Unlocking Value for Residential Broadband Services with Quality Broadband Network

Huawei Ultra Broadband Scenario Insight Report Series
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Partner with STRATEGYANALYTICS
Research, Experts, and Analytics
1. Executive Summary ................................................................. 01

2. Global Residential Broadband Market Development and Growth Trends ................................................. 04

3. Service Provider Opportunities for Value Creation in the Residential Broadband Market .................. 09
   3.1 The Value of Speed .............................................................. 11
   3.2 The Value of Video .............................................................. 13
   3.3 The Value of Bundles ......................................................... 17
   3.4 The Value of the Smart Home .............................................. 20
   3.5 The Value of Customer Data .............................................. 24

4. Recommendations for Adding Value to the Residential Broadband Market ........................................... 27
Global residential broadband subscriptions will increase 10% in 2017, higher than 7.6% CAGR of 2012 to 2016. The broadband access revenue will increase by 7%, also higher than 5.6% CAGR rate of 2012 to 2016.

Household broadband penetration will hit 54% globally by the end of 2017, up from 37% in 2012, with encouraging development in service performance. Fiber connections will grow to 42% of broadband homes at the end of 2017, helping to boost both advertised speeds and real user experience.

Communication service providers (CSPs) globally recognise that demand for connectivity is growing exponentially, both in terms of new devices connecting to networks and increased bandwidth requirements from existing devices. However, while that demand is growing, the value is increasingly being captured at the application and services layer and CSPs are adapting to address these trends, with medium term strategies acknowledging the importance of connectivity alongside more customer-centric service attributes.

**Broadband Households by Connection Type**

Source: Strategy Analytics
High-quality broadband service experience is key to value creation in the residential broadband market.

High quality access has to remain the foundation on which broadband service success is built. CSPs have successfully increased broadband service revenue and ARPU by migrating users to higher-speed services, while consumers rank speed and connection stability issues as the top factors influencing their consideration to switch broadband provider, more important than pricing or a poor customer service experience. High quality broadband access and excellent in-home Wi-Fi experience are also critical from a service enablement perspective. Success for residential broadband providers is dependent on them meeting broader technology, media, and telecoms needs within the household.

Huawei and Strategy Analytics analyse the market trend and recommend service provider should focus on the following strategies to unlock value in the residential broadband market.

<table>
<thead>
<tr>
<th>Value Domain</th>
<th>Market Dynamics &amp; Motivations</th>
<th>Recommendation</th>
</tr>
</thead>
</table>
| Speed        | Broadband ARPU & pricing growth is closely linked to faster services  
• On average, a 100Mbps service costs 75% more than a 10Mbps service  
• Telecom Italia’s ARPU growth (14% year-on-year in 2017) has been enabled by a 90% increase in FTTH connections | Service providers must continue to invest in high speed broadband networks |
|              | Speed is a key driver of customer satisfaction in broadband service providers  
• Those considering changing provider in China are mainly motivated by slow speed (84%) and poor stability (83%) of their current service | Service providers must focus on speed and reliability as a customer service priority |
| Video        | Video is the dominant use case on broadband networks, both in terms of IPTV services and the use of Internet bandwidth.  
• Service providers have been active in providing TV and video services over broadband for many years, in part as a means of adding functionality to linear/broadcast content and in part to compete against traditional pay TV and OTT providers  
• IPTV is used by c. 10% of households in the US, the UK, and Japan, rising to over 20% in Spain, over 30% in the Netherlands and South Korea, and over 50% in France  
• In China, more broadband users use OTT video services such as iQiyi (65%), Youku (64%) and Tencent Video (48%) than watch IPTV (33%) | Broadband service providers need to offer video services to remain relevant, to compete against pay TV providers who offer broadband, and to maximise their share of the consumer wallet |
|              | Consumer demand for higher-bandwidth video content is increasing requirements for broadband access and home content distribution networks  
• Multi-room viewing habits involving UHD content requires significant bandwidth, continuous 100Mbps Wi-Fi coverage are needed to support two simultaneous 4K video streams in the home  
• 42% of consumers in the US, West Europe, China and India have interest in VR applications | Broadband networks and in-home Wi-Fi solutions, need to be built from the perspective of the significant contribution that video makes to overall broadband traffic volumes |
### Bundles

In multi-play markets, fixed broadband services are often the most bundled product in the residential telecoms and media portfolio, with bundles attracting higher spend and lower churn.
- 97% of broadband lines in Spain are in bundles, 92% in Portugal, 85% in the UK, and 59% in China.
- KPN Netherlands has 10% churn across all its consumer propositions, and only 5% among bundle customers. Proximus Belgium’s consumer churn has averaged 21% for single play products, 11% for double-play, 10% for triple-play, and just 3% for quad-play.

Service providers must target multi-play services to increase their share of the consumer wallet, offsetting multi-service discounts by an ability to grow share in previously weak service categories.

### Smart Home

There is strong consumer demand for smart home products, though many different types of companies seeking to capture market share.
- By 2020, consumers will spend nearly $130 billion annually on smart home offerings, with more than 230 million homes worldwide (one in eight) having at least one type of smart system installed.
- More than one in five Chinese consumers expected to buy smart security cameras in the next two years with it topping the list in terms of smart home product most likely to be purchased first.

Service providers can win smart home share by targeting consumers by motivations for purchase (security, convenience, etc.), rather than merely offering a general purpose service and/or device that can be used for many different reasons.

### Customer Data

Customer data, about usage, behaviour and demographics, is an asset of value to advertisers.
- TV, radio and digital advertising will grow from $444 billion in 2017 to $521 billion in 2020.
- Advertising has driven service provider M&A activity in recent years, e.g. Verizon/AOL/Yahoo, Comcast/FreeWheel, Telstra/Ooyala.

Service providers should sell anonymized customer data into advertising platforms, or build more complete platforms themselves where they have significant advertising inventory to sell.

### Summary

Executing in these areas will involve clearly defined strategies on where to partner for content or service expertise and where to innovate and develop services and platforms in-house for greater differentiation and control over the service experience.
Household broadband penetration will hit 52% globally by the end of 2017, up from 37% in 2012.

