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Wireless Broadband Access Market Update

Wireless broadband access makes a resurgence

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Contents

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Summary

In brief

Wireless broadband access (WBA) services, also referred to in the industry as fixed wireless access, have many different use cases. These use cases span all types of operators – integrated operators, pay-TV operators, mobile operators, wireless broadband operators, and next-gen NBN (national broadband network) wholesale operators that are owned by governments. Networks have been deployed in metro-only areas, suburban and rural areas, and sometimes even on a nationwide basis. By 2020, given WBA's high affordability ranking, we estimate that WBA services have the potential to reach almost 350 million homes on a worldwide basis. Further, we believe WBA has the most potential to increase fixed broadband market penetration in emerging markets, where fixed broadband penetration is the lowest and where many of these markets are mobile-first.

Key findings

- **Not a case of one shoe fits all.** We were surprised by the numerous use cases that operators have deployed for WBA for LTE. These include replacing DSL in regional and rural markets, targeting large untapped rural populations, and using mobile spectrum and sites to offer rural services where there is no home broadband. Other scenarios include deploying WBA as an interim service to fiber, and supplementing hard-to-reach fiber "black spots" with WBA.

- **WBA goes LTE.** The fact that today's WBA solutions support LTE is a major reason behind renewed interest in WBA. WBA is following the LTE-Advanced technology evolutions and is also adopting technologies like carrier aggregation, 256QAM, and higher orders of MIMO to increase end users' speeds. These continued speed enhancements and LTE's economies of scale offer compelling financial reasons to use the technology.

- **Vendors rally behind WBA.** WBA's profile is gaining traction as all leading vendors – including Huawei, Ericsson, and Nokia – are now pushing fixed wireless as a last-mile broadband access solution.

- **Next-gen broadband experience.** All vendor solutions incorporate LTE, LTE-Advanced, and LTE-Advanced Pro technologies to push network capacity towards the 1Gbps threshold. This is a big improvement over earlier WBA options. That means WBA will be able to provide a comparable video experience to fixed broadband technologies.

- **DSL capability currently.** In terms of speed, WBA is commonly being offered at speeds similar to DSL technologies, including VDSL. However, existing WBA operators are migrating to higher-speed services, with some already offering peak speeds over 200Mbps.

- **Compelling return on investment.** Vendors claim that a ROI can be achieved in around two years when the platform is deployed as a standalone solution. That is a testament to the less expensive deployment cost of WBA compared to fixed broadband in areas of lower customer density. When WBA is deployed alongside fiber, the combined ROI can be halved to as little as three years.

Recommendations – Operators

- **Large market potential.** Ovum estimates that 350 million households could potentially afford WBA services by 2020; therefore, operators should explore all potential untapped market opportunities and complementary ones for WBA in order to add incremental revenue.

- **WBA is a cheaper alternative.** Compared to fixed broadband, WBA is cheaper to deploy for numerous reasons, and its faster time to market can earn operators quick incremental revenues.

- **WBA targets unreached audiences.** WBA operators can deploy services to help fill gaps in their footprint (e.g. rural areas) or penetrate other valuable customer segments (e.g. tourists, foreign students, renters) that otherwise would not sign up for home fixed broadband solutions.

- **WBA can utilize existing sites.** Existing operators do not have to start from scratch when rolling out WBA. ROI scenarios can be significantly improved when existing mobile operators share base stations for both mobile and WBA.

Recommendations – Regulators

- **WBA appeals to many operators.** We believe that WBA is a viable technology choice for all types of operators. This could include greenfield players coming to market. In addition, existing pay-TV, integrated, or mobile operators can expand their services to new customer segments.

- **WBA meets new customer demand.** WBA can fulfill demand in rural as well as new customer segments, which otherwise would not be addressed with existing fixed broadband technologies. Moreover, these services can be offered at an affordable price.

- **Release relevant spectrum for WBA.** In order to promote the two above goals of encouraging new entrants and existing mobile operators in new market areas, regulators should ensure that all relevant bands – particularly spectrum at 2.3GHz, 2.5GHz, and 3.5–3.7GHz (bands 42 and 43) – are made available, at fair prices, for potential WBA operators. In turn, this will encourage competition in areas currently lacking high-speed broadband, leading to job growth, increased productivity, and GDP growth. Where possible, regulators should avoid allocating spectrum in too fragmented a manner in order to facilitate WBA development.

Market research and insights

LTE breathes new life into WBA services

WBA is experiencing a global resurgence. The need for universal connectivity means that alternatives to the wired network are more in demand than ever, but technologies, such as WiMAX, that were expected to provide the solution have failed to fulfill their promise. Now, a wide variety of operators, including traditional mobile and integrated operators, are seeking to upgrade to more universally supported and sustainable WBA solutions, based on LTE. At the same time, greenfield operators and government-owned wholesale network providers such as nbn in Australia and the Rural Broadband Initiative in New Zealand, and even pay-TV operators, are looking to target customers with WBA services. There are two fundamental reasons for the renewed interest in WBA technologies: First, they are predominantly based on LTE, which offers continued speed enhancements. Moreover, LTE's competitive market proposition (economies of scale) provides today's WBA operators with a compelling financial reason to expand into the home and SME broadband market using WBA. Second, regulators, governments, and operators around the world, but particularly in emerging markets, are focusing on how to get telecommunications services out to the masses, in a cost-effective and time-efficient manner. For emerging markets, there is recognition that expanding high-speed broadband services to suburban and rural areas has socioeconomic benefits (job creation, productivity improvements, GDP uplift, etc.) for the country. In developed markets, the issue is how to "connect the unconnected" mainly in rural areas where it is simply uneconomical to deploy fixed broadband and even mobile broadband services.

Fixed and mobile broadband technologies face challenges

In a utopian world, it would be ideal to deploy high-speed fixed broadband networks across all territories in a given market. However, there are several cost inhibitors to this happening in reality, including:

- expensive last-mile access

- expensive backhaul

- expensive and complex road and site access
- long deployment times
- administration issues for civil works (especially getting power to sites)
- competition for access to ducts/poles
- problematic contractor engagement (due in part to an insufficient number of skilled workers).

Table 1 summarizes the advantages of rolling out WBA rather than fiber services.

Table 1: Advantages of WBA over FTTx

Advantage	Ovum view
Speedy network deployment	In contrast, FTTx deployments often lag behind stated targets. For example, Telkomsel planned to surpass 3 million homes with fiber, but only reached 600,000 homes, short of actual demand for high-speed broadband of 3.6 million homes.
Quick service provisioning at low cost	For fiber-to-the home (where the fiber is already installed) and for WBA services that use an external antenna (e.g. nbn), a customer needs professional installation of CPE (and the antenna in the case of WBA). But for nonexternal, antenna-based WBA services, customers can use self-installed CPEs.
Lower deployment cost	Including lower capex. Fixed broadband has high initial installation fees.
Good customer experience	Higher-speed WBA services support enriched services, which low-speed DSL services cannot.

Source: Ovum

WBA has most potential in emerging markets

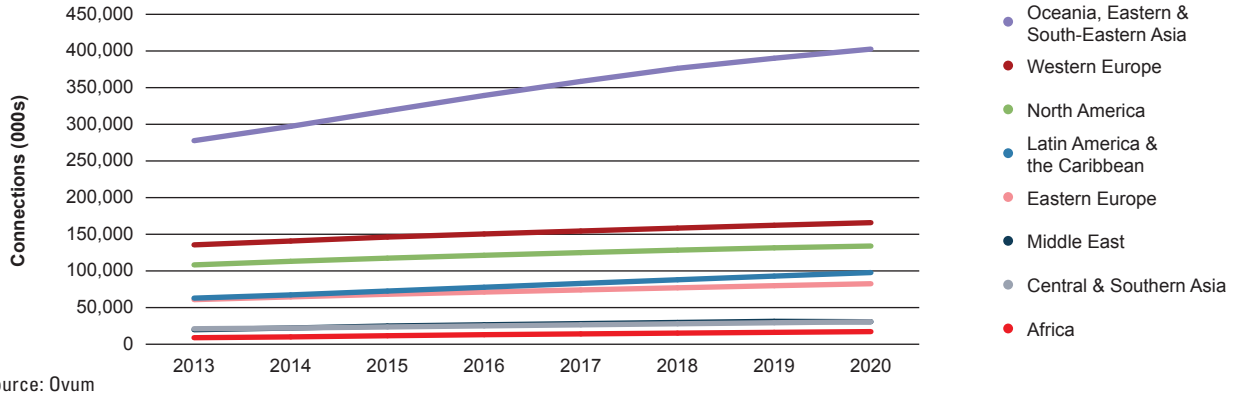
Given the challenges of rolling out fixed broadband in suburban and rural areas, WBA solutions are particularly suited for island nations such as the Philippines or Indonesia, and also, large geographical countries such as Australia, the US, Canada, India, and Pakistan.

