STRATEGY ANALYTICS
Research, Experts, and Analytics

HUAWEI

GUIDE to the Future

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Executive Summary

"Digital transformation" has become a common term in enterprises across all sectors in the post-COVID era. As pointed out by Nick Read, CEO, Vodafone Group, "digital is becoming make or break." The digital transformation "needs a strong and sustainable telco industry," according to José María Álvarez-Pallete, the Chairman of Telefónica and the GSMA. It represents a great opportunity for telecom operators to extend their business scope and explore new business opportunities.

Telecom operators need to build the necessary capabilities to support digital transformation towards 2030. Firstly, operators should focus on the basics, i.e., building and maintaining a high-quality network in terms of coverage, capacity, and cost efficiency. Based on the extended network connectivity, telecom operators can leverage digital technologies to break through the traditional service boundary to explore new business opportunities, particularly in the industrial digitalization market.

Telecom operators also need to fully leverage various resources and advanced automation technologies to extend service capabilities and enhance the value propositions. Collaborations between the public and private sectors and between the telecom industry and hyperscalers will be crucial for successful digital transformation.

As carbon reduction has become one of the key goals of economic and social development towards 2030, Telecom operators can play an active role in the net-zero journey by improving energy efficiency, using renewable energy, and helping customers to reduce carbon emissions. In particular, they can leverage advanced ICT technologies to enable the reduction of global carbon emissions.

Telecom operators need to take a new philosophy to build their differentiated competitiveness. The strategic priority could be transformed from overcoming weaknesses to leveraging strengths. Network capability is the most significant strength of telecom operators. Operators can win a better position in the ICT ecosystem by exploiting the network capability and eventually make up for the weaknesses – such as content applications – through collaboration with OTT partners. Telecom operators and their partners should strengthen their collaboration to embrace the adventure and pursue business success in the next decade.

Looking to 2030

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2.1 "The Tide Shifting"

GSMA revealed its latest Global Mobile Economy Report before the MWC 2022. The report made optimistic predictions for a 5G future and was echoed by industry executives and experts during the event. "The tremendous confidence of telcos overall" has been seen, and the tide is shifting.

The importance of telecom networks has been proven during fighting against COVID-19. Network connectivity is essential for remote work, remote education, remote health care, etc. An OECD report indicated 'since the start of the COVID-19 crisis, demand for broadband communication services has soared, with some operators experiencing as much as a 60% increase in Internet traffic compared to before the crisis.' Network data was also leveraged to assess how well containment was working and reduce the spread of the virus.

With 5G becoming mainstream in many pioneer markets and making considerable progress elsewhere, mobile revenue growth is recovering from the COVID-19 impact. GSMA's Mobile Economy 2022 report points out that mobile operators' revenue growth is "back in positive territory as economic activities pick up around the world post lockdowns." Strategy Analytics' study indicates that "operators leading on 5G network KPIs in their markets are currently outperforming the competition."

5G not only drives the growth of consumer business but also boosts the enterprise business, particularly industrial IoT initiatives. As 5G pioneers, Chinese operators recorded strong growth in the enterprise market. The exhibit below shows the growth and the contribution to the overall growth of Chinese operators' enterprise businesses.

Exhibit 1: Enterprise / Industry Digitalization Business of Chinese Operators

	Revenue Growth Rate	Contribution to Overall Service Revenue Growth
China Mobile	21.4%	43.5%
China Telecom	19.4%	51.6%
China Unicom	28%	59%

Source: Company's annual reports and Strategy Analytics

2.2 "Digital is Becoming Make or Break"

The growth of industry digitalization businesses indicates the strong demands of enterprises for digital transformation. In the post-COVID era, 'Digital transformation' has become a common term in enterprises across all sectors, as they implement new technologies to develop new solutions, improve service delivery, increase operational efficiency, reduce cost, gain competitive advantage, and meet rising customer expectations.

As pointed out by Nick Read, CEO, Vodafone Group at his keynote speech in MWC 2022, "digital will increasingly determine the competitiveness - of not only companies, but also nations and continents. ...... digital is becoming make or break." Many governments have realized this point. South Korea initiated a 5-year New Deal plan to lay the foundations for a digital economy and transform South Korea into a net-zero emissions economy. The 14th 5-Year plan of China sets a target for the added value of the digital economy to account for 10% of GDP by 2025 and a modern market system for the digital economy will be established by 2035. The European Union, Japan, Australia, Saudi Arabia, etc. also released their digital strategies for 2030. In the EU 2030 Digital Compass strategy, it is stated that "achieving gigabit connectivity by 2030 is key."

The advanced connectivity infrastructure will accelerate digital transformation by enabling enterprises to migrate IT systems to the public cloud and deploy more productive machines, such as collaborative robots and autonomous mobile robots. According to Huawei Intelligent World 2030 report, cloud services will account for 87% of enterprises' application expenditures and every 10,000 workers will work with 390 robots by 2030.

Digital technologies will also change people's entertainment and lifestyles. Huawei predicts more than 1 billion XR users globally by 2030. The immersive experience will change the way of working and living and generate high requirements for connectivity infrastructure.

2.3

"The Only One Capable of Transforming the Industry as a Whole"

In the digital transformation journey, "the world needs a strong and sustainable telco industry," pointed out by José María Álvarez-Pallete, the Chairman of Telefónica and the GSMA. At MWC 2022, he stressed the fundamental role of the telecommunications sector in defining the new digital era and the world of superconnectivity. "We are the gateway to the future. Telecommunications make possible all that is to come. Nothing will happen without us in the digital era."

Very high capacity and secure networks, such as 5G, have been a prerequisite for economic and social development. Telecom operators are the primary force to invest in network deployment and drive the advance of communications technologies. GSMA predicts "mobile operators are facing a CAPEX investment requirement of over $600 billion worldwide between 2022 and 2025, roughly 85% of which will be in 5G networks." Thus, telecom operators' business success and sustainable growth are crucial for the world's digital transformation journey.

