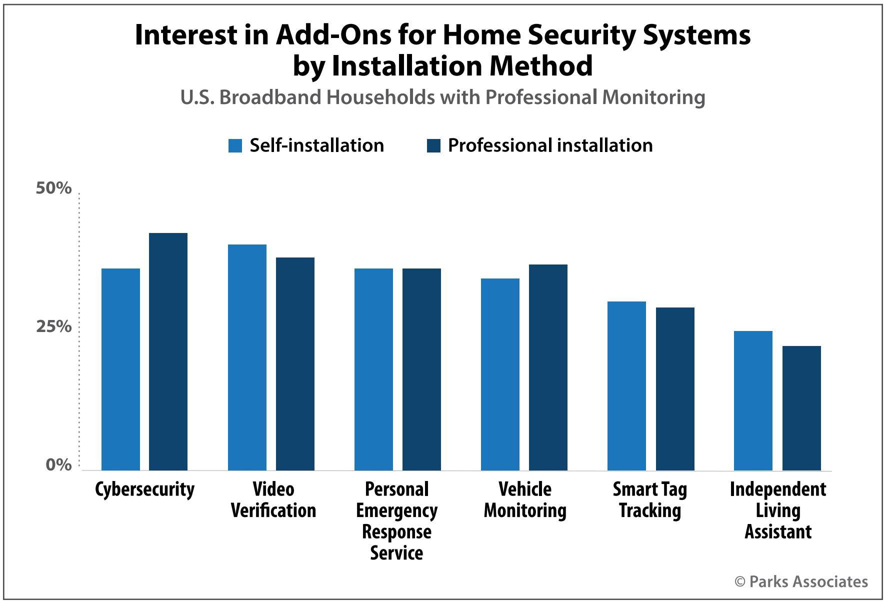
CONSUMER INTEREST AND WILLINGNESS TO PAY FOR CONNECTED HOME SERVICES

Security and Peace of Mind

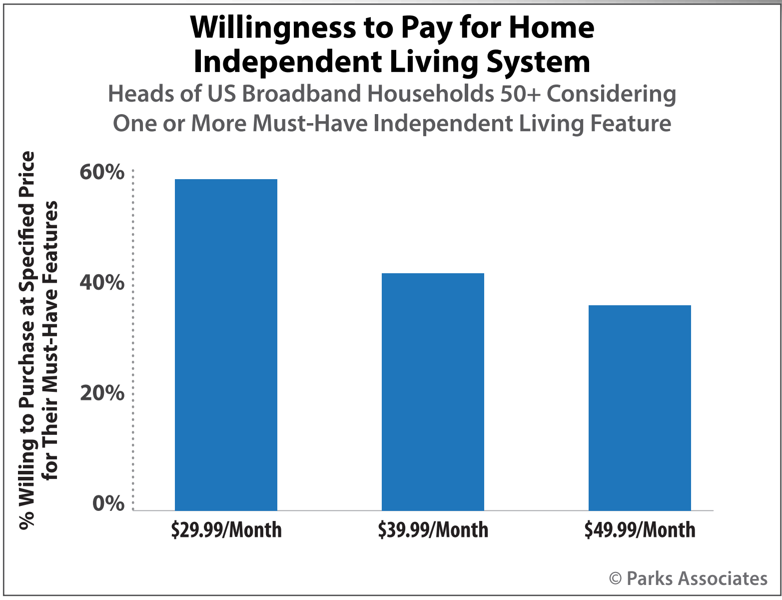
At the end of 2018, 24 percent of U.S. broadband households subscribed to professional monitoring. Historically, security and safety have generated the most compelling consumer interest among all uses.

More than half of professionally monitored subscribers have at least basic interactivity with their security system. Interactivity and support for home controls have enabled an increase in recurring monthly revenue for security providers in recent years. New subscribers pay an average of $55 per month, $5 higher than the average for all security subscribers.

In addition to the traditional security provider, there are new "do-it-yourself" (DIY) security systems with optional



monitoring, video recording, and storage services. Flexible contract options are positioned to expand security into the 70% of households that do not have security systems. Owners of DIY and professionally installed systems show strong interest in add-on services, such as cybersecurity, personal emergency response services (PERS), vehicle monitoring, and smart tag tracking.