Developed markets are characterized by high fixed broadband penetration and low growth. Therefore, service providers are mostly looking for WBA solutions for suburban and rural coverage. In developing markets with low fixed broadband penetration, WBA can provide low-cost broadband in dense urban centers and suburban/rural areas.

Another factor driving WBA deployments is the state of incumbents' copper plants. Some aging copper cannot be cost-effectively upgraded to FTTN, and where FTTP deployments are not affordable, WBA makes sense.

Ovum believes that wireless broadband has the most obvious potential in emerging markets, given their low fixed broadband penetration. Figure 1 shows the forecast of global fixed broadband connections by region.

Figure 1: Global fixed broadband connections by region, 2013–20



Source: Ovum

Total fixed broadband connections will continue to grow over the forecast period. The regions showing the highest rates of growth are the Middle East, Africa, and Latin America & the Caribbean, with 2014–20 CAGRs of 6.8%, 9.5%, and 6.4%, respectively. More developed regions will grow more slowly due to higher levels of saturation and fixed–mobile substitution. Western Europe shows the slowest growth, with a 2.8% CAGR from 2014–20.

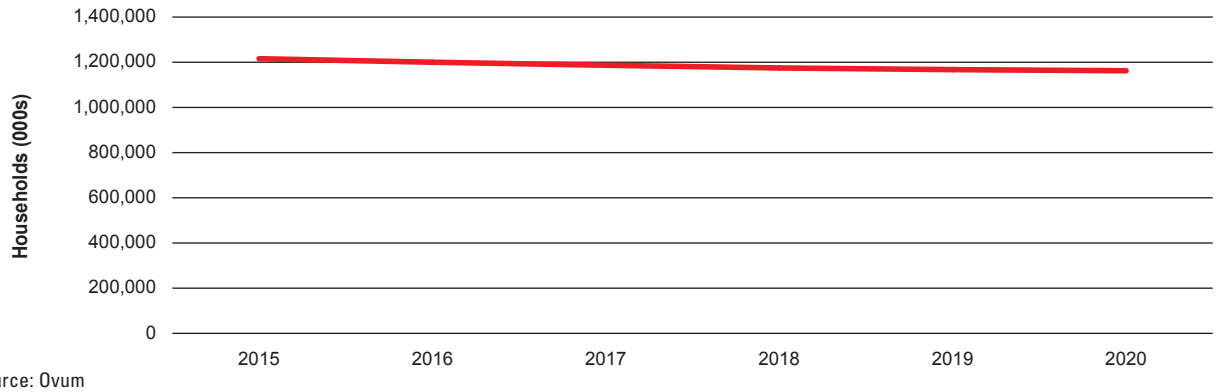
The unconnected

An estimated 48% of households globally still do not have Internet access, let alone a broadband connection (whether fixed or mobile). The disparity between the developed and developing countries is large, with 84% of households in developed countries having Internet access versus 41% in developing countries. For the world's least developed countries, this figure falls to only 11%.[1]

While mobile broadband has helped to fill the broadband gap and provide affordable broadband Internet access to large numbers of people who have no access to, or cannot afford, fixed broadband services, it does not provide an equivalent service to fixed broadband. Hence, the availability of affordable fixed broadband services is still a critical component of closing the digital divide. The ability to support high speeds and large data volumes enhances the user experience and has productivity impacts through changing the way people work and business is conducted.

While the number of traditional and next-generation wireline fixed broadband services will continue to grow and reduce the number of unconnected households, inhibiting factors such as deployment speed and costs (particularly in rural areas) mean that these solutions alone will be insufficient. Figure 2 shows the forecast number of households without a fixed broadband connection.

Figure 2: Households without a fixed broadband connection, 2015–20



Source: Ovum

Having said that, Ovum is not advocating that all mobile operators adopt WBA as a substitute for mobile everywhere. WBA technologies are essentially home broadband and SME-targeted indoor broadband solutions and therefore not full mobility services. As such, WBA services can target user groups other than mobile users. For example, in developed markets, WBA can be used to target specific user groups in urban areas where fixed and LTE coverage is plentiful, including single-home dwellers, occupants of vacation homes, and renters.

WBA has several different use cases

WBA platforms are increasingly being rolled out by operators with a wide variety of use cases. Table 2 shows that operator strategies for launching WBA LTE vary widely. Pay-TV operators, mobile operators, integrated operators, and next-gen NBN wholesale operators (owned by the government) have deployed WBA LTE in metro-only areas, suburban and rural areas, and sometimes even nationwide.

[1]ICT Facts and Figures 2016, ITU

Table 2: Operator WBA deployment strategies				
Operator (country)	Market	Target area	Operator	WBA strategy
China Mobile Jilin	Emerging	Suburban/rural	Integrated	Use existing TD-LTE base stations in rural areas to tap markets not served by fixed broadband.
Spark (New Zealand)	Developed	Nationwide	Integrated	Targeting customers with low-to-mid usage levels and the short-term customer segment (e.g. renters).
Optus (Australia)	Developed	Metro (all capital cities)	Integrated	Targeting users with short-term requirements (students, renters, and occupants of vacation homes, shared accommodation, etc.)
nbn (Australia)	Developed	Rural	Government-owned wholesale network operator	With limited satellite capacity available, nbn chose WBA to reach 600,000 premises as a low-cost, quick-to-market alternative. Retail service providers (which lease capacity from nbn) can sell three speed services to their customers: 25/5Mbps, 12/1Mbps, and 50/20Mbps.
AT&T (US)	Developed	Rural	Integrated	AT&T is attempting to close its DSL networks in regional and rural areas. It plans to bundle WBA LTE with DirecTV, offered via satellite.
Sky Brazil	Emerging	Suburban/rural	Pay TV	Sky Brazil plans to tap the unconnected outside the major cities where cable and fiber have been deployed.
Relish (UK)	Developed	Metro (London); regional (Swindon, Reading); and rural	Start-up (owned by UK's PCCW)	Targeting gaps and areas not served by FTTN. Consumer service offered at up to 50Mbps; business service includes 10/20/30/50/100Mbps services.
T-Mobile Austria	Developed	Nationwide	Integrated operator	MyHomeNet Unlimited complements the firm's dongle service. Service is 50/10Mbps for €29.99 per month.
Softbank Japan – AXGP	Developed	Nationwide	Integrated operator	Service targets ADSL, fiber, and single-person households. Unlimited service offers top speed of 261Mbps; Softbank claims 80% of Japan's fiber users have a lower maximum download speed service.
STC (Saudi Arabia)	Emerging	Nationwide	Integrated operator	Similar to other operators in the Middle East, STC has deployed WBA to help with coverage, particularly outside the main population centers where there is no FTTH or xDSL.
Viva (Kuwait)	Emerging	Nationwide	Integrated operator	Outside the large cities, WBA works well in the Middle East due to a lack of line-of-sight issues. WBA is a complementary technology for Viva, and services range from 105GB to unlimited data.
Source: Ovum				

Where the service is rolled out does not always depend on fixed broadband coverage, but also the customer the operator is targeting. For example, Optus in Australia (which acquired WiMAX operator Vividwireless and owns more than 100MHz of TDD spectrum at 2.3GHz) is rolling out its unlimited data service to all capital cities, despite an abundance of fixed broadband in these metropolitan areas. Optus's strategy is not to target the untapped fixed broadband potential. Rather, it is targeting a more nomadic user base, such as people with vacation homes or students that need to take a modem with them as part of their lifestyle choice.