However, the revenue growth of global telecom operators in the consumer market has been flat for years, and the ARPU is declining continuously. They also face competition and substitution from Internet hyperscalers.

Exhibit 2: Consumer Telecom Service Revenue, 2021-2026
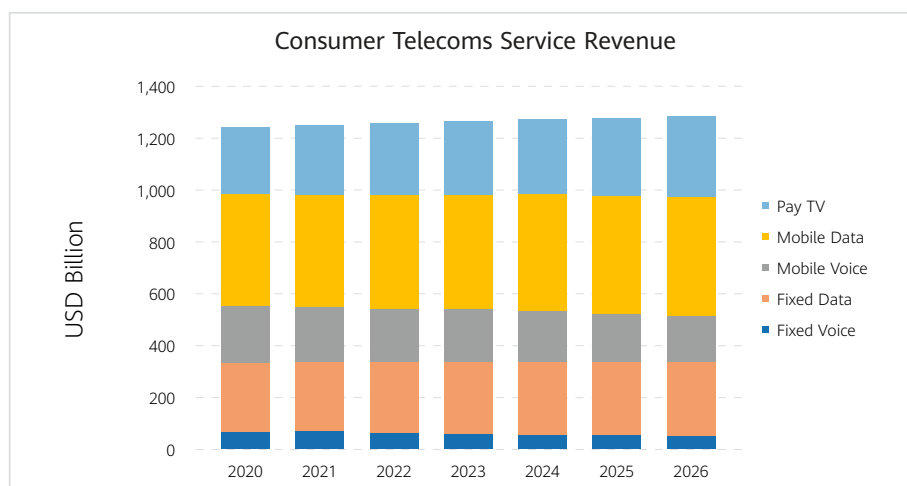
Source: Strategy Analytics, 2021

Therefore, telecom operators need to extend their business scope and explore new business opportunities to achieve sustainable growth towards 2030. Orange Business Service predicted the business service market value for the telecom operator would be up to $930B by 2025, where digital services and integration services together would account for more than 60%. Compared with the players in the industry value chain, i.e., telecom-centric operators, system Integrators, network equipment suppliers, hyperscalers, cyber specialists, etc., integrated telecom operators with global reach are the unique ones, according to Orange Business Service. They are present across all segments and can provide a full range of services, including telecom, IoT, cybersecurity, cloud, digital and data service, etc. This was echoed by José María Álvarez-Pallete, the Chairman of Telefónica and the GSMA at MWC 2022. He pointed out that the telecommunications sector "is the only one capable of transforming the industry as a whole".

To effectively operate the integrated connectivity and digital services, a telecom operator must upgrade its IT architecture, simplify its products and processes, improve the knowledge and skills of employees, etc. The digital transformation will lay the foundation for the sustainable growth of telecom operators in the next decade.

Building Capabilities for 2030

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3.1 Service Capability

To extend the business scope and explore new growth opportunities, telecom operators need to improve their service capabilities across all market segments.

Firstly, operators need to focus on the basics, i.e., building and maintaining a high-quality network in terms of coverage, capacity and cost efficiency. As pointed out by Millicom CEO Mauricio Ramos at MWC 2022, "the way not to be just a dumb pipe is to start by being a really, really good pipe." Huawei predicts that the number of global connections will exceed 200 billion, and the number of connected things will reach 180 billion by 2030. Connectivity will rapidly change from people-centric connectivity in the current B2C/B2H scenarios to connectivity of everyone, everywhere, and everything, including various sensors, campus, factories, and production lines. Either wireless technologies or wireline technologies need to be enhanced to meet the changing requirements.

Based on the extended network connectivity – from Fiber-To-The-Home to Fiber-To-The-Room, from leased line to B-FTTR+ leased line, from wide-area OTN to PTMP-OTN – telecom operators can leverage digital technologies to break through the traditional service boundary to explore new business opportunities, particularly in the industrial digitalization market.

Beyond the network connectivity, a telecom operator who targets being a network-native digital services company also needs to build on a set of strong differentiators, according to Orange Business Service. These differentiators could include:

- Global network – a global network reach is essential for telecom operators to gain multinational corporation customers.

- Broad and focused commercial coverage – broad sales network and competent presales/consulting team are crucial for a successful B2B business.

- Industrialized delivery capabilities – local delivery presence and offshore automatic service capabilities are required to respond to customers' needs quickly while maintaining a reasonable margin.

- Recognized Expertise – not only telecom expertise but also expertise in digital service and even vertical applications are essential for operators to develop the B2B market.

- Trusted global partnership – a firm trust partnership is a prerequisite when the enterprise decides to embed an operator's solution into its core production process.

- Partnership ecosystem – broad partnerships with hyperscalers, equipment vendors, industry solution providers, etc. are essential for telecom operators to develop competitive B2B solutions.

At their keynote speeches in MWC 2022, industry leaders, such as José María Álvarez-Pallete of Telefonica and Nick Read of Vodafone, called for collaborations between the public and private sectors and between the telecom industry and hyperscalers. These collaborations are indeed crucial for telecom operators to extend their business scope and explore new business opportunities. Meanwhile, the partnership inside the telecom industry value chain should also be strengthened. The proactive collaborations between operators and between operators and vendors are vital for the telecom industry to improve the service capability in emerging market segments.

3.2 System Efficiency

When telecom operators extend their service scope, they will face increasing uncertainties.

- The first is how to manage the network effectively. With the large-scale deployment of commercial 5G that co-exists with 2G, 3G, 4G and 5G, network complexities and O&M challenges are increasing significantly.

- The second is how to meet fragmented requirements from diverse industries. The highly customized service scenarios require telecom operators to implement quick service provisioning and agile O&M operation.

- The third is how to leverage the data assets in telecom networks and operations.

