

A young boy with short, light-colored hair and black-rimmed glasses is looking down at a tablet computer he is holding with both hands. He is wearing a dark-colored t-shirt. The background is blurred, showing what appears to be an indoor setting with a white wall and a doorway. The entire image has a blue and purple color overlay.

# BROADBAND AND BEYOND

- New business possibilities for communications service providers (CSPs)
- The pivot to value-added services beyond connectivity
- Connectivity+, smart home and smart city opportunities
- Why CSPs are well-suited to lead the 'beyond-broadband' market

# REPORT INTRODUCTION: IT IS TIME TO LOOK BEYOND CONNECTIVITY

Videonet asked Aliaksandr Baradyntsau, European Head of Media & Telco at EPAM, and Daniel Hesselbarth, Principal, Business Consulting, EPAM, to provide the introduction to this report.



*Aliaksandr Baradyntsau has extensive experience in senior project and account management, helping media and telecoms companies drive mission-critical innovation and adapt agile working practices.*



*Dr Daniel Hesselbarth has spent nearly 20 years in the telecoms and media industry, with leadership roles in product development, project management, innovation and digital transformation.*

The ongoing race to deliver super-fast broadband should not obscure the fact that, within a few years, high levels of competition will ensure that connectivity itself is commoditised. Communications service providers (CSPs) must consider how they differentiate themselves in the future. There are two immediate opportunities – connectivity+ and the smart home – and one slow-burning, yet potentially huge market development to explore – the smart city. In this report, these three markets are referred to as ‘broadband and beyond.’

Connectivity+ begins with the pivot to focus on added-value services and includes things like subscription tech support, family management and physical and cybersecurity. Managed smart Wi-Fi is a key connectivity+ offer. This does more than ensure excellent whole-home wireless coverage – it puts people in charge of Wi-Fi, like meal-time pauses on children’s connections or unique guest passwords.

The smart home includes peace-of-mind monitoring (e.g. baby monitors), physical home security, smart energy and chore automation. The smart city encompasses everything from traffic and parking optimisation to real-time gunshot detection.

Some CSPs are wary of the smart home in particular – first generation offers have not always succeeded. All CSPs should look at this market from the fresh per-

spective, if they are not doing so already. Some business will lead it – and there are plenty of big-brand retailers and tech companies staking their claim, many with rounded device, UI and backoffice ecosystems.

This is not just about imminent revenue streams; it is about ‘owning consumer loyalty’ long-term, making sure households rely on you, and not others, for a range of life-improving services that will help define the next decade of home living, and indeed, mobile living.

CSPs are better placed to pursue the connectivity+, smart home and smart city opportunities than anyone. Putting aside the discrete applications and services for one moment, there are several unavoidable, crucial roles that must be performed across all three markets.

First, someone has to make everything work and provide the provisioning, customer care and ongoing tech support that becomes more important than ever in markets dripping with new technology. CSPs already have the organisation, scale and skills to make this role their own.

Second, cybersecurity will make or break this market and the companies operating in it. Consumers are inviting ultra-connected tech into their living rooms and bedrooms. Trust is everything and relates not just to technical security competence, but to ethics and data privacy. CSPs have that trust.

In addition, CSPs are already part of a highly sophisticated security ecosystem, developed for television, that covers most of the skillsets this market will need. Security as a service – constantly updated, holistic and multi-device – is in their DNA. Nobody is going to get away with ‘sell-and-forget’ devices and services in the broadband-and-beyond marketplace.

When this market takes off, it will not stand still for perhaps two decades. The third universal strength the CSP has is its ability to develop platforms, devices and services, work with a broad selection of partners and provide the open APIs needed to harness industry-wide innovation.

Service providers have been painted as the laggards of the digital age, but in both broadband and television services, the market has already seen the game-changing impact of a more open-source and agile working model. Businesses are learning to work faster, in a more adaptive manner, and de-risk innovation. Those CSPs who have not yet transformed their organisations to focus on agility, or are partly transformed, can do so faster than many of their ‘broadband-and-beyond’ rivals can match CSP development and implementation skills.

EPAM is convinced that CSPs can become the long-term giants in broadband and beyond, regardless of where everyone starts the race. If you look beyond today’s apps and devices to the fundamentals of success, the CSP position is a strong one.

There is no time to waste, however. This report shows that consumers are warming up to connectivity+ and smart home solutions and demonstrates where services can attract new revenue. It is going to become easier to justify launches to the CFO.

This is also a good moment to think about the smart city. This is the natural progression for fixed-line and 5G service providers who can turn ultra-connectivity into new and meaningful applications. CSPs have changed our world by delivering the Internet – now it is time to take a bigger stake in what every home, community and city does with the Internet.

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# BROADBAND AND BEYOND: THE NEXT STEPS FOR COMMUNICATIONS SERVICE PROVIDERS

This report has been written and published by Videonet magazine in collaboration with EPAM. The report author is Adrian Pennington, with help from John Moulding. All contributors are named and works referenced.



The opportunities presented by the Internet of Things (IoT), which consumers access primarily through their smart homes, are vast. The World Economic Forum estimated that IoT will add US \$14 trillion of economic value to the global economy by 2030. It also says increasing bandwidth and data usage could generate an additional US \$65 billion in operating profits for CSPs. That's a healthy increase, and perhaps a necessary one for CSPs if they are to capitalise on the network infrastructure they possess.

Service providers have a unique opportunity to act as a central platform for the smart home. They enter

the contest with huge existing subscriber bases, including billing, high levels of trust and ownership of the network infrastructure. They can use these strengths to become the single, preferred digital provider to the smart home. But they won't have it all their own way.

This report investigates the future service and revenue opportunities for fixed-line service providers who typically make their money today from broadband, voice and Pay TV. It outlines the 'broadband-and-beyond' roadmap that can lead a CSP through three distinct stages of evolution to take advantage of the exciting opportunities that will emerge

in the 2020s, monetising each step along the way.

The report will therefore explore the near-term move from super-fast broadband to a collection of 'connectivity+' offers like perfect managed home Wi-Fi. It will consider how service providers can then move into the smart home market.

Finally, we will look towards the green-field opportunity that is the smart city, as service providers help governments, municipalities, and transport and health departments build a truly connected society.

**The increasing bandwidth and data usage associated with the IoT could generate an extra \$65 billion profit for communications service providers.**

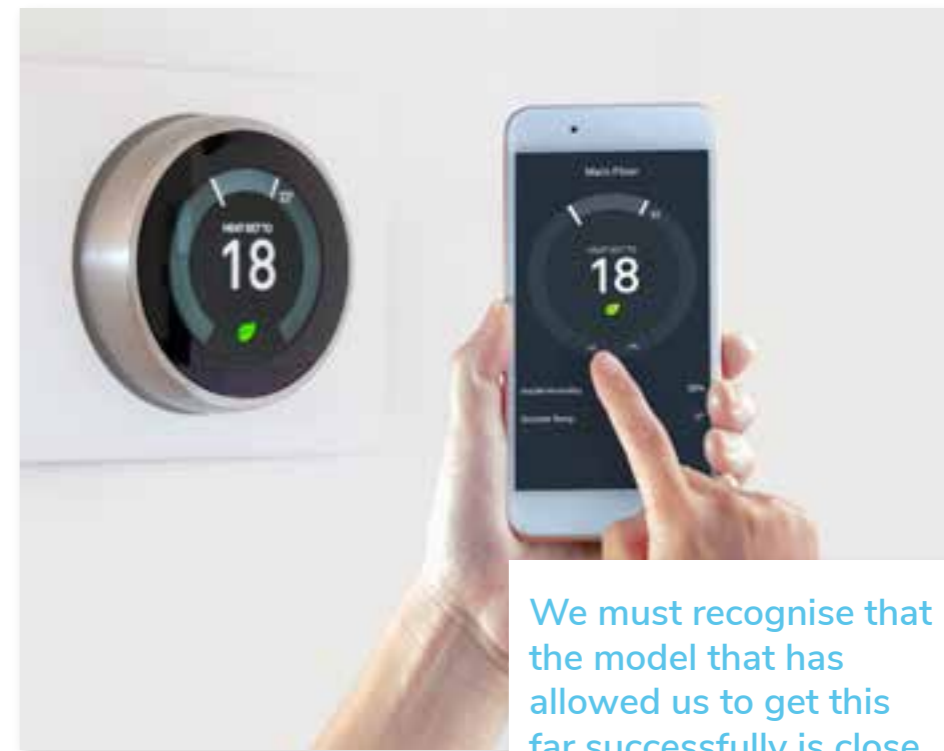
## THE COMPETITIVE LANDSCAPE

Broadband adoption is reaching saturation levels, and subscriber growth is slowing. Consumers are abandoning landline phone and even fee-based VoIP in favour of mobile phones. This trend is most pronounced in young households, but its occurrence is increasing across all age groups and income tiers. Downward pressure on broadband prices will only increase.

At the same time, IoT and widespread fast broadband penetration, both fixed and mobile, are creating an exciting new phase of the connected world. Laptops, fitness wristbands, televisions, security sensors, appliances, utilities and more are, in theory, on course to converge into an easy-to-control, interconnected environment. As connectivity services become commoditised, it is CSPs who are in prime position to build lucrative new markets in the smart home and beyond - but they will face competition along the way.