Over half of the world’s households had a broadband connection at the end of 2016, a figure enjoying stable growth at present. While broadband penetration approaches 90% of households in Western Europe and North America, and exceeds 95% in advanced digital economies like South Korea, the Netherlands, and Hong Kong, there are still many parts of the world where broadband infrastructure or affordable broadband services are still lacking. Africa, in particular, remains largely undeveloped in terms of residential broadband services. The broadband penetration will rise to 60% globally by 2022, with Africa still trailing other regions.
Fiber and mobile broadband connections are dominating growth in broadband households.

42% of broadband homes will have a fiber connection at the end of 2017, including both fiber-to-the-home/premise (FTTH) and fiber-to-the-curb/cabinet (FTTC) solutions utilizing VDSL and VDSL2. In 2017, FTTH connections will grow faster than FTTC/VDSL for the first time as customer demand for higher speed services continues to grow and service providers respond to this demand. Pressure is also being brought to bear by regulators wishing to close the digital divide, both in terms of underserved parts of their own population and in terms of performance compared to other leading nations. National broadband plans and digital divide initiatives are varied in their scope, but all look to service providers to deliver a national infrastructure that can deliver ultra-fast broadband services to the masses:

- The EU’s targets were for “download rates of 30 Mbps for all of its citizens and at least 50% of European households subscribing to internet connections above 100 Mbps by 2020.” The common EU broadband targets for 2025 now call for “all schools, transport hubs and main providers of public services as well as digitally intensive enterprises should have access to internet connections with download/upload speeds of 1 Gigabit of data per second. In addition, all European households, rural or urban, should have access to networks offering a download speed of at least 100 Mbps, which can be upgraded to 1 Gigabit.”

- The Australian governments expectations for the National Broadband Network are that it will “provide peak wholesale download data rates (and proportionate upload rates) of at least 25 Mbps to all premises, and at least 50 Mbps to 90% cent of fixed line premises as soon as possible.”

- The South Africa Connect national broadband policy has set user experience targets of 5 Mbps for 90% of the population and 100 Mbps for 50% of the population by 2020, and 10 Mbps for 100% and 100 Mbps for 80% of the population by 2030

- Thailand’s National Digital Economy Policy and Plan calls for “the broadband network to provide access to at least 95% of the population by 2020, ensuring standard quality of service and reasonable service fee. In addition, cities that are economic and regional hubs should have high-speed fiber optic cable broadband with a minimum speed of 100 Mbps by 2020.”
For many nations, and service providers, fixed wireless (FWA) and mobile broadband (MBB) access forms an important part of their broadband strategies. FWA and MBB will be the primary access platform for 17% of broadband households by the end of 2017, a figure that ranges from 10% in Western Europe to 35% in the Middle East & Africa. The potential for 5G to deliver fiber-like broadband connectivity to households, and to represent a credible alternative to copper, cable, or fiber for the “last mile” connection between broadband nodes to households, is strong. The US is taking the lead here with both Verizon and AT&T testing residential 5G fixed wireless access services in large scale trials during 2017.

Akamai’s State of the Internet reports show healthy increases in average connection speeds on fixed networks. The global average connection speed recorded an annual increase of 15% to 7.2 Mbps in Q1 2017, with 28% of connections above 15 Mbps. The average peak speed (an average of the highest speed recorded by each unique IP address) recorded an annual increase of 28% to 44.6 Mbps. The charts below, from Brazil, Germany, and the USA, show the evolution of broadband subscriptions by advertised download speed. 59% of broadband connections in the USA and 36% in Germany support download speeds of 25 Mbps or higher, while 18% and 11% respectively support download speeds of 100Mbps or higher. In Brazil, 12% of fixed broadband connections supported 34 Mbps or higher in June 2017, up from less than 7% in June 2016.

Akamai’s data also indicate that the gap between peak speed and the average speed is extending. Global operators need further improve their backbone system and content distribution networks (CDN) to improve the experience of mass consumers.
Broadband China Strategy pushed high speed broadband growth in China.

China government launched Broadband China Strategy in August 2013 that targets to achieve 70% broadband penetration in China by 2020. To accelerate the broadband development, China’s telecom regulator officially issued fixed broadband service license to China Mobile – the largest mobile operator in the country – in December 2013. Since then, the industry policy and market competition have pushed China’s broadband market growing rapidly. The overall broadband penetration has reached 69.1% by Q2 2017 according to China Broadband Development Alliance. The original goal of 2020 will be achieved in this year. Meanwhile, the penetration of high speed broadband access has grown rapidly, with the adoption ratio of 20 Mbps or above broadband access increasing from 59.5% in July 2016 to 87.2% in July 2017. By July 2017, the subscriptions to broadband services of 50 Mbps or above have reached 189 million, i.e. 58.0% of total fixed broadband subscriptions.

In a survey of 1,000 Chinese households, conducted by Strategy Analytics in August 2017, speeds also emerged as the dominant factor influencing churn likelihood. 10% of households indicated they were either extremely or very likely to switch broadband service provider in the next 12 months, with a further 34% indicating they were somewhat likely. Of these users, speed-related factors were the most likely to influence this decision: either based on frustration with the speed or service stability of their current broadband service provider or the promise of higher speed services from other providers. The availability of cheaper packages was a secondary consideration to the speed performance.

The data of China Broadband Development Alliance indicate that the average download speed of fixed broadband connections in China reached 14.11 Mbps in Q2 2017. The experienced speed is generally aligned with the advertised speed for the connections with 20 Mbps speed or below. But the speed advantage of fixed broadband compared with mobile broadband has been significantly narrowed. The average download speed of 4G connections also reached 13.46 Mbps in Q2 2017. In order to maintain the competitiveness in 4G era and the coming 5G era, fixed broadband service providers should improve their network and service continuously, not only for access network but also backbone system and content distribution networks (CDN).
The majority of fixed broadband plans have no usage cap or fair use policy today.