Meanwhile, Linkem, a wireless broadband provider in Italy, owns 84MHz of 3.5GHz spectrum across the country and today covers more than 50% of the Italian population, offering high-speed services in most of the large Italian cities and not just in the suburbs or rural areas. Linkem is launching WBA LTE services in the center of Rome in September 2016, and has already launched services in cities including Turin, Naples, Palermo, and Bari. By the end of the year, it will have launched services in 18 of Italy's 20 largest cities. Despite Italy having a fixed broadband penetration rate of 58%, Linkem has more than 360,000 WBA users and says it can price at a discount because its buildout costs are a fraction of those of its fixed broadband competitors. Originally it utilized WiMAX (at the time it was the only solution for 3.5GHz), but today it uses LTE-A.

WBA as an alternative to paying fiber rental charges

In New Zealand, incumbent operator Spark (which acquired WiMAX operator Woosh Wireless) is targeting a transient user base (e.g. renters) as well as urban users waiting for fiber to be connected to their premise by government wholesale provider Chorus. Spark markets its WBA service under its low-cost brand Skinny.

The service is in beta mode with 12,000 customers; however, WBA is a key part of Spark's growth strategy in urban and rural areas – the firm is targeting a minimum of 50,000 WBA net additions within 12 months.

By signing customers directly to Skinny, Spark avoids paying fiber wholesale charges to Chorus, giving Spark a higher profit margin. In short, the cost to deploy the WBA service is lower than the fiber rental fee that Spark pays to Chorus.

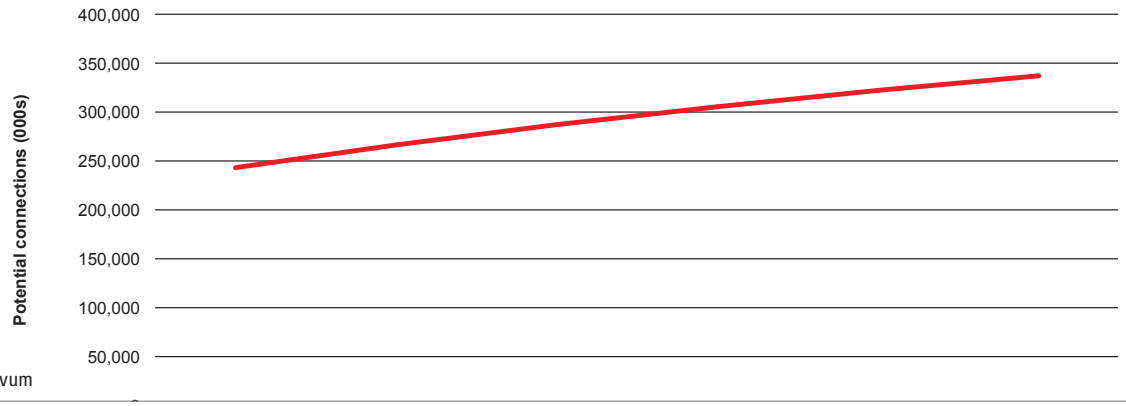
WBA market potential

Figure 2 above showed the number of households without a fixed broadband connection. This includes both households where there is no fixed broadband service available, such as large parts of developing countries and rural areas in countries with a large geographic expanse, as well as households where the available fixed broadband service is too expensive. One of the ITU's broadband advocacy targets is that entry-level broadband services should be affordable, which the ITU defines as less than 5% of gross national income (GNI) per capita.[2] Affordability is affected by multiple factors, including:

- Government policy – national broadband plan, funding models
- Regulation – spectrum access and pricing, wholesale access to infrastructure
- Competition – number of service providers, market dynamics
- Technology costs – network and CPE costs
- Deployment costs – labor costs, geographic access (e.g. remote site).

As discussed above, WBA has the advantage of being both faster and cheaper to deploy than traditional wireline fixed broadband. Based on a consideration of both the ITU's 5% of GNI per capita target and the likely retail level pricing that WBA can achieve, Ovum calculated the size of the segment of the households without fixed broadband service that could be provided with an affordable WBA service. This forecast is shown in Figure 3 below.

Figure 3: WBA market potential, 2015–20



Source: Ovum

This model does not include any substitution between fixed broadband and mobile broadband (neither gain nor loss). The large Asian markets of China, India, and Indonesia – and several "mobile-first" countries (including several countries in Latin America and Africa, where mobile connections are the "norm" given the complete lack of fixed broadband infrastructure) – are the markets with the most potential for WBA as a home broadband or SME broadband service. Typically, in these markets there is a combination of pent-up demand for high-speed broadband services that can be offered at an affordable price, including within the home environment.

[2]http://www.broadbandcommission.org/publications/Pages/bb-targets.aspx

In summary, more operators today are considering the deployment of WBA services for the following reasons:

- The slowing growth of fixed broadband service area coverage in developed markets, and the limited suitability of fixed broadband for deployment outside metropolitan areas due to the high cost of provisioning, makes WBA a viable alternative in areas of lower customer density.
- Operators face challenges with saturated mobile revenue growth, and see connecting the home and SME market as a new revenue source.
- The LTE-supported WBA ecosystem has allowed WBA to expand to lower-density areas, opening up several operator use cases.

Technology deployment scenarios

WBA is a high-speed alternative to fixed broadband

There are several advantages to rolling out WBA, but the main benefits are:

- rapid deployment
- fast speed
- quick return on investment
- low cost to deploy compared to FTTP
- technology roadmap that is delivering steadily faster speeds.

Regarding the first of these, fixed broadband operators are at a relative disadvantage because they must apply for permission from local councils/governments to conduct civil engineering work, such as digging trenches and installing poles, which can cost up to tens of thousands of US dollars per kilometer. With WBA, civil engineering time delays and associated costs are avoided. Moreover, if incumbent mobile and integrated operators can utilize redundant base station capacity for WBA, this can significantly reduce delays in deployment and operators can also use already deployed fiber for backhaul.

Alternatively, for standalone operators with no existing infrastructure, WBA solutions can incorporate the use of their own relatively inexpensive WBA links for backhaul. This makes backhaul a cost-effective part of the ROI focus for operators in rural areas, where there is a lower ratio of customers per base station.

Second, WBA access technologies offer comparable speeds to fixed broadband services. Early configurations can typically support peak data rates of up to 10Mbps using 20MHz of TDD spectrum, with actual data download speeds of around 3Mbps, able to cater to basic Internet services (VoIP and broadband).

Further upgrades to WBA can boost performance and customer experience so that it is similar to VDSL; several operators globally are offering this level of WBA performance. With technology evolution and access to the right spectrum, WBA can deliver the full high-speed broadband experience. As WBA providers move up the technology stack, they can leverage greater broadband capabilities, which means bundling smart home solutions with WBA to include video surveillance and smart home apparatus features (e.g. smart thermostats, smart blinds). Currently, operators including T-Mobile Austria, Japan's Softbank, Italy's Linkem, Spain's Neosky, Sri Lanka's Dialog, Nigeria's Swift, and Saudi Arabia's Mobility have upgraded to LTE-A (with conditional access) and 4x4 MIMO. In Japan, Softbank already offers peak download speeds of 261Mbps, while other operators are also trialing similar speed services.

The third main benefit of WBA is its faster ROI compared to fixed and mobile broadband services. WBA LTE's cost-effectiveness (e.g. in terms of infrastructure deployment) is a contributory factor to its faster ROI, as is the lower cost of TDD spectrum compared to FDD. In addition, WBA signal performance is better than mobile due to the stationary nature of the endpoint, and its ability to use an outdoor antenna at the customer premise to boost the signal. The stronger signal delivered to the customer's wireless modem means that WBA has both a larger coverage range than mobile and a higher potential bandwidth per connection (spectrum band being equal).