The data is not only valuable for the operator itself but also can support enterprise customers to improve their operational efficiency.

Thus, network automation is becoming a must-have to handle these uncertainties and support the extension of service scope. Network automation features can improve the operations efficiency and optimize the network configurations according to the change of traffic patterns and experience requirements. The automation platform can also provide unique value to meet business needs, such as flexibly allocating resources according to the traffic dynamics, guaranteeing the end-to-end SLA requirement, etc.

When telecom operators extend their business in the industrial digitalization market, network automation will be an essential capability. It would be too costly or even impossible for telecom operators to meet the diverse requirements of long-tail applications in vertical industries without the automation capability.

As telecom operators explore new business opportunities in the industry digitalization market, such as system integration, consulting, managed service, cyber defence, etc., operators must notice that most of these ICT services are based on labor intensive business models that could destroy the operator's profit margin. For example, according to NTT Group's IR report, the operating margin of NTT Data – the subsidiary for ICT services – is 6.0%, while the margin of NTT DOCOMO – the subsidiary for mobile communications service – is 19.3%. The operating revenue per employee of NTT Data is less than 1/10 of NTT DOCOMO's, and the operating income per employee of NTT Data is less than 1/33 of NTT DOCOMO's. Orange Business Service also reported that the new businesses, such as cloud services, IoT, consulting, etc. have a much lower gross margin (~20%) than the traditional businesses, such as PSTN voice (>50% margin) or WAN (40-50% margin).

The significant margin and productivity gap will impact the efforts of telecom operators to extend their service scope. Operators need to leverage AI and automation technologies to ease the labor cost burden and improve business efficiency. This will be crucial for telecom operators to explore the industry digitalization market and achieve a successful business transformation.

3.3 Integration of Resources

Data is the lifeblood of a digital economy and computing resources play a central role in digital transformation towards 2030. Cloud computing can provide enterprises a flexible and on-demand processing and storage capability. Thus, cloud services have become an essential element of digital services. Telecom operators must leverage their own resources or collaborate with hyperscalers to build the cloud services portfolio.

Leading Chinese operators are actively developing their own cloud services. China Telecom's e-surfing cloud and China Mobile's industry cloud achieved 102% and 110% growths in 2021, respectively.

Unlike China Telecom or China Mobile, many leading CSPs in developed markets have decided to cooperate with hyperscalers such as Amazon's AWS, Microsoft's Azure, or Google Cloud, following a strategy of 'if you can't beat 'em, join 'em'. As industrial players often need to manage their software and applications across multiple public cloud platforms, the "Multi-Cloud" is becoming an effective approach for telecom operators to collaborate with hyperscalers. Telecom operators can leverage their local or regional resources – connectivity, device portfolio, consulting and system integration, customer service, etc. – to help enterprise customers manage a range of leading cloud vendors, bringing them all together into a single, easy-to-use interface.

With the development of industrial digital transformation, more and more industrial applications are based on real-time data analytics, which requires data to be stored and processed near its source. Telecom operators have a lot of infrastructure and resources close to where their customers use their mobile devices, the edge data center. These capabilities can be a value-added layer between mobile devices and public cloud providers.

As pointed out by Vodafone Group CEO Nick Read in his MWC keynote speech, telecom operators need to fully leverage "regional scale whilst nurturing local grassroots." Telecom operators can leverage their local or regional resources, such as connectivity, edge and regional data centers, sales channels, local service centers, etc., to strengthen their positions in collaboration with hyperscalers and add more value to their B2B service offerings.

3.4 # Competitiveness of Value Proposition

Strategy Analytics' Wireless Operator Performance Benchmarking indicated that the average mobile data use per SIM hit 9.0GB/month globally in Q3 2021 with total traffic increasing 33% year on year, while ARPU slipped marginally. 5G is unlikely to change the per GByte value's declining trajectory unless telecom operators get new approaches to uplift the value of their services. In the report Mobile Data Revenue per Gigabyte Falls Below US$1 as 5G Ramps Up, Strategy Analytics discussed two approaches:

- Delivering more attractive price bundling options on 5G to encourage users to upgrade their price plans, a common trend in South Korea where higher value price plan use on 5G is justified in part through more inclusive (and exclusive) content.

- Offering speed-based price tiers within unlimited data portfolios to encourage users to upgrade for the full 5G experience, a common trend in Finland and used by Vodafone in its unlimited plans in many markets in Europe.

To develop attractive content bundling options, telecom operators need to build partnerships with content providers or invest in exclusive contents, meanwhile guaranteeing the network experience for these bandwidth-hungry contents.

The B2B service is also an area for telecom operators to uplift service value. A survey of 4000 IT Decision Makers by Strategy Analytics in April 2021 across 18 countries found that two thirds of businesses expect IT spending to increase in the next 12 months, and 1 in 3 firms are currently implementing or investigating how to integrate 5G in the next 12 months. As enterprises transform to new digital platforms, the requirements for guaranteed service level agreements (SLAs), fast service provisioning, and on-demand bandwidth are significantly increasing. The deterministic network experience for enterprise customers will be a strong differentiator for telecom operators to compete with challengers in the enterprise communications market.