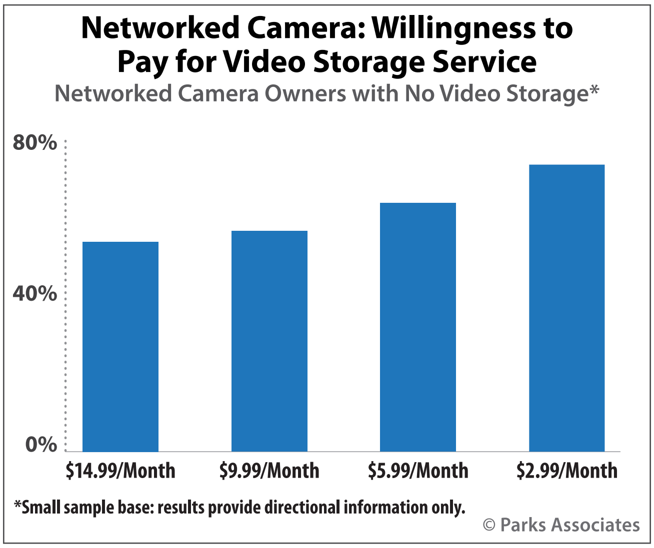
Networked Cameras

Ten percent of U.S. broadband households own at least one networked camera.

In recent years, peace of mind or "soft" security use cases have driven interest in cloud video storage services among consumers who own networked cameras.

Networked cameras are increasingly popular for monitoring children, pets, and home services such as nannies, housekeepers, and delivery personnel.

- About one-third of camera owners pay for video storage, with 59 percent paying $11 or more per month.
- Among camera owners not currently paying for storage, about half indicate a willingness to pay $14.99 per month for 60 days of storage; 74 percent would pay $2.99 per month.



Independent Living

Rapidly aging populations in the United States are creating new demands for independent living services in which smart security and safety devices are supplemented by health-related sensors, connected medical devices, and PERS. Activity monitoring, medication adherence, fall detection, and access control provide peace of mind to caregivers and more independence for elders.

The majority of consumers 50-plus are willing to pay $30 per month for an independent living system that has their must-have features.

Unlike the highly competitive security segment, independent living and aging-in-place solutions are still in their infancy, with no dominant player capturing the market. Service providers may find much more market opportunity with these services.

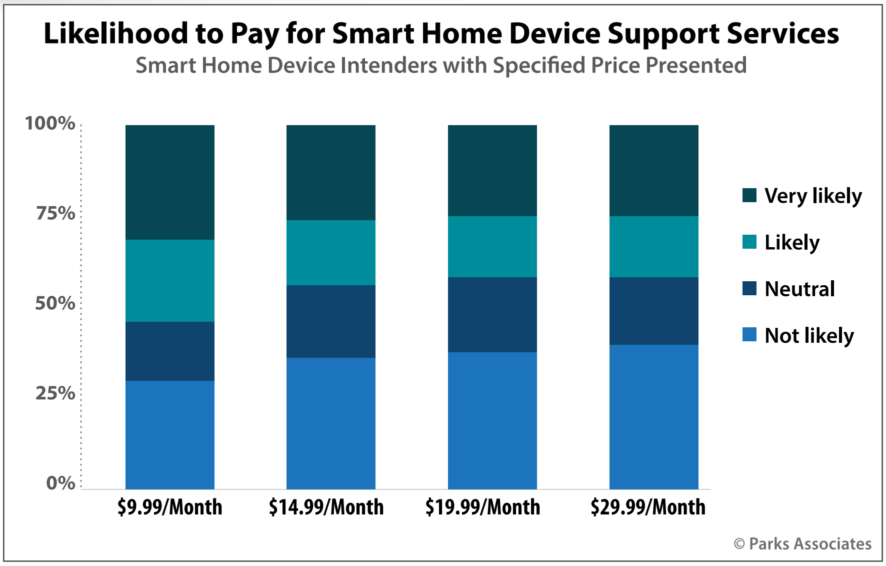
Premium Tech Support Services

Consumers show interest in a variety of support services for smart home devices. The services include on-demand and subscription services for tasks from initial installation, setup, and technical support to ongoing consultation for future purchases.

- Consumers who paid a one-time fee for technical support services in the past 12 months paid $50 or more for one service event.
- Nearly 60 percent of consumers are willing to purchase a comprehensive subscription support service for $9.99 per month.

These support services can also be bundled with related services, such as warranties, cybersecurity, and data backup services.

In planning for smart home services as diverse as security, independent living, and tech support, service providers need to



align with vendors that will enable quick and easy integration across a wide range of applications.

OPPORTUNITIES FOR PUTTING THE "SERVICE" IN "SERVICE PROVIDER"

As broadband service providers seek to compete with endpoint device manufacturers, DIY systems, and service providers in other channels, they need to assert their unique position to relieve pressing consumer pain points. The smart home struggle is real for consumers.

DIY Products

Adoption of self-installed, self-monitored devices (DIY) has increased significantly in recent years, but Parks Associates finds consumers continue to experience frustration over problems during installation, setup, and configuration.

