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mapping a path to telco revenue growth

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October 2021
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the big picture

Communications service providers (CSPs) are pinning their hopes for future revenue growth not on their existing connectivity businesses, but on new B2B services that they hope to develop on top of connectivity by leveraging 5G, IoT, edge computing and AI. To understand the revenue potential of these new ICT services, it is important to understand the current financial state of CSPs' businesses.

Our research for this report was two-pronged. First, we needed to create an up-to-date set of financial data for CSPs globally in order to compare the size and growth rates for their new lines of business and to illustrate how this data compares with growth in the traditional connectivity business (see page 4). But we also wanted to understand how telco leaders feel about their prospects for the future, so we conducted an extensive survey of 205 people working inside 82 CSPs worldwide. Respondents included C-level executives, architects and engineers in IT and network departments, leaders of enterprise lines of business and consultants.

Who are the *Telco growth* survey respondents?

205 **CSP** respondents from **82** companies

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Methodology for creating a financial snapshot

For our research we collected financial KPIs from 31 of the world's largest CSPs, comparing their results for the period from 2018 to 2020. The combined revenue of this group represents about 69% of the service revenue in the telecoms industry, and our analysis throughout the report is based on an extrapolated data model based on the sample group's financial results.

Creating a model was not an easy task because telcos report revenue differently. For example, only 17 of the 31 CSPs we analyzed split their B2B and B2C revenue, and only a handful report revenue for new lines of business. As we were consolidating the results into US dollars (USD), we eliminated the influence of currency exchange rate fluctuations against USD by using a common historic exchange rate across all three years, based on the rate on January 1, 2019.

To build a picture of the importance of these new services to the overall telecoms business we have shown the proportion of total revenue they make up. There is a risk that such calculations could give the impression that revenue from many new services is inconsequential. This is not the case.

The sheer size of the core telecoms business makes revenue from new services look small by comparison. For example, Vodafone is earning $940 million annually from its IoT business; Orange generates $880 million from security services; and China Telecom makes $1.7 billion from cloud services. But these businesses account for just 1.8%, 1.6% and 2.8% of total revenues, respectively.

By tracking revenue for three years, it would normally be possible to get a good feel for how quickly the new lines of business are growing. But the Covid-19 pandemic has significantly impacted telcos' revenue for the last two years.

Overall revenue for telecoms worldwide 2018-2020

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B2B revenue has been hit by business failures and digital transformation projects being put on hold. Nevertheless, three new lines of business we are focusing on in this report – security, IoT and cloud – showed year-on-year growth of 20% to 30% over the period.

Our forecasts in the report for overall B2B services plus security, IoT, cloud, TV and mobile payment services are based on a combination of moving-average model forecasting from historic data, analysis of growth actuals from comparable segments (in telecoms and IT sectors), and adjustments for current market pressure resulting from the pandemic.

It is important to note that our forecasts are based on an extrapolation of existing trends. However, the impact of the Covid-19 pandemic on the 2020 revenue figures made this difficult. Our solution was to use an extrapolation of growth before the pandemic, compensating for the impact and based on our estimates for speed of economic recovery for each of the segments.

We estimated some of the missing data for various CSPs for the period 2018 to 2020 by using data collected from financial reports to create a median number for percentage of total service revenue for a given segment. Then we estimated a figure for the missing CSPs based on that percentage, combined with an assessment of where we think the others are relative to the market leaders.

> **CSPs' challenge is to find a new operating model while continuing to optimize the legacy connectivity business.**

Can B2B deliver?

Our research finds that while total telecoms revenue is flat, B2B is outperforming B2C. However, there is a massive disparity in B2B maturity among CSPs globally, depending on the regions where they operate and when they entered the B2B market. Incumbent telcos in mature, developed markets, for example, already generate more than 20% of their revenue from B2B services and in some cases as much as 40%.

However, most of incumbent CSPs' revenue gains are simply compensating for the decline in revenue from their core network and connectivity businesses. In some cases, core connectivity revenue is declining by more than 5% per year.

Challengers to the incumbents have a much better opportunity to show growth in B2B revenue because they have not been selling enterprise services for very long.

Consumer growth slows

Our analysis of telcos' consumer strategies points to a growing focus on multi-play services across the world with operators expanding to offer the services they currently do not – for example mobile operators expanding into fixed, broadband and TV services. But overall revenue for these services is not growing. Indeed, the pay-TV business has flattened in many countries because of competition from video platforms like Netflix.

When it comes to growth in B2C services, there is a divide between operators in emerging markets (where multi-play and mobile money are growing) and operators in developed markets. CSPs in developed markets are hopeful that 5G will deliver new revenue, either from higher-priced mobile services or 5G fixed wireless access.

Getting there

CSPs are still trying to identify the operating model that will give them the best chance of delivering sustainable revenue growth. Their challenge is how to achieve this while continuing to optimize the legacy connectivity business.

Acquisitions are playing a big part in operators' growth plans, especially for services in which they do not have a lot of expertise, such as security. Cloud, IoT and security services require specialist knowledge and skills, although this has been less of an issue in IoT since 80% to 90% of revenues come from connectivity. Our research has identified that the most successful approach to integrating acquisitions is to leave companies operating as separate businesses and resell their products through existing B2B divisions.

What about connectivity?

In this report, we focus on revenue rather than profitability because very few CSPs report the costs associated with delivering new services. But it is possible to draw some conclusions about the profitability of operators' core connectivity businesses versus new ICT services that rely on professional and managed services.

Telcos generate an EBITDA (earnings before interest, taxes, depreciation and amortization) margin of more than 30% in their core network businesses. Even though financial data for their managed services and professional services businesses is difficult to obtain, we believe the EBIDTA margin for such services is closer to 10%, even among the most successful operators. This is much lower than the 20% EBIDTA margin that most successful global professional services firms generate.

The disparity in the relative profitability of network connectivity and new ICT services raises important questions about where operators should focus as they deploy 5G and associated capabilities such as edge computing, mobile private networks and IoT. CSPs are more committed than ever to their network and connectivity businesses, but it is unclear whether they can grow connectivity revenue through higher prices and/or more connections. If they can't, they stand a better chance of capturing a share of total enterprise spending on many new ICT services by delivering connectivity that better meets the requirements of different enterprise applications.

Read this report to understand:

- The current state of CSPs' businesses and revenue
- The impact of Covid-19 on revenue
- Why security, IoT and cloud services represent the best chance for growth in B2B
- Why MPNs and data-as-a-service also hold promise
- Whether enterprises want to do business with telcos
- How CSPs' consumer businesses are changing, with particular focus on TV and mobile payment services
- What the future holds for connectivity services
- Steps telcos can take to realize revenue growth opportunities

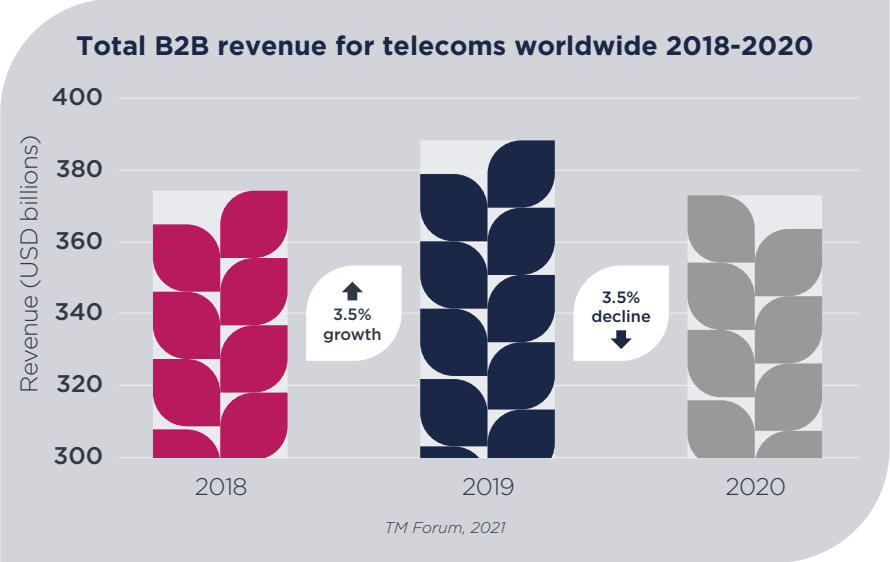
section 1:

