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**Embraces Fiber to
Connect Customers
with the Future**

Telekom Srbija

Ooredoo Qatar

Advancing Qatar's Digital
Frontier: Navigating the
Seas of Connectivity and
Innovation

Vivo

Vivo Brazil Embraces Digital
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New Ultra-broadband Networks Maximize Digital Productivity



Digital technologies are driving rapid growth of the digital economy, with 5G, ultra-broadband, AI, cloud and big data constantly evolving and helping businesses go digital and intelligent. They also bring new applications and experiences to our homes for improved digital productivity.

The ultra-broadband networks needed for widespread digital service adoption and digital productivity originally focused on delivering connectivity. Then, we shifted gears to pursue better experience. With the advent of the 5.5G era, ultra-broadband will need to further unleash productivity with easier and more efficient service access. Ultra-broadband networks need to help everyone benefit from digital services. For this, the industry must overcome three challenges. First, we need to provide the massive computing power required by digital services. Second, we need to provide guaranteed connectivity services for massive numbers of concurrent users. Third, we need to ensure ubiquitous access and high-quality experience for anyone.

Productivity-centric ultra-broadband will require multiple upgrades to our existing network infrastructure:

First, we need to deliver ubiquitous 10-gigabit access by upgrading mobile broadband, home broadband, enterprise campus networks, and enterprise private line services to 10 Gbps. This will enable ubiquitous 10-gigabit mobile broadband, provide whole-house seamless 10-gigabit home networks, upgrade 10-gigabit campus connectivity for organizations, and deliver elastic, high-throughput, 10-gigabit private line services.

Ubiquitous 10-gigabit access also needs converged bearer networks to evolve into high-quality, elastic transport networks. Most IP and optical metro networks need to support 400G and then 800G. Backbone networks will also support 800G, with stronger transport capabilities to support high-concurrency, 10-gigabit services. Through network slicing and other new capabilities, backbone networks will deliver better business experience and boost customer satisfaction. End-to-end optical cross-connect (OXC) networks will also provide experience assurance for latency-sensitive services.

Second, hyper-converged data centers are needed to fully unleash AI computing power. With an advanced hyper-converged architecture, data center networks will be able to address general-purpose computing, storage, high-performance computing, and AI computing requirements. When coupled with 800GE interconnection, this will significantly increase return on investment. With explicit congestion notification algorithms and network scale load balancing algorithms, lossless networks with higher IOPS and AI cluster networks that increase training efficiency by over 20% will also become possible.

Last, telecom large models are needed to make networks more autonomous and self-optimizing. Telecom large models can accelerate our progress towards intent-driven L4 autonomous driving networks (ADNs) that support human-computer interaction and self-optimization. These models already allow engineers to manage twice as many equipment sets, and will make networks more autonomous, digitalized, and intelligent.

In Europe, the Middle East, and Asia Pacific, Huawei is working with leading carriers and industry partners to explore business scenarios and joint innovation in 400G, FTTR, and intelligent cloud networks. Together, we are realizing business visions and cultivating new markets. With 5.5G, ultra-broadband networks will provide ubiquitous 10-gigabit access, elastic ultra-broadband transport, and massive computing power supported by hyper-converged data centers. Rolling out this new generation of digital infrastructure will also advance the digital economy. We look forward to continuing to work with carriers and industry partners to drive forward F5.5G and Net5.5G, as well as the entire ultra-broadband industry.

By Wang Tao (David Wang),
Executive Director
Chairman of the ICT Infrastructure Managing Board
Huawei

DAVID WANG

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Telekom Srbija Embraces Fiber to Connect Customers with the Future

In a recent interview with Vladimir Lučić, CEO of Telekom Srbija, we discussed the telecom giant's remarkable achievements in Serbia and its future endeavors in the ever-evolving telecom landscape. Telekom Srbija builds a robust optical fiber network that underpins all services, including 5G, FTTH, or even digital content, and differentiates the operator from the competition. In this way, Telekom Srbija delivers superior services for both its home and business customers, and helps shape Southeast Europe's telecom sector.

■ By Vladimir Lučić,
CEO, Telekom Srbija

A year of triumph

Despite global challenges and intense market competition, we, at Telekom Srbija, posted record operating profits in 2022. Our revenue surpassed the 1.5 billion euros mark, with an earnings before interest, taxes, depreciation, and amortization (EBITDA) of nearly 600 million euros. This achievement is significant, considering the turbulent economic climate worldwide. And it was a testament to our sound strategy, enabling us to increase our revenue, expand our subscriber base, and outperform our previous years' performance.

Having recently expanded into Germany and Turkey, Telekom Srbija now operates in 12 countries with a combined population of 200 million citizens. Today, we are proud to serve over 11 million diverse customers.

Charting our path towards Fiber to the Home

We began our Fiber to the Home (FTTH) journey as a response to the competitive landscape and the evolving needs of our customers.

Our journey of success at Telekom Srbija has been marked by remarkable achievements, strategic collaborations, and our dedication to providing top-tier services. But more than anything else, this success is down to our robust optical fiber networks, which underpin all of our services and give us a competitive edge.



Initially, we offered standard telecom services, primarily using asymmetric digital subscriber line (ADSL) technology. However, we faced stiff competition from cable operators, and realized that our market share in paid TV and Internet services was not where we wanted it to be. ADSL technology, meanwhile, could no longer meet the demand for high-speed Internet that our customers desired.

To overcome these challenges, we made a strategic decision in 2015 to invest in FTTH. In 2016, we signed our first contract with Huawei, marking a significant turning point for us. This partnership enabled us to rapidly expand our FTTH network, especially in major cities.

Today, we proudly provide FTTH to over one million customers. Huawei's involvement here was instrumental, as they handled the turnkey project, which included infrastructure inside homes. This partnership allowed us to rapidly outpace cable operators in building a high-quality optical fiber network.

This success is evident in our Internet market share, which now stands at nearly 60%. And we also have over 400,000 diverse customers utilizing optical fiber.

Content leadership and user experience

Our journey in FTTH expansion wasn't just about providing a better Internet experience; it also involved offering top-notch content and an enhanced user experience.

Our decision to become a content leader in our region was strategic. We recognized the trend in the telecom industry, where operators are venturing into content creation. In line with this, we decided not only to produce content, but to be the content leader in our region.

To this end, we created the highly popular sports channel, Arena, which is present in six countries. It's not ex-

clusive to our network; other cable operators in these six countries utilize it and pay licensing fees. Furthermore, we offer a wide range of entertainment and movie content, including our own productions, which we aim to grow into the largest in this part of Europe. Subscribers will use their own content, and we will become the main provider of local content in our region. This would also provide us with significant revenue.

This diversification is crucial for the future, as telecom operators shift from relying solely on Internet access for revenue to providing local content as a key offering. Our rich content portfolio gives us a competitive edge over our competitors.

Shaping the future of home broadband

Looking ahead, we will continue to invest in home broadband services, and we plan to develop hundreds of thousands of additional FTTH users. We will need to meet the ever-changing market demands, provide competitive and innovative solutions, and keep improving user experiences.

Huawei is our strategic partner, and together, we aim to continue expanding and enhancing our network and grow the market. This collaboration is pivotal in our journey, as Huawei brings both knowledge and exceptional network quality to the table.

Optical fiber key to unleashing potential of 5G

We understand the importance of staying ahead in the ever-evolving telecom landscape. With 5G, we've undertaken crucial preparations.

Our government is expected to issue 5G licenses soon, and we've already made significant strides to facilitate a swift and effective 5G rollout. First, we've increased the number of our current 4G mobile sites to improve 5G quality and reutilize these sites for 5G deployment. But more importantly, together with Huawei, we've developed a robust optical fiber network, crucial for connecting 5G base stations. With this optical fiber network, we

can meet the speed and overall performance requirements of 5G networks, and ultimately get the most out of 5G.

We also recognize that 5G is not just about faster Internet; it's about introducing a plethora of new digital services. To adapt to this changing landscape, we've opened a venture capital fund and are actively investing in startups. This allows us to produce digital services that showcase the advantages of 5G, setting us apart from competitors and offering our customers a unique and differentiated experience.

Enhancing B2B services

Our position as the oldest telecom operator in the region has given us a strong foundation in serving business customers. We've already made headway in offering additional services through the Internet to small and medium-sized companies.

Many businesses in Serbia and the region understand the importance of Internet for their operations, but may not be well-versed in its effective utilization. To address this need, we're working on a variety of digital services and providing training to our sales personnel. Huawei's support has been instrumental in this, strengthening our presence in the business-to-business (B2B) segment.

In conclusion, our journey of success at Telekom Srbija has been marked by remarkable achievements, strategic collaborations, and our dedication to providing top-tier services. But more than anything else, this success is down to our robust optical fiber networks, which underpin all of our services and give us a competitive edge. Going forward, we will continue to lead the way in shaping Southeast Europe's telecom sector amid ongoing digital transformation.



Advancing Qatar's Digital Frontier: Navigating the Seas of Connectivity and Innovation

In the vibrant heart of Doha, within the bustling offices of Ooredoo, we sat down with Günther Ottendorfer, Chief Technology & Infrastructure Officer of Ooredoo Qatar, to discuss the pivotal role played by the company in steering Qatar into the digital age. With a primary focus on the country's transformative fiber rollout journey, challenges faced, and the unwavering commitment to maintaining exceptional service levels, even during the turbulent pandemic years, we delved into the tapestry of Ooredoo's contribution to Qatar's technological evolution.

■ By Günther Ottendorfer,
Chief Technology & Infrastructure Officer,
Ooredoo Qatar



Ooredoo is a leading international communications company delivering mobile, fixed, broadband internet, as well as managed corporate services tailored to the needs of consumers and businesses across markets in the Middle East, North Africa, and Southeast Asia. As a community-focused company, we are guided by our vision of enriching people's lives and its belief that it can further human progress by leveraging communications to help people achieve their full potential. Ooredoo Qatar's revenue in FY2022 increased by 7% YoY, with fixed-line business revenue increasing by 12%.

The vision unveiled

In 2009, we embarked on a transformative journey fueled by Qatar National Vision 2030 to lead in the digital economy. A prerequisite to achieving that goal was ensuring the availability of a robust connection. Trial areas in West Bay and Mesaimeer marked the inception of a nationwide rollout, which now reaches 99.9% of households.

The global pandemic brought unprecedented challenges, increasing traffic on our network by over 35%. Our response involved reinforcing and expanding network capacity to meet the surge in demand fueled by remote work and the rise of platforms like Zoom and Teams. This showcased our network's adaptability and responsiveness, which persists despite the pandemic being over.

Ensuring stability amidst the storm

Ooredoo's collaboration with Huawei played a pivotal role in maintaining high service availability. Our network

architecture, designed with redundancy in mind, employs a dual-independent network approach, ensuring critical aggregation points are accessible from multiple directions, enhancing overall availability. We also increased capacity at times where it was most needed to provide customers with excellent quality all the time.

During a major sporting event in Qatar, Ooredoo's meticulous planning ensured that stadiums were connected with at least two to three routes to ensure the ultra-high availability of mobile services, fixed services, and broadcasting, among others - providing unparalleled connectivity even under the strain of high uplink traffic. We monitored the availability of that event with a team of over 500 experts on the ground, together with our partners, making the entire event a huge success due to the excellent fiber network we provided.