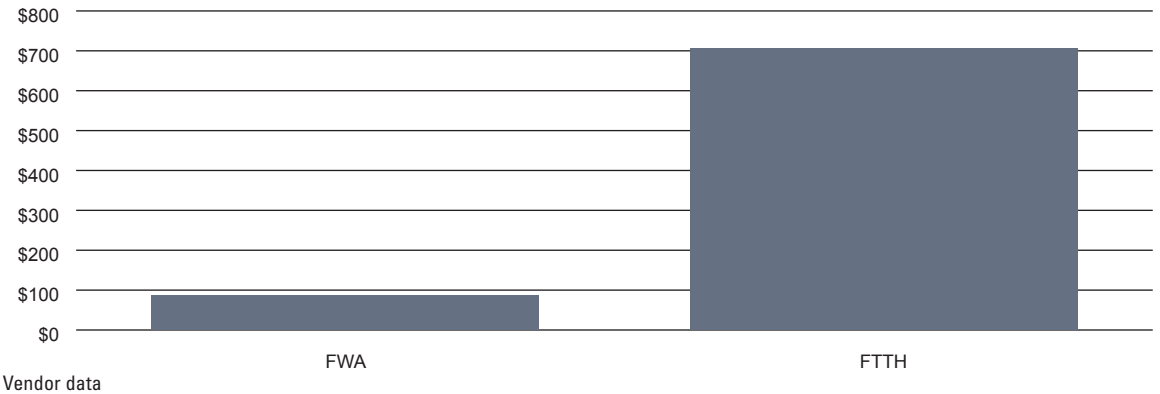
Hence, in both suburban/rural environments (coverage constrained) and urban environments (capacity constrained), fewer cell towers are required per square kilometer. Other factors affecting ROI include: customer installation process (e.g. DIY or technician), revenue per base station, tariffs and date limits, and availability of existing infrastructure to reuse.

Cost structures and ROI

The low cost of deploying WBA relative to fixed-line broadband makes it a highly attractive option for rural and emerging markets, particularly as ARPU levels in these markets tend to be significantly lower than average.

Despite recent declines in engineering costs, civil works remain by far the largest financial component in any fiber deployment. Calculations, supported by various vendors contacted by Ovum, suggest that the civil engineering works and deployment costs for an FTTH rollout are as much as 73% of the total, with the cost of fiber and associated equipment accounting for the remaining 27%. High TCO, including significant ongoing opex costs, renders fiber an expensive option, with capex per subscriber ranging from $500–$700 or even higher (up to $1,000 per subscriber) in larger areas where population density is below 200 households per square kilometer (see Figure 4).

Figure 4: Network rollout capex per subscriber (cost to buy plus cost to deploy)



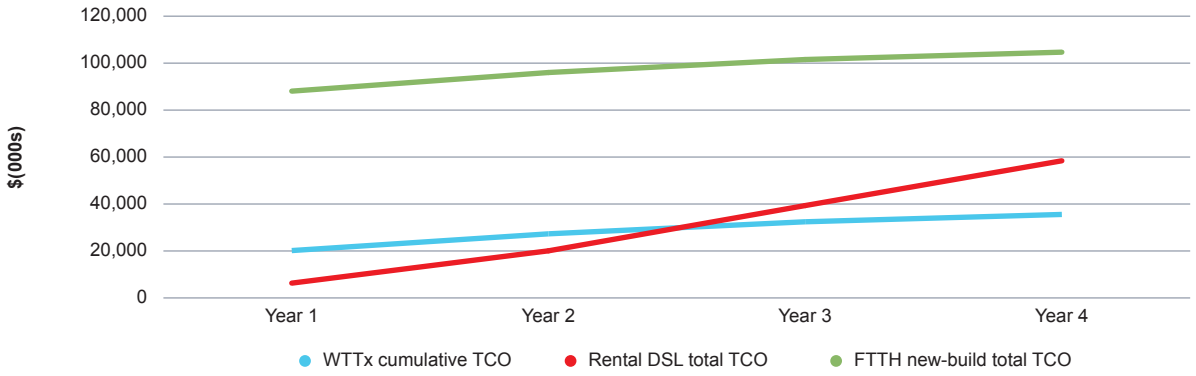
Source: Vendor data

In contrast, serving an equivalent user base with a 10Mbps service using a WBA solution would require a per-subscriber capex of below $100 (around $86 according to one vendor's calculations), with a total capital outlay just one-twelfth that of fiber. By deploying WBA, an operator can expect to achieve breakeven two years earlier than with fiber.

A DSL rental option is likely initially to be more cost-effective even than WBA as it is subject only to line rental and commissioning costs with no capital outlay. However, this option is likely to provide an inferior service experience to WBA and becomes less attractive over time as the cost benefits are eroded by cumulative subscriber growth (see Figure 5).

The advantageous deployment costs of WBA coupled with the performance advantages should mean operators can realize a ROI of around two years.

Figure 5: TCO comparison



Source: Vendor data

Another benefit of lower costs is that WBA LTE operators can provide a profitable service to customers at lower retail price points than operators using other technologies with higher TCO. While there is some potential to charge a premium as a monopoly provider to users that previously had no way to connect, affordability of the WBA service for this customer segment needs to be taken into account.

Spectrum abundance for WBA

The main spectrum bands being used for WBA are 2.3GHz, 2.5GHz, and 3.5GHz, which typically have poorer propagation properties than lower spectrum bands such as 700MHz or 1800MHz. These higher frequency bands are generally not used for coverage purposes for mobile services, since they have a smaller effective range and poor in-building penetration. But by using an outdoor antenna on a rooftop or the side of a building, the higher-capacity bands are made suitable for WBA services, helping to overcome the challenge of indoor building penetration and range limitations associated with using an indoor antenna.

While all LTE spectrum can be used for WBA, given that TDD spectrum is considerably cheaper than FDD spectrum, which is sought after by full mobility service providers, most WBA services are offered over TDD spectrum. This is a key reason why WBA LTE services can generate a ROI as quick as two to three years for operators.

Further, when combined with MIMO technology in RF modules, the 2.3GHz, 2.5GHz, and 3.5GHz frequency bands can provide coverage of up to a 30km coverage area, which is usually the coverage distance provided by the 2.1GHz and even the 1.8GHz frequency band.

Rollout scenarios include sharing mobile capacity and sites

Mobile operators rolling out WBA will have a lower cost of deployment compared to operators that do not have mobile infrastructure in place. For example, where network capacity utilization is low, such as in suburban or rural areas, mobile operators can leverage their existing mobile networks to provide a WBA service. Where capacity constraints are more of an issue (for example, in urban areas), mobile operators can utilize their existing base station sites by adding incremental infrastructure to enable WBA on a separate spectrum band, saving on time to market, lowering last-mile costs (since they can use the fiber backhaul that is at the mobile base station), and overall achieving a quicker ROI.

Factors that will need to be considered are base station density and coverage requirements of the WBA spectrum band, existing antennas and their ability to handle multiple bands, and whether there is room to mount additional antennas.

China Mobile has used idle base station capacity for WBA in suburban and rural areas in three provinces – Jilin, Anhui, and Hubei, all with low fixed broadband penetration – by providing a 4Mbps WBA service for about $10 a month. In Jilin, China Mobile has added $51m in additional revenues since the service launched in March 2014, and in 2015, it increased its fixed broadband market share by nine percentage points over

2014, thanks to its WBA deployment. In two years, China Mobile has amassed 1 million WBA users in the three provinces.

In short, where network capacity utilization is low (e.g. suburban/rural areas), mobile operators can use their existing mobile networks to provide a WBA service. Capacity can be shared between mobile broadband and WBA in different ways:

- Assigning different carriers to mobile broadband and WBA for full isolation (the carriers could be in the same or different spectrum bands).

- Assigning the same (possibly aggregated) carriers to both mobile broadband and WBA. It is still possible to prioritize one service type over the other (e.g. mobile broadband traffic over WBA traffic) to ensure quality of service guarantees.

WBA used as an interim to full fiber services

Another use case comes from the convergence of fixed broadband and WBA, where the operator deploys WBA technologies ahead of FTTx. This generates revenue for the operator while the fiber service is being planned. Further, it allows the operator to gauge where the customer demand is for high-speed fixed broadband, based on the take-up of the WBA service. In turn, the operator can prioritize its FTTx rollout in areas of high demand. In those areas, the fiber that has been deployed to the transmission tower provides the operator a point of presence in those neighborhoods. From a commercial standpoint, when the time comes to swap out the WBA equipment at the premise, there is no need to spend on marketing again, since the customer should present as a migration case.