Either the content development or the enterprise services require the organization and processes of telecom operators to be more flexible and agile. Telecom operators may also need to build dedicated brands for various market segments and develop a highly trusted relationship with enterprise customers.
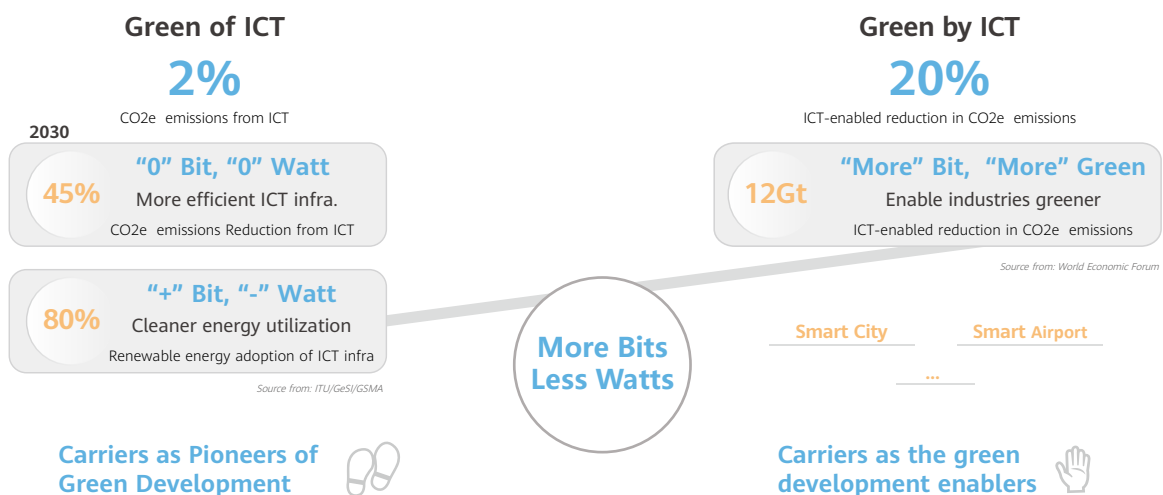
3.5 # Contribution to Society

Carbon reduction is one of the key goals of economic and social development towards 2030. The European Green Deal raised the 2030 greenhouse gas emission reduction target, including emissions and removals, to at least 55% compared to 1990. China's 2030 climate targets aim to peak its carbon emissions by 2030 and achieve carbon neutrality by 2060. The United States, in April 2021, announced a new target to achieve a 50-52% reduction from 2005 levels in economy-wide net greenhouse gas pollution in 2030.

Telecom operators can play an active role in the net-zero journey by improving energy efficiency, using renewable energy, and helping customers to reduce carbon emissions. Particularly, they can leverage advanced ICT technologies to enable the reduction of global carbon emissions.

A GeSI study report shows that ICT has the potential to enable a 20% reduction of global CO_2e emissions by 2030. Meanwhile, the ICT industry will produce just around 2% of global carbon emissions by 2030. Therefore, ICT technology is an effective enabler for greener and more sustainable world development. By extending the network coverage and business scope, telecom operators can enable more carbon reduction from industries, a significant contribution to society.

Exhibit 3: ICT Enablement Effect for Carbon Reduction

Green of ICT

2%

CO_2e emissions from ICT

2030

45% — **"0" Bit, "0" Watt**
More efficient ICT infra.
CO_2e emissions Reduction from ICT

80% — **"+" Bit, "-" Watt**
Cleaner energy utilization
Renewable energy adoption of ICT infra

Source from: ITU/GeSI/GSMA

Green by ICT

20%

ICT-enabled reduction in CO_2e emissions

12Gt — **"More" Bit, "More" Green**
Enable industries greener
ICT-enabled reduction in CO_2e emissions

Source from: World Economic Forum

Smart City   Smart Airport

...

More Bits Less Watts

Carriers as Pioneers of Green Development

Carriers as the green development enablers

Source: Huawei
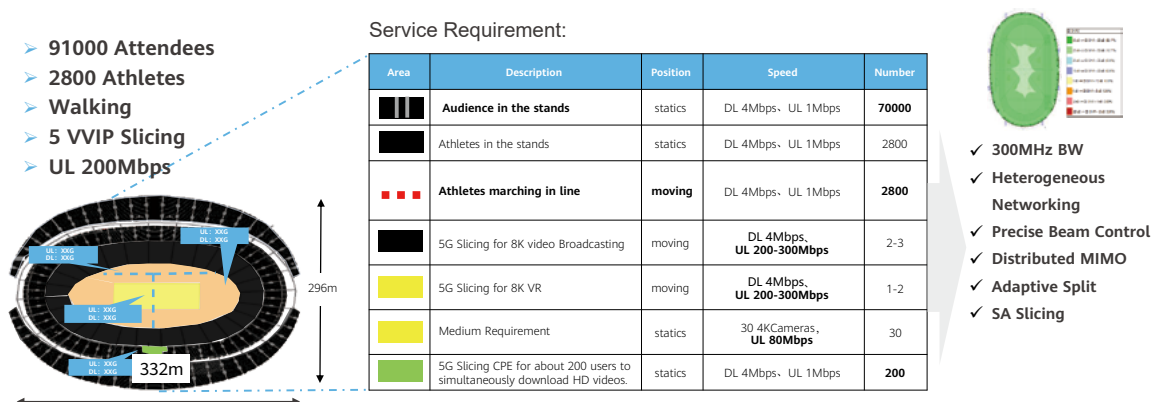
Roadmap towards 2030

4

4.1   Network – Gigaverse Initiative

5G and fiber broadband are the foundation for telecom operators' transformation towards 2030, as they can provide a universal Gigabit per second data experience, i.e., the Gigaverse experience.

According to Strategy Analytics, 5G has soared from a 1% share of all global smartphone shipments in Q2 2019 to a record 52% in Q4 2021, and FTTP (Fiber to the Premises) will account for more than 30% of global residential broadband subscriptions by the end of 2022. Gigabit technologies are becoming mainstream in the global broadband market and already meet the extreme requirements in some specific scenarios and use cases. For example, there is often a data traffic surge in a crowded sports or entertainment event, where users will experience stalled network speeds. 5G and fiber broadband networks together can provide an ultra-high capacity and comprehensive broadband coverage for this scenario. The converged fixed/mobile broadband network can significantly improve the user experience and boost the publicity and branding of the Gigaverse experience.