A global player in connectivity

Ooredoo's commitment to delivering exceptional speeds has positioned Qatar in the global top 20 for fixed speeds, and consistently within the top three for mobile

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Our network architecture, designed with redundancy in mind, employs a dual-independent network approach, ensuring critical aggregation points are accessible from multiple directions, enhancing overall availability.

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speeds. Ongoing infrastructure development underscores our dedication to solidifying Qatar's standing in global connectivity.

Revolutionizing Business Service

As a small team, it became clear to us early on that we needed to leverage the power of automation. Consequently, Ooredoo became one of the first providers globally to develop a 100% automated provisioning process. This innovation not only accelerates customer connections, but minimizes failures due to human error, fostering reliability and reusability. Over 400 complex business services are now provisioned automatically, marking a significant leap towards a seamless, zero-touch operational model.

From Lusail to the Future

Turning our attention to Lusail, a technological cornerstone in Qatar, Ooredoo's extensive fiber deployment supports smart projects within the city. As Lusail continues to evolve, our aim is to extend Ooredoo's technological footprint to other parts of Qatar. Our commitment to technological advancement extends beyond fiber deployment, with our foray into 5G technology standing as a testament to our dedication to providing cutting-edge connectivity solutions. As 5G continues to unfold, Ooredoo remains at the forefront, shaping Qatar's digital landscape.

Continuous Innovation for Fixed Broadband

We have brought two innovations to our customers this year. The first is Fiber to the Room (FTTR). Together with Huawei, we provide FTTR services to customers. With FTTR, customers will be able to connect every single room in their home, even their majlis, resulting in a stable speed everywhere at home, zero blind spots, an upgraded quality for videos and gaming and more connected devices at maximum internet speed. Home internet usage now demands higher and consistent speed, as well as lower latency: for working from home, HD+ live broadcast, 8K video streaming, several VR apps and

games, smart home devices and more. As Ooredoo's fiber network connects more than 99% of households in Qatar, a substantial number of customers will be able to benefit from this new solution.

The second is 50GPON, which can provide customers with up to the 50Gbps access. The introduction of 50 Gbps opens new possibilities, and we anticipate high demand in the future. These innovations align with Ooredoo's commitment to drive Qatar's digitalization forward. The new technology enables consumers to use high-bandwidth latency-sensitive applications such as online collaboration and coordination solutions, 3D cloud design, high-graphic/high-quality AI applications and more. And the initial deployment will be for B2B customers and areas that require high-speed connectivity, with roll-out to consumers to follow, such as 8K content and AR/VR gaming.

Our commitment to excellence is further underscored by strategic partnerships on a global scale. Collaborations with industry leaders and participation in international forums position Ooredoo as a key player in shaping the future of telecommunications not only in Qatar but on the global stage.

Shaping Qatar's Digital Destiny

As we conclude this exploration, it is evident that Ooredoo stands as a beacon in Qatar's technological evolution. From pioneering fiber rollout to embracing automation, venturing into 5G, and unleashing groundbreaking innovations, our commitment to excellence solidifies our role as a key player in realizing Qatar's digital vision. As we hurtle towards 2030, Ooredoo remains at the forefront, navigating challenges, embracing change, and contributing significantly to Qatar's digital legacy. With an unwavering focus on connectivity, innovation, and global collaboration, we continue to shape Qatar's digital destiny.



Vivo Brazil Embraces Digital Technologies to Capture More of the B2B Market



Vivo Brazil is making waves in the Brazilian B2B market. Their financial performance in the second quarter of 2023 for digital services on B2B was remarkable, with revenues reaching R\$800 million (approximately US\$162 million). This figure represents a 24.2% increase in year-on-year revenue, and also accounts for 6.3% of the company's total quarterly earnings.

■ **Debora Ignacio Bortolasi,**
B2B Executive Director, Vivo



This article is an adapted version of the WinWin interview with Ms. Debora Ignacio Bortolasi, B2B Executive Director at Vivo; Mr. Diego Silva de Aguiar, Director of Operations at Telefonica Tech, Brazil; and Ms. Jennifer Zhang, Vice President of CNBG Marketing and Solution Sales Dept at Huawei. They discuss how Vivo Brazil embraced its unique advantages as a carrier to integrate a range of digital technologies — such as 5G, fiber, data communications, and Wi-Fi, as well as cloud and AI — to deliver one-stop solutions for customers and ultimately capture more of the B2B market.

WinWin: Ms. Debora Bortolasi, what are your views on capitalizing on the B2B opportunities brought about by digitalization?

Ms. Debora Bortolasi, Vivo: We started this strategy at Vivo five or six years ago, adding an entire ecosystem on the portfolio, going beyond the core connectivity infrastructure to provide digital services. We've recently set up three different companies, covering cyber security, IT and cloud services, and Internet of Things (IoT) and big data services.

Beyond that, we are investing in network services, acquiring a company last year to provide this whole system to the market. We have one of the biggest B2B sales teams in Brazil, with more than 4,000 salespeople serving the entire market, from small and medium-sized business (SMBs) to the biggest account in Brazil.

WinWin: How does Huawei support Vivo in achieving its goals?

Ms. Debora Bortolasi, Vivo: Huawei is one of our main partners in Brazil, not only for our internal infrastructure covering the whole country, but also with an outright portfolio that Huawei provides. This allows us to offer services through Huawei Cloud, as well as network services. But we still have work to do. Today, our digital services account for just 6% of our revenue, so there is a lot of potential for growth, and Huawei is an important partner to help us achieve those goals.

WinWin: Ms. Zhang, what key values can Huawei bring to carriers in this market?

Ms. Zhang, Huawei: We have done a lot of explorations together with Vivo in 5GtoB, mobile private network (MPN), campus networks, and security services. We hope to strengthen the cooperation in more domains.

First of all, Huawei is the only vendor that supports not only 5G, fiber, data communications, and Wi-Fi, but also cloud and artificial intelligence (AI) technologies, which are the foundation of digitalization. More importantly, Huawei understands not only carriers' strategies, but also their facilities, advantages, and business models. This gives Huawei a unique perspective into carrier requirements from the business point of view, enabling us to provide more innovative cross-domain and multi-technology solutions to achieve mutual benefits.

In the Philippines, for example, we help carriers to improve their service agility to the enterprise, shorten the time to market (TTM), and extend their advantages in wide area networks (WANs) to enterprise local area networks (LANs). We think it is very important to take full advantage of existing network resources.

Secondly, we see carriers as our important partners, not merely resale channels. We fully understand their



“Nowadays, Vivo is not solely a telco company, but has been transforming itself into a digital and tech company, and our value proposition adapts to the customer's needs.”

transformation, capabilities, and requirements. We can support carriers in many managed services, and also help to build their local brand, providing a range of supporting tools and training.

And with local teams in more than 100 countries, we are ideally placed to give carriers very fast response and professional services.

WinWin: Mr. Diego Aguiar, since 2021, IoTCo has been crafting services and solutions in IoT and big data, specifically for the B2B sector. With 5G now ushering in fresh

opportunities, how do you plan to harness mobile private networks in Brazil?

Mr. Diego Aguiar, Telefonica Tech: The way we approach not just private networks, but the entire IoT and big data market, is by creating an entire ecosystem where we can orchestrate the service to our clients. Specifically, on private networks, we start with the connectivity, offering private networks services to our clients. After that, we move onto services like hardware, software, managed services, AI, and many other different solutions on top of those private networks, working in real time with all originating data. We help them to understand that data, and to transform it into strategic insights for the clients to use on a daily basis, allowing them to improve efficiency for their operations.

WinWin: How has your partnership with Huawei been, especially in the realm of 5G for businesses? For instance, I heard IoTCo and Huawei recently won an ANATEL award for a 5G-enabled smart warehouse.

Mr. Diego Aguiar, Telefonica Tech: The partnership has been great. We've been doing a lot, not just to build the market, but in explaining to the clients the advantages of 5G. We use real use cases to show to the clients how they can use 5G on a daily basis. We highlight how this new network brings a lot of different features to be explored. We believe there is a bright future for this cooperation between Telefonica Tech and Huawei.

WinWin: Ms. Debora Bortolasi, apart from 5G for businesses, enterprise leased lines and SD-LAN are emerging as significant markets. How does Huawei's expertise support Vivo in capturing a greater market share?

Ms. Debora Bortolasi, Vivo: Nowadays, Vivo is not solely a telco company, but has been transforming itself into a digital and tech company, and our value proposition adapts to the customer's needs. To provide all-new tech capabilities, we need to guarantee that we have not only the technical capacity in our internal teams, but also the right tools to manage the solutions and to guarantee that all the service-level agreements (SLAs) and the quality of service (QoS) they are buying from us meet their needs. With Huawei's tools and platforms, we can provide this kind of solution to our customers, helping them to guarantee the whole service in the market.

WinWin: Ms. Zhang, in your opinion, what are the B2B opportunities for enhancing campus networks?

Ms. Zhang, Huawei: Undoubtedly, campus network is a promising market, and one in which we see great changes recently, with the number of IoT terminals and connections rising by over 20%. A lot of smart terminals need to be connected in campuses. It is predicted that every 100 sqm of campus will need to connect to more than 500 terminals, including cameras, automated guided vehicles (AGVs), personal digital assistants (PDAs), programmable logic controllers (PLCs), laptops, and video screens. Unlike traditional data communication, there are more and more audio- and video-oriented services that need some interactive collaboration in enterprises. This places different requirements on networks. For example, video meetings need high bandwidth connections; programmable logic controller (PLC) systems need high availability connections; and automated guided vehicle (AGV) needs precise positioning and low latency.

This results in the coexistence of many technologies — such as 5G, fiber, IoT, and Wi-Fi — in the campus. And this puts greater pressure on planning and maintenance for enterprises, compelling them to purchase the one-stop managed service from carriers. In turn, this presents carriers with more opportunities to participate in this market.

For example, in Hong Kong (China), together with HKT, we built some healthcare use cases. In hospitals, we provided 5G+Wi-Fi+IoT converged solutions for campuses, with unified planning and easy maintenance. HKT believed that, compared with a single-technology integrator, the carrier has unique advantages to provide such kinds of unified services in cooperation with Huawei.

In short, we believe the innovations and strategies from carriers such as Vivo Brazil provide a blueprint for other carriers to further expand in the B2B market. This is an area with great promise, and by fully embracing digital technologies, carriers can unleash their full potential and achieve greater success.



du Builds Advanced Transport Network for the Digital Age



As one of the leading telecom operators in the UAE, du consistently introduces innovative technologies and builds high-quality network infrastructure. We use this network to offer premium network connections with higher bandwidth and lower latency, to meet the current and next-generation digital service requirements, and to support the evolving 5G network. All of this contributes to the vision of the UAE as a digital leader.

■ By Hasan Alshemeili,
Head of Technology Planning, du



A multi-service network designed to meet future demand

In 2022, as part of an ambitious infrastructure buildout program, du invested AED 2220 million on rolling out fiber across the country, expanding mobile network coverage (notably 5G), and modernizing its IT infrastructure. During the year, 57,000 homes were connected to the fiber network and nearly 900 mobile sites were added across the nation, significantly improving indoor coverage.

Facing uncertain traffic growth, the key concern going forward is how to meet capacity demands while ensuring

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du is rolling out new technologies such as a 400G and multi-service optical transport network (MS-OTN) to maximize the value of its transport network infrastructure.

