



FTTR's Role

in Optimising the Future Connected Home

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The in-home experience is an essential part of the modern broadband service. Lack of investment on behalf of service providers in this area has proved to quickly result in rising customer dissatisfaction, operations costs, and customer churn.

Leading operators have successfully countered this with investment in both more advanced Wi-Fi hardware and smart Wi-Fi software platforms. However, as fibre-to-the-home (FTTH) rollouts continue and both the bandwidth capabilities of the broadband network and network demands from new innovative cloud applications continue to grow exponentially, there will be a need to push fibre further into the home—especially for premium customers—to guarantee ultra-high bandwidth and ultra-low latency in every corner of the home. Although it is only currently available to the mass residential market in a handful of countries today, because of this demand and service providers' desire to market the optimum broadband experience, Omdia forecasts robust growth in fibre to the room (FTTR) across all regions over the next 10 years.

Key takeaways

- Demands on the home network will continue to accelerate. The use of video-based cloud applications will continue to grow rapidly, placing increasing demands on the network as we move to new video quality standards and new innovative applications such as extended reality (XR) and the metaverse.
- The home network must keep pace. Omdia's research clearly shows that if the home network is allowed to impair the home broadband experience, it can quickly cause significant customer dissatisfaction and soaring operational costs. Leading service providers have been successful in their investment in more advanced Wi-Fi hardware and smart Wi-Fi software, but as we move to gigabit societies, this investment alone will not be enough to provide the required quality of experience on a consistent basis for future premium customers.
- FTTR will ensure a consistent and high-quality experience. In lab trials and service provider pilots, FTTR has proved to provide a higher, more consistent level of service experience across the whole home. This includes more consistent coverage, better device handover times, less application freezing, and more consistent broadband speed. There is already a growing trend among operators to tier broadband plans not just on speed but also by features related to in-home network quality. By promising even greater quality, FTTR could allow the creation of yet more premium broadband tiers that fit alongside operators' existing tariff portfolios.

- FTTR will see robust growth to 2030 and beyond. With the acceleration in growth in FTTH networks and the broadband service providers' desire to differentiate around premium-quality broadband services, Omdia forecasts robust growth in the FTTR share of residential FTTH subscriptions across all regions. In 2030 the figure will be highest in China at 25%, followed by 15% in North America and 12% in Western Europe. Globally, this is equivalent to 8% of all households.
- Pricing and installation strategy will be key to success. The biggest challenge with FTTR is how to deploy it efficiently and cost-effectively. Installation strategy and pricing will be key to creating viable business models and to keeping the offering attractive to the customer. There are numerous ways FTTR could be priced, including one-off fee, monthly recurring fee, and premium bundling, all of which service providers have ready experience of from their advanced Wi-Fi strategies. All strategies should be explored to find the right fit for the particular market. Service providers should also explore ways to create operational efficiencies around installation, such as combining it with existing field work for FTTH rollouts and working with property developers.

Current industry trends

Our reliance on home broadband will only accelerate the COVID-19 crisis created a step change in demand for digital applications. During the crisis people were largely confined to