The idea is that the operator can connect customers quickly (to WBA) and then come back and upsell those customers to fiber, targeting areas with high demand for fiber first. In short, if the operator uses WBA first while deploying FTTx, there will be a quicker ROI than had the operator deployed FTTx alone. Moreover, in this scenario, once the fiber is deployed and connected to households, that spectrum resource can be reallocated to provide mobile services, though the initial network design needs to take this dual use into consideration before construction begins. China Mobile Anhui is using WBA as a probe to scope out the FTTx home broadband market potential, a strategy that has enabled it to amass 220,000 WBA users (in rural areas), and add ¥100m in incremental revenues since launch in late 2014.

The fixed-wireless complementary deployment scenario

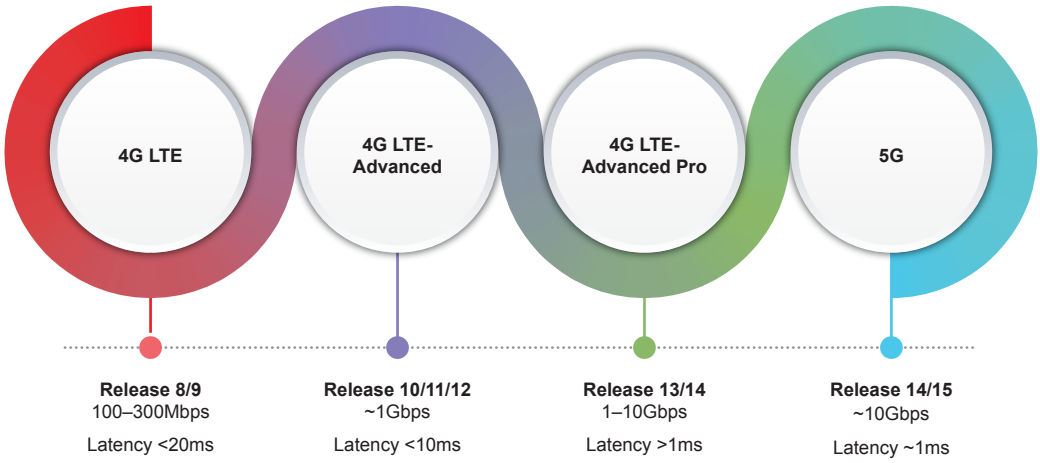
In another deployment variation, an operator, such as Globe Telecom in the Philippines, rolls out fiber resources in urban areas, and deploys WBA where there is no fiber resource in suburban and rural areas, given WBA is the less expensive option in areas with minimal population density. In addition, Globe is also deploying some WBA services in urban areas where it cannot get timely approval to deploy fiber cost-effectively. Globe Telecom plans to leverage this fixed-wireless broadband synergy to shorten ROI for FTTx and WBA by three years, according to its vendor Huawei. This compares to an expected (aggressive) six-year ROI using FTTx alone, or about a two-year ROI on the deployment of WBA as a standalone service.

LTE/LTE-A technology maturity

Long-Term Evolution (LTE) has proved to be the most successful wireless standard in history. According to Ovum, there were 443 LTE networks in operation in 152 countries as of June 2016, with a total of 1.46 billion LTE subscribers.

The LTE standards have continued to evolve (see Figure 6), initially to LTE-Advanced, which encompasses a series of technologies that mobile operators can deploy to improve the performance of their existing LTE networks. The most widely adopted of these is carrier aggregation (CA), which increases network capacity and supports higher data speeds by combining carriers within and between spectrum bands.

Figure 6: LTE standards and performance evolution



Source: Ovum

Theoretically, LTE-A offers peak capacity of 3Gbps in the downlink and 1.5Gbps in the uplink using 100MHz of carrier aggregation and an 8x8 multiple-input multiple-output (MIMO) antenna. It incorporates 256QAM, a modulation scheme that increases spectral efficiency for faster downlink throughput, and Advanced MIMO, which also increases spectral efficiency by adding to the number of antennas. LTE-A was first standardized in 3GPP Release 10, and has so far been deployed by more than 100 operators.

The next evolutionary step is LTE-Advanced Pro, also known as 4.5G. LTE-A Pro is standardized in 3GPP Release 13 and beyond, and marks the start of the network evolution towards 5G. It extends the number of component carriers that can be used for CA and allows for inter-site CA. Other features of LTE-A Pro are designed to allow end-user devices to simultaneously communicate with multiple radio endpoints, and to optimize the performance of hetnets (heterogeneous networks) and improve coordination between small cells and macros.LTE-A Pro supports peak data rates of 1–10Gbps with 100Mbps at the cell edge and boosts the number of connected devices by a factor of 10–100x. It enhances support for a range of new services including mobile TV and video, IoT (Internet of Things), D2D (device to device), and narrowband-IoT.

LTE-A Pro also marks the introduction of Massive MIMO, also known as Full-Dimension MIMO (FD-MIMO) into the LTE standards. Unlike the MIMO systems employed for LTE and LTE-A, Massive MIMO employs a large number of antennas at the eNodeB that can communicate with multiple devices simultaneously. Combined with 3D beamforming antenna technology it allows operators to increase spectral efficiency by an estimated 6–10 times on their existing sites without adding new spectrum. Massive MIMO technology has already been successfully deployed in commercial LTE networks.

How these capabilities are being applied to WBA

Using these technologies, vendors are able to achieve significant increases in WBA system performance, increasing throughput and taking performance levels beyond that provided by copper wire transmission to something closer to the speeds possible with optical fiber.

According to Huawei, upgrading the 2x2 MIMO configuration of standard LTE deployments to 4x4 MIMO can effectively double the peak throughput of WBA systems, while the addition of Massive MIMO helps to push capacity to the current 1Gbps, closer to that of FTTx. Base station capacity also increases linearly with the addition of more carriers, so for example, using carrier aggregation to combine five 20MHz carriers offers a corresponding fivefold increase in capacity. Huawei's WTTx version 2.0 is based on LTE-A (Release 10/11) and can accommodate 2CC carrier aggregation and 4x4 MIMO with 40MHz of spectrum, therefore increasing end-user speed beyond that of earlier versions of WTTx that incorporate 2x2 MIMO and 8T8R.

By progressively incorporating many of these 4G technologies into its own WBA product line, WTTx, Huawei says it has boosted typical end-user data rates from around 3Mbps to above 20Mbps. Different operators design their WBA networks and services to deliver different speeds. Factors affecting this include the targeted customer demography, amount of spectrum utilized, whether it is a standalone WBA network or just an overlay of an existing mobile network, and the technology deployed (LTE or LTE-A, etc.). Nokia too points to efficiency and performance gains from implementing LTE-A and LTE-A Pro enhancements in its FastMile WBA system, including 256QAM and carrier aggregation. However, rather than employ ever larger MIMO antenna configurations, the vendor uses 2x2 MIMO coupled with adaptive antenna technology, which the company says removes much of the complexity associated with installation when directional antennas are used. Nokia says the adaptive antenna can enhance spectral efficiency by up to 140% in a large-scale 10km WBA deployment due to the improved signal level and minimized interference. The good signal-to-interference ratios also mean that the benefit from 256QAM is substantially higher than with a standard antenna solution. This in turn benefits cell-edge users because it provides more consistent data rates across the entire cell area. With the evolution to carrier aggregation and LTE-Advanced Pro, average cell-edge data rates should improve, says Nokia.

WBA supports content plays

Currently, the migration to higher throughput services has enabled operators to target SME customers with VPN/VoIP services. In South Africa, Telkom launched WBA LTE with 2CC CA in October 2014, with a peak speed of 380Mbps, and has since upgraded to 3CC with CA by refarming 1800MHz spectrum for WBA LTE in urban and suburban areas. The integrated operator bundles its own, unmetered IPTV content for WBA customers. Several operators are bundling content alongside their WBA service. For instance, Canada's Xplorenet bundles high-definition satellite TV (Shaw Direct Anywhere Bundles) with broadband, from C$49 month (maximum speed is 25Mbps) in rural areas. US operator AT&T also plans to bundle satellite service DirecTV. Table 3 shows a range of WBA plans in the market at the end of August 2016.