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the network infrastructure is cost effective. To help achieve this, du is rolling out new technologies such as a 400G and multi-service optical transport network (MS-OTN) to maximize the value of its transport network infrastructure. By doing so, du has created a solid network foundation for carrying multi-services now, while also getting ready for the industrial digital transformation in the near future with optimal total cost of ownership (TCO).

All-optical architecture, building an intelligent and green Network

To meet large capacity demands, there are other factors which need to be considered when building a high-quality transport network, and which can help to offer enterprises a better experience. We needed to reduce the

complexity of network expansion and shorten the time to market of services to handle all the traffic growth with an agile network.

To this end, we deployed OTN technology on the metro network to create an all-optical solution with a one-hop architecture and low latency. Additionally, the transport network required end-to-end intelligence capable of automatically allocating network resources and provisioning new services. And last but not least, we wanted a highly-integrated and green solution that could reduce the footprint and the power consumption.

Future of the transport network

From an operator's perspective, my advice to vendors like Huawei would be to continue investing in network technologies, and provide highly integrated and reliable solutions. Those who are able to stay ahead of the competition will be our valued partners, therefore vendors who support standards and openness will thrive to build an agile and digital network.

Looking toward the future, more and more services are bound to pose new challenges to our operators. We need to build an intelligent, green, and multi-service network in advance to turn challenges into opportunities.



Bringing the Benefits of Broadband to All

■ By Martin Creaner,
Director General of the World Broadband
Association (WBBA)



Although difficult to fully quantify, there is now broad understanding of, and consensus on, the importance of broadband to a country's wealth and social development, and the benefits that broadband brings to a country are undeniable. Mobile broadband – through personal smartphones and tablets – can bring swift economic benefits to emerging markets. However, modelling by the ITU shows that it is the continued investment in fixed broadband that drives sustained long-term socioeconomic growth.

The benefits of broadband also spread far beyond those that can be directly monetized. Broadband networks are now used to support a vast range of industries, from manufacturing to health institutions to educational facilities, as well as supporting environmental sustainability objectives and social aspects such as well-being and social equality. The benefits that broadband brings in these areas are equally, if not more, important than those that can be directly monetized.

However, the levels of progress in fixed broadband technology between countries still varies wildly, from markets with 100% full-fiber connectivity, to countries that have

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The next generation of the internet will be highly reliant on such advanced broadband network capabilities and those countries that are lagging behind in rollout, and unable to satisfy or leverage global demand trends, will find themselves at a disadvantage in comparison with the most advanced countries, locking them out of the digital economy of the future.

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less than 1% fixed broadband penetration of any type, compromising the nation's ability to access the benefits of high-quality fixed broadband. Advanced full-fiber broadband networks, which are proven to provide the best level of quality across all metrics, are the pinnacle of this investment. The next generation of the Internet will be highly reliant on such advanced broadband network capabilities and those countries that are lagging behind in rollout, and unable to satisfy or leverage global demand trends, will find themselves at a disadvantage in comparison with the most advanced countries, locking them out of the digital economy of the future.

Those demands can be measured in terms of both ac-

celerated connectivity and growth in consumption. 243 million fixed connections will be added between 2022-27, meaning that by 2027, 32% of the global population will have a fixed broadband connection. Crucially however, most of the fixed broadband population will continue to reside in the developed markets of Asia & Oceania, North America, and Western Europe, meaning that fixed broadband risks remaining the privilege of developed markets.

While we will see an acceleration of demand over the period to 2027 and beyond, there will be no single killer use case or application, rather those future expectations and demands on the network will be driven by a combination

of factors. Future digital consumer applications will rely on high-bandwidth, highly consistent and low-latency networks, as well as a need for speed (see Figure 1 below).

As businesses rapidly digitize, with unprecedented adoption of video-based collaboration tools and the evaluation and adoption of hybrid/multi-cloud services, the

demand for broadband connectivity within the enterprise sector has increased significantly and is only expected to continue rising.

Figure 2 below demonstrates the industry use cases which we expect to drive that demand, over the next 3 and 5 years, with 2B revenues from mature markets

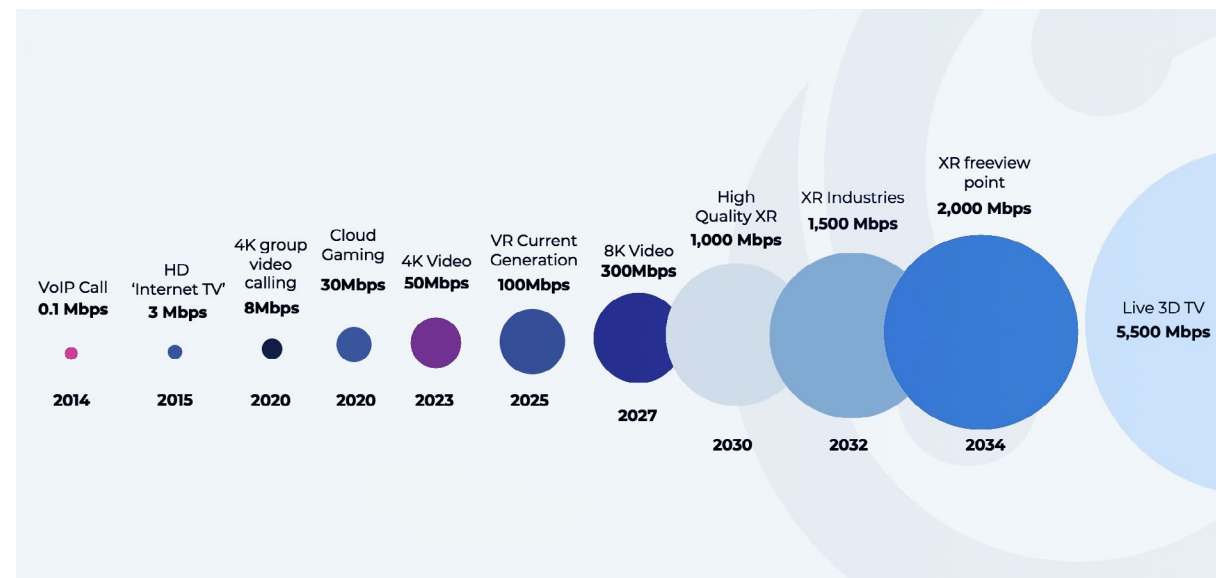


Figure 1

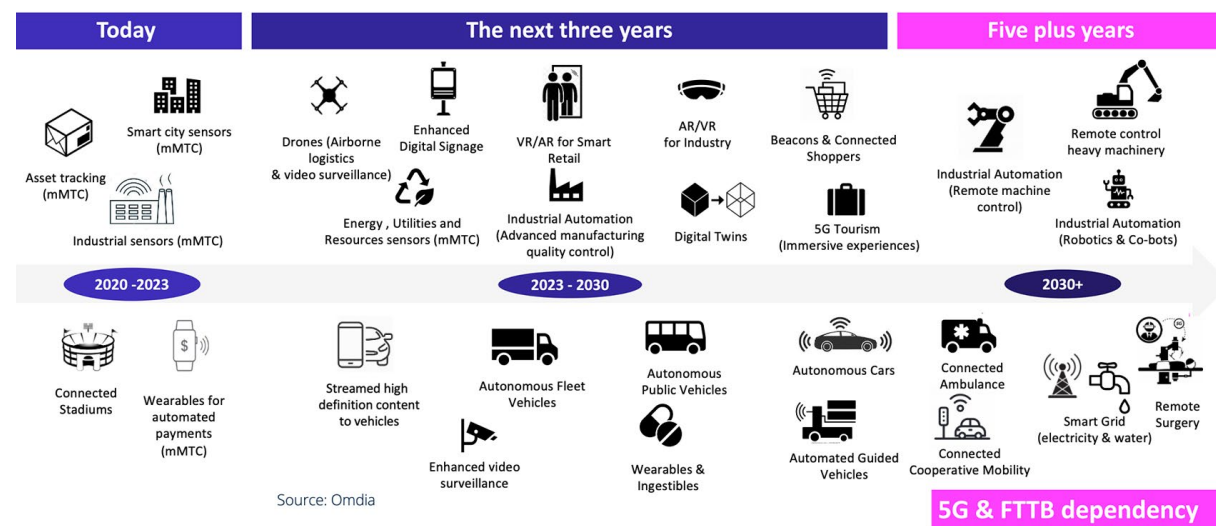


Figure 2

presenting a significant opportunity as whole industries move towards the more fundamental digital transformation provided by better connectivity, where support is required across a whole range of value-added services.

Through a better understanding of the scale, nature and timing of the future demand for services and applications, and to enable all countries to access the benefits of advanced broadband, the World Broadband Association (WBBA) has developed its view on how networks should evolve over the next 10 years, developing a Next-Generation Broadband Technology Roadmap based on the 6 key dimensions of ultra-enhanced speeds, greater intelligence, ultra-reliable & consistent, trustworthy & green, enhanced connectivity and greater sensing capabilities.

The digital economy of 2030 will require networks that compared to today will deliver on average:

- 10 x connection speed: 1G to 10G
- 10 x compute capacity: 90K to 850K edge servers
- 10 x reduction in latency: 10ms to 1-3ms

While the evolution to this next generation of broadband networks is complex, the WBBA is providing a long-term vision and actionable framework for all industry stakeholders, to drive the development of broadband networks that deliver on the requirements above and ultimately provide:

- Ultra-high-speed, high-quality connectivity for all
- A converged network to deliver all services, create synergies, and accelerate monetization
- An agile network that enables the creation of efficient new use cases and business models
- Full automation to maximize network and service operations optimization
- Minimal impact on the environment

Distinct from, yet complementary to, the work already being done by standards and policy bodies, the WBBA is providing the fixed broadband world with a collective voice, shaping opinion, enabling a vibrant business ecosystem and supporting sustainable industry development on the most critical topics.

As well as its ongoing work into the Next-Generation Technology Roadmap, the WBBA is developing a Broadband Investment Guidebook, which is advocating a set of arguments for why it is important and beneficial to all stakeholders to invest in developing broadband in

any given region. By looking at investment in broadband from several different perspectives, including the point of view of governments, the financial community and operators, the WBBA is able to offer actionable recommendations for these different groups to consider on broadband investment strategies.

Embracing sustainability as a core element of corporate strategy offers great potential for the telecom industry, enabling companies to mitigate risks, improve operational efficiencies, enhance their reputation, access capital and drive innovation. Through this work, the WBBA identifies and leads on the role of next generation broadband in a well-defined and operationalized sustainability strategy, including establishing the measures and methods required to help assess and improve network energy efficiency. This helps to support industry stakeholders in aligning with their customers preferences, complying with increased regulatory pressures, and gaining competitive advantage.

The WBBA is also focused on understanding the landscape of cloud network convergence. This group is assessing and advising on how to achieve "cloud and network as one", realising congestion-free new transport infrastructure with better network elastic scalability, enhanced intelligence, and true deterministic experience. By providing a way forward for cloud-based digital transformation, the WBBA is helping to facilitate the success of the digital economy.

Across all of its areas of interest and influence, the aim of WBBA is to help to bridge the digital divide, bringing together broadband industry stakeholders – within open and independent governance structures – to drive cooperation, education, and advocacy in the fixed broadband industry.

The WBBA has members in every continent, bringing together the ecosystem of broadband operators, vendors, regulators, investors and end-users, as it seeks to connect the world by bringing the benefit of broadband to all.