**As connectivity services become commoditised, it is CSPs who are in prime position to build lucrative new markets in the smart home and beyond.**

It's a scenario recognised by Telefónica Chairman & CEO, José María Álvarez-Pallete: "If, in the past, the low penetration of voice and data services assured future growth, the current maturity of the markets and the appearance of new competitors subject to different rules demands a highly focused and alternative strategic approach," he wrote in an open letter to shareholders. "We must recognise that the model that has allowed us to get



**We must recognise that the model that has allowed us to get this far successfully is close to being exhausted.**

José María Álvarez-Pallete,  
Telefónica



this far successfully is close to being exhausted."

In a call to arms, he stressed that Telefónica wanted to be a pioneer, "seeking new formulas for growth, offering the best service to our customers and managing resources as efficiently as possible."

If CSPs are to capitalise on consumers' needs regarding their connected devices in the home, a major challenge lies ahead.

"The biggest risk for CSPs is being reduced to only their core pipe network," says Daniel Hesselbarth, Principal, Business Consulting at EPAM, a leading global development, digital platform engineering, and top digital and product design agency. "Their core feature set is already narrowing to basic connectivity. CSPs should aim to provide a fully managed, secure, scalable and future-proof platform on which to launch an attractive smart home service. They must accelerate moves to become platform-led, data-driven companies."

Disruptors, such as Amazon, Google and Apple, are nipping hard at CSP heels as they try to position their artificial intelligence (AI) hubs as the

single gateway to smart home services. Energy companies are offering boiler maintenance using predictive analytics. Insurance companies are bundling smart home devices and systems with premiums, effectively turning insurance into a service. Access control services are transforming door lock hardware sales into a service that provides a management platform for property owners.

IKEA recently established a new business unit called IKEA Home Smart, which given the brand's popularity, could become a key driver of smart home adoption.

The combination of traditional or online retail channels and self-installation will limit CSP potential across a number of service/device categories. Research firm Parks Associates has found that in the U.S., 67% of broadband homes planning to buy a smart thermostat said they preferred to use a retail channel for their purchase (and one in seven plans to buy one during 2020).

41% of connected medical device owners in U.S. broadband homes bought their device online or at a retail store, and 36% of those intending to purchase a security system say they prefer self-installation. DIY/self-installation dominates new networked camera purchases, Parks Associates reports.

To win in the emerging 'beyond broadband' markets, CSPs must build on the assets, the consumer

relationships and the brand recognition which operators naturally own, as well as adding – organically, by acquisition or partnership – new capabilities in technology, skills and business models.

Service providers have to create, promote and deliver a robust and flexible smart home experience to consumers that incorporates support, security, privacy protection and a variety of personalised value propositions.

**Communications service providers must accelerate moves to become platform-led, data-driven companies.**

Daniel Hesselbarth, EPAM



## SERVICE PROVIDER STRENGTHS

From their ongoing relationship with households to having technical support capabilities and the ability to facilitate in-home support with trained field technicians, CSPs can address consumer needs as they relate to installation, setup and ongoing technical support of smart products.



**Service providers already possess the infrastructure needed to offer support services. These assets put them in an ideal position compared to manufacturers and even retailers.**

Parks Associates

"Service providers already possess the infrastructure needed to offer support services," agrees Parks Associates in a 2019 report,

*Changing Dynamics of the Smart Home.* "These assets put them in an ideal position compared to manufacturers and even retailers."

Consumers are steadily embracing the advantages of the smart home, but with it comes unprecedented vulnerability. Protecting privacy and cybersecurity will become another important selling point for broadband providers.

There is an emerging market to take advantage of – and the window of opportunity could be limited as non-CSP competitors look for a greater role in the consumer home.

Smart home as a service is the 'penta-play' proposition, following quad and triple-play, which will allow CSPs to tap into new revenue streams, reduce churn and outpace competition.



# CONNECTIVITY+ THE PATH TO TRANSFORMATION

According to 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 million 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.

The increasing number of connected devices and increasing traffic in the network make the quality of the connection crucial for delivering not only new digital services but the customer experience. The first step to turning the smart home opportunity into real cash is for CSPs to optimise the network throughout the home.

Poor broadband or home Wi-Fi will make it very hard to cross-sell additional digital services, so ensuring a great connectivity experience is essential.

"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," says Adam Hotchkiss, Co-founder & VP Product at Plume. His company provides managed, fast and adaptive Wi-Fi as a service, most notably through CSPs.

Hotchkiss adds, "The 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-commoditised environment."

**For 5G providers, the 6GHz spectrum band will allow seamless handoffs to mobile devices in homes where their networks might have had difficulty penetrating walls.**

Jeff Heynen, Dell'Oro Group



If they are not to compete on speed and price alone, service providers must shift consumer perceptions of their Internet service from an undifferentiated commodity to a unique product whose features and benefits are tangible. The key here is 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.

"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," warns Hotchkiss. "Any of the 'set-it-and-forget' solutions, including many mesh solutions, won't be sufficient in the smart home environments. Service providers should be looking to build or partner with a cloud-based solution that is infinitely flexible to the continuous changes occurring in their subscribers' homes."

The incoming Wi-Fi 6 standard could dramatically improve how service providers will be able to provide, manage, troubleshoot, and analyse their in-home networking services. It provides options for remote, zero-touch provisioning of devices and services, as well as the automatic

adjustment of Wi-Fi channels to ensure peak performance.

At the same time, the Wi-Fi Alliance is introducing Wi-Fi 6E, which uses the unlicensed 6GHz band. "This means that a huge chunk of unused spectrum will become available for the growing number of residential Wi-Fi devices," explains Jeff Heynen, Senior Research Director at Dell'Oro Group, the telecoms/IT market information provider. "For mobile operators rolling out 5G networks, the 6GHz spectrum band will allow the provision of seamless handoffs to mobile devices in homes where their networks might have had difficulty penetrating walls."

Beyond the speed of the Internet service and the optimisation of the home network, Wi-Fi platforms enabled by systems, like the OpenSync open source framework, allow operators to help consumers personalise their experience. Consumers can change settings like passwords and parental controls, monitor activity across devices, assign permissions and troubleshoot their connection.

Operators can also look to give subscribers greater control over their broadband services using voice interfaces. Google's Nest Wi-Fi mesh systems, for instance, include voice control and allow users to verbally turn on a guest network, reboot the system and initiate parental controls and speed tests. Amazon offers voice control of its eero Wi-Fi mesh routers via Alexa, as well as those from ARRIS/CommScope,



Asus, Belkin, Netgear and TP-LINK. Dell'Oro expects to see more of these services integrated into service provider-supplied gateways.

Being able to personalise 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.

Better Wi-Fi has implications for television service provision too, since it makes lower-cost 'skinny' bundles, which are streaming-only, more attractive. These can be used to appeal to consumers who do not see the value in a full-flavour Pay TV package that is typical of satel-

lite or cable. Some of those consumers are cost-conscious and some are trying to avoid long contract commitments. Such services can be bundled with broadband, or offered as an upsell, in homes where there is no traditional set-top box (STB).

CSPs are already on the case. Comcast explains that its Xfinity Flex product, a device designed to serve the growing number of Internet-only subscribers, "will deepen our relationship with a certain segment of our Internet customers and provide them with real value...we can offer [them] an affordable, flexible, and differentiated platform that includes thousands of free movies and shows for online streaming, an integrated

guide for accessing their favourite apps and connected home devices and the ease of navigating and managing all of it with our voice remote."



Given a choice, consumers cannot be expected to stay with an ISP who does not provide them with the quality of service they expect and need.

Adam Hotchkiss, Cofounder & VP Product, Plume

to ramp-up the collection of home-use data through the router and/or mobile devices via its own apps. Hesselbarth believes it is the data-driven CSP that will enjoy the most success.

"Telecoms will have to adopt new business models based around data," Hesselbarth says. "The data they will have access to is enormous as more devices become connected. Telecoms are in a very good position to leverage this data and offer customers personalised digital services."

The CSP may know the customer from a commercial standpoint - as a revenue generating unit - but not their behaviours and experiences as a person, family or group of people in a home.

Daniel Hesselbarth, EPAM



## PREPARING FOR THE SMART HOME

With managed home Wi-Fi in place, CSPs can look to deliver a whole suite of solutions beyond broadband. These connectivity+ solutions might be a service being used in combination with the device, such as the premium subscriptions for IP cameras that provide video storage and emergency calls. Others include tech guru services, energy and utilities management, home chore automation, baby monitoring, pet tracking services and privacy and security solutions.

The drive towards connectivity+ solutions may prompt a new focus on customer care and how this can be made more personal, more responsive and more automated. After all,



The digital butler proactively solves problems like getting Wi-Fi into the last room. The digital butler is the virtual security guy who makes sure the digital home is not broken into.

Daniel Hesselbarth, EPAM

the number of services that CSPs are either responsible for, or considered to be responsible for by their customers, is likely to expand quickly in the next few years.

Some companies are ahead of this curve. AT&T, for example, uses an AI chatbot to handle online customer interactions. At Comcast, customers can speak to a Talking Guide, which interacts with users through voice-recognition AI. CenturyLink's AI assistant Angie reads and answers 30,000 customer emails each month, correctly interpreting 99% of them and routing the remaining 1% to human managers.