Table 3: Operator WBA deployment plans – August 2016

Operator	Speed details	Monthly data allowance	Monthly cost	Ovum comments
Orange (Orange 4G Home)	"Allows speeds of 20Mbps and 50Mbps down, depending on the coverage you have in house."	35GB	€34.95	Indoor CPE is included. Router has a peak downlink speed of 150Mbps.
Softbank (Softbank Air)	261Mbps max downlink speed, increase from 110Mbps in 2014.	Unlimited	¥4,880 if customer purchases CPE; ¥5,370 if customer rents CPE. Both prices are for 24 months.	261Mbps is the max throughput using 20MHz+10MHz at 2.5GHz; 2CC MIMO 4x4. CPE costs $500.
Telkom South Africa	Launched LTE-A in October 2014; peak speeds over 380Mbps.	5/10/20/50/	Integrated	Targeting users with short-term requirements (students, renters, and occupants of vacation homes, shared accommodation, etc.)
Spark (Home Wireless Broadband)	Uses Huawei B315 modem, with 150Mbps peak speed.	40GB or 80GB	40GB with wireless landline – NZ$79.99 80GB with wireless landline – NZ$89.99 80GB naked – NZ$84.99 (12 months)	CPE is free on contract, but not if on a monthly payment plan. Modem will not work if user takes it outside installed location.
T-Mobile Austria (My HomeNet)	50/10Mbps	Unlimited	€29.99	CPE is free of charge with €20 basic fee and 24-month contract.
China Mobile Anhui	4Mbps	Unlimited	4Mbps (12 months) – CNY600 4Mbps (24 months) – CNY1000	For rural scenario.

Source: Ovum

To keep consumer costs down, some operators bundle the CPE into the monthly price. Telkom also bundles games terminals, laptops, and TV sets with WBA.

The WBA ecosystem

All parts of the ecosystem need to support the market

For WBA broadband access to be successful, it needs a developed ecosystem in three areas:

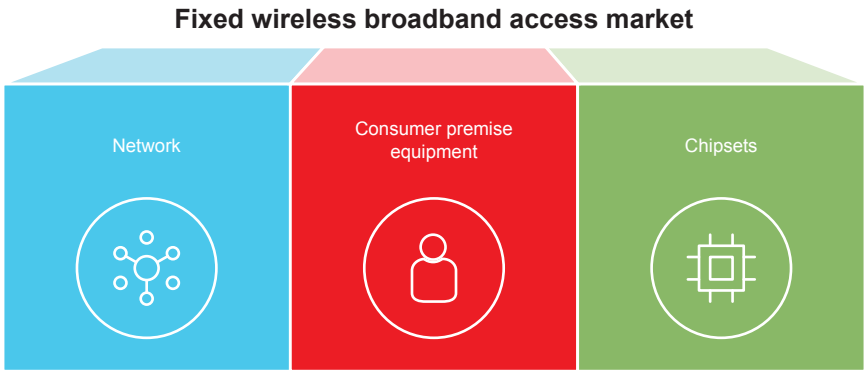
- **Chipsets:** A robust selection of chipset vendors are needed by device (consumer premise equipment or CPE) makers. Multiple chipset vendors help increase competition and drive down the cost of components. Competition also helps ensure continued performance evolution as well. According to Qualcomm, its CAT16 Snapdragon X16, supporting up to 1Gbps per device, will be commercialized by the end of 2016.

- **CPE/devices:** Without devices, end users cannot connect to the network. A wide selection of devices is important because it is rare that one option will fit all deployment scenarios. Secondly, operators like having multiple choices because they can avoid being locked into one vendor, and they have the assurance that if one vendor stops supporting WBA, others will be there to support the operator's commercial services.

- **Network:** Like with chipsets and devices, operators want choices when it comes to network vendors. As in the other two examples, competition at the network level drives down prices and helps operators avoid vendor lock-in.

Figure 7 represents how these three elements are needed to support a successful WBA market. Without a well-rounded ecosystem, mobile operators will be hesitant to enter the market.

Figure 7: The three foundational pieces of the WBA market



Source: Ovum

A robust ecosystem is developing to support WBA

As covered in the previous section, a robust ecosystem is required for operators to invest in WBA. Fortunately for operators wanting to deploy WBA services, there are several different vendors competing in the three areas needed for a successful market.

For chipset vendors, fixed LTE is just another flavor of LTE

For vendors making chipsets for mobile LTE devices, supporting fixed LTE devices is a given. There is not really much difference. For example, Qualcomm uses its Snapdragon platform for fixed and mobile LTE devices. The same is true for Sequans. It uses its Mont Blanc and Cassiopeia platforms, which are designed for both fixed and portable devices.

Chipsets for WBA, other than the fact that they only need to be single mode, are basically the same as those for mobile. Fixed devices do not need to support the multiple standards that most mobile devices do, such as 3G or 2G fallback. Some of the chipset vendors Ovum has identified for this market are:

- GCT Semiconductor
- HiSilicon
- Intel
- MediaTek
- Qualcomm
- Sequans

CPE vendors play a vital role in attracting consumers

CPE plays a crucial role in attracting subscribers and making a WBA service successful. The price of the device needs to be low enough that either consumers are willing to pay for it, or low enough the operator can absorb it into the cost of operations. Secondly, the device needs to be easy to install. Ideally the consumer should be able to install it on his or her own. The second best scenario has the operator deploying it with low-skill labor. The CPE can be either indoor or outdoor. The choice between the two options is influenced by network location, network spectrum, and premise location. Some of the better-known CPE vendors in this market are:

- **Greenpacket** has both indoor and outdoor modems and offers a line of CPE that supports both WiMAX and LTE.
- **Huawei** can now offer a CPE – as part of its consumer group Smart Home product line – that reaches 500Mbps in throughput. Spectrum bands supported on Huawei's fixed LTE CPE are 2.3/2.6/3.5GHz.
- **NetComm Wireless** is a major supplier to Australia's nbn and has been linked to AT&T's WBA deployment in the US.
- **Nokia** will start offering its own CPE with the commercial availability of FastMile.
- **ZyXel** launched a new CPE portfolio at the 2015 Mobile World Congress: LTE3300 for indoor deployments and LTE7400 for outdoor deployments.

The biggest names in LTE support WBA

Ovum estimated in 2015 that Ericsson, Huawei, and Nokia accounted for approximately 82% of all base station revenues. These are the three biggest vendors in the RAN space and they all have highlighted WBA as an important market.

- Ericsson: The vendor is a major contributor to one of the largest WBA networks in the world, Australia's nbn. The company also supports AT&T in this area along with several other rural US deployments and in parts of the Peruvian Amazon. These operators use its Ericsson Radio System to build the networks.
- Huawei: At the 2015 Mobile World Congress, Huawei announced its WTTx offering for WBA using LTE. Using LTE-Advanced Pro technologies, the vendor plans to push network capacity beyond 1Gbps on the downlink. This focus on WBA allows the company to leverage operator relationships it developed

back when it was promoting WiMAX. The company already has WTTx deployments in multiple markets, including Brazil, Canada, Greece, Nigeria, and Saudi Arabia.

- Nokia: Nokia was the last of the Big Three to jump into the WBA market with its 2016 announcement of its FastMile solution. The solution includes an indoor router, outdoor CPE, LTE-Advanced Pro base station, cloud-based network controller, and smartphone application to help with network installation and registration. It supports the 1.8GHz and 2.6GHz bands and has a network capacity of 20MHz channels. The vendor says a single base station using six sectors and 40MHz of bandwidth can support more than 500 homes. Due to the relative newness of the FastMile solution, there are no commercial deployments, but the vendor has indicated customer trials are under way.

WBA case studies

Orange Spain

Market background

Spain is an aggressive quad-play market, and transitioning from DSL (which makes up 54% of total fixed broadband connections) to fiber is a key focus for existing fixed broadband operators in nonrural areas. In February 2013, the Digital Agenda for Spain adopted the targets of the European Commission's Digital Agenda, aiming to cover 100% of Spain's population with 30Mbps speeds by 2020 and achieve 50% take-up of 100Mbps connections by the same year.

Orange's rollout of its WBA service Orange 4G Home can help bridge the gap between Spain's current broadband status and the EU's 2020 goal for high-speed broadband, especially in rural areas.

Market entry strategy and positioning

Orange Spain's WBA service currently covers the following regions: the Iberian Peninsula and Balearic Islands (which includes holiday destinations Ibiza, Mallorca, and Menorca), the Canary Islands, Ceuta, and Melilla.