Maximizing the Value of Premium Intelligent Connectivity for New Opportunities in the Era of Digital Intelligence

By Gary Lu,
President of Huawei Network Marketing &
Solution Sales Department



The world is becoming increasingly connected and intelligent. Communications technology has evolved beyond simply connecting people, now acting as an engine of human progress.

For telecom operators, traditional services like home broadband and enterprise private lines can no longer meet new requirements regarding entertainment, office, and production. The advent of a fully connected, intelligent world has created increasing demand for networks with higher bandwidth, reliability, and security, as well as lower latency. This has left operators needing to build all-optical, premium, and intelligent networks to act as the infrastructure for this intelligent world.

All-optical intelligent connectivity is critical for both data interconnection and a stronger digital economy. More countries, enterprises, and individuals are realizing the value of all-optical intelligent connectivity and working

together to facilitate its adoption. The supportive policies of governments and concerted efforts of operators and equipment vendors across the industry value chain have resulted in diversified network-construction-collaboration models and lower-cost, rapid-construction solutions. This has allowed the majority of Fiber to the Home (FTTH) projects around the world to fully recoup initial investment in less than three years. An increasing number of operators, especially fixed-mobile converged operators, are already generating profits from all-optical intelligent connectivity services. Furthermore, emerging services like extended reality (XR), 8K video, and glasses-free 3D are bringing all-optical intelligent connectivity to homes, enterprises, and computing centers, driving the new growth of operators.

Intelligent fiber connectivity for homes

Broadband acceleration: Home broadband is a founda-

tional service of operators, and there is no end in sight regarding increases in broadband speeds. FTTH is already mainstream within home broadband access, with 75% of all broadband users expected to use fiber by 2030. While 100 Mbps is now an entry-level speed for broadband, gigabit speeds are becoming mainstream among an increasing number of operators. More than 450 operators worldwide have launched gigabit packages, with the total number of gigabit users now exceeding 180 million. A ten-fold increase in bandwidth from 100 Mbps to 1 Gbps is accompanied by a price increase of just 20% to 30%. In addition, ultra-high-speed networks have facilitated a variety of high-value and immersive applications such as cloud gaming, cloud storage, glasses-free 3D, and remote healthcare. These applications will in turn stimulate the home broadband market and create new opportunities.

Experience improvement: Abundant smart home applications mean more smart home devices need to be connected through Wi-Fi, and homes require a Wi-Fi bus network to support ultra-high bandwidth, more connections, and



seamless coverage. The Fiber to the Room (FTTR) service significantly enhances user experience by supporting consistent full-house coverage, up to 2 Gbps in every room, roaming switchover in 20 ms, and over 128 simultaneously connected devices. We believe that FTTR represents the ultimate home Wi-Fi networking solution. More than 30 operators around the world have already launched FTTR services, attracting over 8 million FTTR users within just two years. In Thailand, an operator launched an FTTR package that delivers 40% higher speeds, 20% lower latency, and 40% lower packet loss rate than a mesh Wi-Fi solution. This package has helped the operator increase revenue, improve user experience, and open up new opportunities for its smart home services.

Intelligent fiber connectivity for enterprises

There are two major pain points in the digital transformation of small and medium-sized enterprises (SMEs): (1) a lack of specialized IT personnel, which can be addressed by accessing connectivity and cloud migration services that are as simple as online shopping and (2) cyber security concerns that can only be addressed with data protection services provided by operators. An operator in the Philippines upgraded its live network using Huawei's Cloud-Network Express+ solution, allowing SMEs to connect through just one customer-premises equipment (CPE), without the need for any additional configuration. Services can now be provisioned in just one day (down from five days), while faults can be demarcated in 30 minutes (down from 6 hours). In addition, an operator in Thailand has adopted Huawei's Qiankun Cloud solution to provide enterprises with cyber security assurance. With this solution, Qiankun Shield is deployed at an enterprise's LAN egress to record security logs and then send them to the cloud for analysis, after which policies delivered from the cloud are implemented to block attack sources. This solution facilitates one-stop enterprise security management services through border protection and response, ensuring enterprises' connection security. Many other operators around the world have added Huawei's services for cyber security, Wi-Fi coverage, one-hop cloud access, and much more, to their legacy private line services, thus expanding their business with fiber.

Intelligent fiber connectivity for computing

The world is striding towards an intelligent world faster than ever. By 2030, total general-purpose computing power available around the world is set to increase ten-fold, while total AI computing power will increase 500-fold. Demand for readily-available computing services requires stronger networks that can support elastic agility, deterministic experiences, and awareness-based scheduling. As operators support more powerful computing with stronger networks and facilitate synergies between services and networks, they will be presented with many new opportunities. For example, an operator in China has leveraged computing networks and differentiated latency assurance services (20 ms nationwide, 5 ms intra-province, and 1 ms intra-city) to address a range of computing service scenarios, including China's major national projects like "Eastern Data and Western Storage", "Eastern Data and Western Computing", "Eastern Data and Western Training", and "Eastern Video and Western Rendering". As part of the "Eastern Data and Western Storage" project, the operator worked with the National Center for Cardiovascular Diseases to automate the migration of warm and cold medical imaging data generated in eastern China to data centers in western China for high-reliability and low-cost storage.

Looking to the future, it is clear that a new wave of digital and intelligent transformation is fast approaching. Players in the industry should collaborate on premium intelligent networks to seize opportunities related to industries going intelligent and a computing-powered economy. Together, we can build a fully-connected, intelligent world.

Let's accelerate the arrival of a better future with more advanced communications technology.



Striding Towards F5.5G: The F5.5G-Oriented All-Optical Target Network Architecture Built over Three Phases Helps Operators Succeed



Huawei proposed three-phase network construction in 2023. Specifically, there are currently three driving forces behind network development: video that drives 100 Mbps networks, experience that drives 1 Gbps networks, and intelligence that drives 10 Gbps networks. Against this backdrop, Huawei launched the F5.5G-oriented three-phase all-optical target network architecture — all-optical coverage for 100 Mbps home broadband, all-optical connections extending 1 Gbps to every room, and all-optical computing for 10 Gbps everywhere. The all-optical target networks built over these three phases can support the network connections required by popular services in each phase, bringing F5.5G into reality and leading us closer to an intelligent world.



■ By Richard Jin,
President, Optical Business
Product Line, Huawei

The global fiber broadband industry has developed rapidly since the European Telecommunications Standards Institute (ETSI) released its F5G standard in 2020. By mid-2023, the world already had over 180 million gigabit users, more than 32 million 10G PON ports had been shipped, and more than 100 400G wavelength division multiplexer (WDM) backbone networks had been deployed. The whole industry has reached a consensus on the evolution of F5G. ETSI has since published a white paper F5G Advanced and Beyond, and the World Broadband Association (WBBA) has released their Next-generation Broadband Roadmap. These efforts have greatly accelerated the evolution from F5G to F5.5G in 2022. For example, the world now has more than 10 million FTTR users and over 30 50G PON trials, and more than 20 800G WDM networks have been put into commercial use.

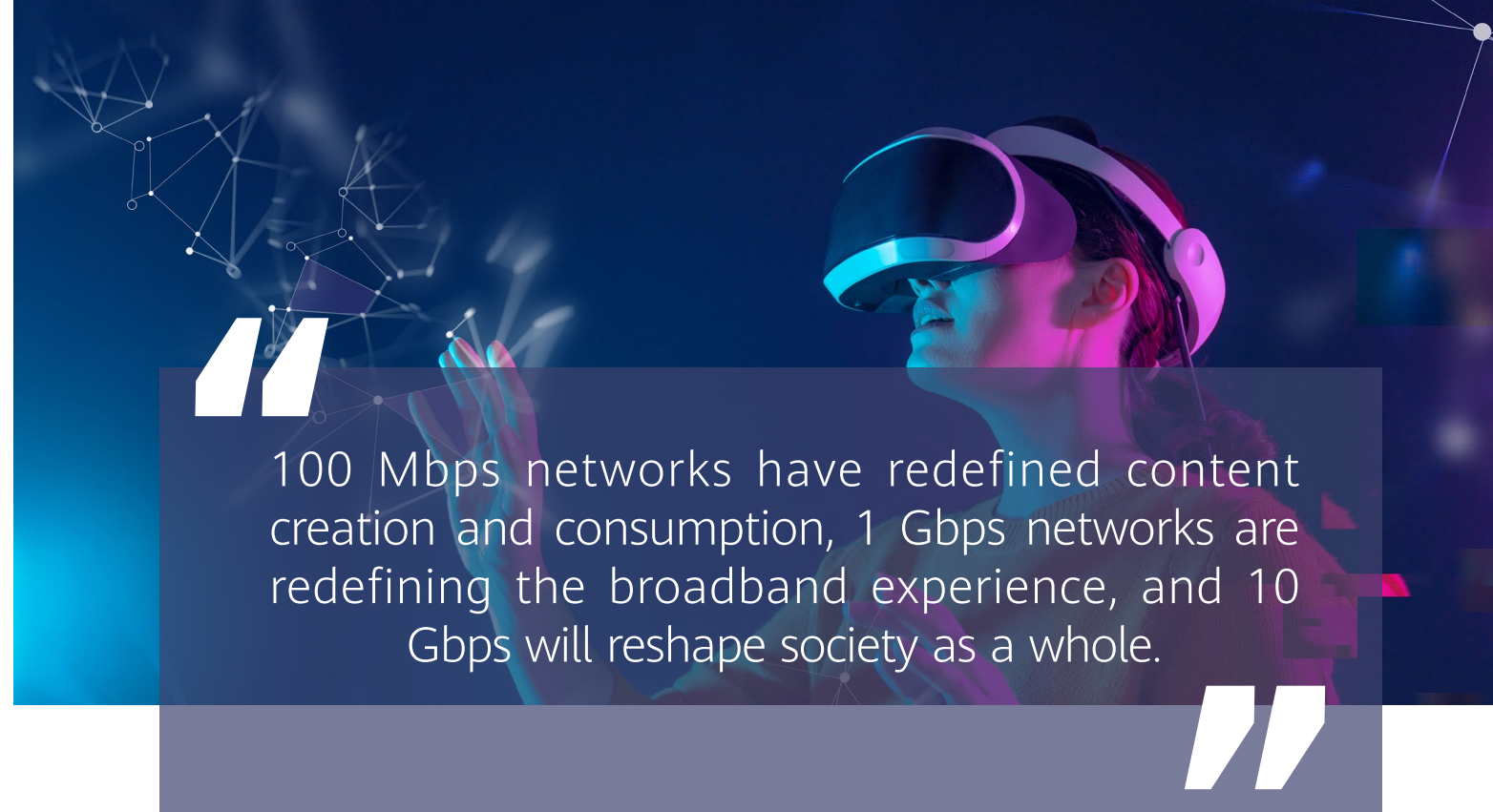
Ultimately though, this boom in all-optical was driven by the services the technology supports. The growing number of online services have driven the development of optical networks in multiple ways. This can be seen in the ever-growing video industry, the better application experiences on smart devices, and the innovative AI services that are influencing all aspects of society.

To further support industry development, operators can build all-optical networks in three phases.

Phase 1: Video-driven all-optical coverage for 100 Mbps home broadband

Over the past 20 years, fixed networks have transformed to provide not only basic connectivity, but also high-resolution 4K video and other superior experiences brought by ultra-HD video. Currently, video accounts for more than 80% of home broadband traffic. Video resolution has increased from 720p (HD) and 1080p (full HD) to 4K (ultra HD), and interactive video is becoming more widespread, requiring tens of megabits per second (Mbps) or even 100 Mbps or more in bandwidth. During this phase, the goal of network construction is to provide all-optical coverage and 100 Mbps home broadband.