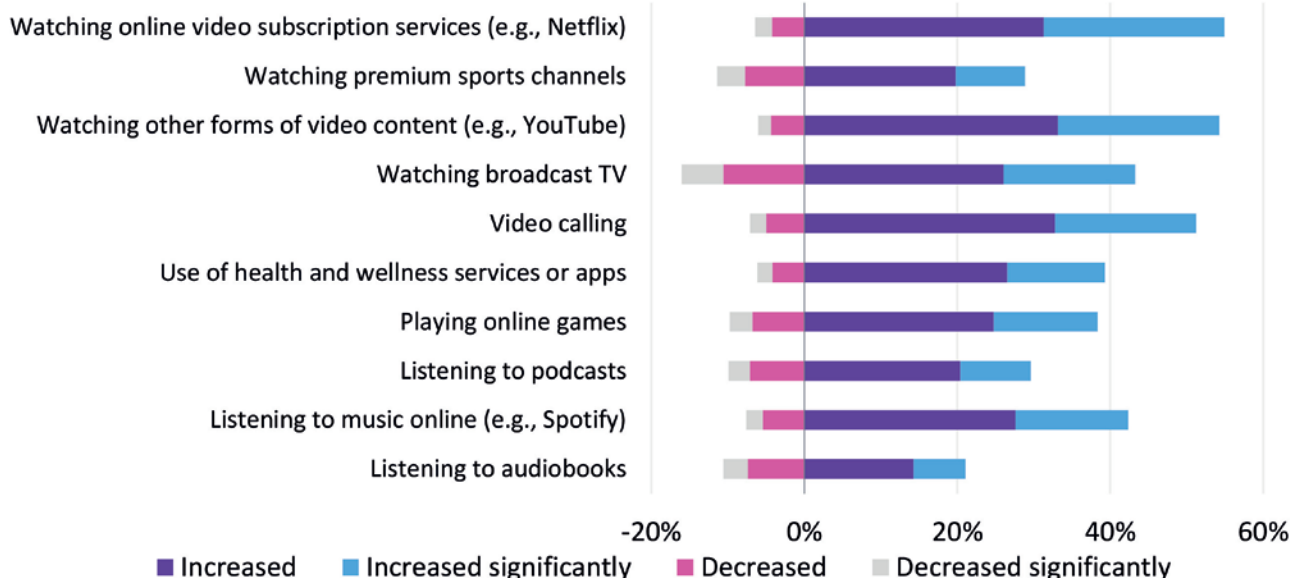
their homes, forcing businesses, government services, and social organisations to either temporarily close or find new digital ways of operating. For consumers, this meant a reliance on digital applications for everything from entertainment and socialising to education, healthcare, shopping and working. Although these restrictions have largely eased, the rate of take-up of these digital applications and services has continued to grow as consumers get used to this new norm.

Figure 1 shows that the use of video-based services in particular grew rapidly thanks to the pandemic, and this growth was not limited to just entertainment applications. 51% of respondents to Omdia's 2021 Digital Consumer Insights survey said that their use of video calling had also increased, and 18% of them said this was in a significant way.

Figure 2 shows how this growth is a long-term step change in behavior rather than a short-term spike, with usage of both online video services (in terms of views) and video calling (in terms of minutes) continuing to accelerate toward 2027 and beyond.

It must be noted that even before COVID-19, the world was entering a new era in communications, underpinned by the next generation of fixed and mobile communication networks. However, the pandemic has highlighted the importance of this evolution and, with digitally advanced countries faring better than others, has served to accelerate the urgency around greater infrastructure investment.