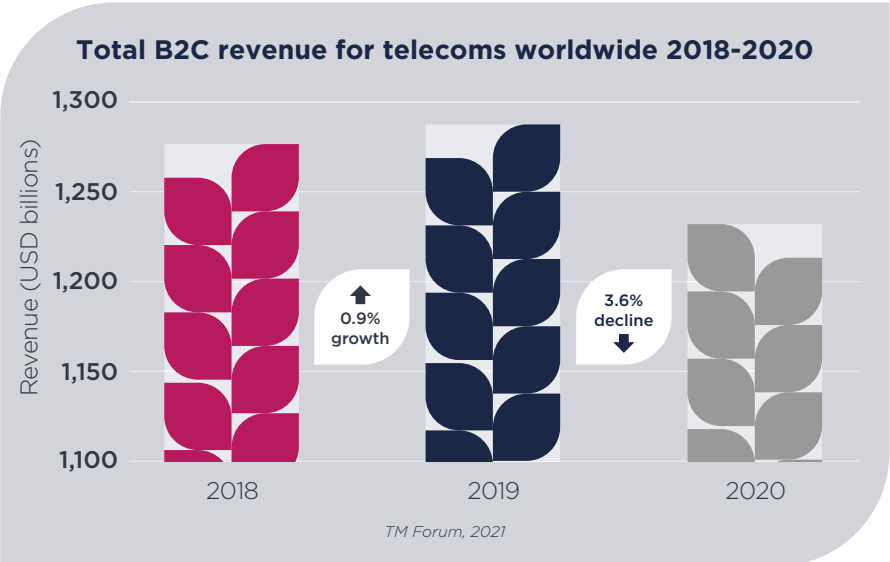
the state of telecoms revenue worldwide

Worldwide telecoms revenues are still extremely flat, showing very little growth for several years. A bright spot on the horizon, however, is the market for B2B services which is giving communications service providers (CSPs) reason to hope that they have discovered a path to revenue growth for the next decade.

Between 2019 and 2020, revenue from consumer services registered a decline of 3.6% due to the impact of the Covid-19 pandemic, and revenue from enterprise services also took a hit, falling by 3.5% year on year. However, prior to 2020 revenue from B2B services was growing steadily at around 3.5% annually. This is leading most telcos to shift their focus to enterprise lines of business.

Existing B2B services – voice and data communications packages for enterprises and small and medium enterprises (SMEs) – are not likely to generate vast growth in the coming years, so telcos are pursuing new service models for hot areas such as security, IoT and cloud – despite the vagaries around what the next killer application might be.





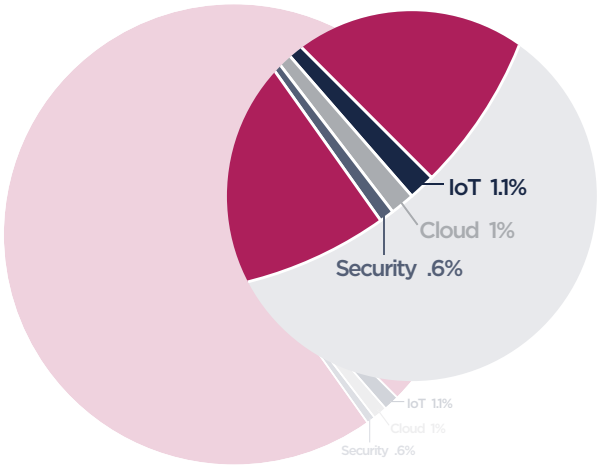
Impact of Covid-19

It is essential to address the effect that the pandemic has had on businesses worldwide and how it has affected CSPs' financial performance. Historically, telcos have not been negatively impacted by macroeconomic cycles. For example, they have been resilient in times of recession due to their strong capital positions and because their utility-like core services are necessary.

However, the shift to working from home for a billion people worldwide hit usage of telcos' core B2B services hard. Many offices were closed indefinitely during the first quarter of 2020, with workers switching to consumer fixed broadband connections.

> **The new business models we have analyzed make up just 1% or less of the total revenue of a typical CSP.**

Slicing the telco revenue pie



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Enterprise revenue from fixed data services was affected but not catastrophically as many business customers are on long-term contracts which ensured that CSPs still received some income. Consequently, the huge drop in usage of B2B fixed data services was not entirely mirrored in the financial results.

Consumer fixed and wireless broadband became a connectivity lifeline for many millions of office workers – for work, shopping, entertainment, and video calling their family and friends. Many CSPs accepted enterprise customers working over their consumer connections and did not try to increase prices, calculating that it would be a temporary shift.

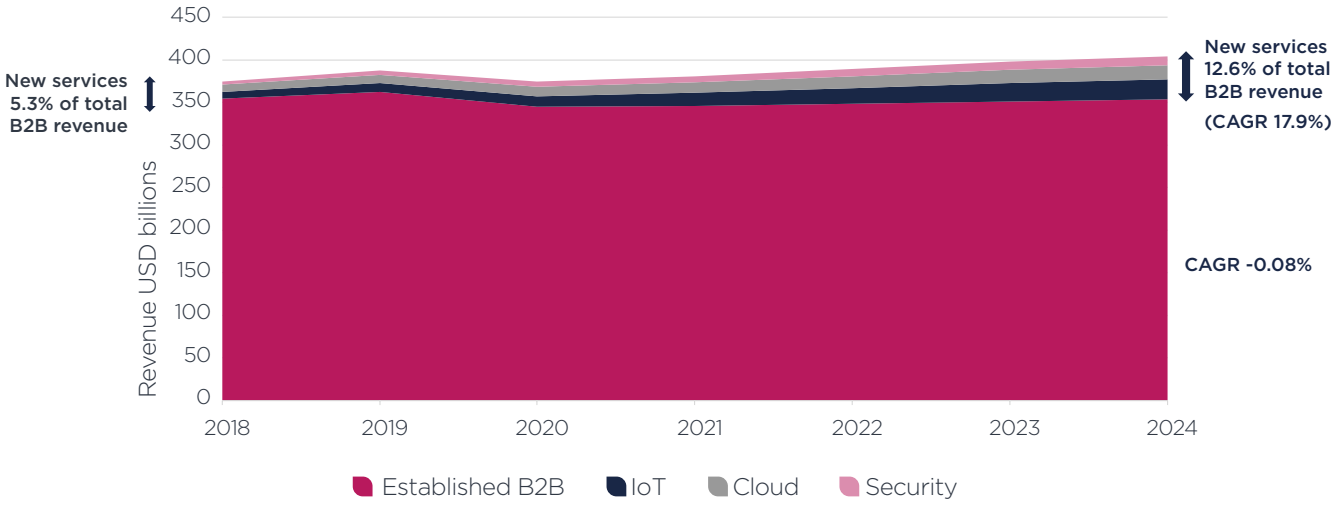
Revenue from B2B and B2C fixed voice services dropped as some companies closed permanently and the ongoing residential trend to cut landline connections accelerated, with hard-hit consumers looking to cut their monthly bills. There was also a huge drop in roaming revenue throughout 2020 caused by lockdowns and travel bans.