Exhibit 4: Gigaverse Enables Unprecedented Stadium Experience

- ➢ 91000 Attendees
- ➢ 2800 Athletes
- ➢ Walking
- ➢ 5 VVIP Slicing
- ➢ UL 200Mbps

Service Requirement:

Area	Description	Position	Speed	Number
	Audience in the stands	statics	DL 4Mbps、UL 1Mbps	**70000**
	Athletes in the stands	statics	DL 4Mbps、UL 1Mbps	2800
	Athletes marching in line	**moving**	DL 4Mbps、UL 1Mbps	**2800**
	5G Slicing for 8K video Broadcasting	moving	DL 4Mbps、**UL 200-300Mbps**	2-3
	5G Slicing for 8K VR	moving	DL 4Mbps、**UL 200-300Mbps**	1-2
	Medium Requirement	statics	30 4KCameras、**UL 80Mbps**	30
	5G Slicing CPE for about 200 users to simultaneously download HD videos.	statics	DL 4Mbps、UL 1Mbps	**200**

- ✓ **300MHz BW**
- ✓ **Heterogeneous Networking**
- ✓ **Precise Beam Control**
- ✓ **Distributed MIMO**
- ✓ **Adaptive Split**
- ✓ **SA Slicing**

Source: Huawei

In the transformation towards 2030, telecom operators need to expand the Gigaverse experience continuously. The first step is to extend the Gigaverse experience from a peak experience to an average experience for all users in a service area. For example, Chinese operators supported the 4K live TV on the high-speed train, which significantly extended

the availability of the Gigaverse experience.

The second step is to further enhance the user experience through introducing advanced technologies – such as 10G-PON, 5G-Advanced, and even 6G – to meet the requirements of Metaverse or any other emerging bandwidth-hungry application. The exhibit below summarizes the evolution roadmap of the Gigaverse initiative.

Exhibit 5: Evolution towards Gigaverse Initiative for Diversified Markets
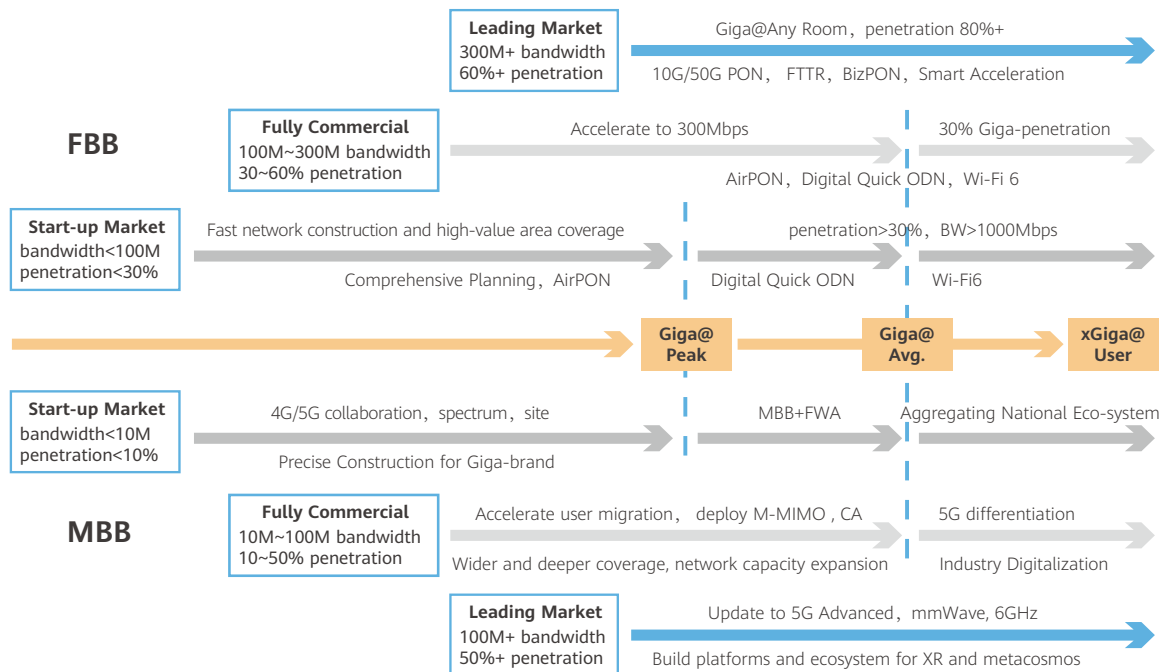
Source: Strategy Analytics and Huawei

Telecom operators can evolve their network deployment strategies with the development of the Gigaverse initiative. In the early phase of the 5G rollout, a fast deployment can give operators the first-mover advantage to build the brand with a premium experience. Meanwhile, operators can extend the fiber network to offer a fixed-mobile converged broadband experience.

When 5G reaches the mass market, fiber network penetration will become a key differentiator. The stronger the fiber infrastructure, the stronger the network competitiveness. Telecom operators can leverage the advantages of 5G and fiber networks to extend the broadband network reach from wide areas to local areas to explore new business opportunities.

Eventually, telecom operators will build a ubiquitous Gigabit network capability to support various new services and empower sustainable growth in the next decade.

4.2 Efficiency – Ultra-automation Speed-up

Most leading telecom operators have recognized that network automation is a must-have for the digital transformation towards 2030. In 2019, the TM Forum, together with Huawei, China Mobile, Orange, BT, Telstra, and Ericsson jointly defined the high-level criteria of Autonomous Driving Network (ADN) L1 to L5.