Change in use of digital applications, 2021

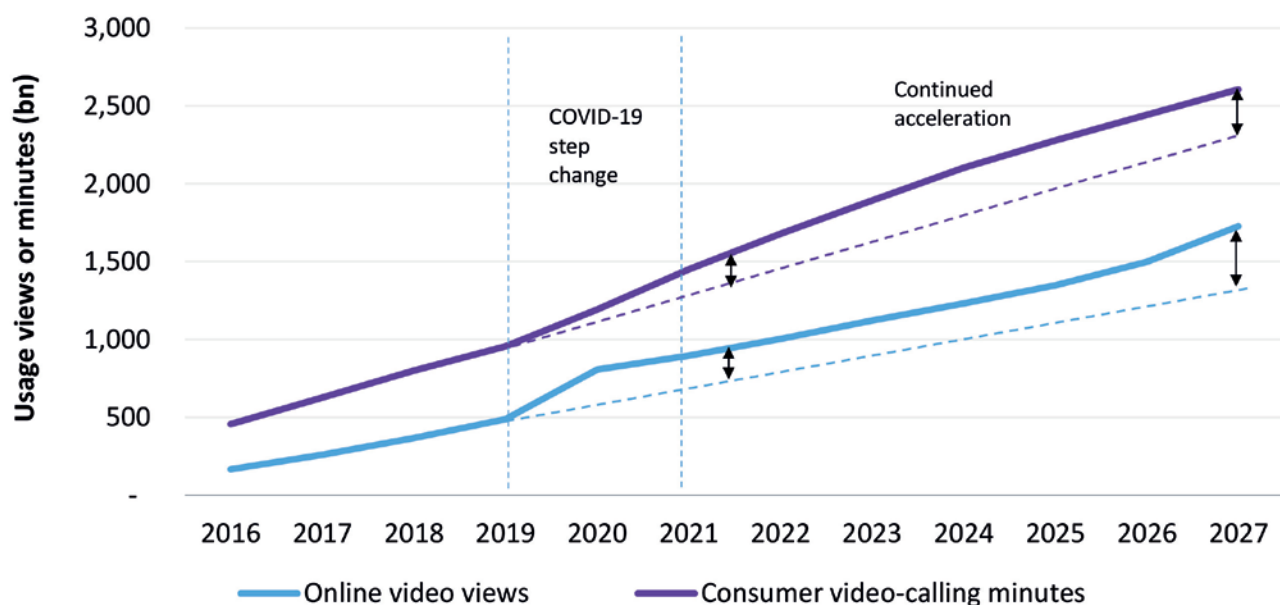


Note: Survey of 13,285 consumers in 13 countries

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Figure 1: Reliance on digital applications continues to grow

Global, online video views and consumer video-calling minutes, 2016–27



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Figure 2: Growth in use of digital video applications continues through 2027

The home network must keep pace

Pushed by the investment in next-generation broadband access networks, broadband speeds are set to increase exponentially. By the end of 2027, the average FTTH penetration globally will be 43%, and the global average consumer broadband speed will be just over 830Mbps, an increase from just over 120Mbps in 2020. By 2030 top speeds of 10Gbps and more will be common in highly developed countries.

On the flip side, media companies and consumer electronics vendors continue to create new cloud-based applications and consumer devices that will place greater demands on the network. For example, new 8K video applications require five times the bandwidth of 4K, and the next generation in XR technology will require 10 times the bandwidth of today's virtual reality (VR) applications.

If the capability of the home Wi-Fi network cannot keep pace with both the wider capability of the broadband access network and the demands of new applications, it will quickly become the new bottleneck in the broadband experience.

Home network investment is critical to service providers

Operational metrics from broadband service providers have already shown that if they do not invest in the home network it quickly becomes a key area of customer dissatisfaction

and a core driver of customer service calls. Omdia's research indicates that service providers have witnessed up to 60% of all broadband service calls becoming related to the Wi-Fi network, with corresponding operation costs rising in some cases by 40%:

- With no remote diagnostic capability, such calls take a lot of time to resolve and can cost \$5–30.
- Without better management tools, 10–15% of customers need more than a single call.
- Because of faulty diagnosis, Wi-Fi equipment is often returned even though it is not faulty (vendors claim up to 80% of routers are being returned as “no fault found”).
- Wi-Fi issues that are not resolved result in a reduction of Net Promoter Score (NPS) by up to 40 points, leading to greater customer churn.

Challenges for in-premises experience and industry directions

New Wi-Fi standards and smart Wi-Fi platforms have elevated the home Wi-Fi experience

Because of rising operational costs, leading broadband service providers have made significant investments in their home Wi-Fi capability. To date, this new investment is largely a combination of new Wi-Fi hardware (such as Wi-Fi 6 routers and mesh Wi-Fi technology) and software in terms of what are called “smart Wi-Fi platforms.” These software platforms enable cloud-

based artificial intelligence (AI) data analytics to monitor the performance of the home network, dynamically altering certain characteristics of the network to maximise the user experience as far as possible, and provide customer service teams with far greater remote troubleshooting capabilities.

Omdia's research has found this investment has led to significant improvements in service provider operations:

- Up to 60% reduction in setup support calls
- A reduction of up to 30% in overall customer service calls
- Engineer support visits—which typically cost \$60–80 but can be as much as \$400 per incident—reduced by up to 30%
- Enhanced customer experience leading to an increase in service provider NPS of 10–40 points
- Reductions of 12–30% in customer churn figures

Pushing fibre closer to the customer brings the next level in service consistency