From a pricing perspective, Strategy Analytics’ Teligen broadband price benchmarking database shows an evolution in plan options that closely mirrors the push in all markets to faster speed services, with the average advertised speed of broadband plans increasing from 41 Mbps in June 2013 to 136 Mbps in June 2017. 61% of plans in 2013 offered maximum speeds below 30 Mbps, while in 2017 61% of plans offer maximum speeds of 30 Mbps and higher, while 37% of plans support maximum speeds of at least 100 Mbps. Usage limits on plans are also increasing and becoming less common. The majority of fixed broadband plans have no usage cap or fair use policy, accounting for 74% of plans in 2013 and 78% of plans in 2017, while only 12% of plans currently have monthly usage limits of less than 200 GB.</div>
In an increasingly competitive residential broadband environment, service providers face a multitude of challenges in sustaining growth in their businesses, not least how to expand broadband into more marginal (rural) regions and into more marginal (price-sensitive) segments. Globally, broadband ARPs will fall 1.4% in 2017, though the shifting regional mix will be a key factor in this decline. ARPs will increase in the majority of regions as service providers address strategies to increase customer value, not least a focus on upselling higher-speed connections. Overall, broadband access revenue will increase 7% in 2017 and at a CAGR of 4% through 2022, but this growth will be hard fought as competitive pressures and regulatory intensity on delivering low-cost high-quality ubiquitous broadband continues.

Service providers globally recognise that demand for connectivity is growing exponentially, both in terms of new devices connecting to networks and in terms of increased bandwidth requirements from existing devices. At the same time, consumers are becoming more technology agnostic: they just expect connectivity to work. However, while that demand for connectivity is growing, the value is increasingly being captured at the application and services layer: increasingly it is Amazon, Google, Facebook, Netflix et al who are benefiting from increased consumer usage and spend on services, rather than connectivity providers. Communication service providers are adapting to address these trends, with medium term strategies acknowledging the importance of connectivity, alongside more customer-centric attributes, as key to their success.
Examples from Telia Company, Orange, SingTel, and BT below highlight a commonality in themes, built around:

- Offering the best possible connectivity
- Enhancing the customer relationship and creating more personal connections with customers
- Identifying new service and content revenue streams

<table>
<thead>
<tr>
<th>Operator</th>
<th>Strategy Priorities</th>
</tr>
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</table>
| BT       | • Maintain broadband leadership  
           • Drive convergence  
           • Strengthen sport and content  
           • Transform customer experience |
| Orange   | • Offering enriched connectivity  
           • Reinventing the customer relationship  
           • Building a company model that is both digital and caring  
           • Supporting the transformation of business customers  
           • Diversifying by capitalizing our assets  
           • An unmatched customer experience |
| SingTel  | • Deliver a differentiated network experience  
           • Enhance customer experience through digitalization  
           • Innovate with new products, services and content |
| Telia    | • Value through superior network connectivity  
           • Customer loyalty through convergence  
           • Competitive operations |

We believe that value creation for broadband service providers must be viewed on multiple dimensions. Medium term growth strategies need to be built around extracting additional value from faster connectivity, from video content and partnerships, from convergent bundles, from the smart home, and from customer data.
3.1 The Value of Speed

As seen in section 2, broadband tariff plans have seen strong increases in both the average advertised speeds and the size of monthly usage allowances. As user requirements for faster connectivity continue to grow, broadband service providers have been successful in monetizing the demand for speed.

Comparing broadband tariffs from Strategy Analytics’ Teligen database, based on a monthly download requirement of 30GB, and taking into account a range of different minimum download speed requirements, we see a clear pattern of increasing prices. A user requiring only a basic broadband service will pay an average of just under $30 a month, while a user looking for very high speed broadband will pay almost double that cost – just over $55. While this is a very simplistic analysis, without any distinct qualification of the offers included beyond speed – the trend is clear, higher speeds come at a premium price.

As noted above, broadband ARPs will fall 1.4% in 2017, driven in part by the shifting regional mix. ARPs will rise in the majority of regions, supported by the growing share of higher-speed connections. While many service providers have struggled to lift broadband access ARPU by a significant amount in recent years, there are good examples of operators who have increased ARPU more significantly, such as Telecom Italia and AT&T, through strong migration to FTTP and FTTC broadband services.
Telecom Italia’s success in broadband has come from adopting an attacker approach to defend its market share and a focus on driving up adoption of ultra-broadband (fiber) services. Its broadband service revenue increased 17.8% year-on-year in Q2 2017, which is primarily a result of a 13.8% increase in ARPU from an improving customer mix. Its ultra-broadband expansion in 2017 is built on both an extension of 200Mbps eVDSL coverage and an acceleration in its FTTH deployment to 30 cities before the end of the year, taking overall NGN coverage to 70% of households. Fiber adoption has been key to that ARPU uplift, with its share of domestic broadband customers increasing from 11% to 20% over the last year. Telecom Italia is also working on IP core network evolution, platform modernization and new national photonic network with links up to 400 Gbps. The enhanced backbone and core networks become a solid foundation for Telecom Italia’s successful broadband access service.
Video is the dominant use case on broadband networks in both developed and developing markets, both in terms of IPTV services and in terms of the use of Internet bandwidth. Service providers have been active in providing TV and video services over broadband for many years, in part as a means of adding functionality to linear/broadcast content and in part to compete against traditional pay TV platforms (cable and satellite TV) and OTT providers for the customer relationship. Video is a key part of the residential bundle and broadband providers who do not have a history in cable or satellite have turned to developing their own IPTV services or partnering with established OTT players to compete effectively for that multi-play household. IPTV, including hybrid IPTV solutions that also receive TV broadcasts through an aerial, is a key part of the TV landscape in most countries, though penetration can vary significantly even in highly developed IPTV markets: IPTV is used around 10% of households in the US, the UK, and Japan, rising to over 20% in Spain, over 30% in the Netherlands and South Korea, and over 50% in France.