Exhibit 6: Autonomous Networks Levels

Autonomous Levels	L0 Manual Operation & Maintenance	L1 Assisted Operation & Maintenance	L2 Partial Autonomous Networks	L3 Conditional Autonomous Networks	L4 High Autonomous Networks	L5 Full Autonomous Networks
Execution	P	P/S	S	S	S	S
Awareness	P	P/S	P/S	S	S	S
Analysis	P	P	P/S	P/S	S	S
Decision	P	P	P	P/S	S	S
Intent/ Experience	P	P	P	P	P/S	S
Applicability	N/A	Select Scenarios				All Scenarios

Source: TM Forum

Some leading operators have set clear roadmaps for implementing the Autonomous Driving Network. China Mobile targets implementing a Level-4 autonomous network by 2025 through a phased approach:

• Phase 1: 2021 – 2022, to implement entire network L2 and some OpCos L3

• Phase 2: 2023 – 2024, to implement entire network L3 and some OpCos L4

• Phase 3: 2025, to implement entire network L4

In practice, some provincial branches of China Mobile have moved beyond the schedule. For example, China Mobile Henan Branch has launched an L3 autonomous driving network in 2021. The ADN features enable China Mobile Henan to shorten the troubleshooting time of the 5G bearer network and 5G core network to 5 minutes and 15 minutes respectively, and to improve the poor QoE detection accuracy of home broadband service from 30% to 95%.

Vodafone also set the target of achieving zero-touch intelligent networks by 2025. The zero-touch intelligent network features will automate human manual processes, drive efficiency, speed & reliability, and eventually achieve predictive and automated network operations.

It is expected that the evolution of Autonomous Driving Networks from L0 to L5 will take ten years. The overall ADN level will reach level 4 by 2025, and then some leading operators will move to Level 5 along with the digital transformation towards 2030.

4.3 Resources – Intelligent Computing & Network as a Service

Huawei's "Intelligent World 2030" report predicted that cloud services will account for 87% of enterprises' application expenditures. Leading CSPs have realized the importance of cloud-network synergy for meeting the requirements of enterprise customers on cloud service access and networking in the digital era. A one-stop "cloud + network" service is required to implement the fast deployment, elastic bandwidth, and performance visualization.

Many telecom operators have developed multi-cloud strategies to resell third-party cloud services and bundle their network services with cloud services to meet diverse customer requirements. For example, Orange Business Service (OBS) takes an end to end approach to being the experienced cloud integrator that embeds cloud, network, and security service into a rich portfolio of global solutions. OBS has built partnerships with leading

cloud vendors including AWS, Azure, Google Cloud Platform, etc., and implemented projects for more than 3,500 customers. To effectively manage the multi-cloud service, leading operators, such as BT, Vodafone, T-Systems, NTT, etc., have developed their own multi-cloud management platform that can provide enterprise customers a one-stop-shop covering hosting, monitoring, provisioning, and workload migration through a unified, self-service dashboard.

As cloud and edge computing play critical roles in enterprise digital transformation, telecom operators can fully leverage all computing (public cloud, edge cloud, private cloud, etc.) and connectivity resources to develop a resource-orchestrated solution to serve enterprise customers. China Mobile has provided its iron & steel factory customer with a smart steel solution that integrates 5G connectivity, edge computing, public cloud, and system integration service. The resource-orchestrated solution enables a win-win deal for China Mobile and the factory.

In the future, the network connectivity and computing resources can be seamlessly integrated to form a demand-centric service platform. In its 2030 network-cloud integration vision, China Telecom targets a "100% Cloud Native, 100% Network Automation, and AI Native" platform to provide unified cloud-network slicing and open capabilities.

The evolution roadmap of intelligent computing and network as a service can be summarized by the exhibit below.

Exhibit 7: Intelligent Computing & Network as a Service
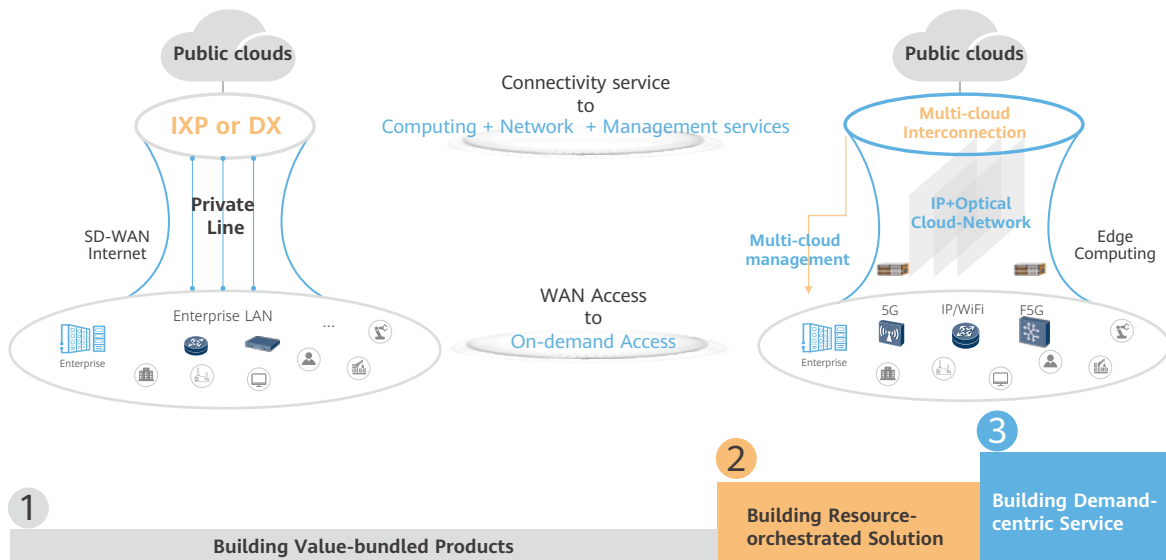
Source: Huawei

4.4 Value Proposition – Differentiated Experience On-demand

In the mobile broadband market, best effort data transmission is the traditional manner for telecom operators to handle traffic data. However, emerging applications require operators to improve service capabilities and provide a differentiated experience. For example, the cloud VR video requires at least 120 Mbps bandwidth and less than 20 ms end-to-end delay. The best effort mechanism is not sufficient to guarantee such an extreme experience. SLA and QoE assurance mechanisms are emerging to provide the value proposition with differentiated experience.