As AI customer care assistants become more sophisticated, they can take on the role of on-premise staff. Hesselbarth certainly views them in this light.

"The digital butler (or concierge) will proactively solve problems like getting Wi-Fi into the last room and it will do all that with as little customer interaction as possible," he says. "The digital butler is also the virtual security guy who makes sure the digital home is not compromised or broken into. This is a natural extension for any service provider, but the first essential step is to provide broadband not just up to the wall but into the entire home."

## EXTRACTING VALUE

Existing customer relationships may give CSPs an advantage over competitors in the race to the smart home, but there is no room for complacency. The relationship today is fairly one-dimensional and data-light - far from sufficient for the world we are entering.

"The CSP may know the customer from a commercial standpoint - as a revenue generating unit - but not their behaviours and experiences as a person, family or group of people in a home," argues Hesselbarth. "Huge amounts of data are not being analysed by the CSP, such as how much fluctuation in terms of bandwidth per device or whether the customer is particularly security conscious."

"The router knows everything," he affirms. "You know the type of device, whether it's mobile or fixed-line, the quality of service, usage behaviour, problems with lag and interference. The CSP would be able to determine all of that through the router. The CSP needs to collect and analyse the data to properly leverage its window of advantage and build up new services."

Provided GDPR compliance is properly executed and legally watertight and that the trust of the customer is maintained, the CSP is advised

## BUSINESS MODELS AND PARTNERSHIPS

Consumers expect a seamless transition between their digital services and it is clear that connectivity in home and out of home are equally important. Realising this, operators are developing total connectivity offerings that combine fixed-line and mobile Internet in one bundle.

"There is a high synergy between mobile and fixed-line operators in terms of the value proposition to consumers and the possible efficiencies gained from resource optimisation," says Aliaksandr Baradyntsau, European Head of Media & Telco at EPAM.

"The barriers between fixed and mobile services will be removed and genuine 'Penta' packages will be launched (voice, video, data, mobile, smart home) to cover all family members, tailored to individual needs."



The barriers between fixed and mobile services will be removed and genuine 'Penta' packages will be tailored to individual needs.

Aliaksandr Baradyntsau, EPAM



• Consumer electronics manufacturers: A group struggling to move from unit sales to a service model. "CSPs can leverage their existing assets to drive adaption of devices, help manufacturers create value for consumers and revenue-share any profit," suggests Baradyntsau. "On top of that, CSPs can use existing billing systems to charge additional services costs for device maintenance, monitoring and premium features. Easy installation and user provisioning will be a clear benefit to consumers."

Unifying fixed and mobile connectivity is considered step one. Step two is to recognise that the smart home is currently fragmented between multiple brands with competing and often incompatible technologies. There is an opportunity for the CSP to aggregate product and service into one platform that they manage.

"The possibilities for CSPs are wide open once their offering is delivered via a software platform with integration capabilities built-in," says Hotchkiss. "They now have a platform to bring in any OTT service without the fear of hardware incompatibility."

In its 25 years of experience, EPAM has found that three groups of providers benefit from a partnership with a technology company:

- Other service providers: Insurance firms, utilities companies, healthcare providers and retailers provide partnership opportunities with one key being the split of revenue share. Insurance firms are interested in smart energy as a way to keep homes at a suitable temperature when unoccupied, avoiding the possibility of burst pipes and water leaks. One insurance company, Ageas, has already told customers it views smart security as a means to reduce premiums – eventually. The scale of the CSP business will be important in order to secure the best terms of each deal.
- Apple, Amazon, Microsoft, Google: The prevailing perception is that Silicon Valley’s tech giants are competitors, but look at the changing relationship telcos have with Netflix; once perceived as a strong competitor for video services, more recently, telcos wanting to aggregate SVOD have found Netflix to be a core partner. On most STBs, consumers can access the Netflix app and even bundle Netflix payments with telecom bills. EPAM predicts a similar situation in the smart home market between telecoms and technology companies.



## CONNECTIVITY+ REVENUE MODELS

CSPs are advised to consider two main factors when offering connectivity+ services:

### 1/ INCREASE IN THE CUSTOMER LONGEVITY

Adding new services to existing super-fast broadband offerings lowers customer churn rates. According to Plume, new services can lower churn by 30% or more, adding an average 3.3 years of extra life to the customer, resulting in net profit increases

over the lifetime of the customer without the need to raise monthly fees. Providing additional services at no additional charge, especially for high-value customers, provides substantial returns to the operator in terms of operational cash flow.

**New services can lower churn by 30+%, adding an average 3.3 years of extra life to a customer.**

### 2/ INCREASE IN MONTHLY ARPU

Interviewed for this report, Plume said an average \$15 ARPU can be achieved when coupling whole-home Wi-Fi and connectivity+ services. Advanced Wi-Fi is not just about revenue either – it also lowers OpEx expenses by solving customer Wi-Fi connectivity and congestion issues, especially for those consumers leasing hardware.

More advanced platform integration and data generation from devices and the network is needed to build more sophisticated services and revenues.

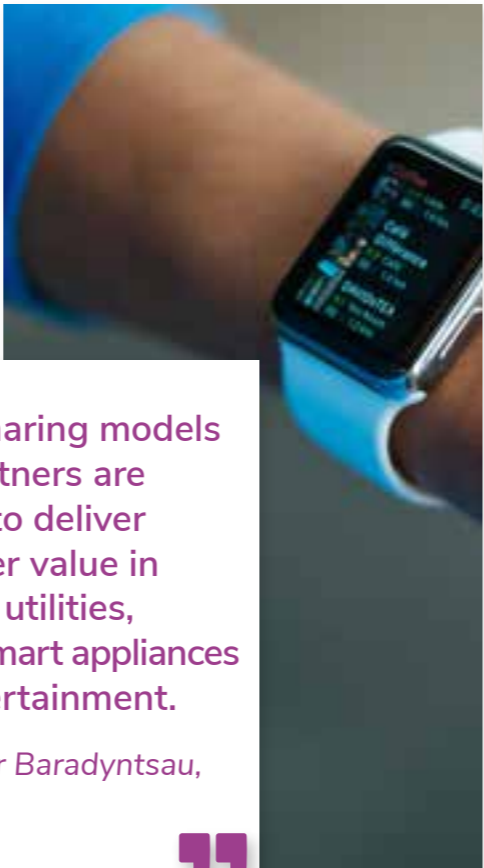
“New revenue generation should ideally be based on a per-monthly subscription, but could also be free-mium,” says Baradyntsau. “Prof-

it-sharing models with partners will be needed to deliver value to consumers in the areas of security, utilities, health, smart appliances and entertainment. Data monetisation is also a possibility in areas like banking, insurance or retail.”

A second benefit of connectivity+ to CSPs, leading into full smart home propositions, is churn reduction. Baradyntsau adds, “When customers perceive greater value in services, it will increase ARPU and reduce the probability that they would decide to change for another service.”

**Profit-sharing models with partners are needed to deliver consumer value in security, utilities, health, smart appliances and entertainment.**

*Aliaksandr Baradyntsau, EPAM*



## SHOWCASE 1: CONNECTIVITY + AT VODAFONE

In 2015, Vodafone entered the home broadband market in the UK and is currently concentrated on rolling out full-fibre to 15 cities and 500,000 households with BT Openreach and CityFibre. As of January 2020, just 11% of UK premises are connected to full fibre. Vodafone is promising download and upload speeds of up to 900Mbps through its Vodafone Gigafast Broadband service and will tie this with its expanding 5G network “to offer customers the best converged fixed and mobile services.”

In parallel to this, Vodafone’s entry into the smart home is part of its wider consumer IoT strategy to connect a range of products fitted with a Vodafone SIM card.

‘V by Vodafone’, launched in 2017, includes a smartphone app providing customers with a single interface and overview of all IoT-enabled products registered to their account.

In return, consumers are tempted with connectivity+ solutions, such as V-Pet, a location and activity

tracker for dogs and cats; V-Bag, presented as an “advanced briefcase, handbag and schoolbag tracker” and V-Auto, a vehicle tracker and journey analysis widget that includes an HD security camera for the car that automatically connects to Vodafone’s IoT network.

The operator hopes to connect children to its network with a V-kids watch (£135 plus £4 per month service fee), which enables parents to exchange voice messages with their child, set safe zones and check their location.

With these offers, the operator aims to tap into the demand for connected home technologies and wearables. It quotes Ofcom figures estimating that wearables will be the most widely used IoT application in the UK, with approximately 28 million connections, by 2024.

A V-Home hub, introduced last year, wirelessly connects Vodafone smart devices together (gathering data back to the network) with access via the app. This costs from £99 (plus

£14 per month service fee). Amazon Alexa provides voice control.

There is also a security package branded V-Home that includes a camera, a multi-sensor, a siren plus the V-Home Hub. Customers can add water leak sensors and smoke sensors.

“As part of our V-Home service, customer care agents will contact you to ensure that you are aware of any missed alerts – all for much less per month than traditional monitoring services,” explains the operator.

Vodafone recently announced a partnership with Samsung SmartThings to expand its portfolio of devices to light bulbs, smart plugs and doorbells.