- Sixteen percent of connected entertainment device owners and 28% of smart home device owners report the setup process as being difficult or very difficult.
- One in five consumers who found the smart home device process "very difficult" returned the device.
- Twelve percent of smart home device owners report technical problems going unresolved in 2018.

When DIY consumers are asked how they would like to install future devices (regardless of the cost involved), 41 percent indicate they prefer some form of technical assistance. This consumer preference points the way toward demand for professional services that can deliver convenience and technical support.

- Many DIY consumers may evolve into Do-It-for-Me (DIFM) consumers for a variety of reasons:
- Self-installation is either too difficult or too inconvenient.
- As the number of desired devices in the home increases, DIY consumers may shift to pro-installed systems that provide more reliable interoperability and unified control.
- Rising affluence and declining prices may lead younger adopters into professional services.
- Services and features built on top of basic smart home control offer compelling value propositions for desirable use cases.

Support Services

Broadband service providers are uniquely positioned to roll trucks with technicians for installation and configuration services. They also have the resources to provide ongoing technical support services for initial installs as well as subsequent self-installed devices. Those that have adopted software-defined networks have added visibility into home networks to deliver more robust support services.

Given these advantages, providers are well-positioned to address recurrent concerns over Wi-Fi network management and data security, a key area of concern for consumers and an area in which providers frequently lose revenue to retailers.

- Difficulty connecting devices to the router has remained the leading issue facing smart home device customers for the past two years.
- Among those smart home consumers who report experiencing problems, 33 percent reported a loss of wireless connectivity and 27 percent report an unresponsive device.

- Thirty-seven percent of Wi-Fi households report their Wi-Fi seems slow at least once a week, and another 20% report Wi-Fi coverage problems.

To address these network connectivity issues, 22 percent of U.S. broadband households have purchased Wi-Fi extenders. Service providers know that most of these devices do not solve connectivity issues. Another 11 percent of U.S. broadband households have purchased whole home mesh networking systems that relegates the carrier-provided gateway to "bridge" mode.

Absence of Wi-Fi solutions from service providers is driving consumers to retail, even though service providers are in position to solve these issues

The lack of a carrier-grade, whole-home, managed Wi-Fi solution contributes to consumer perceptions of poor internet service, which can act as a barrier to adoption of new connected services and potentially drive customer churn.

Privacy and Security

Parks Associates finds more than three-quarters of consumers have concerns about unauthorized access of their personal data.

Network security embedded on customer premises equipment (CPE), such as Wi-Fi gateways, can address security concerns in a more robust way than can endpoint security solutions alone.

Since service providers are the leading source of CPE, they can offer hardware solutions that address the problems associated with network coverage, congestion, network security, and onboarding of devices.

- Almost half of U.S. broadband households are "very concerned" about the hacking of their devices and the historical data on them.

Consumers expect their network provider to be best able to address their network security. Solid, reliable Wi-Fi and network security are building blocks for future IoT offerings and can serve as key differentiators from other smart home services.

Service providers can bundle premium Wi-Fi and cybersecurity services with other smart home services to create truly differentiated offerings from other competitors in the smart home space.

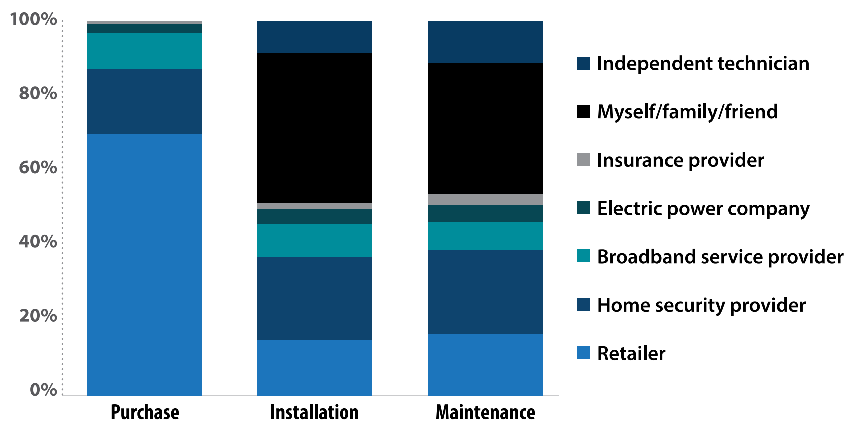
SERVICE PROVIDERS HAVE A WINDOW OF OPPORTUNITY AS A SMART HOME CHANNEL

Retailers are the most appealing purchase channel for smart home devices, but Parks Associates research finds approximately 10 percent of U.S. broadband households consider broadband service providers their channel of choice.