Where's the growth?

Many of the CSPs analyzed in this report were seeing B2B growth before the pandemic, and they have been focusing on digital transformation of B2B operations and service development. We believe that much of this growth is coming from established B2B services as CSPs widen their portfolios aimed at large and small enterprises to drive growth.

Growth is coming from connectivity-based solutions such as software-defined wide area networks which act as an overlay (in a sense, a value-added service). New ICT services such as security, IoT and cloud are

Revenue growth for new ICT services in context of entire B2B market



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also contributing to overall B2B growth, but it is important to look at their size compared to existing core business revenues.

The services we have analyzed make up just 1% or less of the total revenue of a typical CSP, even among progressive operators that have invested heavily in diversification strategies. We'll look at each segment in more detail later in the report.

Pay TV stalls

On the consumer side, the pandemic hit CSPs' Pay TV revenue as some consumers turned to over-the-top (OTT) players like Netflix and Disney Plus and others cancelled their subscriptions to save money. However, some operators opted to partner with services like Netflix, integrating them into cable and satellite platforms.

The Pay TV segment is still relatively large compared with the other non-communications categories at around 4% of total revenue. We predict that these revenues will drop off slightly over the coming five years (see Section 10).

What's ahead?

Most CSPs are worried about flat and declining revenues, and in a growth-obsessed industry the search for the next big source of additional revenue has become a sole focus for many. However, the capital position of CSPs is strong. Their core business is not in radical decline, and the services they sell are essential to society.

Consequently, a catastrophic decline in revenue is not likely to happen any time soon. Still, the search is on for the new hot ticket, and many nascent service models are showing promise. The challenge operators and their suppliers face is continuing to drive transformation of the traditional telco through investment in technology and software.

In 2018, new ICT service categories represented just 5.3% of total B2B revenue, despite IoT existing as a concept for over a decade. By 2024 we predict this share will rise to 12.6% due to the traditional B2B connectivity market being very flat and most growth coming from these new lines of business.

During this period standalone 5G will also be deployed, further stimulating revenue for B2B and B2B2C use cases. We will study profitability for these service categories over the same period in the next TM Forum Benchmark report, scheduled for early 2022.

In the next section we look at why CSPs believe B2B services are the answer to growth.

section 2:

why CSPs believe B2B is the answer to growth

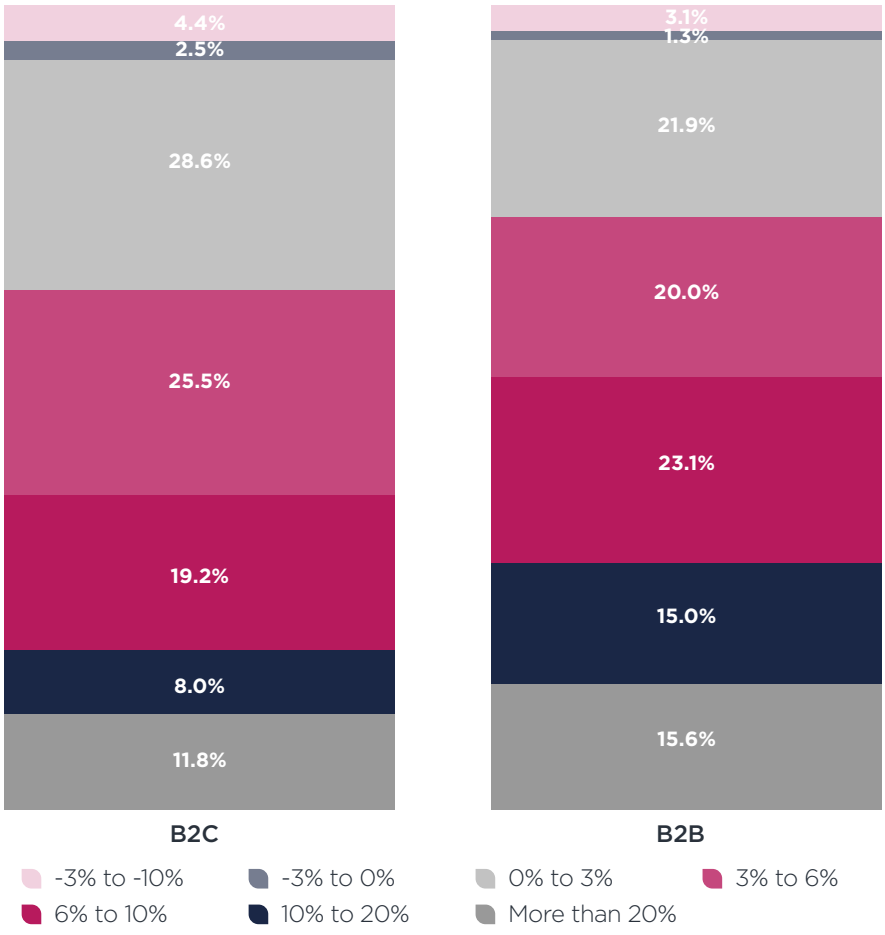
Communications service providers (CSPs) and their suppliers clearly believe that the enterprise market presents a better opportunity for revenue growth than the consumer sector. Indeed, in the survey conducted for this report five times as many respondents identified B2B as a more likely source of future revenue, although two thirds said they see opportunities across both segments.

Similarly, when we asked respondents to estimate compound annual growth rate (CAGR) for their organizations over the next five years in each market, they favored B2B. The most optimistic answers show a clear vote for higher CAGR in B2B than B2C, with more than half of respondents saying they expect CAGR of more than 6% in their B2B businesses over the next five years while about 40% of respondents expect more than 6% growth in B2C.

Reasons for optimism

It is important to note that globally many CSPs are bullish about B2B because their enterprise businesses are relatively immature. They are pinning their hopes on growth resulting from the deployment of technologies such as 5G and IoT (see page 10).

CSPs' projections for revenue growth in the next 5 years



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We believe these segments may demonstrate strong revenue potential but only when starting from a low revenue base. In other words, B2B may be a fast-growing part of CSPs' businesses, but it is small in absolute terms.

Several trends are responsible for CSPs' optimism:

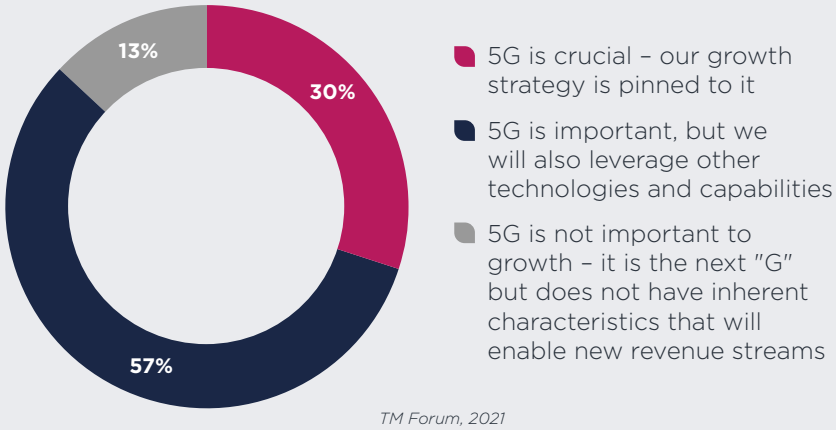
- **Digital transformation** – most companies are transforming their businesses digitally, and CSPs envision helping them embrace Industry 4.0, which describes the confluence of new technologies such as AI, quantum computing, smart manufacturing, IoT and 5G. The inclusion of 5G in the list has created high expectations for the role and value of communications technologies.
- **5G** – CSPs are building their 5G return-on-investment narratives around B2B and B2B2X use cases, which is leading to "verticalization" of business opportunities. Operators envision leveraging multi-access edge computing (MEC) so that they can play an important role at the edge (see panel).
- **IoT** – expectations for IoT growth have cooled recently, but most operators still believe that at some time in the future – perhaps five to ten years from now – their networks will connect as many things as people or buildings.
- **New lines of business** – the promising financial performance of new lines of business such as security, IoT, cloud and other new ICT services is encouraging CSPs to explore other ways to serve enterprises.