Although the investment in better hardware and smart Wi-Fi software has been a success, Wi-Fi as a technology remains subject to environmental interference, which, although potentially reduced through techniques such as dynamic band and channel steering, cannot always be fully eliminated. This will become increasingly important with the launch of future Wi-Fi standards that utilise higher-frequency bands, which naturally have a higher attenuation. The long-term impact of this is that once again the Wi-Fi element of the network will start to

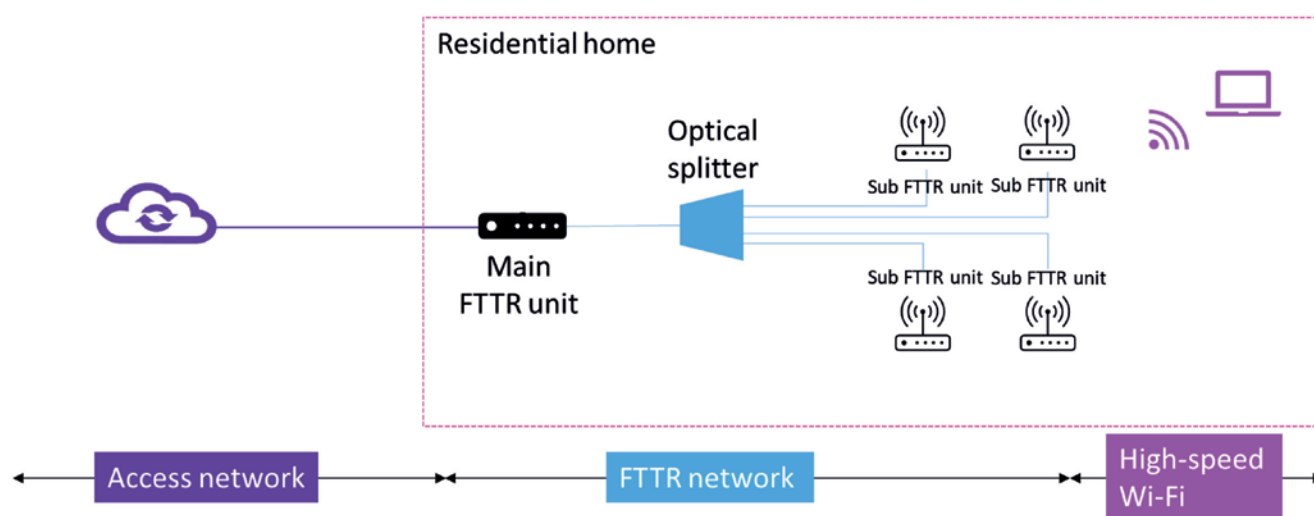
diminish the quality of the final connection, especially for more premium customers.

One of the simplest and most effective ways of mitigating environmental interference and overall signal attenuation on a radio signal is to shorten the distance between transceiver and receiver. In the home this can be achieved using a wired backbone around the home, which then connects individual Wi-Fi access points in each room of the house. The optimum cabling technology for this internal backbone is optical fibre: it is the most future-proof, cost-efficient, sustainable and consistent of all cabling options (Figure 3).

When point-to-multipoint (P2MP) technology is used in the FTTR architecture, the optical splitting enables better network scalability and makes more efficient use of the fibre-optic cables, thus saving installation costs.

FTTR offers the most consistent quality of service

Today Wi-Fi is by far the most popular in-home network technology: over 90% of all broadband customer premises equipment (CPE) shipped in 2021 was Wi-Fi enabled. This wide availability, together with its simplicity of use for consumers and, because of its scale, relatively cheap chipsets, means that an increasing number of devices in our homes have become Wi-Fi enabled, including smart TVs, webcams, smart doorbells, white goods such as washing machines and ovens, smartphones and tablets.



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Figure 3: FTTR network schematic

This reliance on Wi-Fi means that the signal needs to consistently reach every corner of the home. In some cases (on average approximately 50% according to Omdia's research), using modern Wi-Fi technology as discussed above, a single router is adequate to cover the complete home. However, for the rest, Wi-Fi extenders are needed to increase the reach, and they themselves typically rely on Wi-Fi to connect back to the main router.