In the North American pay TV and subscription video on demand market, still dominated by cable and satellite, IPTV services have carved out a 13% revenue share and provide a significant revenue uplift for broadband providers there. Total IPTV revenue provides a 24% uplift on top of broadband access revenue in the region. Prior to its acquisition of DIRECTV in 2015, AT&T’s U-Verse IPTV service, with ARPU’s of over $100 per month, generated more revenue for the service provider’s Entertainment Group than its high speed Internet service. This pattern of value creation through pay TV can be a strong one for broadband providers. For example, in the UK, BT has boosted its IPTV proposition with an investment in football rights, and over the three years between March 2013 and March 2016 (prior to the integration of EE), it increased its retail broadband base by 20% and its consumer ARPU by 20%, while ARPU’s for the more established pay TV (and triple-play) providers were largely unchanged.

The challenge for broadband providers who do not have a pay TV cable or satellite background is then creating a TV solution that can compete effectively in the market. Options here range across acquiring an existing pay TV provider, acquiring content rights and building a pay TV service, leveraging existing free-to-air broadcasts and TV-on-demand.
catch up services, or partnering with an existing subscription video on demand or OTT video provider distribute their content or resell their service.

Broadband providers have adopted all of these strategies, and in most instances have employed a combination of many of these, in order to develop a viable IPTV service. These choices need to address the ability to compete against established pay TV providers, who will have a significant advantage of scale in securing content, and be flexible enough to address changing consumer viewing habits. That flexibility is critical in an increasingly fragmented video marketplace from an audience perspective, where highly differentiated offers are critical in connecting with a segmented customer base exhibiting wildly differing expenditure profiles. While partnering with an established OTT proposition such as Netflix can also be attractive, in terms of providing customers the value added service and tapping into the OTT brand recognition, service providers need to trade off that against the loss of mindshare in the customer relationship.

Not only do TV strategies need to address the broad range of consumer purchasing profiles and priorities, they also need to address viewing habits that span multiple platforms and devices. Multi-screen services are a core part of subscription video today and, in many respects, this can play into the hands of broadband service providers who excel in providing high quality seamless network connectivity. Strategy Analytics’ ConsumerMetrix research shows a strong pattern of multi-screen video use in developed markets. Within the audience for each content type, we see the TV accounting for around 80% of viewing for sports events and full-length movies, though smartphones, tablets and computers are increasingly used for shorter programming, with 27% of the audience watching TV episodes on these devices, rising to 32% for news, 34% for sports highlights, and 88% of user-generated content. There are also strong multi-screen distinctions by age: TV’s share of the audience was 15-20% lower for those in the 18-34 years category, versus those over 35 years of age.

Alongside subscription and free video on demand services available across this wide range of devices, TV providers have embraced multi-screen video opportunities, in many cases from a value generation perspective. While TV Everywhere services are an important factor in service provider choice for some consumers, so are value generating in their ability to drive customer acquisition and retention and so maximize core TV revenues, they can often be monetized in their own right. TV Everywhere solutions such as Sky UK’s Sky Go Extra, at GB£5/month, or Deutsche Telekom’s EntertainTV mobil, at €6.95/month, are good examples of how extra value can be generated through these features.
High quality multi-screen video services will require an upgrade to home Wi-Fi networks.

One challenge broadband service providers will need to address on this path to widespread adoption of 4K video and increasing multi-screen behaviour patterns is the quality of the home Wi-Fi experience. Multi-room viewing habits involving UHD content requires significant bandwidth, continuous 300Mbps Wi-Fi coverage are needed to support two simultaneous 4K video streams in the home. The higher Wi-Fi throughput will be required if next generation immersive experience is required, such as 360° virtual reality applications.

<table>
<thead>
<tr>
<th>Video Service Performance Requirements</th>
<th>1080P</th>
<th>Pseudo 4K</th>
<th>Basic 4K</th>
<th>True 4K</th>
<th>Ultimate 4K</th>
<th>360° Interactive VR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>1920*1080</td>
<td>3840*2160</td>
<td>3840*2160</td>
<td>3840*2160</td>
<td>3840*2160</td>
<td>5073*5707 per eye</td>
</tr>
<tr>
<td>Frame rate</td>
<td>23P</td>
<td>23P</td>
<td>30P</td>
<td>50/60P</td>
<td>100/120P</td>
<td>&gt; 90P</td>
</tr>
<tr>
<td>Sample bits</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>12~17</td>
</tr>
<tr>
<td>Video coding</td>
<td>H.264</td>
<td>H.264/H.265</td>
<td>H.265</td>
<td>H.265</td>
<td>H.265</td>
<td>3D video coding</td>
</tr>
<tr>
<td>Bandwidth Req.</td>
<td>5~8Mbps</td>
<td>8~15Mbps</td>
<td>20~30Mbps</td>
<td>30~50Mbps</td>
<td>50~100Mbps</td>
<td>Hundreds Mbps to several Gbps</td>
</tr>
<tr>
<td>Latency Req.</td>
<td>12~20ms</td>
<td>7~12ms</td>
<td>6~11ms</td>
<td>6~11ms</td>
<td>6~11ms</td>
<td>5~9 ms</td>
</tr>
<tr>
<td>Packet loss Req.</td>
<td>5*10^-4</td>
<td>5*10^-4</td>
<td>1*10^-4</td>
<td>5*10^-5</td>
<td>5*10^-5</td>
<td>&lt; 5*10^-5</td>
</tr>
</tbody>
</table>

Source: Huawei
Multi-screen video services and 4K video will require an upgrade to access network.

With the long duration of video consuming, multi-screen behaviour in peak hours requires a smaller bandwidth convergence ratio. For smooth 4K video and multi-screen experience, access network need an upgrade from GPON/EPON to 10G PON. But the upgrade workload is heavy because of the numerous equipment and nodes in access network. Service providers must plan for the upgrade in advance and keep continuous investment to meet the users’ increasing bandwidth demand.