Will 5G play a starring role?

While early 5G deployments have focused on deploying radio access networks to increase capacity and speed for mobile broadband customers, CSPs will roll out standalone 5G networks that use cloud computing and MEC during the next two years. This will allow them to target enterprises with services such as network slicing and edge computing.

The CSPs we surveyed consider 5G to be integral to their B2B expansion, with more than 85% of respondents saying it is either crucial or important to enterprise growth. However, nearly six out of ten CSPs said 5G is just one of several technologies that will drive growth. Indeed, some operators see their investments in edge computing, cloud native IT systems and networks, and IoT connectivity as sitting under an umbrella of 5G services.

Importance of 5G to CSPs' revenue growth



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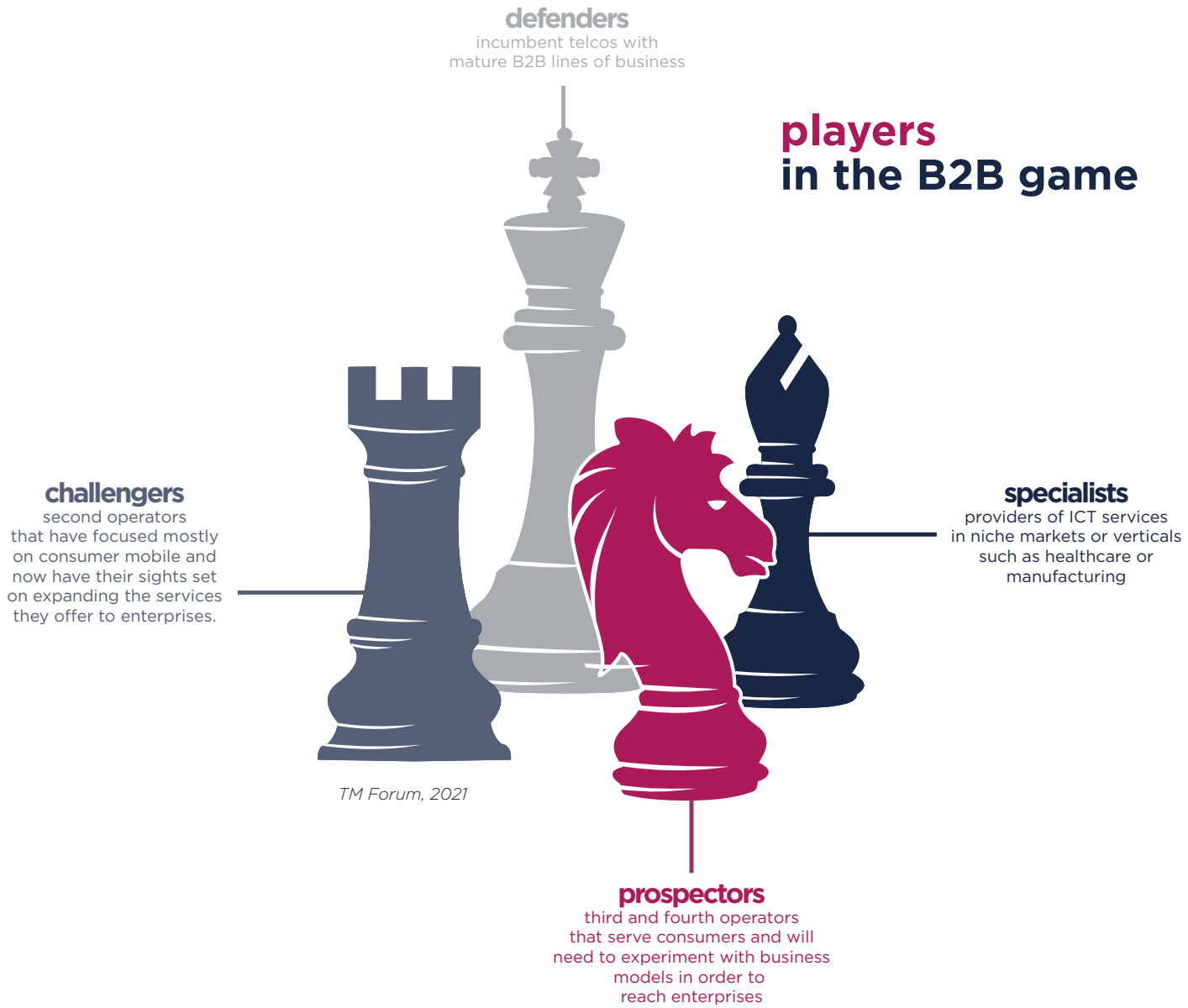

The B2B telecoms market is complex. Services that telcos offer to enterprises vary widely, as do the types of companies they serve, from small office/home office environments to multinational corporations (see page 14). In addition, the size and maturity of operators' enterprise lines of business vary widely. As part of our research, we looked at CSPs' current B2B activities and market prospects and categorized the operators as one of four types of companies as shown in the infographic above.

Defenders

In most countries, particularly developed markets in North America, Europe and parts of Asia, incumbent CSPs have relatively mature B2B lines of business, built before governments introduced competition into fixed and mobile markets in the 1980s and 1990s. They have been providing fixed-line and broadband services to businesses and consumers for more than 50 years.

On the consumer side they have expanded into mobile and TV services, and on the enterprise side into managed services that allow companies to outsource non-core technology functions. So far, however, the CSPs' mobile services have not been widely integrated into enterprises' corporate networks.

Incumbent operators are defending their legacy and must create new products and services to compensate for the decline in revenue from voice communications and connectivity more broadly. Their challenge is to grow new revenue more quickly than old revenue declines.

Operators in this category include: Deutsche Telekom, Orange and Telefónica in Europe; AT&T and Verizon in the US; and SingTel and Telstra in the Asia-Pacific region.

Challengers

Since the 1990s, "second" or "alternative" carriers have been challenging incumbents in telecoms markets. They first emerged in the local exchange, followed by startup mobile operators.

Many of the mobile operators have since expanded their service portfolios to offer fixed line, broadband and TV services. And although their focus is primarily the consumer market, many have expanded into the enterprise sector through a combination of fiber deployment and acquisitions. However, in most cases B2B remains a relatively small part of their overall business.

Challengers are more likely to be mobile-centric in their strategies for developing new lines of business because mobility is their legacy. To target the enterprise market, most must develop new skills and competencies that are not always adjacent to their core business.

Companies in this category include China Mobile and Vodafone – two of the biggest IoT service providers in the telecoms sector – India's Reliance Jio, and T-Mobile in the US. It is also worth noting that large operator groups can be *defenders* in their home markets but *challengers* in other markets.

Specialists

The B2B market is more fragmented than the consumer sector, and this has given rise to a huge number of specialized ICT service providers. *Specialists* may have unique selling propositions based on:

- **Network capabilities** such as fiber deployments
- **Market size** (see page 14 for a description of types of business customers)
- **Verticals** like healthcare, manufacturing or automotive
- **Geography** which could include countries, cities or even buildings
- **Product lines** such as unified communications, private networks, call center services or IoT

Specialists that focus on verticals or geographies are particularly relevant in 5G-enabled growth markets. Every vertical sector has its own providers of ICT services, and CSPs will have to decide whether to partner or compete.