Although an adequate solution for today's applications, utilising Wi-Fi for the in-home backhaul is not perfect and can reduce the overall bandwidth in addition to other issues such as slightly increased CPE handover times (i.e., the time taken for a mobile device such as a smartphone to switch from one access point to another) and increased network latency, which can have an impact on some applications such as video or cloud gaming. As applications develop and demand more of the network, these issues will become increasingly apparent.

The ITU-T Q3/SG15 working group is therefore developing a series of recommendations (G.fin series) for an FTTR system with centralised coordination architecture to enable the coordination between the fibre links and the Wi-Fi access links in order to ensure improvement in quality of service. This coordination architecture consists of the central main FTTR unit, which dynamically collects data on the network transmission demand, identifies the local network environment, and generates the required coordination strategy. The outcome is that transient network operation and control, including the air

interface signaling, device handover, real-time link visibility, and so on, can be achieved.

Replacing the in-home backhaul with a centralised FTTR architecture has been proved in both lab test results (see Table 1) and service provider pilots to reduce the impact of the in-home backhaul network to provide a greater and more consistent experience across the whole of the home.

FTTR business benefits and new opportunities

Potential business models

FTTR rollouts present operators with a number of opportunities to enhance existing business models and create new ones.

There is already a pronounced trend among operators to tier their broadband plans by features related to in-home network quality. For example, some operators either already bundle smart Wi-Fi routers / mesh Wi-Fi hardware into higher-tier broadband plans or have separate tiered offerings for the more advanced Wi-Fi offerings on top of the broadband tier. By promising even better quality, FTTR could allow the creation of yet further premium tiers that fit alongside operators' existing tariff portfolios.

Other operators also offer Wi-Fi speed guarantees to subscribers that take mesh Wi-Fi hardware. Such offers typically come with an additional monthly charge, such as Sky UK's Broadband Boost offer, which is charged at an additional

Lab test	Mesh Wi-Fi solution	FTTR solution	Notes
Roaming signal strength change (score out of 20)	18	20	The signal difference before and after the FTTR roaming is small, which only affects the user bandwidth slightly and therefore has minimal impact on the experience
Roaming handover time (score out of 5)	4	5	The FTTR switching time is slightly lower and more stable than with the mesh Wi-Fi solution
Roaming game delay (score out of 15)	11	15	The maximum latency of the FTTR solution is 25% lower than that of mesh Wi-Fi
Video freeze during roaming (score out of 10)	6	10	Using QQ video as the test source, the test using FTTR froze four times less than it did with mesh Wi-Fi
Impact of mesh on rate capability	Attenuation 30%+	No obvious change	Rates of comparison nodes in the home coverage test
Mesh wireless speed test (score out of 10)	8	10	In the home coverage test, the FTTR performance was 60% better than that of mesh Wi-Fi

Table 1: Huawei's FTTR solution compared with a well-known retail mesh Wi-Fi product

£5 (\$5.80) per month. However, the drawback here is that the speeds guaranteed are generally much lower than the access speeds marketed by the operators. FTTR offers the promise of much higher speed guarantees, potentially delivering a gigabit to the room, and a corresponding increase in the ability of operators to charge for such guarantees and the attractiveness of such offers. These high-speed guarantees fit well with many operators' strategies to push the adoption of gigabit and multigigabit FTTH plans.

Overall, operators must carefully consider how they charge for FTTR. One option that has been adopted is to charge a single upfront fee alongside a fixed-term contract for FTTR and associated Wi-Fi devices. Other operators charge a monthly subscription fee alongside a fixed-term contract for FTTR. An alternative option could be to offer FTTR free to higher-value customers in order to reduce churn.

It is also worth noting that if operators can successfully position themselves as providers of high-quality in-home connectivity through the launch of FTTR, they will be better placed to capitalise on other associated opportunities. Consumers are showing interest in in-home services such as connected-home cybersecurity that offers protection at the Wi-Fi network level. Such services are a good match for an operator that has a clear focus on in-home network performance.

It is clear that FTTR offers multiple opportunities for operators to boost their revenue. However, an assessment of potential FTTR business models should also take into account the potential cost reductions that FTTR can deliver. As discussed, up to 60% of calls to operator call centres are Wi-Fi related; improving the quality and visibility of the in-home network with FTTR has the potential to reduce this number and associated truck rolls.