<table>
<thead>
<tr>
<th>Household devices</th>
<th>Devices combination of multi-screen</th>
<th>Downstream bandwidth requirement</th>
<th>Total bandwidth requirement (1:64 split ratio)</th>
<th>Type of PON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without OTT TV</td>
<td>1 PAD+1 PC+1 smartphone</td>
<td>5+10+5 = 20M</td>
<td>1.28G</td>
<td>GPON</td>
</tr>
<tr>
<td>With OTT TV (1080P-dominated)</td>
<td>1 OTT TV+1 PAD+1 PC+ 1 smartphone</td>
<td>10+20 = 30M</td>
<td>1.92G</td>
<td>GPON</td>
</tr>
<tr>
<td>With OTT TV (4K-dominated)</td>
<td>1 OTT TV+1 PAD+1 PC+ 1 smartphone</td>
<td>25+20 = 45M</td>
<td>2.88G</td>
<td>10G PON</td>
</tr>
<tr>
<td>With OTT TV (4K-dominated) and VR</td>
<td>1 OTT TV+1 PAD+1 PC+ 1 smartphone + 1 VR</td>
<td>45+80 = 125M</td>
<td>8G</td>
<td>10G PON</td>
</tr>
</tbody>
</table>

Source: Huawei
3.3 The Value of Bundles

One of the key motivations of offering TV services alongside broadband connectivity is the value that service providers are able to extract from service bundles. While there can be significant pricing pressure within bundles, so often hard to justify in relation to the revenue potential of individual services, there are very few service providers who are equally strong in all components of a multi-play bundle. As a result, the value of bundles can be derived from:

- Access to an increased share of household expenditure. Broadband access on its own accounts for only a small share of household expenditure on telecoms and media services
- Strong customer loyalty gains by bringing multiple services under a single contract
- Good “upsell” opportunities within households that have already shown a willingness to buy multiple services from a single provider, so upgrading those customers to higher broadband speeds, premium TV channels or larger mobile broadband buckets, ideally across multiple mobiles in the family, to maintain or increase overall pricing

![Multiplay Household Penetration Graph](image)

Source: CNMC

**Take-up of bundled services**

Proportion of households

![UK Take-up of Bundled Services](image)

Source: Ofcom, Communications Market Report 2016
As a result of these operational benefits, the move to multi-play services has been a strong trend this decade, with the majority of use of broadband and pay TV services in particular happening within bundles. Markets where triple-play and quad-play services dominate residential purchasing patterns are typically ones where the incumbent service provider has taken strong position, either as a market leader driving adoption from a strong service portfolio position or as a competitive response to an aggressive rival. For example, while Spain and Portugal enjoy high levels of triple and quad-play adoption (back up by strong positions from Movistar and MEO respectively), the largest single multi-play bundle in both the UK and Sweden is double-play fixed voice and broadband (as a result of a weaker or later push to quad-play from the incumbents there).

What is clear in many multi-play markets is that mobile services have been harder to bring into the bundle, with many households still making household-level decision on fixed voice, broadband, and TV but personal-level decisions on mobile, and even where mobile is bundled into a multi-play plan this frequently will not include all the mobile lines in the household. But in multi-play markets, fixed broadband services are often the most bundled product: 97% of broadband lines in Spain are in bundles, 92% in Portugal, 85% in the UK, 59% in China, and 42% in Sweden. From a broadband service provider perspective, there is a strong argument that the value of the bundle is as much about survival as value creation, with the standalone broadband purchase becoming a historical artefact.

This plan adoption dynamic obviously also flows through into revenue profiles in markets. For example, in Portugal the service revenue from multi-play services is more than six times larger than the combined revenue from single play fixed voice, broadband and pay TV services. For Swisscom, 51% of its consumer service revenue came from bundled products in H1 2017, up from 44% in H1 2016. So we see strong profiles of ARPU uplift for operators pushing multi-play service propositions, for example in Belgium Proximus’s quad-play ARPUs are 3.2x single-play levels and 2x double-play levels, with the uplift even higher in Portugal. While that ARPU uplift can be bought at the cost of bundled discounts and so lower spend overall than in a single play environment, it is also worth noting that Proximus’s overall consumer ARPU is increasing. The growing mix of multi-play adoption in its subscriber
base converting into a higher value base as it is able to take share in multi-play segments where it was previously weak (e.g. TV).

Any service provider concern about lost value through bundle discounts can also be mitigated by strong churn benefits and lower customer acquisition costs from multi-play strategies. KPN Netherlands increased the share of fixed-mobile convergence bundles within its consumer customer households from 31% in March 2016 to 39% in March 2017. Across all its consumer propositions it has a net promoter score (NPS) of 10 and churn of 10% per annum; among its bundle customers it enjoys an NPS of 23 and churn below 5%. KPN also cut its consumer marketing expenses 34% between 2015 and 2016 as more of its acquisition business was built around upsell opportunities.

This is a picture also seen in Proximus’s churn profiles. Over the last year’s Proximus’s consumer churn has averaged 21% for single play products, 11% for double-play, 10% for triple-play, and just 3% for quad-play, with overall churn falling as multi-play adoption rises.

These customer loyalty patterns create a very strong position from which service providers can develop long-lasting and highly personalised customer experiences. Not only do higher spending customer displaying lower churn likelihood convert into a more predictable revenue stream on which to plan growth, they also represent households where service providers can use that relationship to offer a wider variety of services, both in telecoms and media, and also in smart home and smart life services.

The consumer survey conducted by Strategy Analytics in August 2017 found that 45% respondents have bundled mobile service with fixed telephone, broadband or TV together, China has much higher mobile bundling percentage than European countries such as the UK, Spain, Portugal and Sweden (as shown in the chart above). Because of China Mobile’s strong leader position in mobile market, 52% of China Mobile broadband customers report that they bundle mobile service with their multi-play bill – higher than China Telecom (44%) and China Unicom (39%) customers.
3.4 The Value of the Smart Home and Home Networking

By 2020, consumers worldwide will be spending nearly $130 billion annually on smart home offerings, with more than 230 million homes worldwide or about one in eight will have at least one type of smart system installed. There are many different types of companies seeking to capture market share for one or more products and/or services in the smart home market including retailers, insurance companies, energy providers, security service providers and device manufacturers to name the prominent market participants to date. Service providers will have to effectively compete and/or partner with these types of companies in order to earn a viable market position.

Strategy Analytics estimates that 47% of consumer smart home spend by 2020, or more than $60 billion, can be addressed by communications service providers. The success in winning a share of this addressable market will be based on targeting consumers by motivations for purchase, rather than merely offering a general purpose service and/or device that can be used for many different reasons. Developing messaging that highlights use cases and applications personalizes the value propositions for consumers.