Similarly, companies providing services in specific regions are particularly relevant to the emerging mobile private network (MPN) market. For example, "neutral host providers" – companies that deliver in-building Wi-Fi and cellular coverage – are building MPNs for enterprises that need indoor coverage.

Specialists that focus on a product category are likely to be MVNOs, resellers or distributors of networks, hardware and software products. Their skills tend to be more around the integration of products and capabilities and delivering the business capabilities required by enterprises. For example, European telecoms service provider Gamma provides unified communications services in Germany, the Netherlands, Spain and the UK.

Prospectors

The later a mobile operator entered a market, the less likely it is to have dedicated resources for diversifying from its core consumer business. Most third, fourth and fifth mobile operators have struggled to achieve profitability, although some third mobile operators have managed to scale through mergers and acquisitions.

We call these companies *prospectors* because they necessarily must take a different approach to addressing B2B opportunities, either as wholesale operators, "asset-light" operators (such as MVNOs or B2B operators that buy dark fiber or wholesale services) or highly specialized, niche operators.

Perhaps the best example of a prospector is Hutchison Telecom which entered the European telecoms market in the 3G era and remains a challenger. The company is now experimenting in sectors such as MPNs as a greenfield player.

In the next section we'll look more closely at the types of products and services CSPs are developing to target the enterprise market.

section 3:

products & services for the enterprise market

Communications service providers (CSPs) that have mature B2B lines of business have developed extensive product portfolios to serve different types of companies. Offers range from basic voice connectivity to more complex managed and professional services. This section explores the products with a focus on how companies of various size and type might use them.

enterprise services for sale

network	hardware & software	managed & professional services
approach CSP sells connectivity & communications services	**approach** CSP resells: • hardware (routers/devices) • software-as-a-service	**approach** CSP sells: • managed networks • managed cloud services • professional integration services/IT services
competitive threats other telcos and asset-light CSPs such as MVNOs	**competitive threats** partners' direct-to-customer businesses	**competitive threats** systems integrators & consulting companies
primary target(s) all businesses	**primary target(s)** all businesses	**primary target(s)** large & multinational companies, government
outlook in mature markets, telco's B2B revenues are declining by 0%-5% per year; fixed broadband continues to grow, especially in developing markets and for *challenger* operators	**outlook** many telcos are seeking to increase SaaS sales through portals and marketplaces; equipment sales are under pressure due to migration to cloud	**outlook** CSPs' legacy managed network & services businesses are under pressure due to declines in MPLS and leased lines; strong growth in security, cloud & IoT

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As shown in the graphic on page 13, enterprise services can be broken down into three main categories:

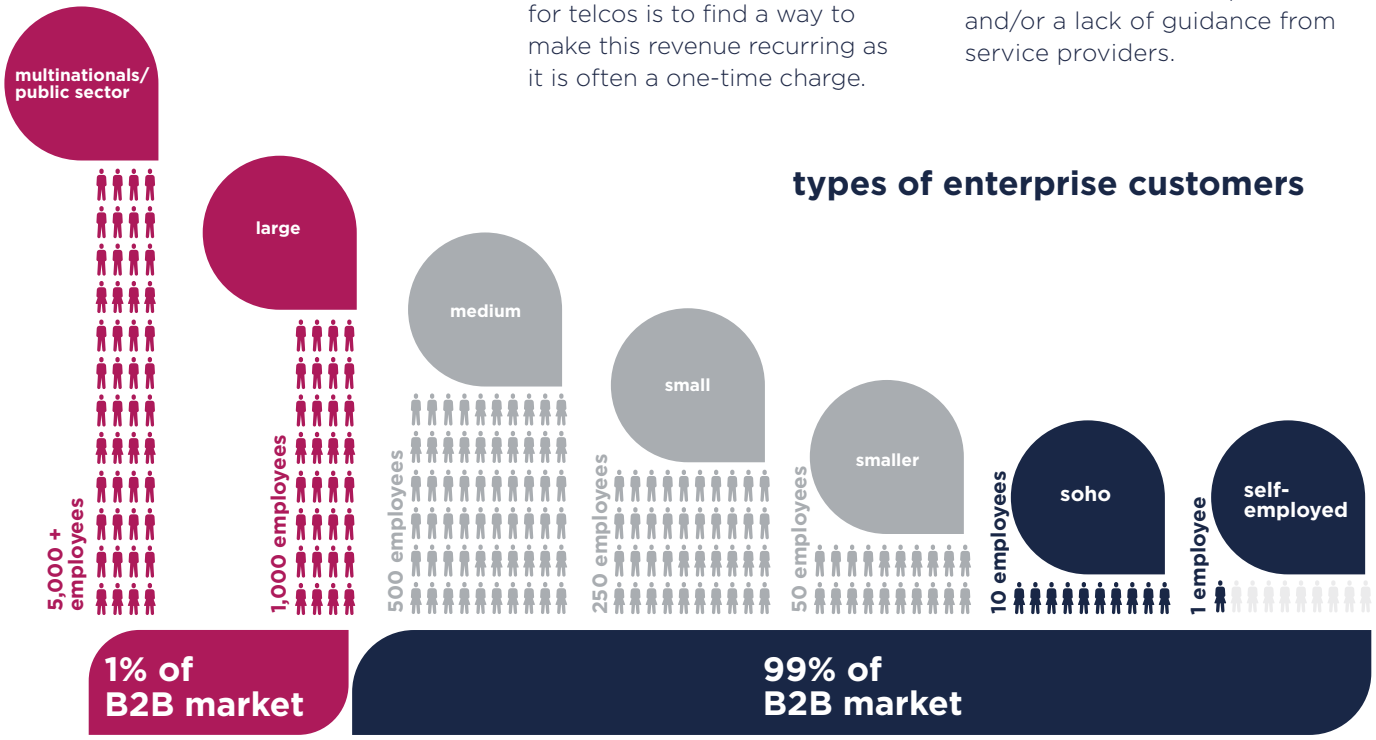
- **Network** – the CSP delivers connectivity and voice and/or data communications across public fixed and mobile networks. Many enterprises are migrating to all-IP networks and adopting unified communications that bring together networks that were previously physically separate. Growing adoption of software-defined wide area networks (SD-WANs) and the migration of traffic from private networks into public clouds are putting immense pressure on operators' connectivity revenues.
- **Resale of software & hardware** – the CSP resells products from third parties (such as phone systems, routers, private branch exchanges and mobile phones) or software services. For example, many operators resell Microsoft 365 to small businesses as part of a package. Other categories of products that are resold by telecoms operators include unified communications, storage and security services.
- **Managed & professional services** – some CSPs separate these services, but they use the same business model. In the case of managed services, the telco manages a large private network on behalf of an enterprise. The growth of cloud computing and enterprises' adoption of hybrid-cloud and multi-cloud networks has breathed new life into this business for CSPs. Professional services often go a step further, providing systems integration for managed networks, but increasingly CSPs are delivering professional services in new areas such as IoT and security. The challenge for telcos is to find a way to make this revenue recurring as it is often a one-time charge.

Struggling to serve SMEs

Most CSPs segment their B2B customers based on size of company. A classic market segmentation looks like the graphic below.

Self-employed and small office/home office (SoHo) customers often buy products aimed at the consumer market, although operators have tried with mixed success to offer services such as IT support, backup, and internet/web tools and capabilities in order to move them to higher-priced plans.

The small and medium enterprise (SME) sector often gets caught between the SoHo market and larger enterprises. CSPs often contend that SMEs represent a good growth opportunity but admit that they struggle to serve them efficiently through physical and digital channels. Many SMEs are keen to increase their digital capabilities particularly in terms of how they serve their own customers but are held back by a lack of internal IT expertise and/or a lack of guidance from service providers.