**Vodafone V-Home includes a camera, multi-sensor and siren, and customers can add water leak and smoke sensors.**

## SHOWCASE 2: CONNECTIVITY + AT SWISSCOM

Swiss market leader Swisscom has enrolled a variety of initiatives to strengthen its position in connectivity+. “Swisscom TV is our most important product to prove our home services,” says Nicolas von Mural, Senior Manager Entertainment Proposition at Swisscom. “This combines TV UX, aggregation of own FTA [free-to-air], pay and third-party content as well as an integrated far-field voice solution.”

An expanding smart home play and cloud service (MyCloud) are two initiatives supporting its ambition and areas where it intends to intensify focus. In addition, Swisscom is developing value-added services, such as Internet security.

Swisscom’s move into the smart home is predicated on providing a

superior fixed mobile convergence on which to deliver connectivity+. “Our ambition is to deliver the best connectivity with the best network in Switzerland,” says von Mural. “We ensure seamless integration into existing Swisscom systems and apps.”

“It is important to constantly train our customer services touchpoints so that they become digital smart home experts, and have strategic partnerships with strong smart home companies like Sonos, Philips and Logitech, which support premium positioning, best quality and broad offerings. It is also important to keep the entry barrier low in effort, but also in price investment.”

von Mural adds: “To make it relevant to a broad customer base, it

is also important to make it easy to use and to support this relevance with dedicated use cases. In addition, we integrate third-party systems (especially from market leaders) into our core-services.”

**“It is important to constantly train our customer service touchpoints, so they become digital smart home experts.”**

*Nicolas von Mural, Swisscom*

THE SKILLS AND TECHNOLOGIES FOR CONNECTIVITY+

Connectivity+ cannot start without a technology that extends all the way from the hardware and firmware to the mobile application. The hardware needs to support Gbps speeds capable of meeting capacity requirements of the home. Firmware, critically open sourced, needs to work across a wide variety of hardware platforms to gain widescale adoption in the ISP market.

“The cloud needs to gather statistics and also control the network, providing virtualization of services to the end customer,” says Hotchkiss. “A mobile app is required to interact and engage with the customer, ensuring a long-lasting relationship with the end user.”

“Building one of these layers is difficult, let alone all four [hardware, firmware, the cloud, mobile app]. However, any service worth deploying needs control of all these layers,” he warns. “It is not for the faint of heart.”

One option is OpenSync, a common, open source software framework, which enables third-party smart

home services to be broadly deployed across CPE from multiple vendors.

This technology is supported by numerous CSPs globally, including Comcast, Bell Canada and Liberty Global, plus Samsung and connectivity+ service providers like Plume. Charter Communications is one of the latest adopters, having integrated OpenSync into its latest Wi-Fi router platforms.

CSPs taking the SaaS route can effectively outsource the worries associated with building applications/ services or porting them to multi-vendor hardware. Consolomio from i4things is an example. This is presented as the world’s first Smart Home as a Service (SHaaS). It supports a broad range of white-label and brand devices managed via a UI, and integrates with existing backend systems at a service provider.

“The digital home and its four layers might appear challenging at first glance. However, in EPAM’s point of view, the opportunities outweigh the challenges substantially,” says Baradyntsau.



The technology behind connectivity+ includes Gbps hardware, open-sourced firmware, cloud virtualization and a mobile app - it is not for the faint of heart.



INTO THE SMART HOME

Establishing a solid connectivity play, as outlined above, forms the backbone to evolving smart home strategies, although both can be pursued in parallel. Service provider ambitions in the smart home space are not new, but traditionally they have been challenging, with many past efforts abandoned or producing costly and disappointing results.

First generation Smart Home offers have not always been successful, leading to some reluctance,” observes Hesselbarth. “We urge all CSPs to look at this market afresh, if they are not doing so already.”

Providers today are rightly cautious when considering the smart home space; however, multiple factors have aligned to make now the optimal time for service providers to enter this service area.

For one thing, the smart home market has moved out of the early adopter stage. One of the main conclusions of Telefónica’s report, *Things Matter 2019*, is that 90% of users claim that they are loyal to IoT and that there is a growing intention to acquire and use IoT devices or solutions - especially if they meet user expectations (on price, compatibility between devices and ease of use). Telefónica identifies some devices and applications that tend to grow user loyalty as smart watches, smart plugs, home access control and home energy efficiency applications. Beyond the home, the company points to connected car devices, car sharing and urban parking applications or trackers.

With more than a quarter of households owning at least one device,

The smart home has been challenging in the past, but multiple factors have aligned to make this the optimal moment for market entry.



and more than 50% intending to purchase a smart home device in the next 12 months [per Parks Associates], service providers can now confidently invest.

The consumer experience strongly influences the next purchase of smart home devices. Parks Associates research suggests that when a household buys one connected device and the experience of setup and daily operation goes smoothly, more purchases will follow.

More than a quarter of households own at least one smart home device and more than 50% intend to purchase in the next 12 months.

Parks Associates

FIRST, MAKE IT SAFE

As in medicine, ‘first, do no harm.’ Gartner estimates that there will be 25 billion IoT devices in use by 2021, many lacking sufficient security features. Online hackers can exploit these devices and steal personal data by attacking home networks. Consumers may not have the skills or tools to protect themselves from such attacks.

CSPs can deploy cybersecurity technology to protect all smart devices without any action required by consumers.

There have already been warnings. Smart home security hit the national headlines in 2014 with the disturbing discovery that footage from security cameras in homes (and gyms, and offices) was being streamed live on rogue websites, including footage from baby monitors showing children sleeping in their cribs. One showed a small boy watching television in Woking, United Kingdom.

Meanwhile, hacked CCTV cameras and printers were among the devices used by the Mirai malware to launch a DDoS (distributed denial of service) attack on the Dyn DNS service in 2016 – pointing to how weak home security can quickly become a global network issue.

CSPs that deploy cybersecurity technology can provide protection to all smart devices in homes on their networks without any action required by consumers. And partnering with cybersecurity vendors – as Telenet did with Israeli vendor SAM - enriches

**Parks Associates has found that 71% of U.S. broadband households with smart home devices are concerned about cybersecurity.**

the business value proposition for network operators by delivering network visibility, management capabilities and creating new revenue streams with additional services.

Parks Associates has found that 71% of U.S. smart home households are concerned about cybersecurity (concerns can intensify with device adoption). Speaking ahead of a Parks Associates connected home event last year, Derrick Dicoi, VP, Strategy and Product Management at Comcast Cable, noted the need to keep the entire home - both digital and physical - secure. "With heightened consumer awareness around privacy, convergence between digital and physical security, in a way that does not overburden consumers, will be key," the exec commented.

CSPs can make security one of their competitive differentiators. Together with established ecosystem partners, they have experience in:

- Protecting high value data streams

(e.g. premium video content )

- Managing security across multiple devices cost-effectively (e.g. multi-DRM)

- Minimising the software/processing footprint for security

- Implementing cloud-based (and multi-territory) security implementations

- Dynamic security (adjusting security levels to match threat exposure)

- Partnering at a deep level with silicon and device developers and manufacturers

- Firewalling apps from firmware and hardware (e.g. on STBs)

- Auditing security design and implementation

- Monitoring evolving threats at a global level

- Proactively updating security clients (hardware and software)

- Managing privacy-sensitive data

- Full GDPR (and equivalent) compliance

CSPs understand the concept of 'security as a managed service'. They

rely on ongoing relationships with consumers meaning that they have never been able to 'sell and forget'. For many of their smart home rivals, like retailers, this will be brand new territory.

It is worth noting that some major security solution vendors that CSPs have worked with for many years on their Pay TV operations are themselves expanding into the smart home and IoT space. Irdeto, for example, has a Trusted Home solution that protects the connected home beyond the router, partly harnessing fingerprinting technology.

The Kudelski Group, which has a standalone cybersecurity unit, recently announced that it has joined Deutsche Telekom's nuSIM initiative, which moves SIM functionality from the physical SIM card directly to the chipset. nuSIM is aimed at the IoT market where devices like trackers and sensors have new size, power and bandwidth constraints. Kudelski has over two decades of experience in embedded security.

For Deutsche Telekom, a key aim for nuSIM is enabling IoT devices and applications to be delivered cost-effectively at scale. That will be a challenge for everyone. It helps communication service providers that they are part of an ecosystem that already contains the know-how and talent that will be needed.

## SMART HOME REVENUE MODELS

For all their strengths when competing in the smart home ecosystem, CSPs exhibit a key weakness: their reliance on a revenue model based on recurring monthly fees. True, some consumers do prefer recurring fees over higher up-front fees, but to the mass market, ongoing fees are generally not appealing. Parks Associates research finds that consumers are reluctant to take on a new service or solution if it means taking on new monthly fees.

Yet its research also found that when offered a choice between a single, upfront cost for a device or a hardware-as-a-service value-add-

ed offering, a strong majority of consumers prefer the latter. With a hardware-as-a-service proposal, consumers pay less upfront and establish an ongoing support and service relationship with the provider.

"Current business models that rely on recurring consumer fees will eventually give way to alternatives that leverage the data and connection to a specific product or end-user," it predicts.

When it comes to leveraging data, CSPs may be in a stronger position than even they realise. At Cable Congress in 2017, the event dedicated to the cable operator community in Europe, the head of one of the worlds' most important media buyers made clear his desire that the cable industry should cooperate with advertisers and marketers to help them leverage the new consumer touch points that are emerging in the connected home era.