One further avenue that operators could explore to monetise FTTR would be to work with property developers to install it in new-build properties. This would build on the existing relationships operators have often established with property developers to install FTTH. Property developers have already seen that the availability of FTTH can drive an increase in the value of properties, and FTTR could further increase the desirability of new-build residences.

Case study A: Latin American operator

Operator A launched FTTR in June 2022, becoming the first operator to do so in Latin America. The FTTR launch fits well

with the operator's ongoing extensive FTTH rollout, which has grown from more than 1 million premises passed in 2018 to just under 17 million at the end of 2022. Moving forward, as FTTH subscription take-up grows, it is expected that Operator A will explore opportunities to install FTTH and FTTR at the same time.

Operator A identified that in-home coverage was sometimes damaging customers' perceptions of the quality of their broadband service. In this way FTTR can help deliver improved customer satisfaction and reinforce the perception of Operator A as a provider of high-quality broadband. This is particularly important because FTTH overbuild is increasing in the operator's home market, so operators need to do more than just roll out FTTH in order to differentiate themselves. Operator A has even gone as far as creating a separate fibre brand in order to effectively promote its FTTR proposition.

Operator A's launch also reflects the opportunities that FTTR offers to boost ARPU. The operator charges an additional \$25 for a 400Mbps FTTH plan with FTTR included, a 122% increase. For its 1Gbps FTTH plan, adding FTTR increases the monthly fee by 72%.

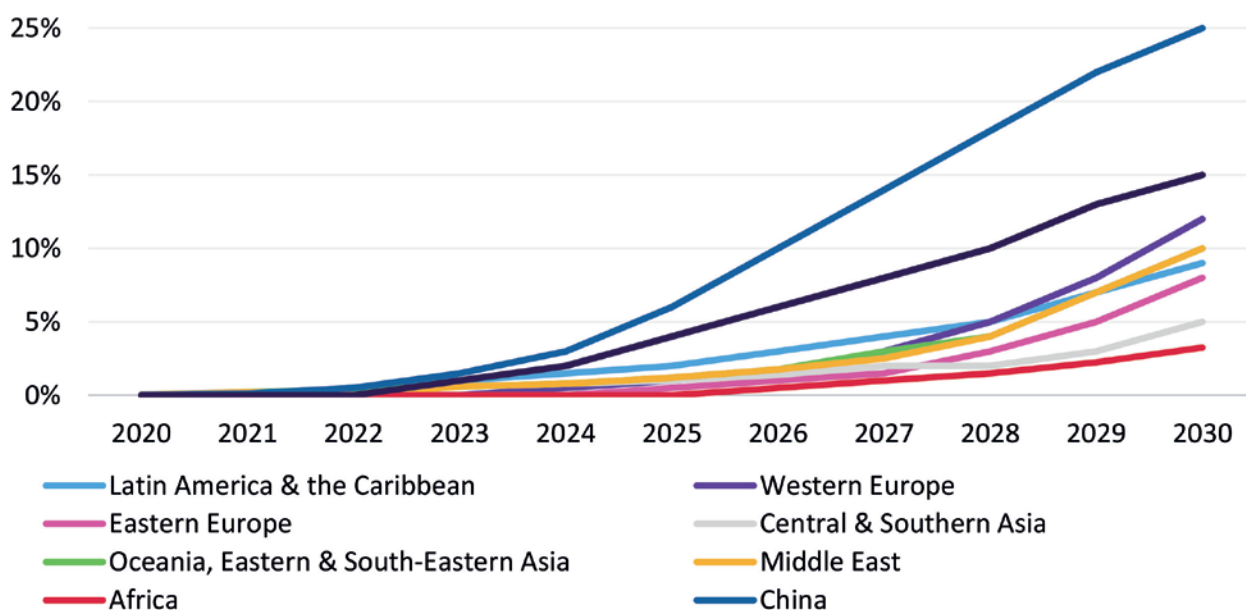
Case study B: Middle Eastern operator

After an initial trial, Operator B launched a commercial FTTR service in early 2022. The company stated that the launch of FTTR was fully aligned with both its sustainability goals and its number 1 global speed ranking initiative.