TM Forum, 2021 (based on a graphic from Omdia)

Large incumbent CSPs (defenders) have business units dedicated to large multinational enterprises and government bodies, particularly telcos that operate in multiple countries or regions. They have dedicated account management teams for such customers, and increasingly these teams are expected to understand customers' business challenges and opportunities. Large enterprises make extensive use of public and private cloud solutions and are keen to leverage new technology in areas such as IoT, advanced analytics and AI.

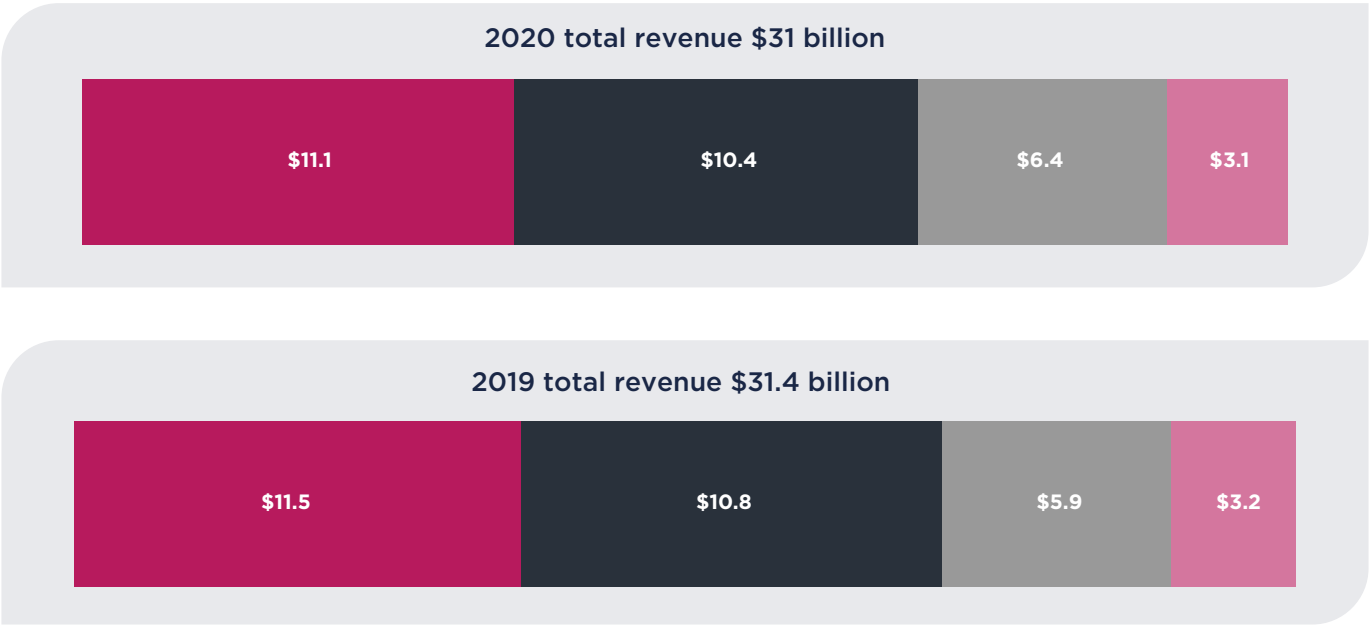
Breaking it down

Among the 31 telecoms operator groups analyzed in this report only Verizon splits revenue across different market segments in its financial reporting. The company divides B2B revenue, which amounted to $31 billion in 2020, into four categories as shown below.

Most large European operator groups, which have sizeable global businesses, likely have a similar breakdown. But the makeup of B2B revenue is very different for CSPs in countries that are not home to a lot of multinational companies and for operators that are mobile centric and therefore likely to focus more on SMEs and SoHo customers.

In the next section, we'll look at which of types of services and customer segments are growing.

Verizon's enterprise revenue allocation



TM Forum, 2021 (source: Verizon)

section 4:

which enterprise services have the most potential?

When it comes to increasing B2B revenue, communications service providers (CSPs) envision two phases. In the medium term, they will look at the strategy for the existing enterprise line of business and is likely to be based on how revenue and profitability are reported both internally and externally, with the focus very much on the next quarter or current financial year. Later they will consider how new technology and IT architectures can create new lines of business and revenue.

Only 17 of the 31 telecoms operator groups analyzed in this report publish B2B revenue in their financial reporting, and as noted in the previous section, only Verizon breaks down B2B revenue by type of customer. The table below shows enterprise revenue from 2018 to 2020 for CSPs that report it separately in their publicly available financial statements.

B2B revenue for selected CSPs 2018-2020
Revenue (US billions)

	2018	2019	2020	2020 B2B % of total rev
AT&T	30.9	34.5	30.5	18%
BT	7.9	7.6	7.4	27%
中国移动 China Mobile	6.1	6.6	6.1	5%
China unicom 中国联通	1.2	1.3	1.3	3%
T	16.9	17.4	18.6	16%
KDDI KDDI Research	8.1	8.6	9.1	19%
kpn	2.5	2.4	2.1	11%
kt	2.3	2.4	2.5	35%
MTN	0.9	0.9	0.9	7%

	2018	2019	2020	2020 B2B % of total rev
ooredoo	1.2	1.2	1.2	16%
Singtel	4.7	4.4	4.4	38%
Telefónica	10	9.8	9.5	19%
telenor	2.3	2	2.3	16%
Telia	0.7	0.7	0.7	9%
TELSTRA	5.8	5.8	5.4	34%
TURKCELL	0.6	0.7	0.9	17%
verizon	27.8	28.2	27.9	22%

TM Forum, 2021

The data does not suggest that the telecoms industry is on the verge of a B2B revenue explosion, even though operators grew enterprise revenue more than consumer revenue over the period. However, as noted, the selected two-year period is not enough time to show definitive trends because of the Covid-19 pandemic which resulted in many businesses delaying investments and some failing.

Six CSPs have increased B2B revenue. Deutsche Telekom has grown by stabilizing its T-Systems IT services unit and increasing B2B business at T-Mobile in the US. China Unicom has diversified beyond its core mobile business into fixed broadband and new ICT services, while KDDI is seeing strong growth in segments such as IoT, cloud and financial services.

> **“*Defenders* are likely generating 30% to 40% of their revenue from the B2B market, while *challengers* may be realizing less than 10% of revenues from B2B.**

Identifying trends in operators' B2B revenues is also difficult because many of the CSPs included in our research (Axiata, Deutsche Telekom, Orange, SingTel, Telefónica , Telenor and Vodafone) own operating companies in several countries that can be classified as *defenders*, *challengers* and *prospectors* (see page 11).

Defenders are likely generating 30% to 40% of their revenue from the B2B market, while challengers may be realizing less than 10% of revenues from B2B. Standalone defenders include AT&T (although the company has expanded aggressively in the consumer TV market in recent years), BT, KPN and Telstra. They all experienced flat or declining B2B revenue over the two-year period.

Tempering expectations

Looking at the B2B revenue totals overall, there is little to justify excitement about the potential for future B2B growth. The enterprise business is not significantly outperforming the consumer business, and in some cases B2B's share of total revenue is actually declining.

It is important to consider the impact of Covid-19 which has depressed revenues for 2019 and 2020. While CSPs' businesses generally have held up well over the period, operators have been hit by the decline in business activity along with business failures and down-sizing.

However, even without the pandemic it is unlikely that telcos' enterprise businesses would have performed significantly better than consumer services. Operators have only just begun to deploy 5G, and it will be some time before advanced core capabilities aimed at guaranteeing quality of service and low latency start to have an impact on top-line revenues.

The key issues impacting B2B revenue are and will continue to be:

1. **The continued decline of voice revenue** – KPN is one of the few CSPs that breaks out B2B voice revenue. In the last three years, the proportion of its total revenue coming from voice services has fallen from 6% to 4.1% in the Dutch market.