Since 2015, operators have been moving towards fixed-mobile convergence (FMC), and copper cables have been quickly replaced by fiber to the home (FTTH) networks. To adapt to this shift, Huawei has provided the industry's only series of AirPON solutions to support fast FTTH deployment in different scenarios while also allowing compatibility between GPON and 10G PON, enabling fast provisioning of gigabit services in traffic hubs. In addition, Huawei's FlexPON+ solution, with its unique optical path and heat dissipation design, doubles port



“100 Mbps networks have redefined content creation and consumption, 1 Gbps networks are redefining the broadband experience, and 10 Gbps will reshape society as a whole.”

density from 16 to 32 ports per unit, reducing the space required for installation by 50%. As part of the solution, the dual class D module increases coverage by 8 kilometers. The FlexPON+ solution ensures that existing ODNs can be easily upgraded to 10G PONs without any reconstruction. The fiber iris technology of Huawei's DQ ODN solution also increases resource identification accuracy to 95%. With this solution, link faults can be located within 15 minutes, without needing site visits. OTNs deployed at metropolitan area networks (MANs) and 3D-mesh 400G-ready backbone networks are becoming the mainstream. All of these will support non-blocking bandwidth and zero video frame freezing.

Phase 2: Experience-driven all-optical connections extending 1 Gbps to every room

As a wider array of digital applications are being used at home, fiber is also extending from living rooms to bedrooms, studies, and kitchens, enabling click-and-start video applications and immersive XR cloud gaming experiences. These developments pose higher require-

ments on network coverage, bandwidth, latency, and roaming. In this phase, users are willing to pay for a better home network experience, making end-to-end (E2E) service experience assurance a top priority. The goal in this phase is to provide all-optical connections and 1 Gbps for every room. To achieve this, operators need to upgrade 10G PON to deliver gigabit services, introduce fiber-to-the-room (FTTR), deploy 100G metro OTNs at COs, and upgrade backbone networks to 400G, to realize the E2E non-blocking and ultra-broadband access required for superior user experience.

Huawei is the first supplier in the industry to launch FTTR products and solutions, and maintains a lead in this area through major innovations such as the C-WAN architecture. In 2023, Huawei launched an upgraded version, C-WAN 1.5, which enhances the main FTTR ONT's centralized management and optimization capabilities, doubles the number of concurrent connections supported to 256, and achieves zero packet loss in roaming. In addition, the upgrade from Wi-Fi 6 to Wi-Fi 7 increases access rates to 3 Gbps and reduces latency by 30%.

For the deployment of OTN at COs, Huawei has launched a large number of innovative products and technologies. A new mini wavelength selective switch (WSS), for

example, supports multiple forms of CO networking and is compatible with existing networks, reducing network CAPEX by 20%. In addition, the latest fine grain OTN (fgOTN) technology supports encapsulation and grooming at a granularity of 10 Mbps, 100 times more connections, and 30% lower site latency.

Phase 3: Intelligence-driven all-optical computing for 10 Gbps everywhere

AI is accelerating content production and driving intelligent transformation across industries. To cope with the inevitable traffic surges and migration of massive amounts of data to the cloud that will follow, a computing-centric network will be needed to provide bus-level connectivity. Similar to how the CPU, bus, and accessories of a computer work together, the computing and storage modules of a data center (DC) need to exchange data with end-users in real time through a high-performance network to realize the goal of this phase: all-optical computing for 10 Gbps everywhere.

In this phase, an FTTR-based all-optical home bus is needed to support connect-and-play IoT devices and integrate connectivity, computing, and storage capabilities for 10 Gbps everywhere at home. In addition, access networks need to be upgraded to 50G PON and backward

compatible with GPON and 10G PON, metro OTNs need to be deployed at COs, and backbone networks need to be upgraded to 800G OTNs to build an all-optical cloud bus, which will facilitate all-optical one-hop user-to-DC and DC-to-DC connections. To make this happen, Huawei has launched the industry's first next-generation OTN designed for data centers—the Kepler platform.

The Kepler platform employs a dual 3D orthogonal architecture and delivers a per-subrack switching capacity of 100 Tbps, four times the industry average. Its front-to-rear airflow design and copper/diamond composite cooling materials reduce power consumption per Gbit by 65% and lower the power usage effectiveness (PUE) value to 1.2. Kepler innovatively uses powerful built-in optical processing units (OPUs) and high-precision optical sensors in the OTN equipment to reduce the time required for performance parameter inspection and processing from seconds to milliseconds, enabling much faster connectivity.

This all-optical target network built over these three phases can ensure parallel evolution and smooth upgrade from F5G to F5.5G. At every phase of development, operators will need different all-optical target network construction solutions. So far, 100 Mbps networks have redefined content creation and consumption, 1 Gbps networks are redefining the broadband experience, and 10 Gbps will reshape society as a whole. Let's work together to bring F5.5G into reality and stride towards an intelligent world.



Bring Net5.5G into Reality, Inspire New Growth



In the 5.5G era, immersive applications such as glasses-free 3D and mixed reality are maturing. More and more home broadband and mobile broadband users are increasingly willing to pay more for attractive and high-quality applications that go beyond simple Internet browsing and social media interactions. Leading carriers are upgrading to 10 Gbps mobile broadband and home networks to provide these new services that offer new user experiences to drive growth. In addition, carriers are also seeing growth in the government and enterprise market as campus networks and private lines are upgrading to 10 Gbps thanks to enterprises adopting ultra-HD video conferencing, and AI computing power's explosive growth.

■ By Leon Wang,
President, Data Communication Product Line,
Huawei



10 Gbps enterprise campus networks offer new market opportunities

Digital transformation is continuing to increase enterprise campus network requirements in terms of quality. Premium enterprise network services are becoming a key area where carriers can distinguish themselves from the competition and achieve revenue growth. The three areas they are focusing on include:

1. Guaranteed wireless networks: High-density Wi-Fi access on enterprise networks is now needed for all-wire-



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Net5.5G must fully support ubiquitous 10 Gbps connections, elastic ultra-broadband transport, and autonomous network self-optimization. As home broadband, mobile broadband, enterprise campus network, and enterprise private line services upgrade to 10 Gbps, Net5.5G transport networks will also have a role to play to help carriers achieve growth.

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less office environments as employees now typically have three or more connected devices.

2. Guaranteed video conferencing: Enterprises increasingly need networks with zero packet loss to support video quality. Poor-quality video conferencing severely impacts day-to-day work and operations given the increasing number of video calls and conferences employees participate in.

3. Guaranteed network maintenance: The sales of cloud management services that simplify maintenance are surging as many small- and medium-sized enterprises lack their own professional O&M team.

One leading carrier in the Middle East has achieved 30% B2B revenue growth by providing premium campus network services for high-value customers such as those in the banking and energy industries. Instead of turning to a traditional managed service provider (MSP) model, the carrier provided services for enterprise customers using

their own cloud management model. This model has greatly reduced labor costs, as they no longer rely on onsite expert services, as well as improved customer loyalty and profitability.

Intelligent transformation creates new opportunities for 10 Gbps computing private lines and intelligent computing cloud services

As industries go intelligent, an increasing number of enterprises are using AI to boost efficiency. However, many companies do not have the resources to build the kinds of ultra-large computing clusters needed for AI foundation model training. This is where intelligent computing services are coming into play. Carriers are increasingly expected to provide traditional network services and cloud services, as well as AI computing services. For ex-

ample, a car maker may only need gigabit private lines for regular office work. However, to train an autonomous driving model, it would need to upload massive amounts of data to a computing center after each drive test. That would require a 10 Gbps private line service. Fixed 10 Gbps private lines are expensive, so car makers often prefer to pay an extra 30% on top of their existing gigabit private line to obtain an on-demand elastic 10 Gbps computing private line service. Then the question becomes, how can carriers better capitalize on these kinds of opportunities with product innovation?

Global expenditure on computing infrastructure and services is expected to reach US\$200 billion by 2025. This makes computing services a new blue ocean market for carriers hoping to increase revenue.

Carriers have natural advantages in end-to-end network and computing power assurance. One carrier in China has already started to build a 10,000-GPU computing cluster and plans to provide end-to-end elastic computing private lines, premium 10 Gbps campus networks, and intelligent computing services, with the hope of achieving a 30% revenue growth in the government and enterprise market. In July this year, the UAE's Etisalat by e&, Germany's Deutsche Telekom, South Korea's SKT, and Singapore's Singtel also came together to create the Global Telco AI Alliance. The alliance is committed to incubating telecom foundation models, providing computing services for both enterprises and individuals, and exploring new business models.

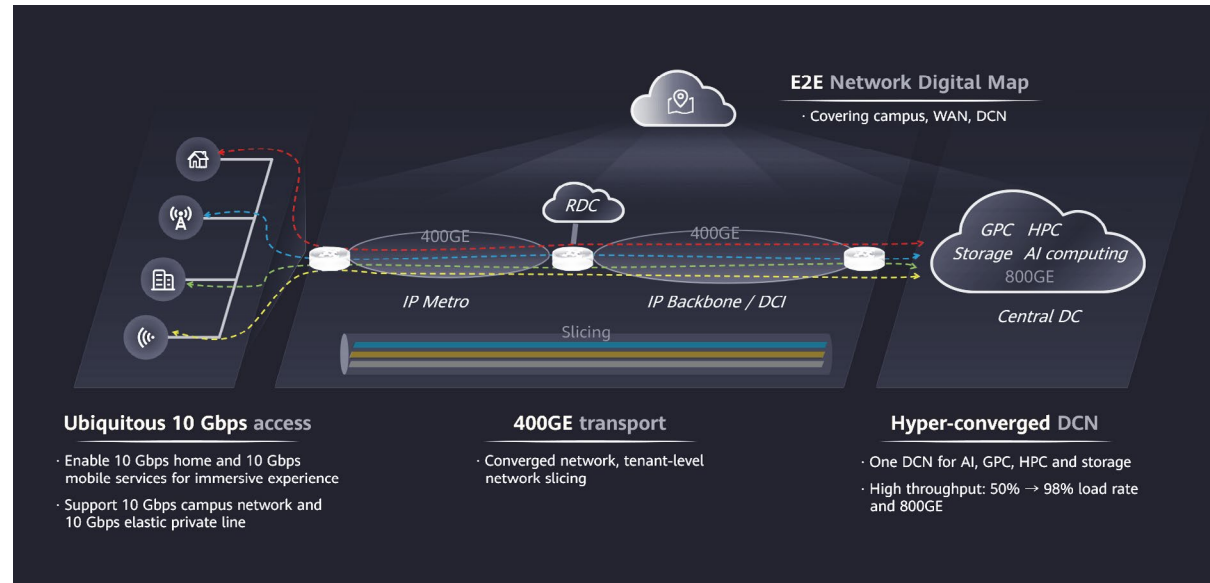
Four types of 10 Gbps services that need Net5.5G transport networks

In 2022, the consulting firm Omdia released their Research on the Trends of Data Communication for 2030 white paper in conjunction with industry partners. In addition to defining a clear industry vision for Net5.5G, the white paper also laid out six upgraded network capabilities that will be needed, including green ultra-broadband, intelligent network, and IPv6 Enhanced. Based on these directions, industry players are now discussing application scenarios and network architecture for Net5.5G.