Orange Spain is targeting three main user groups with Orange 4G Home. These are:

- nomadic users
- rural users
- SMEs.

Within the nomadic user group, there are three key customer focus areas: youth/students, foreign workers, and vacationers. Approximately 20% of the population are youth, while Ceuta and Melilla are hubs for migrant workers crossing back and forth from Morocco. Meanwhile, Orange Spain's WBA coverage includes popular tourist destinations Ibiza, Mallorca, and Menorca, where millions of northern Europeans visit in the summer and where many have permanent vacation homes.

These user groups will be attracted to Orange 4G Home for several reasons, but one key reason is that fixed broadband customers are required by regulations to have a PSTN phone service. Other requirements include the user to have a local bank account and Spanish social security number (NIE-number) or passport, and to sign a minimum 12-month contract (for the fixed broadband service). Early termination of this contract can result in penalty charges. These factors are inhibitors to nomadic users becoming traditional fixed broadband users.

WBA service offering

Orange 4G Home offers 35GB for €34.95 a month in the Iberian Peninsula and Balearic Islands. Rates vary slightly depending on the service area. Once the monthly data quota is exceeded, the service is throttled

to 128Kbps, or a customer can buy an additional 5GB for €10 a month. Orange claims the service achieves actual speeds between 20–50Mbps.

Orange markets its WBA service as offering more data for a cheaper price, compared with its mobile broadband service for tablets (1GB for €10.89 a month) and its Mi-Fi service, which offers 5GB for €24.95 a month. Orange Spain bundles in promotions for 4G Home users including 50% discounts on monthly rates for new mobile users. The discount applies for three months. Orange subsidiary Jazztel also offers WBA services to its fixed broadband customers, including in Madrid.

WBA success factors and opportunity

Orange Spain deployed WBA using 2x20MHz spectrum on the 1.8GHz band and 2x10MHz spectrum on the 800MHz band, the same spectrum that it uses for mobile services. Orange Spain prioritizes mobile broadband traffic over WBA traffic to ensure QoS guarantees. Orange Spain also reserves some carriers (spectrum) for mobile broadband only.

Orange also has some 3.5GHz spectrum that it obtained for 5G use; however, if it needs additional capacity for WBA ahead of 5G deployment, it could potentially use the 3.5GHz band for WBA. Doing this in advance could free up more capacity on the mobile spectrum bands before it impacts existing mobile users.

AT&T

Market background

AT&T has settled on WBA LTE as a way to expand its service to rural and underserved areas – the US Federal Communications Commission (FCC) reports that around 1 in 3 rural consumers do not have Internet access, compared with 1 in 100 urban consumers. Part of the reason for this disparity is the cost of rolling out DSL or fiber lines to rural areas, where distance and low population density make such investments harder to justify.

The FCC offers companies subsidies through its Connect America Fund to serve rural areas with broadband. To qualify for the subsidies a company must offer minimum download/upload speeds of 10/1Mbps, and build its network out to specific targets each year until it reaches 100% of funded locations by 2020. AT&T has accepted $427.7m in annual, ongoing support to reach 2.2 million rural customers in 18 states, which it will use to fund its fixed-wireless LTE rollout, among other rural area initiatives.

Market entry strategy and positioning

AT&T's WBA service is not available yet, though the company is testing the technology in four states: Alabama, Georgia, Kansas, and Virginia. It is currently experimenting with wireless spectrum on its LTE bands (e.g. 700MHz) using a 20MHz configuration, with 2x10MHz paired uplink and downlink, which is delivering speeds in tests of up to 15–25Mbps. In line with Connect America requirements, it says it will deliver speeds of at least 10Mbps 90% of the time.

AT&T included LTE-based WBA as part of its draft proposal for buying DirecTV, offering to deploy the technology to 13 million rural customers across 48 states as a concession to regulators during the process of finalizing the merger. However, while that proposal was not included in the final merger conditions, AT&T has gone ahead with testing LTE as a WBA replacement for its legacy DSL network, including in rural areas.

That said, AT&T is also looking at other options for WBA, including testing 5G-related technologies in markets like Austin. The 5G initiative is separate from AT&T's deployment of LTE WBA, and is intended to give the company experience in deploying and operating 5G infrastructure while the global standards are still being worked out. Fixed-wireless LTE will coexist alongside the 5G network and provide a more cost-effective source of fixed broadband for rural customers than 5G, which will be priced at premium levels at launch, expected in 2020.

Meanwhile, AT&T's main network rival, Verizon, is offering its own LTE-based WBA service to underserved customers. The service offers download speeds between 5 and 12Mbps, costing between $60 and $120 per month based on the data allowance selected (see Table 4). The offer includes Wi-Fi connectivity for up to 20 devices, and up to five email accounts; installation is also included, and there is no activation fee. Verizon is also working on its own 5G network testing for fixed access, and has finalized its 5G radio specifications.

Table 4: Verizon's WBA service tiers and pricing – August 2016

Monthly data allowance	Monthly price
10GB	$60
20GB	$90
30GB	$120

Source: Ovum

WBA service offering

WBA LTE represents an opportunity for AT&T to offer faster broadband to rural and underserved customers in a more cost-effective manner than expanding its DSL or FTTx networks. In the large metro areas where the company has built out its Gigapower network (FTTP to new buildings in upmarket areas), connecting homes that have already been passed by fiber is much simpler, and upgrading the network's top speeds is a way to ward off competition from other fiber providers, such as Comcast or Google.

This is not an option in rural areas. The distances for the networks and low population density mean the investment would be too costly. WBA via LTE, on the other hand, leverages one of AT&T's key strengths – its network coverage – while pairing the service with DirecTV gives rural customers access to DirecTV's content deals (in particular, sports content). AT&T has also announced plans to end support for its legacy DSL network, in favor of WBA via LTE and U-Verse fiber.

NBN

Market background

The Australian National Broadband Network (NBN) is being constructed by nbn co (nbn) as a national wholesale-only access network using a mix of access technologies to minimize cost and increase speed of deployment. The government's policy objectives for the NBN are to provide download rates of 25Mbps to all premises and 50Mbps to all fixed-line premises. As part of its network planning, nbn determines which access technology should be utilized on an area-by-area basis so as to minimize peak funding and optimize economic returns.

WBA LTE (TDD) was selected as the access technology for the less densely populated areas, which are estimated to contain 590,000 premises (or 5% of premises) by the completion of the NBN rollout in 2020. Satellite broadband will cover the final 3% of the remotest premises.

The WBA network program began in 2011 and is being constructed and managed by Ericsson. Initially launching with a 12Mbps/1Mbps wholesale service, this was soon upgraded to 25Mbps/5Mbps and then in 4Q15 upgraded again to a 25–50Mbps/5–20Mbps service. The network design is optimized for WBA and more than 1,400 sites have already been acquired to provide coverage. The tower build is expected to be completed by 2018.

Market entry strategy and positioning

As a government business enterprise, nbn's primary role is to enable Australia's greater participation in the digital economy and help bridge the digital divide. It provides its services on a wholesale basis to retail service providers (RSPs). For households and businesses in regional and rural areas, nbn provides RSPs with committed capacity to support reliable download and upload speeds based on its WBA network. The

wholesale service is provided at the Layer-2 level, and RSPs decide how to package and price the retail services.

The primary competition for nbn's WBA service is copper-based broadband (often only plain ADSL) and expanding coverage and capacity from mobile broadband networks. Following the release of nbn's Corporate Plan 2012–2015, take-up rates for the WBA service have proven to be significantly higher than originally anticipated. More recent Corporate Plans have incorporated both higher take-up rates for WBA and a larger footprint.

The NBN WBA network requires line-of-sight between the base station and the premises being connected. To provide the required support for reliable high-speed broadband services, the network is optimized for WBA services and nbn plans and manages the number of connections per base station. This results in a different base station layout (and more base stations) than that required for a mobile broadband network design. From nbn's 2014 review of its WBA and satellite services, on average each base station is only able to reach about 20% of the area within its theoretical 14km radius. This requires careful positioning of the base stations to ensure they cover the required premises optimally. Despite these difficulties, nbn was achieving about 35% co-location on preexisting towers built by third parties.