2. **The stagnation of the core fixed/broadband connectivity business** – revenues are flat, and in some cases declining, in many developed markets. The growing popularity of SD-WAN services for businesses is hitting revenue that telcos generate from MPLS, a technique for optimizing data networks. While MPLS is a relatively expensive solution, SD-WAN is highly competitive, with telcos fighting to secure a role. However, there is still strong growth for basic fixed broadband connectivity in many markets across the world, particularly mobile-centric markets in the Middle East, large parts of Asia, eastern Europe and Latin America.

3. **The speed of adoption of cloud, security and IoT services** – new ICT services are not easy to scale. Many CSPs now report revenue for some new ICT services like IoT, although it is not clear whether they all define “legacy” and “new” services in the same way.

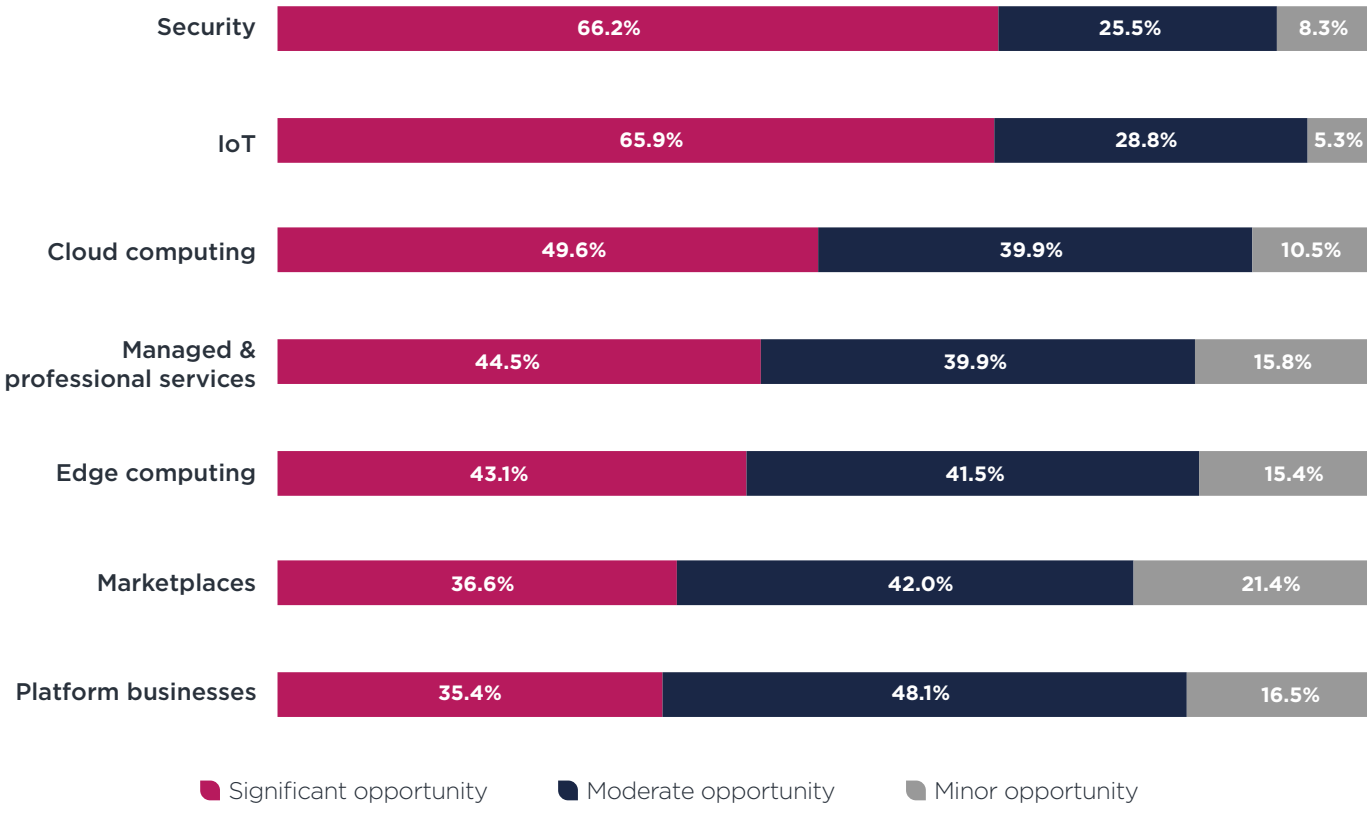
The promise of ICT services

Traditional managed network and professional IT services are typically provided only by incumbent or challenger CSPs that have fixed-line businesses. But new ICT services are much less reliant on the fixed network, which could lead to new revenue through 5G. Examples include:

- **Security** – this is a fast-growing category and one in which many telcos have made significant acquisitions. Security can either be sold as a standalone service or as an integral part of a managed network service.
- **IoT** – most operators include IoT within their new ICT services category even though an estimated 80% to 90% of operators' IoT revenue comes from connectivity.
- **Cloud** – Telcos are offering cloud computing services including secure WANs for large and small enterprises. Edge computing for applications requiring ultra-low latency could also be included, although we offered it as a separate choice in our survey (see below).
- **Managed mobile private networks (MPNs)** – MPNs are a new and promising line of business. Based on various market research estimates, the MPN market could be worth $5 billion to $8 billion by 2025, and CSPs are positioning themselves to build and operate them (see page 34 for more on MPNs).
- **Industry/vertical solutions** – this is a broad and largely undefined category of services aimed at specific vertical sectors such as manufacturing or automotive. Potential services likely will split along traditional product lines – namely connectivity, equipment resale and services. However, an emerging opportunity lies in service orchestration (see page 19).

In our survey, we asked CSPs which of these service categories represent the best opportunity for revenue growth. Security topped IoT but only slightly, with about two thirds of respondents calling each a significant opportunity. About half of respondents believe cloud services are a significant opportunity for growth.

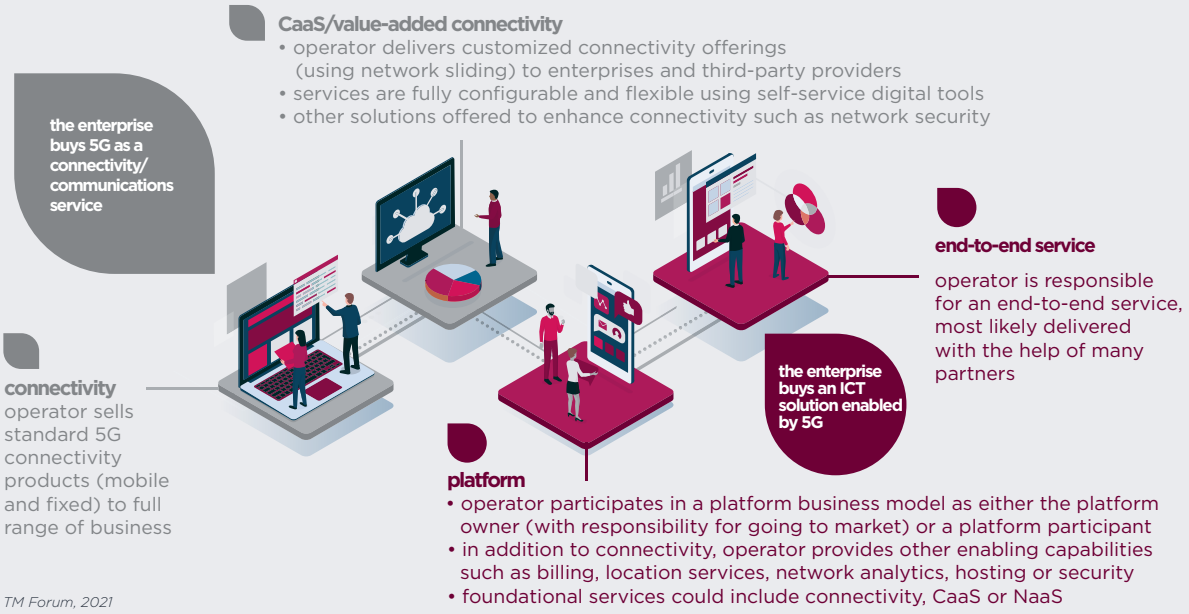
Best service categories for growth



TM Forum, 2021

Service orchestration represents a new opportunity for CSPs

Roles for CSPs in delivering 5G services



TM Forum, 2021

Service orchestration is a potential role for CSPs in delivering ICT solutions to large enterprises. The graphic above, originally published in our December 2020 report on enterprise 5G, shows four possible roles for CSPs in delivering 5G. Service orchestration could happen on either side of the diagram, and in some cases could overlap the roles.