Consumers may subscribe to a security monitoring service, install a programmable communicating thermostat or electronic door lock, but their motivation for doing so is related to the “application” of the technology to satisfy needs or wants. Service providers should tap into the underlying applications or motivations for purchase in the following smart home product and service categories:

- **Safety and Security** – consumers often subscribe to professionally monitored security services to satisfy their desire to enhance the safety and security of their home. However, many install self-monitoring systems which may include many of the same types of devices as the professionally monitored systems, but notifications and status updates are sent only to the consumers or people they designate to receive them and not to the authorities.

- **Peace of Mind** – this is a widely used phrase to describe applications that generally monitor activities in a home, but not focused on intrusion detection or fire emergencies. Knowing that a service technician took care of something needing repair via notifications from door locks and cameras is a simple example, as is knowing a child arrived home from school. Other example includes leak detection or knowing that there is no leak detected.

- **Convenience** – this is usually satisfied via some form of automation. Arriving home sets off a sequence of events that make it easy to enter a dark home on a hot night loaded with bags in your hands. But there is also an element of convenience in a thermostat that adjusts based on weather forecasts with no human intervention even though the main application of the thermostat is energy management.
• **Energy Management** – this is relatively self-explanatory, but there are differences in how different consumers implement energy management. The thermostat is more straightforward than smart plugs or occupancy-sensing light switches. Some may install these light switches to reduce energy consumption; others for convenience.

• **Entertainment** – this continues to be a major opportunity for service providers via Remote-enabled Entertainment Controls. Integrated Entertainment Controls, while categorized as an entertainment application, are not considered a service provider opportunity as these are often a customized entertainment system installation or one set up by a retailer’s installation staff.

• **Medical and Health** – the only source of revenue we see for service providers associated with this application is a fee for communication links from the Remote Patient Monitoring systems to medical facilities and professionals. We estimate this to be approximately $2/month per patient.

• **Other** – this is a small category of applications not covered by the definitions above, but that are implemented with professionally monitored security, self-monitoring and control systems, automation systems or other types of smart devices installed in a home.

Our Chinese home user survey found strong interest in smart home security products among Chinese consumers, including security cameras, home monitoring systems, door lock and viewers, and location trackers. More than one in five consumers expected to buy smart security cameras in the next two years with it topping the list in terms of smart home product most likely to be purchased first.

Across the smart home product categories, smart home assistants recorded the strongest medium term interest overall from Chinese consumers, with Strategy Analytics forecasting that 165 million intelligent home speakers will be in use globally by 2022. Voice has long been considered as an alternative human-machine-interface (HMI) for connected devices and one that may ultimately replace keyboards and touchscreens across many of the devices that we use today. Artificial intelligence technologies including speech recognition, natural language processing and machine learning have now progressed to a level that allows for the development of consumer grade devices that can accurately interpret and act on natural voice based commands.
Intelligent Home Speakers are a physical manifestation of this emerging HMI and are being positioned as home-based hubs for interaction with other connected home devices and services. Smartphones will undoubtedly adopt the same functionality moving forwards such as always listening far-field microphones, but dedicated intelligent speakers offer the advantage of being able to deliver a superior sound quality and a more convenient interface for home control based tasks in multi-user environments. While it is unlikely that intelligent speakers will replace the smartphone for more personal or one to one use cases in the home such as messaging, voice calls and web browsing, they do have the potential to become the primary interface for communal household and smart home applications such as temperature and lighting control, security, general queries, entertainment and ecommerce.

Consumers are using Intelligent Home Speakers for a variety of reasons with the most common use cases being listening to music, controlling smart home devices such as lighting, accessing news and weather updates and creating shopping and to-do lists. In the case of Amazon's Echo family of devices, users also have access to the more than 5000 'skills' or apps that have been developed for the Alexa platform to make everyday tasks even simpler. Such wide ranging functionality has certainly proved to be a powerful incentive for early adopting consumers and users can generally find a number of applications that they will regularly use.

The challenge for service providers in this space will be in developing a viable proposition that can compete with Amazon Echo, Google Home or Apple HomePod. In China, where competition for connected home dominance will be highly localized, major technology players such as Baidu, TenCent and Alibaba are also all developing their own digital assistants and plan to launch supporting speaker hardware soon. The digital assistants delivered through these products stand to have a big impact on how consumers manage their homes, but also on how companies do business today. They will challenge the relationships companies have with their customers and create new paradigms for marketers. Those who wish to successfully navigate this emerging landscape will need to understand consumer preferences and behaviors, secure partnerships across industries, and adapt and refine customer experiences for this new medium.

Service providers eyeing this space need to choose whether to go it alone or partner with a major technology player. Despite the existence of global tech rivals, there are a growing number of service providers active in this space. For example, South Korea's SK Telecom, KT, and LG U+, as well as Orange and Deutsche Telekom in Europe are building their own digital assistant platforms, initially as a means to provide a common interface for all of the services that they offer as well as to help develop their in-house smart home offerings.

A good home networking environment is an important foundation for the smart home services. Wi-Fi is the mainstream technology that is used for home networking today. However, current home Wi-Fi solutions have not been able to fully meet the home networking demands. There are still issues either for the performance or for the management and maintenance capability.

The coverage and experienced data speed of Wi-Fi system in a home are strongly impacted by penetration losses and interference. Walls, windows and doors and even human bodies are obstacles that could block Wi-Fi signals. The exhibit below shows the penetration loss of some typical obstacles in a home. More complex home environment will lead to higher penetration loss and more significant impact on Wi-Fi coverage and data rate.
With the number of connected devices increasing, the management and maintenance capability of home Wi-Fi solution becomes more and more important. Incorrect installation and configuration often lead to home network failure and compatible issues. According to the statistics of Chinese operators, 30-50% of home network faults are rooted to Wi-Fi failures. Our Chinese home user survey also found that 60% of consumers who are interested in smart products would also prefer to buy them from their service provider with a maintenance service plan, rather than buy products outright, and install and maintain themselves. Certainly, managing the complexity of smart home devices is an area where consumers need support and where there is a good role for service providers as trusted partners.