Consumer consent, data ethics and GDPR-standard privacy protections are taken for granted in such discussions – every reputable advertiser and media agency wants an ecosystem built on trust. And what Omnicom Media Group's Global CEO at the time, Barry Cupples, said, is worthy of note, because he was not only thinking about addressable TV advertising, but the opportunity for marketers to influence digital assistants.

As Videonet reported at the time, Cupples saw a future where home life is complemented by artificial intelligence, with personal digital assistants using their data on what we do, and even our changing opinions, to replace goods that have run out and possibly switch brands of product without being asked. He raised the prospect that marketers would need to start 'talking' to the machines that make such decisions.

A key theme of that 2017 event was how the cable industry moves beyond super-fast access networks to provide 'smart pipes' - like becoming

a conduit for smart home services and AI-inspired activities. Cupples was interested in the data that could be made available and how it could help marketers get closer to consumers. CSPs are in a trusted position to get the necessary customer opt-ins and provide the transparency that the marketing industry will need if it wants to learn more about consumers and reach them in new ways in the smart home and IoT future.

"The classical, often rather hardware-rent focused revenue models of CSPs, should give way to creative service-based models that leverage data and provide tangible value-add for the consumer," says Baradyntsau.

The road towards connectivity+ and the smart home has not been easy, with consumer pricing being an early barrier. Several operators entered the smart home services space only to struggle to gain traction.

Salutary lessons can be taken from Orange, which launched its connected home service, Homelive, in France in 2014.

The solution not only required customers to pay upfront for the equipment, including a Homelive smart bridge needed to connect all devices, but also required a monthly fee to access services such as SMS alerts, data backup and 24/7 technical support.

**With hardware-as-a-service, consumers pay less upfront and establish an ongoing support and service relationship with the provider.**



MARKET FORECASTS AND BARRIERS TO ENTRY

There is plenty of data to suggest that the ‘beyond broadband’ market is approaching a tipping point. In a forecast through to 2022, published in April 2018, the analyst firm Ovum expected the number of smart home households to grow 280% to 471 million households during the period. “1.5 billion smart home devices will be sold in 2022, up from 416 million in 2017,” the company stated.

Meanwhile, techUK, whose 850 member companies represent about half of all tech sector jobs in the UK, issued its annual *The State of the Connected Home* report in June. This shows that 60% of consumers now own at least one smart home device, led by the 25-44 age group.

Baradyntsau says, “There is a window of opportunity for CSPs to enter the Smart Home market, and it is open now. They should use their head start with regards to established customer relationships and trust to offer these services to their customers.”

The main drivers towards purchases are confidence that consumers can indeed use new smart home devices, expectations for some level of interoperability and the wish that these devices will provide comfort. “More than half of consumers are confident that they can use new smart products - which is a tipping point for this sector,” the organisation states.

The report finds that consumers are willing to pay a premium for smart products, once the added-value of owning has been clearly explained to them. “We are also beginning to see the emergence of the concept of an ‘ecosystem’ of products from a consumer perspective. We believe this might be partly enabled and accelerated by the increasing ownership of smart speakers, which are fundamentally built around the existence of an ecosystem of connected devices.”

As stated above, Parks Associates, the analyst and forecasting firm,



estimates half of homes could buy a smart home device in the next year. **The following statistics come from the vast Parks Associates research bank in this sector.**

- Smart home device ownership in Canada is 14%, and in the UK it is 16% (as of September 2019). Q4 2019 U.S. figures (from a survey of 10,000 broadband homes) put the number at 29%, which represents a 20% year-on-year growth.
- 11% of U.S. broadband households own one or more smart major appliance (e.g. a smart refrigerator, oven, dishwasher, clothes washer, microwave, clothes dryer, standalone A/C unit or water heater), up from 3% in 2014. (January 2020 figures).
- 43% of U.S. broadband households intended to purchase a smart home device in 2019 (June 2019).
- Broadband households with residential security will exceed 15% in the UK, 9% in France and 10% in Spain by 2023 (September 2019 figures). These numbers cover professionally installed systems whether or not the owners still subscribe to professional monitoring services and some DIY systems.
- 61% of UK broadband households value access to real-time energy data as a way to better manage energy use and cost (November 2019).

• Smart thermostats and networked cameras are the most highly adopted smart home devices (August 2019).

- 23% of U.S. broadband households are likely to buy a smart thermostat in 2019 (October 2019 figures).
- 25% of U.S. broadband households plan to buy a smart video doorbell in 2019 (figures given in January 2019).
- Half of consumers who currently own or intend to buy a smart door lock, a smart garage door opener or video doorbell value the ability to remotely allow Amazon package deliveries (July 2019).
- By 2023, annual U.S. sales of smart plugs will reach 5.7 million, with an annual sales revenue of \$188 million (January 2020).

• At the end of Q4 18, 28% of U.S. broadband households reported the presence of an active security system, with 24% having professional monitoring.

**We are beginning to see the emergence of the concept of an ‘ecosystem’ of products, from a consumer perspective, perhaps accelerated by increased smart speaker ownership.**



**Cost, concerns about privacy and security and lack of knowledge are the barriers to smart home adoption.**

TechUK

- 25% of U.S. broadband homes plan to buy a smart speaker with voice assistant in 2019 (August 2019 figures).
- Among residents of multi-dwelling units (with broadband) in the U.S., 19% feel that smart home devices are a very important consideration when looking for a home to rent or purchase (June 2019). According to Patrice Samuels, Senior Analyst at Parks Associates: “Having smart home devices pre-installed in the home creates an immediate opportunity to demonstrate specific value propositions in safety, energy management and convenience. It also opens avenues for ongoing services, such as tech support and data management, that are key to ensuring a positive user experience.”

There is evidence that consumers are willing to pay for at least some smart

devices and services. For example:

- More than 60% of networked camera owners pay for video storage services (Parks Associates, October 2019).
- When additional benefits are recognised, 52% of consumers are willing to pay more for a smart rather than a non-smart product, when it comes down to home security (techUK 2019 report).
- 12% of people would pay a premium for a smart product that accurately monitors their health (download full techUK 2019 report here).
- In its Smart Homes Devices and Services Forecast: 2018–23, Ovum predicted that smart home service revenue (for services with recurring monthly fees) will be worth 25% of the overall smart home market (although professional home security accounts for 70% of the service payments market).

When it comes to the barriers for adoption, there is a large degree of consensus among those who are studying the subject. Price and privacy concerns are never far from the top of the list. Consumers worry about reliability and difficulty using products, too.

In 2019, Ovum listed the barriers to entry. They include not seeing the benefit of technology, cost and a lack of trust that solutions will work properly or maintain privacy. Another barrier is where “the solution is not suitable for their living arrangements, perhaps because they rent an apartment or live in shared accommodation.”

Parks Associates stated in October that 22% of UK broadband households that do not own a smart home device and don’t plan to purchase one are stalling due to security and privacy concerns. The company pointed out that security concerns can intensify with device adoption.

TechUK finds the barriers to adoption unchanged from previous years: “Cost, concerns about privacy and security, and lack of knowledge.”

**Multi-dwelling unit residents in the U.S. feel that smart home devices are a very important consideration when looking for a home to rent or purchase.**

Parks Associates

## SUCCEEDING IN THE SMART HOME MARKETPLACE

Operators found their initial moves into the smart home market rebuffed by slow consumer adoption. They have since revised their vision with some of their initiatives outlined here.

### SHOWCASE 3: SMART HOME AT ORANGE

Late last year, Orange relaunched its smart home strategy having rethought its business model and technology to gain better traction in the race for the smart home.

The key feature is a smart speaker in which the operator's proprietary AI assistant Djingo acts as the interface for customers to access Orange products and services, such as Orange TV.

It is also integrated with Alexa for enhancing the overall smart living experience including links to Amazon's partner ecosystem.

To secure interoperability with connected devices, Orange's broadband wireless router, Livebox, is the smart home gateway allowing customers to control Orange-branded connected devices, as well as those from third-party vendors such as D-Link and Bosch.



"By bundling its new connected home service into the router, Orange will eliminate the need for a separate smart bridge, overcoming one important entry barrier its predecessor Homelive had," analyses Ovum. "Most importantly, the new service won't require an additional subscription fee, enabling users to control their smart devices via voice or app (on smartphone or TV screen) at no extra cost."

Orange has reduced the cost barrier to stimulate greater adoption. Orange Spain's portfolio features four device packs (lighting, smart plugs, and two for surveillance), available with a 24-month interest-free, pay-in-installments option. A Google smart speaker in each of the packs starts from €2.50 per month.

For customers willing to pay extra for value-added security services,

Orange offers a Protected Home service in partnership with Groupama. This remote surveillance service will rely on connected devices to trigger alerts and call for professional support when necessary. According to Ovum, only 17% of respondents in France have a professional connected home alarm that alerts the police in case of a break-in. This means that there is still plenty of room for growth in this market if Orange can get its strategy right.

Orange's AI assistant Djingo acts as the interface for customers to access Orange products and services. It is also integrated with Alexa.