In the residential broadband market, the COVID-19 pandemic has driven up the demand for remote work and education. With the number of connected devices increasing, the home Wi-Fi network is becoming a bottleneck for the broadband experience. The need for Fiber to the Room (FTTR) is emerging, which can provide a differentiated residential broadband experience.

In the business market, the SLA capability and deployment flexibility provided by 5G Ultra-Reliable and Low Latency Communications (URLLC) features can create broader opportunities for telecom operators. By leveraging network slicing, edge computing, uplink enhancement, indoor positioning, etc., telecom operators can provide enterprise customers with a unique network experience.

To further improve value propositions, telecom operators need to optimize the organization and processes, shorten the response time to customer demands, and enhance the ease of use of their services. BSS, OSS, service orchestration platform, etc. can play a crucial role. Telecom operators can evolve the guaranteed experience to an on-demand experience, which will create more value for customers.

The exhibit below summarizes the roadmap of telecom operators to evolve their value propositions.

Exhibit 8: Building Future-Oriented Network Differentiation

3 Steps Network Planning to On-demand Experience

Service Volume

B2C
From Traffic oriented to Experience oriented
Planning Deterministic Services

B2B
Industry application oriented
From connectivity to connectivity + computing

B2H
From Entertainment to multi-service oriented
From "2Home" to "2Room"

3 On-demand Experience

2 Guaranteed Experience

1 Best Effort Experience

Network Capability (Time)

Source: Huawei

4.5 ESG – More Bits Less Watts

A holistic approach is needed to achieve the net zero target. Telecom operators can strive in three dimensions to move towards the target, including improving energy efficiency, using renewable energy, and helping customers to reduce carbon emissions.

Many leading operators have introduced renewable energy supplies into their networks. Since July 2021, Vodafone's entire European operations – including mobile and fixed networks, data centres, retail, and offices – have been 100% powered by electricity from renewable sources. Vodafone is also committed to achieving the same step-change in Africa by 2025. Orange has signed a Corporate Power Purchase Agreement (CPPA) with Total, which will supply Orange with 100 GWh a year of renewable electricity over a period of 20 years. China Mobile has also deployed wind or solar powered base stations to lower the demand for fossil fuel energy. In the case of the China Mobile Jiangsu branch, solar powered 5G base stations have reduced electricity consumption by 24%.

To improve the energy efficiency of the overall ICT system, continuous technological innovation is required across equipment, sites, and the entire network to ensure optimal service performance and stability with the lowest power consumption. Telecom operators can consider a three-layer green ICT framework to improve their energy efficiency.

Exhibit 9: Green ICT Framework

Green Operation

③ • Unified indicator systems, measurable and optimized   • Multi-dimensional accurate energy efficiency improvement

Green Network

② • All-optical   • Simplified   • Intelligent

① **Green Site** • Site Simplified • Maximizing renewable energy • Intelligent management   **Green DC** • Simulation Design • natural cooling • Prefabricated module/all-flash
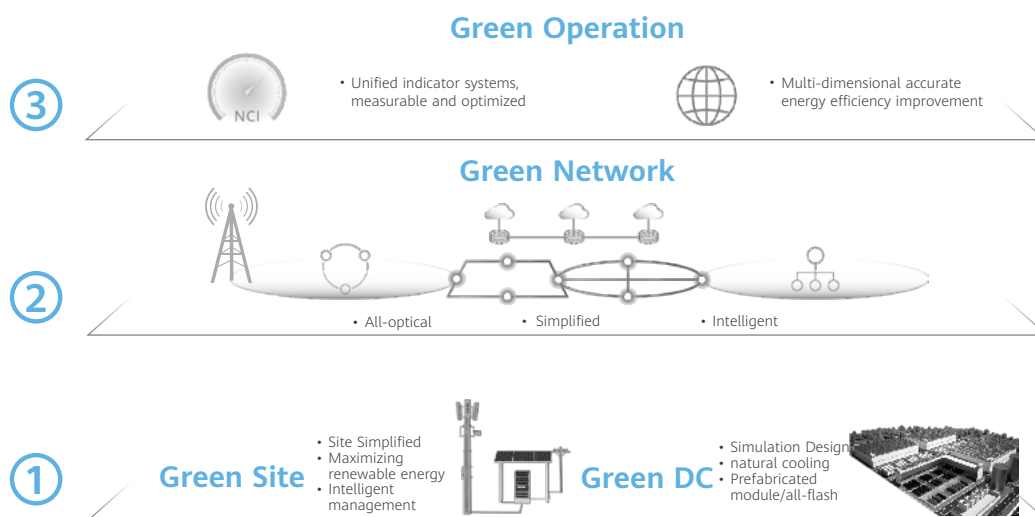
Source: Huawei

The network energy efficiency can be benchmarked by the Network Carbon Intensity (NCI) that was defined in the Huawei whitepaper. "The ratio of the carbon quantity emitted by all equipment due to electricity consumption of a systematized network facility within a long period of normal operation (preferably one year) to the total amount of data volume handled by the facility in the same period."

$$Network\ Carbon\ Intensity(kg\ CO_2e\ /\ terabyte) = \frac{Total\ Carbon\ Emission}{Total\ Data\ Volume}$$

In addition to using renewable energy and improving the energy efficiency of their own systems, telecom operators can also help customers reduce carbon emissions by leveraging advanced ICT technologies. For example, Vodafone has set itself the target to enable business customers to reduce their carbon emissions by a total of 350 million tonnes globally by 2030. According to a joint report by Vodafone and WPI Economics, IoT technologies have the ability to help the UK to achieve significant carbon reductions in the next decade. China Mobile is also actively researching and developing a variety of ICT solutions to support emission reduction society wide. In the 2016-2020 period, China Mobile has helped society reduce carbon emissions by more than 800 million tons.