We believe that emerging applications will pose challenges to static services, manual OAM, and gigabit broadband access of traditional networks. Net5.5G must fully support ubiquitous 10 Gbps connections, elastic ultra-broadband transport, and autonomous network self-optimization. As home broadband, mobile broadband, enterprise campus network, and enterprise private line services upgrade to 10 Gbps, Net5.5G transport networks will also have a role to play to help carriers achieve growth.

First, 100GE IP transport networks currently cannot support the high concurrency of massive 10 Gbps services. 400GE converged metro and backbone networks will be needed to provide more high-value services for customers. Traditionally, carriers build dedicated networks for





Industry Digitalization with China Telecom's Premium OTN

specific services. As traffic surges, the capacity expansion for these networks will become extremely costly, making network convergence an important step forward. Then new capabilities such as tenant-level network slicing will need to be introduced to provide different levels of services on single networks, ensuring service SLAs and improving user satisfaction. For example, a leading carrier in Spain who was seeing mobile and home broadband service traffic increase over 30% every year has started to deploy 400GE networks at scale. Their early decision to build a converged IP metro and backbone network has now paid off as it has reduced TCO by 30%.

Digital transformation is also driving quality upgrade in enterprise campus networks. By implementing the upgrade to 10 Gbps based on Wi-Fi 7 and leveraging the technology for zero lag during video conferencing, carriers can add enterprise campus networks on top of private lines. In this way, they can provide one-stop services by offering premium managed LAN services, making it possible to deliver high-quality 10 Gbps wireless connection, video service, and O&M service experience to enterprise customers, thereby accelerating B2B service growth.

In addition, new growth opportunities such as computing services and elastic computing private lines are increasing as AI permeates more industries. Carriers can provide efficient computing power through 800GE data center networks, agile access to computing power through 10

Gbps elastic private lines, and computing services for more users through high-throughput computing power access to seize these new opportunities.

Finally, to improve network operation efficiency, carriers will need to use real-time network digital maps to implement multi-layer visualization and automatic optimization.

Net5.5G: From conceptual research to applications

Since the new industry vision of Net5.5G was proposed, Huawei has worked with partners to actively promote the research of related use cases and the formulation of technical standards. Huawei has also joined the World Broadband Association (WBBA) network technology working group to conduct research on key scenarios and actively contribute to technical standards such as Wi-Fi 7, 800GE, SRv6, and network digital map in standards organizations such as IEEE and IETF. Looking into the future, standards formulation, application innovation, and the launch of commercial solutions and practices will accelerate the transition of Net5.5G from conceptual research to applications, inspiring new growth for carriers.



Extensive application of foundation models will depend on the quality of optical transport networks (OTNs), as they are required for the efficient scheduling of and reliable access to computing power. China Telecom has maintained a lead in the the country's high-end government and enterprise private line market thanks to its Premium OTN solution. The carrier's networks already cover 345 cities across China, with over 30,000 nodes now serving more than 3,000 business customers in sectors like government and finance. These achievements have increased China Telecom's revenue from industry digitalization.

■ By Feng Wei,
Deputy General Manager, Government and Enterprise IT Service Business Group, China Telecom



Heated competition started this year over AI foundation models, seen through Alibaba's Tongyi Qianwen, Huawei's Pangu, Tencent's Hunyuan, Baidu's Ernie Bot, iFLYTEK's Spark, and many more. The result of this is a new wave of demand for computing power across industries.

Foundation models require not just powerful AI computing clusters, but also powerful transport networks to support the efficient scheduling of and reliable access to computing power. The task of providing these networks falls on telecom carriers. In China, an Action Plan for the High-quality Development of Computing Infrastructure has been released to support this by the Ministry of Industry and Information Technology (MIIT), the State Council's State-owned Assets Supervision and Administration Commission (SASAC), as well as four other government organizations. The action plan proposes

that 80% of key application places in China should be covered by optical transport networks (OTNs) by 2025. This makes OTNs a key prerequisite for network transmission power.

China Telecom has been preparing for the opportunities brought by digital transformation for quite a while. Back in 2019, the carrier launched its first Next-generation Premium OTN solution, showcasing its strengths in converged cloud-network infrastructure. This solution allowed the company to provide government and enterprise customers with private line and private network products. These high-quality networks ensured better customer experience by delivering on-demand high bandwidths, low latencies, intelligence, visibility, and cloud-network convergence.

Over the four years since then, China Telecom has built an ultra-large private service network covering 345 cities across the country, with over 30,000 nodes supporting edge access within 2 kilometers in 90% of main urban areas. In addition, their Premium OTNs have been connected to all of the 114 Tianyi Cloud (China Telecom's cloud service) pools and key Internet data centers (IDCs) in China. This has allowed China Telecom to provide high-quality connections and converged cloud-network

services to over 3,000 customers in sectors like government and finance. For China Telecom, this success has been translated into growth of revenue from industry digitalization every year.

Ten technical capabilities supporting industry digitalization

Government and enterprise customer requirements on network quality, in particular, have increased as industrial digitalization has advanced. High latency, slow service provisioning, complex network management, difficult bandwidth adjustment, and overloaded equipment rooms are no longer acceptable.

China Telecom's Government and Enterprise IT Service Business Group conducted a deep study of these customer requirements in 2022, which has resulted in their most recent upgrade of the company's Premium OTN solution. By adding two more key features – ultra-high transmission capacity and energy efficiency – to the solution's existing eight capabilities, such as ultra-wide coverage and ultra-high speed, this upgraded solution



Through the Next-generation Premium OTN solution, China Telecom provides government and enterprise customers with private line and private network products, ensuring better customer experience by delivering on-demand high bandwidths, low latencies, intelligence, visibility, and cloud-network convergence.

is now better meeting government and enterprise customer requirements for quick access to computing power, elastic adjustment, and flexible intelligence. This has allowed China Telecom to maintain its lead in China's high-end government and enterprise private line market.

This new Premium OTN solution delivers on ultra-high transmission capacity requirements by providing available bandwidth guarantee packages for government and enterprise customers through multiple online customer service channels, such as the Tianyi Cloud portal and the intelligent government and enterprise service platform. This package supports periodic automatic adjustment, guarantees bandwidth expansion in minutes and access to computing power in milliseconds, and ensures always-online end-to-end services.

Premium OTN also delivers improved energy efficiency thanks to its partner's optical cross-connect (OXC) and OTN equipment, which improve transmission capacity while significantly reducing equipment room size and power consumption. These new OTN private lines consume over 80% less power than synchronous digital hierarchy (SDH) private lines while delivering the same bandwidth.

China Telecom's Premium OTN has made significant contributions to digital transformation of government and enterprise customers. A large bank in China, for example, was able to use this product to respond to the traffic surge caused by the launch of a new service in Shanghai and Fuzhou in just 3 minutes. It also hitlessly raised the bandwidth from 300 Mbit/s to 600 Mbit/s to ensure the customer's service continuity. A provincial fire rescue corps used the product's self-service portal to better track troubleshooting progress. The improved visibility of performance data, like latency and traffic, provided by the portal has helped them improve their network O&M efficiency.

Seizing the government and enterprise market with both technologies and services

China Telecom has been investing for many years in the government and enterprise market. As heavy-load networks, SDH networks have more than 1 million lines and carry more than 70% of high-value industry services. With the aim of achieving carbon peak and carbon

neutrality, the industry has reached a consensus on the importance of migrating from SDH to OTN. China Telecom plans to retire 40% of SDH equipment and migrate 30% of SDH private lines in 2023. To achieve these goals, China Telecom has launched the smooth SDH migration solution, a hassle-free solution for customers featuring fast migration, easy rollback, and high efficiency. This solution forms low-carbon all-optical networks with higher speeds, quality, and energy efficiency, as well as openly accessible basic resources.

To meet industry requirements for high-quality connectivity and services during digital transformation, China Telecom launched the one-stop expert service solution for Premium OTN private lines. This solution uses an end-to-end automated and intelligent O&M management platform to provide eight services for government and enterprise customers, including dedicated teams, periodic service reports, performance testing and analysis, and proactive optimization. So far, the solution has been rolled out in provinces such as Hunan and Shandong, enabling visualized management, reducing O&M costs, and improving the management efficiency of customer networks.

Optical service units (OSUs) are a key innovation of China Telecom in the government and enterprise market. The company has been actively exploring next-generation OSU encapsulation technology to improve industry private network technologies, services, and user experience. The company is expected to build E2E capabilities in 2023 and put them into commercial use at scale by 2024, bringing differentiated competitiveness to government and enterprise customers. China Telecom will upgrade its technology to increase connections 100-fold and build a massive industry private network. For service upgrades, the company will provide bandwidth that can be automatically adjusted between 2 Mbit/s and 100 Gbit/s, achieving zero service interruptions. For experience upgrades, latency per site will be reduced to 10 μ s, with the overall latency reduced by 70%.

Facilitating China Telecom's second growth curve

With the aim of fulfilling increasing requirements for ultra-high-definition (UHD) videos, cloud computing, and enterprise cloud migration, OTN has witnessed rapid de-

velopment in recent years, enabled by its large-capacity scheduling and strong maintenance capabilities. An earlier market research report, *Retrospect and Development Analysis: The Global Optical Transport Network (OTN) Equipment Market*, predicted that China's OTN equipment market would be worth CNY54.669 billion in 2022 and will maintain strong development momentum in the future.

Keeping pace with industry digitalization, China Telecom delivers high-bandwidth, low-latency, and full-coverage OTN private networks for government and enterprise customers. The company has actively carried out intelligent operation upgrades and continues to diversify and improve its services. It uses its intelligent cloud-network infrastructure, operation system, and products and services to deliver user experiences underpinned by high-quality products, fast delivery, and excellent services.

Private line services are not just the starting point of the government and enterprise business, but the basis for developing computing networks. Using the combination of one private line, one private network, and multiple digital, information, and communications technologies (DICTs), China Telecom is bringing its private line services into more application scenarios to create a new growth curve.

In recent years, China Telecom has performed exceptionally well in industry digitalization. In the first half of 2023, the company's industry digitalization revenue reached CNY68.8 billion, increasing 16.7% year-on-year and accounting for 29.2% of its service revenue. As a key field in industry digitalization, the government and enterprise market has become a growth engine of the company, helping it create a second growth curve.

Looking into the future, China Telecom will work with players across the industry value chain to deploy more advanced, flexible, and efficient premium optical networks across cities, towns, and villages. It will continue to innovate in Premium OTN private line services for governments and enterprises. China Telecom is committed to building cloud-network connectivity with deterministic experience and contributing to a digital China.



China Unicom Hebei: Achieving Home Broadband Success with FTTR



Home broadband is a key service for carriers, and Fiber to the Room (FTTR) is rapidly becoming a key supporting solution for it. China Unicom Hebei has decided to look to FTTR for home broadband service growth, building high-quality and full-coverage home broadband networks by focusing on three key factors: differentiated and innovative products, digital marketing, and premium services. This strategy has increased China Unicom Hebei's user satisfaction score by 0.6 points and total revenue by 10%. The carrier is now a leader in FTTR, ranking No. 1 in the number of FTTR users.

■ By China Unicom Hebei

Carriers saw a slowdown in home broadband service growth over the past few years, especially as market competition intensified and the industry as a whole encountered unprecedented challenges.

China Unicom Hebei was no exception. We were struggling in two specific areas. First, we needed to increase our broadband market share for new business growth. Second, we needed to increase our total number of gigabit broadband users. Gigabit broadband is an emerging

technology in the broadband market, and the number of gigabit broadband users represents a carrier's broadband market prospect. Indeed, there is huge market potential in this technology.