This is an area where service providers can take an active role, in line with this emerging consumer demand for smart home solutions, addressing the higher requirement for installation and customer care services across smart home and home networking products. For example, PCCW in Hong Kong has provided Smart Living service that includes home network, home entertainment and home automation applications. To enable customer to tailor network solution to home design, PCCW provides customer on-stop service including installation, on-site service, after-sales service and technical support.

To accelerate smart home service development, operators and vendors should joint force to develop more intelligent home networking solutions with self-configuration, self-management and self-healing capabilities. Operators’ customer service resources could also become a strong differentiator in the smart home market. Operators could leverage their technician and service channel resources to improve competitiveness and set a high entrance threshold for emerging smart home players.

<table>
<thead>
<tr>
<th>Obstacle</th>
<th>Penetration loss (dB)</th>
<th>Obstacle</th>
<th>Penetration loss (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load bearing wall</td>
<td>20 – 40</td>
<td>Concrete wall</td>
<td>10 – 18</td>
</tr>
<tr>
<td>Floor</td>
<td>30</td>
<td>Window glass</td>
<td>2 – 4</td>
</tr>
<tr>
<td>Wood door</td>
<td>3 – 5</td>
<td>Coated glass</td>
<td>12 – 15</td>
</tr>
<tr>
<td>Wood furniture</td>
<td>2 – 10</td>
<td>Wood partition</td>
<td>5 – 8</td>
</tr>
</tbody>
</table>

Source: Huawei
3.5 The Value of Customer Data

Customer data, about usage, behaviour and demographics, is a vital source of value creation for broadband service providers. It can be used as an asset of value to advertisers, so as a revenue source in its own right, but also to improve the overall customer experience by enhancing customer interactions, providing real-time personalized offers, and forecasting network requirements to ensure the best possible quality of service.

With the ability to track users’ online habits, app preferences, demographics, location, and other billing insights, telecom companies are in a strong position to take a bite of advertising revenue with the aid of ad tech. Strategy Analytics forecasts TV, radio and digital advertising will grow from $444 billion in 2017 to $521 billion in 2020. Service providers can sell customer data into advertising platforms, or build more complete platforms themselves where they have significant advertising inventory to sell, in particular through their own video services.

Over the last five years, we have seen a growing service provider push into content and advertising across all channels, putting them into more direct competition with digital-first companies like Google and Facebook (who are in turn encroaching into territory once held by the CSPs). US service providers have perhaps done more than most in this regard:

- **Verizon/AOL** - Verizon’s acquisition of AOL for $4.4 billion in May 2015 made Verizon a fully integrated provider capable of offering broadband, mobile voice and data -- and entertainment content. By leveraging AOL’s ad tech platform, Verizon has been able to tie its broadband and mobile subscribers together and target users across devices. Verizon’s acquisitions give it a full line-up of ad tech properties and the capability of delivering targeted ads to mobile devices, desktops and digital video, making it one of the few players to take a bite of the ad revenue from Facebook and Google.

- **Verizon/Yahoo** – Verizon completed its $4.5 billion acquisition of Yahoo in June 2017. The unit has been merged with AOL to create a new online media and advertising division, called Oath, that is home to more than 50 media and technology brands, and to advertising platforms including ONE by AOL and Yahoo's BrightRoll.

- **Liberty Global/LookLive** - In September 2015, Liberty Global, one of the largest international cable companies,
invested €2 million in Amsterdam-based Startup LookLive together with Volta Ventures. LookLive creates contextual information from entertainment and broadcast media and provides new revenue opportunities for brands, broadcasters, media companies and cable/satellite operators.

**Comcast/FreeWheel** - Comcast, the US’s largest cable & broadband operator and owner of NBCUniversal, paid $360 million in May 2014 for video ad tech firm FreeWheel, one of the biggest platforms TV networks and online content producers use to serve ads in online video. FreeWheel's clients include Fox, AOL, Viacom and Turner Sports. With the FreeWheel purchase, Comcast was able to offer its advertising partners a one-stop shop to purchase ads for huge, defined audiences across multiple platforms. The purchase also provided Comcast an opportunity to offer addressable advertising for live TV.

**Comcast/Visable World** - Soon after completing the FreeWheel deal, the cable giant acquired the TV ad-targeting firm Visible World. Visible World works with marketers to deliver ads to specific audiences and households based on zip codes, using data from cable set top boxes and other sources.

**Telstra/Ooyala** - In August 2014, Australian telco Telstra grabbed a 98% stake into streaming video distribution platform Ooyala and then bought video supply-side platform Videoplaza. For Telstra, the acquisitions help it offer new, differentiated services to business customers as part of its Global Applications and Platforms (GAP) business.

**Singtel Corp/ Amobee** - In 2012, Singapore telecom Singtel Corp. paid $321 million for mobile ad tech firm Amobee, and in 2013 Amobee bought Gradient X, a real-time bidding (RTB) ad platform for mobile ads. Gradient X enabled Amobee to offer companies the ability to make media buys through multiple channels and formats like video and HTML5.

The use of customer data to enhance the customer experience is also an area seeing active development from service providers. Telefonica’s AURA solution is a good example of how service providers have evolved beyond customer data as an input for internal processes to allowing users to interact directly with their data and empowering them to make informed choices about their service use. AURA provides an interface from which users can review their telecoms and media use, control how their data is shared with third parties, and also extract more value from their service experience as they interact with this account information. This ranges from troubleshooting device problems, to adding users or new products to their account, upgrading their service plan, finding new movies or TV programs to watch, or reviewing and managing which devices have access to the home router.

Customer data could also be used to improve service provider’s operation efficiency. Chinese operators have leveraged their customers data – such as customer’s device brand, model, ARPU, data volume, brand loyalty etc. – to decide the device subsidy policy for given device brand and models. Telekom Indonesia has used the data from billing system, customer care system and information of customer’s usage pattern, network status, etc. to prevent customer churn. With the support of customer and network data analytics, Telecom Indonesia has lowered its churn rate from 5% to 2% in six months. Telecom Indonesia also analyse customer’s IPTV watching behaviour to extract information of audience share and program share, and do the deep analysis on location and time segment. Based on these analytics, Telekom Indonesia can provide TV rating and share information to TV stations and advertising agencies on daily basis. This could create new revenue sources.