Service providers' relatively low top-of-mind consideration signals the need to do more to reposition themselves for growth that will benefit players who get a foothold in the home. Once foundational smart home brands and systems are in place – such as those rapidly coming to market from tech giants – new entrants find it increasingly difficult. Until now, service providers have not offered much in the way of smart home services that would drive their share of the business upward, but the opportunity remains, especially among consumers who gravitate toward a DIFM option. Partnerships with the device brands consumers love, supported by a feature-rich application platforms, will help.

Most Appealing Purchase Location/Installation/Maintenance Option

U.S. Broadband Households Planning to Purchase at Least One Smart Home Device



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- State of the Smart Home Market in a Year of Disruption
- Creating Value through Elevated User Experiences
- Monitoring Services: Expanding Beyond Security

Creating Value at Home: Disruption and Consumer Tech

- AI and the Smart Home: Proactive and Predictive Intelligence
- DIY: Impact on Smart Home and Security
- Independent Living: Serving Seniors and Chronically Ill

Tech Driving Innovations

- AI and the Smart Home: Proactive and Predictive Intelligence
- Connectivity: Impact of Gigabit Broadband, 5G, and Wi-Fi 6
- Investing in the Future: 2025 Outlook

Ecosystem Opportunities

- MDUs in Focus: Builders, Property Managers, and Connected Solutions
- Energy Management: Opportunities in the Smart Home
- Connected Cars: Extending Functions in the Home
- Connected Health at Home: The Next Smart Home
- Support: Onboarding and Ongoing Services
- Privacy and Security: Protecting the Consumer

Visionary Speakers

Samir Ahmad
Investment Manager
KPN Ventures

Andrew Beach
VP, Community Technology
Mill Creek Residential

Noopur Davis
EVP, Chief Product and Information Security Officer
Comcast

Erika Diamond
VP, Utility and Market Services
EnergyHub

Anne Ferguson
VP, Marketing
Alarm.com

Oisin Hanrahan
Chief Product Officer, ANGI Homeservices; Co-founder & CEO, Handy

Rodney Harrell, PhD
VP, Livable Communities and Long-Term Services and Supports
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Roughly one-third of consumers prefer a non-retail purchase channel, including providers in home security, broadband services, and independent contractors.

Service providers as a group fair even better as channels for installation and maintenance, though preference for broadband services is steady at 10 percent for both activities. This point further underscores the opportunity for broadband service providers to cultivate a strong consumer perception that they can deliver services beyond their core offering.

The position of service providers is strengthened by their ability to offer more for more – more valuable services to capture more revenue per user.

Service providers can offer more value than retail and security service providers by offering bundled solutions that make customers' lives easier on several fronts.

With more value creation comes the opportunity to capture more revenue per user:

- Sales of devices with on-bill financing and bundling with other services
- Hardware support for smart home services in the CPE that simplifies the user experience and reduces costs to consumers
- Installation services for initial products, enabling upsell opportunities
- Technical support for connected devices and optimizing the home network
- Premium Wi-Fi services
- Cybersecurity Services
- Parental controls for broadband and entertainment content
- Proactive network and device management

LONG-TERM INVESTMENTS IN FLEXIBLE PLATFORMS ARE NEEDED

Smart home use cases and value propositions are still evolving and will continue down that path for decades to come. Service providers are rightly concerned that they not invest in technology platforms that will soon become obsolete or are so rigidly inflexible that they cannot take advantage of new partnerships. The smart home is a long-term investment.

Some service providers have picked a partner for a specific use case and then had to completely retool to take their business in another direction. Most have lost the appetite for building and maintaining a proprietary platform in the face of relentless technological change and complexity.

Open, cloud-based platforms and hardware-agnostic technologies provide service providers with freedom to let strategy drive their business without being limited by past partnerships.

Today, service providers may launch a security-based independent living solution, but tomorrow they may want to partner to support emerging connected health solutions. New smart home services typically require a value chain of partners that need to be integrated into an orchestrated ecosystem that delivers a unified user experience. Broadband service providers need technology solutions that won't disrupt their business but will seamlessly support new directions. ❖

Broadband service providers have more options than ever for leveraging technology partners so that, in the future, they will be open for business.

Brad Russell leads Parks Associates' connected home team, exploring leading-edge issues converging in the connected home – smart home devices and services, home networking, IoT data privacy and security, data-driven applications, and platform services. Brad's custom research work includes market sizing and forecasts, ecosystem and competitive landscapes, channel analyses, and go-to-market strategies. Brad balances the art and science of market research to generate insights that lead to more astute business strategy and value-generating practices. He has a background in marketing communications, technology startups and online media.

Brad received his bachelor of science degree in advertising and marketing from the University of Texas at Austin. He also earned a M.Div. and a D.Min. with concentrations in ethics and cross-cultural collaboration.