## SHOWCASE 4: SMART HOME AT TELEFÓNICA

Telefónica made its first moves into the smart home in Latin America in 2016 partnered with Huawei. Latterly it has focussed on its home market.

In Spain, the acquisition of a 50% stake in local alarm business Prosegur is the operator's spearhead into the domestic connected home security market. It's a joint venture leveraging both companies' established brands. A separate IoT Cybersecurity Unit brings together the company's cybersecurity and IoT capabilities, including management of secure credentials for devices and DNS security.

Also in Spain, Telefónica has partnered with UK-based Tunstall Healthcare to develop projects for the remote management of patients in the country.

Other attempts to monetise the surplus data from the consumer experi-

ence include My Tracker, which is presented as a "localisation experience" that allows the user to locate objects, pets and people; and My Car, which delivers vehicle-driving information.

Devices running these and other IoT apps incorporating Telefónica SIM cards are tied into Telefónica's managed connectivity platform, Kite. Here, the operator is offering joint market approaches with leading cloud providers and has signalled its intent to collaborate with these partners to design and deploy new connected home apps.

This value proposition built on top of connectivity allows the integration between devices and the public cloud in an easy, secure and reliable way, providing retail/utility/tech giant customers with benefits, including access and visibility of SIM and network information in real-time, reduced setup time and cost for new IoT solutions development and enhanced security management for all IoT devices installed.

Through its Movistar mobile brand, Telefónica offers the 'Living Apps' ecosystem of devices and applications which enables the user to improve their digital experience in the living room. The ecosystem then is opened up to third parties.

Telefónica calls this a "Home as a Computer" model. The Living Apps run on multiple devices, such as the TV, router or gateway or Movistar Home. Aura, Telefónica's digital assistant, allows the user to manage these apps with voice.

One partner is Spanish tourism giant Globalia, which works with Telefonica to enable customers to book flights with Globalia carrier Air Europa by voice commands, "simply and without having to leave the comfort of their sofa." Globalia points out that applying AI will allow them to customise the customer's trip "according to their preferences and in real-time."

Telefónica has signalled its intent to collaborate with leading cloud providers to design and deploy new connected home apps.



## SHOWCASE 5: SMART HOME AT DEUTSCHE TELEKOM

Like Telefónica and Orange, Deutsche Telekom has entered the AI assistant market with the launch of a smart speaker, Magenta. The AI assistant offers integration with DT's products and services, such as telephone, Magenta TV and Magenta SmartHome.

The company has partnered with Amazon to offer additional capabilities beyond DT's own ecosystem and reduce the functionality gap with existing AI smart speakers.

Ovum Senior Analyst Mariana Zamoszczuk explains, "This strategy enables native integration with Amazon's Alexa as a second voice service, unlocking numerous features, services and access to a comprehensive partner ecosystem."

As the multi-voice assistant speaker trend grows, Ovum expects DT to consider partnering with other key consumer AI platforms, such as Google Assistant.



## SHOWCASE 6: SMART HOME AT SWISSCOM

Swisscom has identified three primary areas in the smart home: convenience/comfort, security and 'on the go'. According to Senior Manager Nicolas von Muralt, the telco's intention is to offer converged services for home and on-the-go usage on whatever device and whenever needed. "Converged products and services should always fit and strengthen our overall proposition and deliver concrete use cases and benefits to our customers," he says.

For example, the company has a vision of smart home products with sensors activated by mobile tracking (such as leaving home and activating the alarm system), which can prove an overall fixed-mobile convergent experience.

A far-field voice assistant acts as the customer interface in products including the Swisscom TV Entertainment OS set-top box intro-

duced in November 2019. Swisscom is developing the platform with third-party integration.

"To reach high financial margins and profits in the smart home is a challenging ambition for a telco," says von Muralt. "Given the saturated market in Switzerland and our high market share, reducing mobile and broadband churn is a significant lever resulting in a better financial performance.

"For Swisscom, our core ambition is to increase the relevance to customers of all our products, to show them the benefits when using our products all together, which should result in more usage of our products and services and higher customer satisfaction, stickiness and lower churn.

"As an example, our Home app is developed explicitly to deliver this combination and integration of services."

He adds that the highest share of revenue in the smart home still comes from hardware sales. Swisscom's target is to increase customer value and revenue streams from its services.



## TECHNICAL SUPPORT AS A DIFFERENTIATOR

Customer/technical support is an issue that every CSP must master if they want to grow connectivity+ and smart home services profitably. This becomes even more true as smart products and solutions approach mass-market adoption – with later adopters having even higher expectations that technology should work seamlessly.

It can be painful when consumers take on the install and set up of products themselves. Approximately one-third of connected entertainment device owners and half of smart home device owners who set up their devices themselves experience problems, finds Parks Associates.

The most common problems include connecting devices to the Internet, learning how to use devices, configuring settings and communicating with other devices. Many first-time buyers are joining the wave of smart

home adoption, and they will need as much or more support as the early buyers, stresses Parks Associates.

This plays into the hands of CSPs, who have well-established customer contact centres and a heritage in technical support. Beyond setup, consumers can experience other technical problems throughout the device lifecycle that cause frustration and need resolution for continued operation.

These recurring issues create demand for support services beyond setup. Parks Associates suggests that one fifth of U.S. broadband households have a technical support subscription for their Internet-connected entertainment and smart home devices.

Service providers' existing service relationships give them a competitive advantage for the sale of on-

going support subscriptions – and so far nobody has stepped up to dominate the support space. Parks figures show that no single company has captured more than 14% of this market.

"There is huge potential for CSPs to extend their technical support to Connectivity+ environments, strengthening their customer relationship even further," says Hesselbarth. "However, it requires modern tools to make use of data gathered from the household."

**Consumers can experience technical problems throughout the device lifecycle - creating demand for support services beyond setup.**



## BEYOND BROADBAND AT DEUTSCHE TELEKOM

Deutsche Telekom has a clear strategy to differentiate itself in the future, based on value-added services that derive from a great broadband experience, rather than relying just on the broadband itself. As Pedro Bandeira, VP Product and New Business, Europe, at the pan-European telco points out: "Today, broadband is about speed, especially speed into the home. We need to move from focusing only on speed and look at how we give customers the tools to control their Internet experience."

Giving consumers more control requires next-gen technology wrapped in a super-friendly UX. And

Bandeira is determined that the increasingly connected Deutsche Telekom home 'thinks human.'

So, a cybersecurity solution does not boast how many viruses it killed for you today, but advises you to upgrade some device software to limit the chances of an emerging security threat. It means parents can decide to cut Wi-Fi access on their child's devices at bedtime with a simple command, whether through an app or a voice command.

DT has introduced its own digital assistant, Magenta, on a Deutsche Telekom branded smart speaker that also accommodates Amazon's Alexa. When dealing

with a customer service issue, it is Magenta that could help. The assistant will set the wheels in motion in the backend. “You could adjust your radio connection [Wi-Fi] and router resource to increase support for a streaming connection,” Bandeira explains.

This is a reactive use case. The idea is that the service provider will also spot trouble for you and automatically optimise settings, or ‘chat’ with the customer. A message to the customer could say: ‘We know you are having a bad experience in the kitchen. If you move a few metres towards X, that will help. Meanwhile, we are going to send you an extender to increase your Wi-Fi coverage.’

The people-friendly UX is made easier as voice technology matures. Bandeira is convinced that voice will help service providers increase engagement with multiple services. “For years we have relied on graphical user interaction through the mobile, PC or television screen. Sometimes people give up on a feature or service when it is hard to access. Voice makes complex tasks easier, so it is more inclusive.

“Voice is a very important piece of in-home interaction,” Bandeira declares. “It creates an opportunity to get services used more widely.”

When it comes to the smart home, Bandeira be-

lieves one of the chief goals for Deutsche Telekom is to deliver peace of mind. He thinks CSPs are well placed to deliver monitoring services, thanks to a well-established security ecosystem that already protects highly-valuable assets (e.g. premium video content). “People trust us,” he adds.

For Bandeira, success in the smart home market depends a lot upon mindset. It’s about users having control over their world. It’s about peace of mind. And it is also about positive engagement above passive presence.

On this last point, the DT executive says: “Valuable as they are, fire and smoke sensors are a negative interaction use case because if everything goes well, you never interact with them or see the value. We also need to be able to create ways to interact often and positively. We need to create great and happy user experiences in the home, from controlling music, doors and lights to checking on your kids and pets.

“You create an interaction and if something is used every day, it becomes sticky,” Bandeira emphasises.

# TECHNOLOGY BUILDING BLOCKS

## EMERGING CPE REQUIREMENTS

The coming year will mark a tipping point for key network, customer premise equipment (CPE) and smart home technology that has been in the works for years. The confluence of technologies, such as DOCSIS 4.0, 6GHz spectrum and Wi-Fi 6, are pushing a range of new services into the realm of reality.