The nbn WBA network is currently based on 2.3GHz spectrum. The operator holds both 2.3GHz and 3.5GHz spectrum in regional and rural areas and acquired additional 3.5GHz spectrum in the urban fringe during 2015/2016 to support WBA services in that area. In late 2014, nbn and Ericsson conducted a trial of 3.5GHz LTE TDD. With the maturing of the 3.5GHz LTE TDD ecosystem, this provides nbn with a means to cost-effectively expand WBA capacity and coverage. A WBA capacity upgrade is planned for FY2017.

As of June 30, 2016, nbn's WBA service was available to 420,500 premises and a service was active in 117,500 premises, with nbn activating about 1,200 new WBA services per week.

WBA service offering

As a wholesale network, the NBN provides WBA as an access connectivity service to the RSPs. RSPs make different commercial market decisions about how they will price and package their retail services using nbn's wholesale WBA access. Some RSPs take a technology-neutral approach and offer equivalent plans and pricing across the different access technologies (subject to maximum supported speeds), while some differentiate according to technology. In addition to different combinations of speed and download limits, other package options include bundling with telephony or OTT video services.

Table 5 shows the monthly price for the available combinations of WBA speeds and download limits available from SkyMesh. Plans can be bundled with a telephony service for an additional fee, and access to Netflix is offered on an unmetered basis. The majority of the plans also include an additional off-peak data allowance.

Table 5: SkyMesh's WBA nbn plans – August 2016

	12/1Mbps	25/5Mbps	Up to 50/20Mbps
6GB	A$29.95	A$34.95	A$44.95
30GB	A$39.95	A$44.95	A$54.95
60GB	A$49.95	A$54.95	A$64.95
120GB	A$59.95	A$64.95	A$74.95
240GB	A$69.95	A$74.95	A$84.95
600GB	A$79.95	A$84.95	A$94.95
1.2TB	n/a	n/a	A$114.95

Source: SkyMesh

WBA success factors and opportunity

Designing and then managing the WBA network to provide high, consistent speeds to end customers is critical to the success of WBA in Australia. On the customer side, NetComm Wireless's WBA devices are being used. These include an external antenna to improve the signal strength. As part of the customer activation process, nbn provides a professional signal-strength test before installation to ensure the service quality will meet a specified standard.

The ability of the NBN WBA service to support the same fast broadband services and applications available to customers in the metropolitan areas is an important part of overcoming the digital divide in Australia. The higher than originally anticipated take-up of WBA services is testament to the value they provide in regional and rural areas.

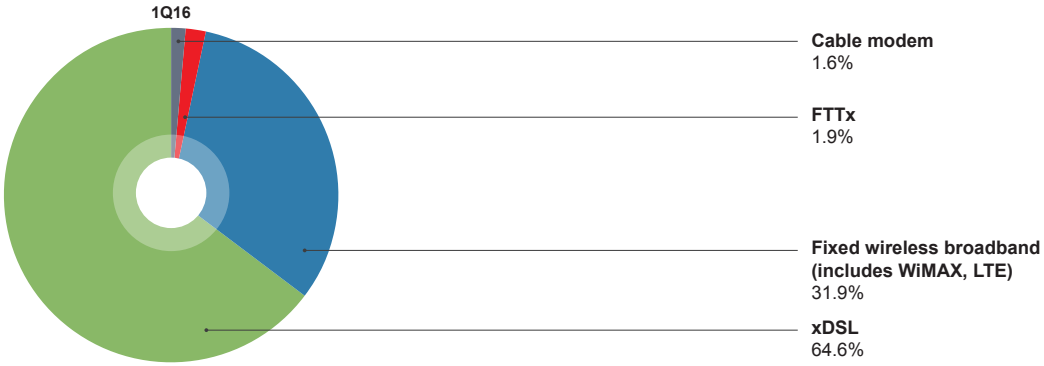
Globe Telecom

Market background

Fixed broadband adoption in the Philippines has been slow compared with most of its neighbors in the Asia-Pacific region. At end-1Q16, only 16.7% of households had broadband access. This falls short of the target set out in the Philippine Digital Strategy for 2011–16 to have 80% of households with at least 2Mbps broadband connectivity.

Due to the archipelago geography of the country, fixed network deployments in the Philippines are complicated and costly. Low-speed xDSL remains the dominant access technology (see Figure 8), with 64.6% market share. High-speed FTTx deployments are limited to urban areas. Meanwhile, fixed wireless broadband technologies have seen increasing adoption, with 31.9% share of the market.

Figure 8: Fixed broadband subscription market share by technology – Philippines



Source: Ovum

Market entry strategy and positioning

Globe has launched WBA in subrural and rural areas with low population density. WBA is also used to complement fiber deployments in metro and urban areas where Globe is unable to get site permission to deploy fiber, for instance.

The use of WBA has enabled Globe to extend its service coverage to subrural and rural areas as well as plug gaps in coverage within metro and urban areas. Huawei expects this dual deployment strategy to shorten Globe's combined ROI on WBA and fiber by three years.

WBA service offering

Globe's broadband plus fixed voice service is delivered through DSL or WBA, and includes bundled OTT content, including Spotify, HOOQ, and NBA League Pass for basketball (see Table 6). The cheapest monthly plan (PHP1,099) includes a 20GB data allowance over WBA, while high-end plans have data allowances of up to 100GB for DSL and up to 80GB for WBA.

Table 6: Globe Telecom and PLDT's WBA offering				
CSP	Broadband plan / price (PHP)	Maximum speed (Mbps)	Data allowance	Entertainment pack
Globe Telecom	Starter / 1,099	2	LTE 20GB	Spotify
	Starter / 1,299	3	LTE 30GB or DSL 50GB	HOOQ
	Avid / 1,599	5	LTE 50GB or DSL 60GB	HOOQ+Spotify or NBA
	Avid / 1,999	7	LTE 60GB or DSL 70GB	HOOQ+Spotify or NBA
	Advanced / 2,499	10	LTE 70GB or DSL 80GB	HOOQ+Spotify or NBA
PLDT	Fun Plan / 699	3	LTE 30GB	iFlix, Fox Networks Group, Pinoy Blockbuster
	Fun Plan / 999	5	LTE 50GB	iFlix, Fox Networks Group, Pinoy Blockbuster
	Fun Plan / 1599	10	LTE 70GB	iFlix, Fox Networks Group, Pinoy Blockbuster
Note: Globe states a minimum speed of 256Kbps and minimum service reliability of 80% for WBA. Source: Globe Telecom, PLDT				

Meanwhile, PLDT's WBA Home Ultera service does not include fixed voice, but offers similar speeds to Globe, and OTT services iFlix, Fox Networks Group, and Pinoy Blockbuster.

WBA success factors and opportunity

Globe's 1Q16 WBA LTE subscribers grew nearly 600% year over year to an estimated 279,000, up from 40,000 in 1Q15. While Globe does not split out its WBA LTE revenue, its 1Q16 total home broadband revenue, which includes wired, fixed wireless (WBA LTE and WiMAX), bundled voice, and data subscriptions, increased 51% year on year to PHP3.48bn. Bundling exclusive OTT content with its home broadband plans was a key contributor to customer growth.

Offering extensive OTT content is a major differentiator for mobile operators in the Philippines and consumers have come to expect them. It makes sense for WBA products in the Philippines, at the right speed, to include entertainment bundles. Globe has the opportunity to leverage its exclusive content offers for WBA and upsell existing WiMAX customers to its WBA offer.

Appendix

Methodology

For this analysis, Ovum interviewed several operators and vendors mentioned in this report. We also supplemented the research using publicly available research materials, including media clippings and announcements, and financial statements as released by both operators and vendors. Included data was sourced predominantly from Ovum's research base, including World Broadband Information Service and World Cellular Information Service, as well as secondary sources mentioned in the paper.

We refer to wireless broadband access services as line-of-sight wireless services that require an outside-building antenna. These services are sometimes referred to as fixed wireless access services. Separately, we refer to full mobility services as mobile services or mobile broadband services. Strictly speaking, a mobile service is a wireless broadband access service. However, for the purpose of this white paper, WBA refers only to a fixed wireless access service.

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