Exhibit 10: Carbon Reductions by IoT Technologies

Source: Vodafone

5G B2B applications can help enterprises further improve energy efficiency and contribute to global carbon reduction. GSMA's recent report 5G in Verticals in China 2022 includes some exciting cases that 5G B2B solutions empower carbon reduction activities. It is expected that these 5G solutions will be spread to support broader carbon reduction activities in the coming years.

5 / Conclusion – GUIDE is Now

The global telecom industry is entering a new cycle. Extending business scope and exploring new business opportunities are crucial for the sustainable growth of telecom operators in the next decade. Telecom operators need to improve their capabilities and set the roadmap towards 2030 in five dimensions:

- Service capability

- System efficiency

- Integration of resources

- Value of proposition

- Contribution to society

To serve the operators' sustainable business development towards 2030, Huawei proposes a set of network evolution targets, including:

- Mobile broadband networks will evolve to 5G-Advanced. 3GPP has announced it will recognize Rel-18 as the first release of 5G-Advanced that will provide intelligent network solutions and cover new use cases. By 2030, the peak downlink rate will reach more than 10Gbps. The uplink will reach 1Gbps, and the network latency will be shortened to 5ms. There will be more diversified mobile IoT access capabilities.

- Fixed broadband networks will evolve to F5.5G. The F5.5G will be an enhancement for F5G that has been standardized by ETSI F5G Group. By 2030, 10Gbps everywhere will be achieved in the home environment. The home network should be fully upgraded to Wi-Fi 7 to implement intelligent QOS management of home access.

- The passive optical network (PON) will be upgraded to 50G PON. The metropolitan area network will be upgraded to 800G, and the backbone network will be upgraded to more than 400G.

- All services will be migrated to the cloud. The cloud-network synergy and the deployment of computing power networks will drive IP networks to fully evolve to IPv6+.

- The telecommunications network is entirely moving towards intelligent operation and maintenance. With the autonomous network (AN) being standardized by TM Forum, ITU-T, etc., AN platforms are expected to be deployed on a large scale in the coming years.

Exhibit 11: GUIDE Network Architecture towards 2030
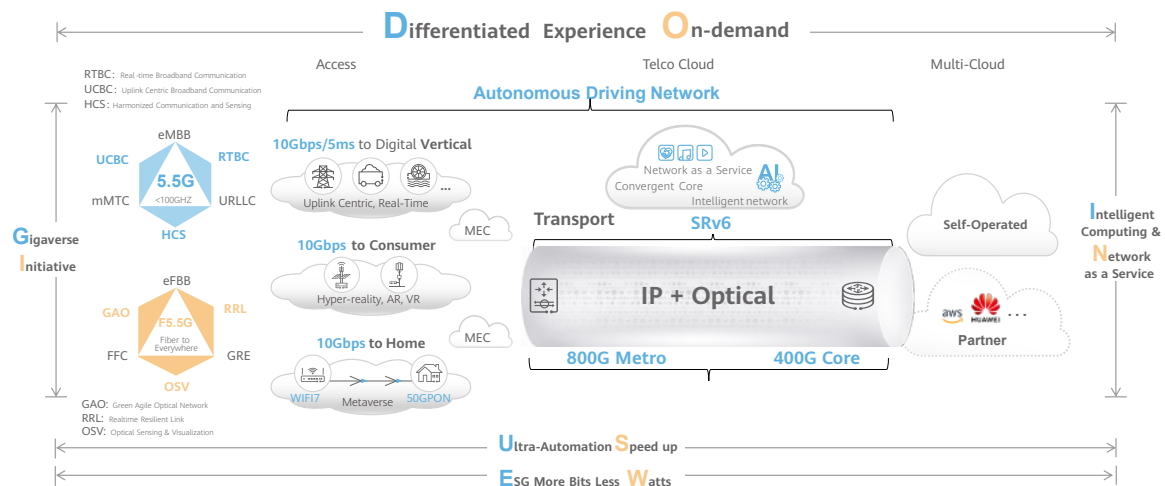
Source: Huawei

The win-win partnership between telecom operators and telecom equipment vendors needs to be strengthened to advance technology innovation. Technology innovation should target the expansion and success of telecom operators' businesses rather than innovation for innovation's sake.

The telecom industry can further enhance network capabilities based on these technological innovations. Continuously enhanced network capabilities will be the catalyst for telecom operators' digital transformation. Telecom operators need to take a new philosophy to build their differentiated competitiveness. The strategic priority could be transformed from overcoming weaknesses to leveraging strengths. Network capability is the most significant strength of telecom operators. Operators can win a better position in the ICT ecosystem by exploiting the network capability and eventually make up for the weaknesses – such as content applications – through collaboration with OTT partners. Telecom operators and their partners should strengthen their collaboration to embrace the adventure and pursue business success in the next decade.

Exhibit 12:   New Philosophy of Building Telco's Differentiated Competitiveness
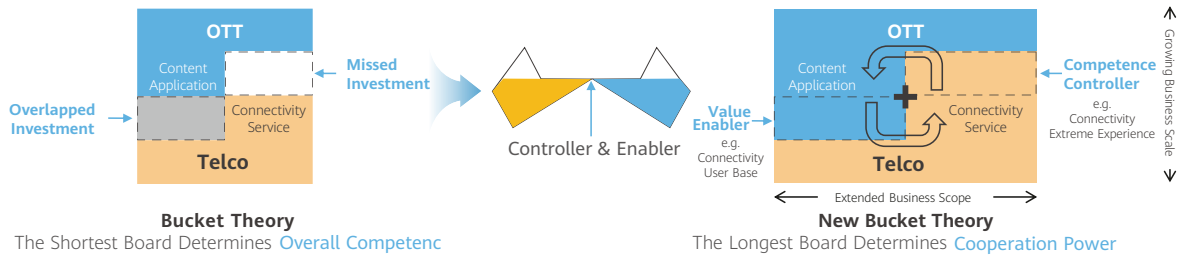
Source: Huawei

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