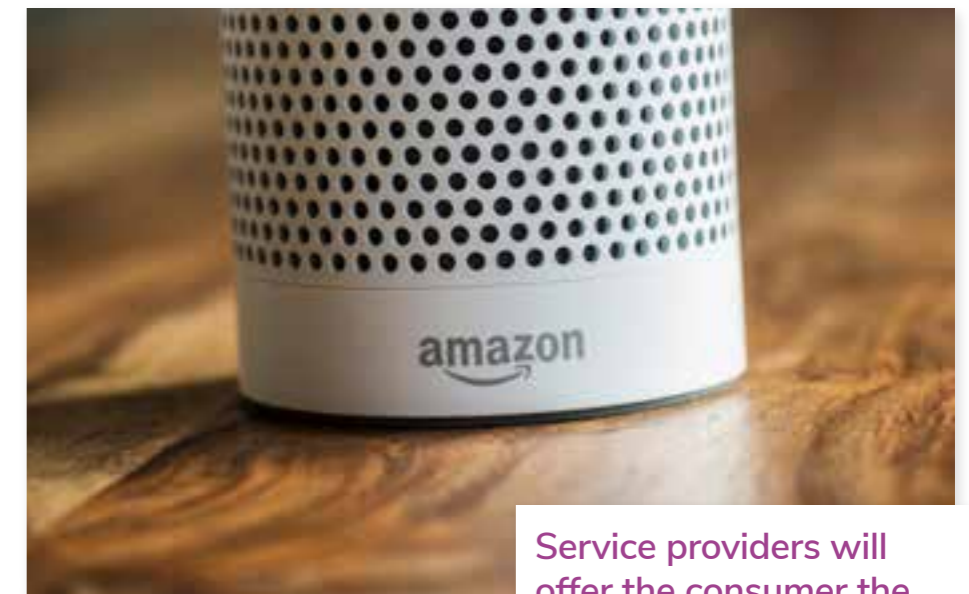
Whether it’s 10Gbps access speeds, more pervasive and powerful home networks, or visual assistants, “a range of exciting trends are emerging to improve the customer experience and drive new levels of service capability for ISPs,” says Charles Cheevers, CTO, CPE at CommScope, a market leader supplying CSPs.

The big question for vendors and operators is how to make smart investments to capitalise on these large technology shifts.

**The confluence of technologies such as DOCSIS 4.0, 6GHz spectrum and Wi-Fi 6 are pushing a range of new services into the realm of reality.**

“One development is that WAN access speeds will increase to 200Mbps on average, catering to new services like cloud gaming,” Cheevers points out. “Priorities will shift from simply achieving faster raw speeds to getting low-latency performance to support new gaming and virtual reality services.

“We will also see the residential STB evolve to include far-field voice, speakers and visual assistants, leveraging the demarcation of this device in heavy-trafficked rooms and



**Service providers will offer the consumer the AI assistant of their choice, but they will also offer their own Wake Word for specific service provider skills.**

Charles Cheevers,  
CommScope



capitalising on the trend of visual assistance. This new class of device is something CommScope has termed the ‘smart media device’ (SMD).”

CommScope believes the SMD can support a range of operator-provided and third-party skills (or applications) that will help reduce churn and increase total operator revenues. These could also become an aggregation point for the rapidly growing array of smart assistant ecosystems.

“Service providers will offer the consumer the AI assistant of their choice - Amazon Alexa, Google Assistant, Siri, Cortana and others - but they will also offer their own Wake Word to offer specific service provider skills such as ‘What’s my Wi-Fi password?’ or ‘Show me my current bill,’ which will be unique to their service offering.”

Cheevers has previously called the combination of a global assistant ecosystem with a more specific service provider ecosystem a marriage made in heaven. He has also acknowledged the possibility that we will see specialist voice ecosystems evolve, which could offer skills outside of these two categories.

Multi-assistant aggregation raises two technology challenges for the smart media device and its backend software. The device should be able to onboard multiple voice systems if necessary and provide a mechanism for transferring requests that are direct-

ed at the wrong assistant. Each voice ecosystem must be able to recognise if a request should be offloaded.

As the multi-voice assistant speaker trend grows, Ovum also expects operators to develop solutions that work with multiple AI platforms. This will be crucial to offering flexibility and value to customers, provided that at all times it provides an optimal user experience regardless of the chosen AI assistant.

SFR, the French quad-play provider owned by Altice, is among the CSPs to pioneer the concept. The new SFR Box 8 device (provided by CommScope and the first example of their SMD vision in action) includes an SFR assistant and Alexa, both made available via a high-quality speaker. If you want an SFR skill, you use the wake-up phrase ‘Okay, SFR’.

SFR is also pioneering the idea that a CSP can harness its gateway device to provide visual assistance. This is another notable opportunity for telcos and cable operators as the connectivity+ and smart home



markets develop, because they have an important advantage in the world of ‘visuals’ – STBs functions attached to television sets, often in multiple rooms like the living room, kitchen and bedroom.

Amazon is pursuing the visual assistant opportunity, where a screen accompanies a voice-based digital assistant with Echo Show and its tablet-sized screen. But as Cheevers told Videonet last year, CSPs could trump this by harnessing the television set and its potentially vast real estate to give visual feedback for skills that need more than a voice-based answer. A list of football fixtures (match dates/venues) is a good example of where a visual list is preferable, due to its sheer size.

It is quite possible that a voice-enabled SMD, featuring far-field microphone and speaker, with smart assistants onboard and using a television set for visual display, could provide a faster and easier route to

smart home applications than a UX provided by companies who want to compete with CSPs for control of the smart home.

Cheevers is particularly excited by one ‘broadband and beyond’ service opportunity for CSPs with a voice and visual assistant in the living room. That is the ‘Aging in Place’ market, where care companies use smart home technology to help the elderly live independently for as long as possible.

As he points out, elderly people can spend long periods in the living room. Also, people recovering from illness and those with chronic debilitating conditions could be added to the list of people close to a television – raising the possibility that a CSP gateway could help in the connected health market, too.

CSP voice/assistant presence is viewed as a multiroom strategy. Cheevers predicts that voice AI services will be increasingly included in

service provider solutions, and says there is a strong desire to add voice assistance to devices ranging from the broadband/TV gateway to IoT hubs and to other types of access, and Wi-Fi extenders.

“The number and diversity of digital devices in the household will explode,” asserts Hesselbarth. “This should emphasise the need for a modern and modular software approach to keep operational maintenance effort at a minimum.”

**Elderly people can spend long periods in the living room. CSPs could tether visual assistance on televisions to voice-enabled gateways for the Ageing in Place market.**



## CREATING AN INNOVATION HUB

Not surprisingly, another challenge for the CSP in the ‘broadband and beyond’ market is developing and managing new customer premise equipment – and doing so in parallel with a transformation in operations capabilities.

There are a number of technological projects and initiatives CSPs have to implement to bring a radical innovation to their connected home offering. “They will need new technological capabilities, especially in development of a connected devices cloud, and artificial intelligence to derive value from surplus data capture,” says EPAM’s Baradyntsau.

The scale and size of the CSP’s business will be an important factor in succeeding in the connected home market but even the likes of AT&T or Telefónica need to strategically partner, acquire or joint-venture with third-parties to build up the human and technical resources required to sustain the ‘penta play’.

Telefónica’s CEO José María Álvarez-Pallete has talked about how the explosion of connectivity, AI and the new needs of customers will form the central axis of its strategy. The operator’s data unit, LUCA, is intended as an incubator for launching new smart home (and enterprise) projects in a more agile way and at a lower cost by training algorithms on Big Data.

**CSPs need new technological capabilities: development of a connected devices cloud, and AI to derive value from surplus data capture.**

*Aliaksandr Baradyntsau, EPAM*

## INTELLIGENT USE OF BIG DATA

“The single most pressing activity the CSP needs to do is build up their competency in data gathering,” stresses Hesselbarth. “They need to collect GDPR-compliant data and apply intelligence in order to deliver personalised information and recommendations to the customer and to cycle back into services and product updates.”

“This further requires a change in the organisation’s culture by building up in-house competency and hiring data scientists.”

An example of organisational re-engineering can be seen at Liberty Global, the pan-European cable operator/CSP. The company now features a cloud-native microservices

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architecture built on AWS that provides one ‘back office’ for STB and OTT services for cross-device customer journeys and a data lake that uses AI/ML (artificial intelligence/machine learning) to better inform decisions around product design, customer satisfaction and potential new revenue sources.

“One result is an environment ripe for self-disruption, continuous innovation and optimisation by instituting rapid design, build, test and deploy programmes,” explains Baradyntsau at EPAM, who helped Liberty Global with the project.

“This digital transformation journey helped Liberty Global enable agile

processes, regular production releases and speed up time-to-market. “The data lake leverages insights from individual viewing behaviours and greater audience trends to make each interaction more personal with anonymised data,” Baradyntsau continues. “With this foundation in place, customers have continuous access to new enhancements like tailored recommendations and individual watchlists.”

**To build a smart home ecosystem, the CSP will need to add new devices and services seamlessly.**



## OPEN STANDARDS

CSPs could develop a smart home hub functionality to seamlessly connect, control and monitor devices. The functionality can be integrated into existing STBs or Wi-Fi routers. However, the service provider is unlikely to be able to sustain a zoo of devices and keep them all up-to-date with necessary upgrades.

While it may design and deliver some CPE itself, the CSP needs a platform hosted in the cloud for data collection, feedback and software updates to successfully scale the business. This must be primed to integrate additional services and gadgets from partners.

To build a smart home ecosystem, the CSP will need to add new devices and services seamlessly, growing with customer needs and the rapid evolution of technology. “To do that, you must have a very clear framework that third-parties can connect to in order to minimise the effort to onboard these devices,” says Hesselbarth.