Therefore, China Unicom Hebei actively sought new growth in home broadband by exploring an upgrade of our broadband services to gigabit speeds. We adopted two new strategies—"one line for one home" and "no gigabit without FTTR"—which helped us successfully

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explore FTTR. We were then able to build differentiated advantages and improve user satisfaction score by 0.6 points, helping us gain a 10% increase in revenue and leadership in the FTTR field as the carrier with the highest number of FTTR users.

FTTR: A powerful tool for business success in home broadband

China Unicom Hebei has used FTTR as a powerful tool to facilitate rapid growth in home broadband services. This growth can be measured in four ways:

First, rapid user base growth. Since launching our first FTTR service in 2021, we have seen our number of FTTR users skyrocket, winning over 900,000 FTTR users so far.

Second, steady growth in broadband ARPU. In 2023, premium packages accounted for 91% of all new FTTR broadband subscriptions, and 95% of all existing FTTR broadband subscriptions. The average revenue per user (ARPU) of fixed-mobile converged packages upgraded to FTTR services was also about 88% higher than that of all broadband users as a whole.

Third, growth in broadband service revenue. By the end of 2022, China Unicom Hebei's revenue had increased by about 10%, thanks to the growth in FTTR user base.

Fourth, improvements in broadband experience and user stickiness. In 2023, the monthly activeness of both broadband users and FTTR users across our network had greatly improved. The amount of time users spent online also surged after they subscribed to FTTR services. Thanks to the great experience delivered by these innovative and premium services, our customer satisfaction score increased by 0.6 points.

FTTR services have increased China Unicom Hebei's broadband service revenue and user stickiness, driven package upgrades, reduced user churn rates, and, most importantly, boosted profitability.

Three key factors to be a leader in FTTR

When developing our FTTR services, China Unicom Hebei decided to base our strategy on three key factors:

differentiated and innovative products, digital marketing, and premium services.

First, China Unicom Hebei developed differentiated and innovative products to make FTTR part of basic converged packages. We have provided three FTTR-converged products of different tiers to address different user needs.

China Unicom Hebei provides differentiated and innovative products that can cover all users in homes with two or more bedrooms, while offering region-specific services like cross-sea livestreaming broadband. We also provided Internet access services for teenagers.

The FTTR-converged packages have allowed China Unicom Hebei to evolve from a one-off charging model to a long-term charging model, while also driving users to upgrade their packages. FTTR services, provided as part of our mid-range and more premium packages,



have driven user upgrades to higher-range packages and helped us gain more value from broadband users.

Second, China Unicom Hebei uses multiple marketing methods to drive rapid growth in FTTR services. We promote FTTR services not only in traditional ways, such as door-to-door promotion, promotion during installation and maintenance, community promotion, and in-store marketing, but also by using digital marketing methods to boost user growth.

Digital marketing has allowed us to identify 200,000 potential FTTR users a month. However, typical digital marketing methods lack a unified supporting platform for different markets, making it difficult to accurately identify potential customers. Our digital marketing, however, is supported by Huawei's iBRAS solution, which helps us identify high-value residential compounds where we can conduct precision marketing.

Third, China Unicom Hebei has solidified its competitive edge in premium services. We have more than 5000 professional smart home service engineers and promise to pay CNY50 in compensation for each valid Wi-Fi complaint submitted. This has helped us build a premium service brand image.

Moreover, China Unicom Hebei has developed standardized FTTR service delivery capabilities that allow us to maintain strict standards, including same-day installation and provisioning, standard delivery times, and tested primary- and secondary-device speeds exceeding 1.1 Gbps. We have also provided installation and maintenance assistant apps.

FTTR: The key to carrier success in the home broadband market

Diverse home service applications like VR movies, VR gaming, 4K video, and whole-house intelligence are entering the mainstream. This requires carriers to deliver low-latency, multi-connection, and ultra-high-speed home broadband services supported by high-quality networks.

FTTR is an innovative way of providing stable, low-latency, and high-quality gigabit home network coverage. It can support gigabit coverage throughout the home, and

smart roaming and imperceptible switchover when users move from room to room.

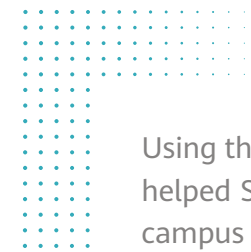
In addition, FTTR-B services can extend gigabit optical fiber from homes to enterprises and provide wider coverage. They can provide high-quality connections for commercial buildings, small- and medium-sized shops, and small campuses, opening up new FTTR markets for carriers.

Carriers around the world are actively developing FTTR services. By October 2023, more than 90 provincial carriers in China had launched FTTR networking services. It's now clear that the FTTR market holds great promise. Market research firm Omdia predicts that China will have more than seven million FTTR users by the end of 2023.

China Unicom Hebei's success in FTTR services and the huge market potential of FTTR have both indicated a clear trend: FTTR will be the key to carriers' success in the future home broadband market.



Intelligent Cloud Wi-Fi for Solid Network Infrastructure, China Mobile Shanghai Is Injecting New Momentum into Digital Transformation



Using the intelligent cloud Wi-Fi network service platform, China Mobile Shanghai helped Shanghai Maritime University upgrade the campus network at its Lingang campus to deliver one-stop service management and visualized and intelligent O&M. Now the university is going fully wireless, digital, and intelligent, and has set a benchmark for China Mobile Shanghai to power more industries with its vertically integrated solutions.

■ By China Mobile Shanghai

Foundation models are regarded as the most powerful knowledge distillers ever. Since the start of this year, they have been enabling more and more industries to go intelligent with their powerful deep learning capabilities. It

is estimated that by 2026, up to 20% of businesses will be using AI, and this will boost the digital economy.

Enterprise networks are being further upgraded, and

Enterprise networks are being further upgraded, and this requires carriers to provide more secure, reliable, and autonomous networks that can support quick migrations to the cloud.

this requires carriers to provide more secure, reliable, and autonomous networks that can support quick migrations to the cloud. Campus networks, for example, are not just connecting people — they are also connecting things and extending from offices to production systems. This means that customers from vertical industries are looking for faster and more stable campus networks.

When it comes to campus networks, user experience is king. In 2022, China Mobile Shanghai helped Shanghai Maritime University upgrade the campus network at its Lingang campus to deliver one-stop service management and visualized and intelligent O&M. This article describes how we did this, and how we later deployed an intelligent cloud Wi-Fi solution to facilitate industry digitalization.

The network challenges associated with intelligent campus transformation

Dating back to 1909, Shanghai Maritime University is a multidisciplinary university that focuses on applied research, specializing in disciplines like shipping, logistics, and oceans. It covers an area of 1.33 million square meters and has nearly 1300 full-time teachers and more

than 27,000 students. The university's Lingang campus was opened in 2008. For more than a decade, the campus has adopted a hybrid networking model and used equipment from different vendors. As a result, the wireless network did not support roaming and the network experience was poor.

In recent years, the government has issued a series of mandates to accelerate the digitalization of the education sector. It is becoming more important than ever to use new technologies such as Wi-Fi 6 and 5G to upgrade campus network infrastructure. In addition, in the post-COVID-19 era, hybrid teaching has become much more mainstream, and this raises higher requirements for campus networks. Driven by this, universities are racing to build dedicated campus networks. Shanghai Maritime University is no exception. They are focusing on pushing their intelligent transformation agenda forward and have set two goals.

First, they want to develop the university into a digital and intelligent maritime brand by providing special courses like remote teaching in a virtual space and smart port logistics.

Second, they want to resolve the problems of multi-vendor networking and poor roaming experience. Their goal is to make roaming imperceptible.

To achieve these goals, the university first needed to address the three main problems facing its networks, particularly its Wi-Fi networks. The first was the outdated legacy equipment that needed to be upgraded. There were more than 1000 Wi-Fi 5 routers on the campus. The second was the poor user experience caused by patchy coverage and frequent interruptions while roaming. Multimedia classrooms did not have Wi-Fi connections, and this undermined intelligent teaching. The third was the difficult O&M. The university's Wi-Fi network, which was built in 2007 and had since been upgraded twice, included equipment from multiple vendors.

The intelligent cloud Wi-Fi solution: Enabling one-stop network management

To address these challenges, China Mobile Shanghai built an intelligent Wi-Fi solution to help Shanghai Maritime University digitalize their campus.

We used Wi-Fi 6 access points (APs) and also employed orthogonal frequency division multiple access (OFDMA) and multi-user multiple-input multiple-output (MU-MIMO) technologies for joint scheduling to improve AP throughput and provide full Wi-Fi 6 coverage across 40 campus buildings. Since the traffic on campus networks is prone to surges during peak times, we used a smart antenna technology that features dynamic zooming to switch the APs to omnidirectional or high-density mode when the number of user devices crosses a certain threshold. This has increased the throughput of the entire campus network by 20%.

China Mobile Shanghai has also connected the devices of the faculty, students, and visitors as well as IP-based IoT devices to the campus network to ensure security within network boundaries and deliver the superior experience of imperceptible network access. Now that the campus network data can be collected and analyzed in real time, we can measure the health of the campus network from seven different aspects and evaluate the user experience that the network provides. This allows IT O&M personnel to better understand the current network status and quality, and to locate most network faults, which in turn ensures a quality network experience for teachers and students anytime and anywhere.

These measures have helped the university make tangible progress in its Wi-Fi network upgrade. According to a field test, more than 1000 APs deployed at the campus provided full wireless coverage in all key areas. While users were roaming, latency was as low as 20 ms and the average packet loss rate was less than 1%. Teachers and students were able to easily download large files, live-stream lectures, and attend video conferences. This proves that better campus networks can help improve teaching efficiency, cultivate talent, optimize management processes, and boost the local digital economy.

To support the upgrade of campus networks, China Mobile Shanghai is using digital and intelligent technologies to build strong network infrastructure, with the aim of laying a solid foundation for future development as the education sector continues to go digital and universities embrace digital technologies and race to build intelligent campuses.

Digital technologies will continue to enable more industries

The partnership between China Mobile Shanghai and Shanghai Maritime University was a success that has benefited both parties. The university has become more competitive as it has evolved into a leading digital and intelligent maritime brand. Teachers and students now enjoy a better campus Wi-Fi and 5G experience, and they report higher satisfaction levels.

After the success of this project, China Mobile Shanghai has had the chance to expand further into the campus network market. In future, we will monetize dormitory broadband networks and egress private lines deployed for the campus.

China Mobile Shanghai has launched a one-stop digital network infrastructure solution for sectors such as government, finance, education, and healthcare. Moving forward, we will keep innovating and implement our strategy of building a new information service system covering connectivity, computing, and new capabilities. Our ultimate goal is to provide high-quality digital network services for enterprise and industry customers.



AIS: Innovating in Home Broadband to Deliver Premium Digital Life Experience

AIS is the leading Thai communications service provider. The company's strategic goal is to transition from a traditional communications service provider into a cognitive technology company or "Cognitive Tech-Co", and to bring each user a premium and distinctive experience to enhance their lives and businesses through innovations, services, and products.

■ By Sunee Rojanaolarnrat,
Head of Fixed Broadband Marketing,
AIS Thailand



New usage patterns are bringing new opportunities

Our core is the mobile business, which serves 45.3 million people and provides full 5G network coverage nationwide, while the fibre broadband business is under the brand AIS Fibre, which now serves 2.38 million households. AIS also supplies digital and business services including cloud, security, IoT, digital payments, video, and gaming.