We will see many more service providers adopt a similar approach in how they interact with their customers and empower them with knowledge and control of their own usage profiles and personal data. This will ultimately offer
service providers real benefits in terms of more cost-effective and rewarding customer engagement, and more options to extract value in a controlled way from customer data. While there are always customer acquisition opportunities as service providers build reputations for a high-quality customer experience, the real focus in the shorter term is on boosting existing satisfaction and loyalty, and increasing trust in that relationship.

Those customer satisfaction gains will initially come through the easier process for basic fault resolution, service discovery and product upgrades. There are certainly segments in the market, particularly millennials, who prefer to have these types of interactions automated, rather than talking to a customer service rep, which can bring with it challenges ranging from conflicting advice, aggressive sales tactics, or simply the inability to find the right person who can really help. Some users have no problem regularly calling their service provider to find out why their bill is higher this month, but for many it can be easier to let these matters go and retain a general sense that they are not getting value for money. So a platform that puts the user in control of resolving these issues, without the need for costly customer care support, represents a win for both the customer and the service provider.
Household broadband penetration will hit 52% globally by the end of 2017, up from 37% in 2012, with encouraging development in service performance. Fiber and mobile broadband connections are dominating growth in broadband households, with 42% of broadband homes predicted to have a fiber connection at the end of 2017, including both fiber-to-the-home/premise (FTTH) and fiber-to-the-curb/cabinet (FTTC) solutions. Both advertised speeds and real user experience on broadband is improving significantly with Strategy Analytics’ Teligen broadband price benchmarking database seeing the average advertised speed of broadband plans increase from 41 Mbps in June 2013 to 136 Mbps in June 2017, while Akamai reports a 28% increase in average peak speed over the last year to 44.6 Mbps in Q1 2017.

In an increasingly competitive residential broadband environment, service providers face a multitude of challenges in sustaining growth in their businesses, not least how to expand broadband into more marginal regions and segments. Overall, broadband access revenue will increase 7% in 2017 and at a CAGR of 4% through 2022, but this growth will be hard fought as competitive pressures and regulatory intensity on delivering low-cost high-quality ubiquitous broadband continues.

Communication service providers (CSPs) globally recognise that demand for connectivity is growing exponentially, both in terms of new devices connecting to networks and in terms of increased bandwidth requirements from existing devices. At the same time, consumers are becoming more technology agnostic: they just expect connectivity to work. However, while that demand for connectivity is growing, the value is increasingly being captured at the application and services layer and CSPs are adapting to address these trends, with medium term strategies acknowledging the importance of connectivity alongside more customer-centric service attributes.

High-quality broadband service experience is key to value creation in the residential broadband market.

The authors believe that high quality access has to remain the foundation on which broadband service success is built. CSPs in both developed and developing markets have successfully increased broadband service revenue and ARPU by migrating users to higher-speed services, while consumers rank speed and connection stability issues as the top factors influencing their consideration to switch broadband provider, more important that pricing or a poor customer service experience.

High quality broadband access is also critical from a service enablement perspective. As we have highlighted in this report, success for residential broadband providers is dependent on them meeting broader technology, media, and telecoms needs within the household. In many countries, broadband connectivity is one of the most bundled telecoms services, so strategies for broadband value creation do need to take account of its role as a key enabler within the residential service bundle. These strategies need to address:

- **Multiplay services and the role of video and TV**: Broadband networks, and just as importantly in-home Wi-
Fi solutions, need to be built from the perspective of the significant contribution that video makes to overall broadband traffic volumes. Broadband service providers increasingly need to offer video services to remain relevant, to compete against pay TV providers who offer broadband, and to maximise their share of the consumer wallet. With connectivity expertise, they are well placed to address evolving consumer viewing habits that span multiple platforms and devices.

- **Smart home opportunities**: The smart home is a rapidly growing market offering significant opportunity for broadband providers. This is a market with many actors looking to become the trusted partner for households across security, energy management, healthcare, entertainment, and home automation, with competitors ranging from retailers, to insurance companies, or energy providers. Broadband providers can have a strong role to play here, developing a trusted relationship with consumers across installation and service support. The success in winning a share of this addressable market will be based on targeting consumers by motivations for purchase (safety, piece of mind, convenience, etc.), rather than merely offering a general purpose service and/or device that can be used for many different reasons.

- **Customer data and analytics**: Customer data, about usage, behaviour and demographics, is a vital source of value creation for broadband service providers. It can be used as an asset of value to advertisers, so as a revenue source in its own right, but also to improve the overall customer experience by enhancing customer interactions, providing real-time personalized offers, and forecasting network requirements to ensure the best possible quality of service.

These represent the key areas where service providers to create additional value in the residential broadband market. Executing in these areas will involve clearly defined strategies on where to partner for content or service expertise and where to innovate and develop services and platforms in-house for greater differentiation and control over the service experience. Ultimately, broadband service providers need to understand the motivations of their target segments in order to best align their propositions and messaging to embed themselves as a trusted and valued partner in the home.
Research Methodology

Huawei iLab, partnered with Strategic Analytics, with long-term research experiences and the China consumer survey in 2017, strives to present the current situation of the drivers for broadband both comprehensively and impartially. Huawei iLab tries to point out latent problems facing the industry, identify the industrial trends and conclude some recommendations for broadband development. Main sources of data include Strategy Analytics (on macroeconomics, industrial trends, and business model), Huawei iLab (on scenario research, user experience research, and network capability), as well as other public third-party materials. Note that data involved in this analytical report is bound to factors including time period, sample quantity, and level of research. All information provided is for reference only.

Huawei iLab is the scenario lab for the network product line, which is dedicated to studies on scenarios, experience, ecosystems, and friendly networks. It studies the friendliness of networks from the perspective of user scenarios and experience, and studies the industry and ecosystem from the perspective of impacts on networks. It is willing to work with industry partners to facilitate business and technical innovation, industry development, and development of an open industry ecosystem for a better connected world.

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