“The platform needs to adhere to open standards. A CSP running the platform could assure that devices are tested for security and ease of use. By combining consumer data analytics and a digital hub, then leveraging an ecosystem of providers, CSPs can offer the desired personalised service.”

**The smart home platform needs to adhere to open standards. A CSP running the platform can assure that devices are tested for security and ease of use.**

When it comes to CPEs, the broadband-and-beyond marketplace presents a number of challenges, including:

- Greater device diversity – where CSPs provide their own portfolio, they must learn to manage more

CPE projects and device lifecycles simultaneously.

- Cost pressure – sometimes connectivity+ and smart home services will add only marginal revenues, or be used as churn-busters, so development costs must be kept firmly in check.

- Reduction of ‘footprint’ – the CPE trajectory is towards smaller and lower-powered devices, doing more with less processing power, and the smart home and IoT is likely to accelerate the trend.

- Agility – in a fast-moving market, projects must be launched and finished quickly, and installed device software will need to be upgraded regularly.

“Separating hardware from software, and separating the hardware abstraction layer (HAL) from middleware from application layer are prerequisites if you want CPE agility,” Hesselbarth adds, addressing the last point. He points to the growing importance of open source solutions across the communications services landscape, including for devices.

Open source, according to EPAM, has multiple benefits such as:

- Standardisation of core functions, e.g. those needed for video, broadband or IoT devices

- A multi-vendor hardware market, encouraging increased competition

- Greater control of device launch and roadmap versus legacy approaches

- Proven stability and scale - multiple implementations of non-differentiating components, whether hardware abstraction layers or middleware, etc., hardens the software. Bugs are discovered and resolved faster.

- The community defines and prioritises development of any shared software stack. Device and feature roadmaps are no longer tied to those of a single middleware partner.

- Faster time-to-market ([RDK claims](#) one-third of the time versus pre-RDK deployments, when integrating devices with a new chipset).



- The competitive battleground moves to value-added services and applications, e.g. UX and data analytics.

- Re-use of software developed by the CSP. Taking RDK as an example, the Portuguese Pay TV provider NOS said in 2018, “We can easily port all the software we have developed. Having two STBs is like having one if you have different vendors but the same chipset.”

- License-free solutions.

The desire to guard software capabilities and knowledge remains a barrier to using open source in some organisations. But the evidence from one ultra-competitive and dynamic marketplace – television – is that open source lifts all boats on the rising tide while allowing pioneers to lead.

There, the use of RDK (mainly in the cable industry) and the use of Android TV (mainly among medium-or smaller-sized Pay TV providers) has helped drive a generational upgrade in the user experience on Pay TV platforms, including better content search and discovery and inclusion of popular streaming apps on STBs. Essential new features have been brought to market faster.

As an example of the efficiencies achieved with open source, RDK

provides a common way to deal with complex video and management functions like content security, rendering, networking, peripherals and device management. RDK users now differentiate on the application and service layer, where consumers see direct value.

“For broadband gateways, RDK provides a common technical method, across chipset suppliers and OEMs, to manage home-networking interfaces, device management, diagnostics, and IoT interfaces, such as Bluetooth, Thread and Zigbee,” explains Technicolor, a leading CPE supplier to network service providers.

Comcast, a market-leading U.S. cable operator, helped instigate and lead RDK and is one of its greatest champions. The company’s original motive for driving RDK was the need to differentiate around the user experience rather than on how many HD television channels it could offer (which had become a commodity feature) or on price.

Hesselbarth advises that to go open source, however, CSPs must be willing to go all-in. “An ecosystem where you only take other people’s contributions and never give by contributing your own developments to the community is not sustainable.”

## TOWARDS THE SMART CITY

By mastering the connectivity+ and smart home market opportunities, CSPs can cement their place in our home lives, as well as pursue new revenues. The next stage of the broadband-and-beyond journey, which can start in parallel, is to reach outwards to the smart city.

“The smart city shows great potential for more safety, intelligent transport and increased comfort for the growing municipalities of our world and are a good example for areas of growth for CSPs,” says Hesselbarth.

Ovum (now called Omdia) has forecast that the smart cities device and activities at junctions. market will grow from 117m devices in 2018 to 399m by 2023. IDC says global spending on smart cities initiatives will total nearly \$124 billion in 2020 (up 19% YoY).

Verizon is among the CSPs actively pursuing this opportunity, working with city governments and planners and a growing tech ecosystem. Defining the smart city, the company says, “Solutions harness and analyse data using a tightly woven portfolio of wireless networking technologies. Sensors and devices work at the edge to collect data. Solutions unite small bits of information to provide full visibility. Verizon smart city solutions help you make sense of the data - processing

and analysing it in near real-time, and then give you ways to disseminate those findings to the public.”

Verizon offers a portfolio of smart city solutions that includes intelligent lighting and digital kiosks. Intelligent traffic management is a cloud-based, end-to-end SaaS solution that uses machine-to-machine (M2M) technologies and wireless networking to gather data on traffic. It gives you a better way to monitor traffic, improve signal timing and manage traffic flow. It uses in-ground and micro-radar sensors

to gather information on traffic flow and activities at junctions.

Occupancy using smart video cameras. Updated information can be shared with drivers via apps so they can find parking places faster.

Public safety is an important application. Gunshot detection is an extreme example, where wireless sensors can generate detailed, real-time, location-based information when a firearm is discharged. As with much of the smart city, there is scope for functional integration. The mobile network could be used to provide real-time video to emergency services including police, for example.



**Telco core competencies for the smart city include managing multi network connectivity and facilitating project and solution integration across political silos.**

Frost & Sullivan



Public health organisations are likely to be among the key stakeholders. This market segment, like the others, relies on real-time monitoring and data flows. Smart energy grids and better public transport are other outcomes of the smart city.

A white paper from the research/consulting company Frost & Sullivan, called Smart Cities Need Telecommunications Service Providers, outlines the core competencies it believes telecoms providers bring to the table and which will help to differentiate them. These are:

- Managing multi-network connectivity - their operations centres manage fixed-line, cellular, Wi-Fi and private networks. “This particular skill set is critical for the operation and management of several communication networks managed by a city.”

- Nationally scalable blueprints. Scale and uptime are critical, and the research company is thinking especially of emergency response and recovery, including during disasters.

- Governmental relationships - telcos have worked closely with stakeholders in executing complex communications deployments already. They can facilitate project and solution integration across political silos.

Data-backhauling is going to be a crucial task in the smart city, given the number of end-points. And the GSMA, which represents the mobile industry, long ago highlighted the

need for a sophisticated and horizontally-scalable enabling platform so consumers can interact and transact with municipal services in a private and secure manner – not a service delivery platform but an ‘Urban OS’.

Mobile or telecoms providers need not limit themselves to core network and intelligence roles, however. They can try to offer end-to-end solutions that include an operator-branded consumer service. Early on, the GSMA identified other reasons why telecom operators are well placed for the smart city:

- Trusted brands
- Sophisticated authentication and billing
- Mass-market customer care and self-service capability
- Consumer and commercial distribution and marketing channels

- Real-time customer insight (e.g. presence, location and usage)
- Data centre scale
- Technology expertise in both networking and IT.

The provision of managed infrastructure is a given, but can be added to the list. Last year the GSMA remind-ed everyone that mobile operators can support low-cost, connected devices that offer long battery life and can be rolled out at huge scale.

CSPs need not limit themselves to core network and intelligence roles in the smart city – they can try to offer end-to-end solutions.

GSMA



Smart cities are developing with 4G, but the arrival of super-fast and low-latency 5G mobile is expected to accelerate developments, partly by enabling more connections. Applications could eventually include vehicle-to-vehicle communications (V2V), including hazard warnings to a car behind.

Getting the smart city deployed needs a high level of collaboration between private enterprise and public bodies. There are calls for streamlined planning (e.g. for 5G small-cell sites on lamp posts) and access procedures (e.g. to public buildings). Ovum says the public sector will gain more from 5G than it did from previous generations of mobile technology. This should help the wheels turn.

As with so much of the broadband-and-beyond roadmap, CSPs are starting in a good place to capitalise on the opportunities in the smart city.

# CONCLUSION

The rollout of 5G places increased pressure and urgency on CSPs to differentiate their broadband service and create a premium experience in order to maintain and grow market share. It is already anticipated that all ‘next-generation’ Internet connectivity services, from 5G to the 10G service that cable companies are developing, will change the way consumers use broadband in the home, whether through the adoption of augmented reality content, digital health tools, remote education or new e-tail shopping experiences.

5G ushers in new security concerns. The report on the EU coordinated risk assessment on cybersecurity in 5G networks, published in October, points to an increased exposure to attacks and more potential entry points for attackers and highlights the danger of poor software development processes within suppliers, given the

fact that 5G networks are increasingly based on software. CSPs are, of course, well equipped to handle these concerns.

Increased broadband activity means the burden on consumers’ home Wi-Fi networks will grow exponentially, transforming their needs and expectations of their CSP. 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 and service.

The most important promise CSPs can make to their consumers is that they have the infrastructure in place to keep up with the pace of change and truly deliver on the opportunity that ‘beyond broadband’ presents.

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