The broadband business has strong growth in both subscriber and revenue base, with double-digit growth year-on-year. Our network coverage has now been expanded to cover all 77 provinces of Thailand, and we still have



many opportunities to grow as the penetration for home broadband in Thailand is only about 50%. Broadband speed in Thailand is also growing very high due to high competition among all Internet service providers (ISPs). Gigabit users have also grown, now representing about 30% of our total customer base.

A study into our home broadband service found that customers have already changed their behavior and usage patterns from wanting an entertainment hub to seeking a more diverse platform. The service type of smart home has already increased by 7 times, time spent online gaming has increased 5 times, and traffic such as e-commerce or cloud storage is increasing by 10 times.

Therefore, home broadband needs to support more device connections, higher speed, better coverage, and provide the best customer experience to serve more people at home in all usage scenarios.

Differentiation leadership is the engine for growth

The goal of AIS Fibre is to become the most-admired digital life ISP in Thailand. In the initial phase, we are the first to accelerate the 2 Gbps speed directly to customers'

homes to meet demand in some sectors. In the second phase, we are strengthening the giga home network on mass. The third phase will see the development of smart home connectivity and beyond, into the future.

Maintaining leadership means we must innovate. We believe AIS provides the country's fastest network, technology-leading equipment, and the best service and customer experience. Since its launch, AIS Fibre has differentiated itself from other ISPs in the market by being the only ISP to offer a pure fibre optic network using FTTH technology. The network already delivers up to 1 Gbps at a time when competitors in the market are still using VDSL technology or a copper cable network.

Our accelerated One Fibre strategy is boosting this to 2 Gbps, and we are the first to accelerate the 2 Gbps speed directly to the customer's homes.

Key areas of focus for AIS Fibre are leadership through improvement and innovation, sustainability, and differentiated positioning. These strengths are reflected in the capabilities of the network infrastructure and device technology, and through product innovation and service excellence over the 8 years that the AIS Fibre has been available in the market.



“ Home broadband needs to support more device connections, higher speed, better coverage, and provide the best customer experience to serve more people at home in all usage scenarios. ”

Innovation is the core competence of AIS

To support differentiated usage behavior with best experience, we have introduced scenario-based broadband in Thailand, which means we can identify and prioritize services by using technology. Our AI-powered router technology enables a better scenario service experience, and so allows for monetization. For example, we can prioritize applications such as games, conferences, or live streaming, and the traffic will be prioritized using Wi-Fi splicing and accelerated via a priority "VIP" lane. As a result, the latency in homes can be reduced by 50% and the user has a better experience.

We are also the only provider to launch the fibre-to-the-room (FTTR) service, which allows our customers to enjoy a fully digital lifestyle experience in the home, with stable and seamless Wi-Fi. This is particularly important in larger properties or multiple dwellings where Wi-Fi coverage can be a major challenge and where 1 Gbps fibre connection doesn't necessarily equate to a 1 Gbps experience. Compared with Mesh Wi-Fi, FTTR technology has significant advantages including better appearance with transparent

fibre. Currently, we have expanded the FTTR or "Home FibreLAN" package from Bangkok to 28 provinces.

With a totally new service concept of Home FibreLAN, the go-to-market strategy is very important. We position this as primarily a premium service with three key features: customer targeting, package design, and professional installation.

- For customer targeting, we aim for the group of houses that are big or have multiple floors, or houses with a thick structure and Wi-Fi barrier that create Wi-Fi coverage problems. This group of customers is interested in Wi-Fi coverage and stability, and they can afford to pay for this Home FibreLAN service.
- Regarding package design offering, we make three easy-to-understand levels for customers to choose from, starting from 3 rooms, 4 rooms or 5 rooms - serving different customer requirements to provide 1 Gbps speed for both upload and download in every room.
- Finally, professional installation is required, in order to provide a good delivery experience and build a good brand effect. We have provided the professional in-

stallation team to survey the customer's home and talk to the owner to better understand their usage behavior. This helps for designing where to put routers and how to wire the transparent Fibre LAN first before doing the installation.

After launching this FTTR service, we have seen improvements across many areas. Compared with Mesh Wi-Fi, the FTTR service resulted in a 30% increase in ARPU, proving that the user experience has been greatly improved. In addition, Wi-Fi download speeds increased by 60%, and latency was reduced by 20%. Customer satisfaction also increased by about 0.6 points.

As a result of these innovations (AI Routers and FTTR solution), AIS Fibre was recognized by the industry with the award Broadband Telecom Company of the Year from Asian Telecom Awards 2023.

Focusing on brand proposition

Our focus is on the customers, and customer needs are our driving force. We will continue to maintain our fo-

cus on developing a range of products and innovations to provide the best home broadband experience. The positioning of innovative leadership will enhance the value and capabilities of AIS Fibre towards becoming the No. 1 cognitive home broadband provider and aim to set a new standard for the home broadband industry in Thailand.



Market Leadership Built on Broadband Success and Service Innovation

HKT is the leading provider of mobile, fixed broadband and corporate services in Hong Kong's relatively small, but densely-populated market. Among other landmark achievements, HKT was the first mobile operator to launch 5G services across Hong Kong's Mass Transit Railway (MTR) network and in fixed-line networks — the company's inaugural venture more than 100 years ago. Today, HKT's broadband network coverage is virtually 100 per cent.

By Derek Choi,
Managing Director, Consumer Marketing &
Pay TV, HKT Limited



Our broadband strategy, roadmap and successes

Hong Kong is densely populated, with 7.3 million people residing in the 1,100-sq. km. city. Where both commercial and residential buildings abound, the city offers ample opportunities to roll out broadband, mobile and related services.

HKT has garnered a reputation for being Hong Kong's most reliable fixed voice network service operator. Our quad-play offering spans broadband, fixed-line telephone, mobile and Pay-TV services. HKT delivers

its broadband service through the territory's most extensive fibre access (fibre-to-the-home) network, with nearly 90 per cent of the population enjoying access to 10Gbps coverage.

How we increased ARPU with 4 major VAS

Having become increasingly commoditised and commonplace in Hong Kong, high-speed 1,000 Mbps broadband service has seen a decline in average revenue per user (ARPU) over the past years. In light of market challenges and fierce competition, we launched four value-added services (VAS) to help maintain our competitive edge.

Now TV: Our most important VAS is Now TV, a Pay-TV service we launched 20 years ago. As Hong Kong's Pay-TV service market leader, we offer a comprehensive selection of content under the Now TV banner, including an impressive line-up of sports programmes such as the Premier League and UEFA Champions League, as well

as exciting home entertainment featuring educational content and popular drama series from the likes of HBO.

Gamer Pack: Designed with gamers in mind, the Gamer Pack provides exclusive low latency guarantee and latency monitoring for designated online games to enhance online gaming experience. We offer the Gamer Pack as a part of our broadband bundle, which helps us sustain ARPU.

Home Wi-Fi: We offer Home Wi-Fi as a VAS through different options that enhance our customers' Wi-Fi experience. Customers are invited to make their selections, in part, based on the size and nature of their properties. The typical Hong Kong apartment averages about 600 sq. ft., and uses Wi-Fi routers. We offer a range of devices, from Wi-Fi 6 to Wi-Fi 6E, depending on bandwidth requirements.

For larger properties, we have introduced fibre-to-the-room (FTTR) technology, which ensures smooth, seamless and reliable Wi-Fi connection. FTTR technology involves laying optical fibres along the walls or ceilings into





“As 4K video becomes mainstream and 8K looms on the horizon, there has been a growing consumer need for higher bandwidth and also higher revenue potential.”

every room, in each of which we install different routers that allow customers to enjoy up to 1,000 Mbps access from every corner of each room.

Security: We built Netvigator Shield in an effort to protect customers from cyber-attacks, including phishing emails, malicious websites and online scams. Our list of harmful sites and domains is updated frequently to protect customers to the best of our ability.

Meeting growing bandwidth demand with 2.5 Gbps Service

Earlier this year, our 2.5 Gbps service launched to an initially lukewarm response from consumers who did not see the need for such a service at home. We sought to change this perception at our Modern Home facility by demonstrating how within a 1,000-sq. ft. household with four to five members, it is not uncommon to find multi-

ple bandwidth-demanding applications and IoT devices, including air-conditioning controllers, smart fans, dehumidifiers and video doorbells. Coupled with the consumption of pay TV or over-the-top (OTT) content, 2.5 Gbps services have become more important than ever.

Our demonstration proved to be a success: since its launch, our 2.5 Gbps service saw a 30 percent increase in ARPU, compared to homes running on 1 Gbps.

Ensuring competitiveness through network investments

With the help of Huawei, we have continued to invest in network upgrade and have been able to sustain ARPU with our VAS and 2.5 Gbps service. We have even built a 10G capacity access network with XGS-PON, ensuring our competitiveness.

The consumption of content and video uploads to the cloud places heavy demand on bandwidth. To support growing demand from popular social media platforms such as TikTok, YouTube and Instagram, we support symmetrical uplink and downlink speeds.

As 4K video becomes mainstream and 8K looms on the horizon, there has been a growing consumer need for higher bandwidth and also higher revenue potential. Some professional users, including gamers, for example, need dedicated bandwidth. We offer such customers the option of 1000 Mbps, and even 4 x 1000 Mbps. For home offices, entertainment or gaming, we can provide dedicated downstream bandwidth with individual public IP addresses.

Zero-touch on-demand bandwidth upgrades for home users

We have launched a 10 GPON optical network terminal (ONT) with Huawei, which is helping us upgrade our consumers from 1 Gbps to higher bandwidths. Once installed, our 10 GPON ONT enables us to remotely deliver multi-PON broadband and Pay-TV services upon request.

With the ONT modules, we are also able to deliver bandwidth on demand: increasing a customer's bandwidth from 2.5 Gbps to 5 Gbps or even 10 Gbps is only a phone call away.

Smart living and smart charging

Meanwhile, our smart living home solutions are seeing an uptake in the commercial sector. We can now pre-install smart living home solutions in new residential properties and offer IoT solutions such as lighting and air-conditioning control. We are also anticipating collaborations with leading property developers and universities.

With electric vehicles (EVs) rising in popularity, we introduced EV Smart Charge charging solutions. Here in Hong Kong, most of us live in big housing estates with hundreds of parking spaces, which presents challenges to the installation of EV charging facilities. Like what we

did with broadband services, we invest in EV charging facilities, which we then lease to drivers.

Service bundles for greater household spending

In an effort to enhance scenario-based consumer experience, we have been selling service bundles with comprehensive offerings for work, study and home entertainment. For example, our HKT Super Bundle includes broadband, fixed line, mobile and Now TV services.

In addition to providing the ultimate scenario-based consumer experiences, our service bundles also help increase customer stickiness.

These successes have all contributed to Asian Telecom's recognition towards HKT as "Broadband Telecom Company of the Year - Hong Kong" and "Infrastructure Initiative of the Year - Hong Kong" in 2023. As the telecom leader in Hong Kong, HKT will continue to invest in networks, maintain our technological leadership and innovation capabilities, and provide even better services for consumers.





Building a Fully Connected, Intelligent World

Green All-optical Network

Building a DC-centric network that features high bandwidth, low latency, and high reliability with 400G, OXC, and ASON technologies, facilitating digital transformation in various industries.