The operator is working with Huawei to accelerate and enable FTTR application in multiple scenarios including individual houses, large apartment blocks, and small to medium-sized businesses. Huawei is also working with the operator's installation engineers to optimise the installation process.

In Operator B's view, the recent booms in e-learning, gaming, and entertainment content and applications mean that customers require ultra-high speeds with ultra reliability throughout their homes, and delivering this will differentiate the operator's brand.

Over the next five years, the operator expects FTTR to reach more residential and enterprise areas in its home market as the company continues to strive to develop premium broadband services and drive the growth of digital applications and smart homes in line with its 2030 vision.



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Figure 5: FTTR share of residential FTTH subscriptions by region, 2020–30

FTTR will see robust growth over the next 10 years

Today, FTTR is a very immature offering and is only available to the mass residential market in a handful of countries. However, with the accelerating growth in FTTH subscriptions, and service providers' desire to market premium-quality broadband services, Omdia forecasts robust growth in the FTTR share of residential FTTH subscriptions across all regions.

In 2030 the figure will be highest in China at 25%, followed by 15% in North America and 12% in Western Europe. These figures reflect the early deployments of FTTR by operators in the Chinese market. They also demonstrate that FTTR penetration is likely to be linked to income levels and that FTTR will at least initially often be a premium service, while other households will be content to rely on single-router or mesh Wi-Fi solutions.

The Middle East is another region that presents a promising area for growth, and Omdia forecasts 10% of residential FTTH subscriptions will have FTTR by 2030. This reflects strong initial momentum behind the technology with some operators having already launched services. Large villa-style properties in the region are also a good match for FTTR solutions.

We forecast that FTTR penetration of total residential FTTH subscriptions will still be increasing even in 2030. This reflects the long-term potential of the market and the fact that consumer bandwidth demands will continue to increase. Moreover, increasing numbers of new-build properties will have FTTR installed.

FTTR deployment challenges and solution

The installation of in-building fibre cabling in mass-market residential homes is a new venture for many service providers so poses a new set of business challenges. There are some examples of in-building cabling (e.g., in multiple dwelling units, or MDUs), but on a global scale this accounts only for a small percentage of households, especially for cases of cabling to every room. However, where a residential building is due to be fitted with indoor cabling, or where existing indoor cabling needs updating, indoor fibre-optical cabling is the obvious choice. It is the most sustainable, future-proof, and cost-efficient of all cabling technologies, so the business case for installing it is straightforward.

The bigger issue is for the millions of households that have no or very little indoor cabling. Although Wi-Fi mesh is not perfect, one major advantage is that it is simple to install and, in most cases, can be done by the customer. Installing optical cable requires engineer installation and is therefore a more costly option for service providers to deploy.

Vendors are working hard to minimise these costs, but they can never be eliminated altogether. New transparent adhesive fibre and zero-splicing connections will reduce installation costs by making the process relatively quick and easy. Although engineer installation will still be required, the adhesive fibre can be installed without the need for trunking and, being transparent and relatively fine, has minimal impact on home

decoration. Additionally, without the need for splicing there is less requirement for the engineer to have specialised training. The results from customer trials indicate that installation times can differ based on the style and size of the home, but the average time required to install the FTTR network using this technology was typically 30 minutes per room.

Combining FTTR with engineering visits will further reduce cost

Reducing subscriber acquisition costs (including installation costs) has been a key part of the traditional broadband business model. Minimising acquisition costs means return on investment can be achieved more quickly, leading to higher per customer profitability. In the broadband industry this has been a major driver behind the development of self-installation techniques and industry standards. However, it is not always possible or even desirable to use customer self-installation.

When rolling out a new infrastructure, such as FTTH to a property, it may be necessary to send an engineer out to complete the work. Additionally, some service providers (e.g., Armstrong in the US) have chosen to use engineer installation as a default with the aim of providing a high-quality broadband experience. In such cases FTTR installation could be offered to the customer as an option while the engineer is already visiting the property, thus creating efficiencies and reducing costs.



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