Service orchestration as an extension of connectivity

Service orchestration as an extension of connectivity is how CSPs envision providing network slicing, which is a key promise of 5G. In a 5G core, network functions running as software on virtualized infrastructure allow operators to run separate networks over the same physical infrastructure. Using slicing, CSPs can allocate specific resources to an application, service, set of users or network.

Orchestration builds on the growing use of automation in networks. While automation eliminates manual network processes, orchestration is the process of stringing those tasks together. Service orchestration is needed across network elements and cloud computing functions, whether they are in a CSP's network, the public cloud, an edge cloud or the enterprise's private cloud. This process is critical to reducing complexity.

It may be a tough sell with enterprises, however, because they do not necessarily view connectivity and network orchestration as important to their business goals. Their primary focus is on the application or capability and the IT that enables it, and connectivity may or may not be required as part of the solution. If connectivity is needed, it likely must fit into an existing architecture rather than a new one built around connectivity.

Service orchestration as the coordinator of a complex partner ecosystem

Some CSPs envision acting as a coordinator of a partner ecosystem that seeks to deliver new services to enterprises using a platform business model. Integrating partners has always been a B2B requirement, one that professional services firms typically provide. But the process becomes more complex, and more crucial, as partners come together in platform business models.

The more capabilities within an overall B2B solution that a CSP can provide, the better its chance of playing the service orchestrator role. For example, a telco with a strong existing professional services practice, an established role as a reseller of hardware and cloud services, and a track record in managed services has a good shot at fulfilling the role because it already captures a large part of the overall value proposition.

Telcos will incur costs in delivering both types of service orchestration. In Section 12, we'll look at ways for them to not only recoup these costs, but also increase revenue.

Operators reporting revenue from new ICT services include a mixture of *defenders* and *challengers*. For the *defenders*, this revenue compensates for the loss of legacy revenue. For *challengers*, it represents net revenue growth.

We have not attempted to assess the profitability of new ICT services in this research, although our assumption is that even the most successful operators are recording low, single-digit EBITDA (earnings before interest, taxes, depreciation and amortization) margins.

In addition to highlighting new ICT revenue, some CSPs break down lines of business within the overall B2B category. We'll explore some of these opportunities later in the report.

Professional services

Most new revenue opportunities for CSPs sit within the managed and professional services categories – a broad, diverse set of services that require many new skills and capabilities. Many telcos have large managed and professional services businesses. Companies like BT, Deutsche Telekom, Orange and Telefónica, for example, generate between 30% and 40% of their B2B revenues, or 10% to 13% of total revenues, from professional services.

A large part of this business is managing enterprises' networks and in some cases IT systems. Services typically are customized, with telcos securing contracts by offering to manage their clients' systems at a lower cost than the enterprise would spend doing it in-house.

CSPs have targeted this business in the past expecting to build synergies and scale that allow them to significantly reduce costs, but they have had mixed success.

In some cases, the managed services business is seen as a "pull through" for the higher-margin managed network business and justifies accepting a lower level of profitability.

CSPs dominate the managed services business with some limited competition from professional services firms. However, the IT services landscape is much bigger and more competitive. In general, the further the services business is from the network, the less competence and fewer capabilities the telco is able to offer.

What's IT worth?

The market for IT services is huge, with multiple independent research firms putting the value at around $1 trillion. Players include:

- Global professional services firms such as Accenture, IBM, Wipro and Infosys which serve large multinational organizations (for example, Accenture works closely with hyperscale cloud providers)
- Global and regional systems integrators specializing in technology and IT (for example, NEC, Presidio and SCSK Europe)
- Specialist IT services companies that focus on specific regions or industries (for example, the UK's National Health Service has a dedicated division called NHS Digital which buys services from healthcare-focused IT service providers)

There is little data available to compare the profitability of CSPs' professional services practices with the other three types of providers. However, based on our research and conversations with both CSPs and systems integrators, we believe that CSPs' profitability in professional services is well below that of global professional services firms.

Defender operators need to transform their professional services organizations if they hope to rely on them for revenue growth. Global consulting firm Bain & Company suggests that telcos need to increase speed and agility to be more like the technology services sector.

This requires continuous innovation, constantly evolving partner ecosystems, making professional services an integral part of managed services offerings, and optimizing use of staff resources and talent. In terms of business models, Bain foresees a combination of low-margin, people-focused services that do not scale and higher-margin, subscription-based services that can scale through a platform business model.

It's worth noting that CSPs have varied relationships with professional services firms and IT service providers. They are big users of their services, particularly when it comes to integrating back-office systems. Professional service firms also provide strategy consulting services across different parts of the organization.

When it comes to providing services to customers they often partner – for example, if an enterprise expresses a clear preference for working with a specific systems integrator. But they are also becoming competitors as some CSPs are seeking to build new revenue streams by providing digital transformation services to businesses.

In the next three sections, we'll look more closely at the most promising new lines of business: security, IoT and cloud services.

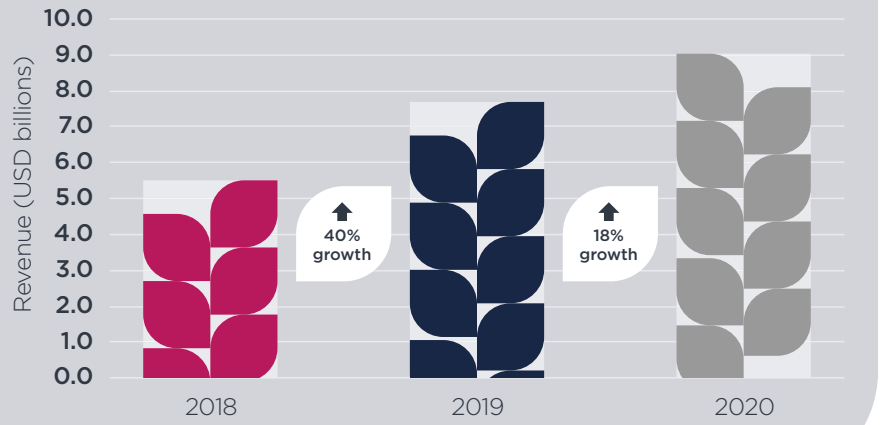
section 5:

security services are an emerging sweet spot for telcos

Security, especially cybersecurity, is a growing challenge for all enterprises as they accelerate digitization of their networks, operations and relationships with customers. It is an issue for communications service providers (CSPs), too, but it is also one of their best opportunities to tap new revenue as providers of managed security services.

In the survey conducted for this report, CSPs chose security as the most promising sector for new revenue growth with two thirds calling it a significant opportunity. Based on our research, we estimate that revenue for security services grew by almost 20% in 2020.

Total security services revenue for telecoms worldwide 2018-2020



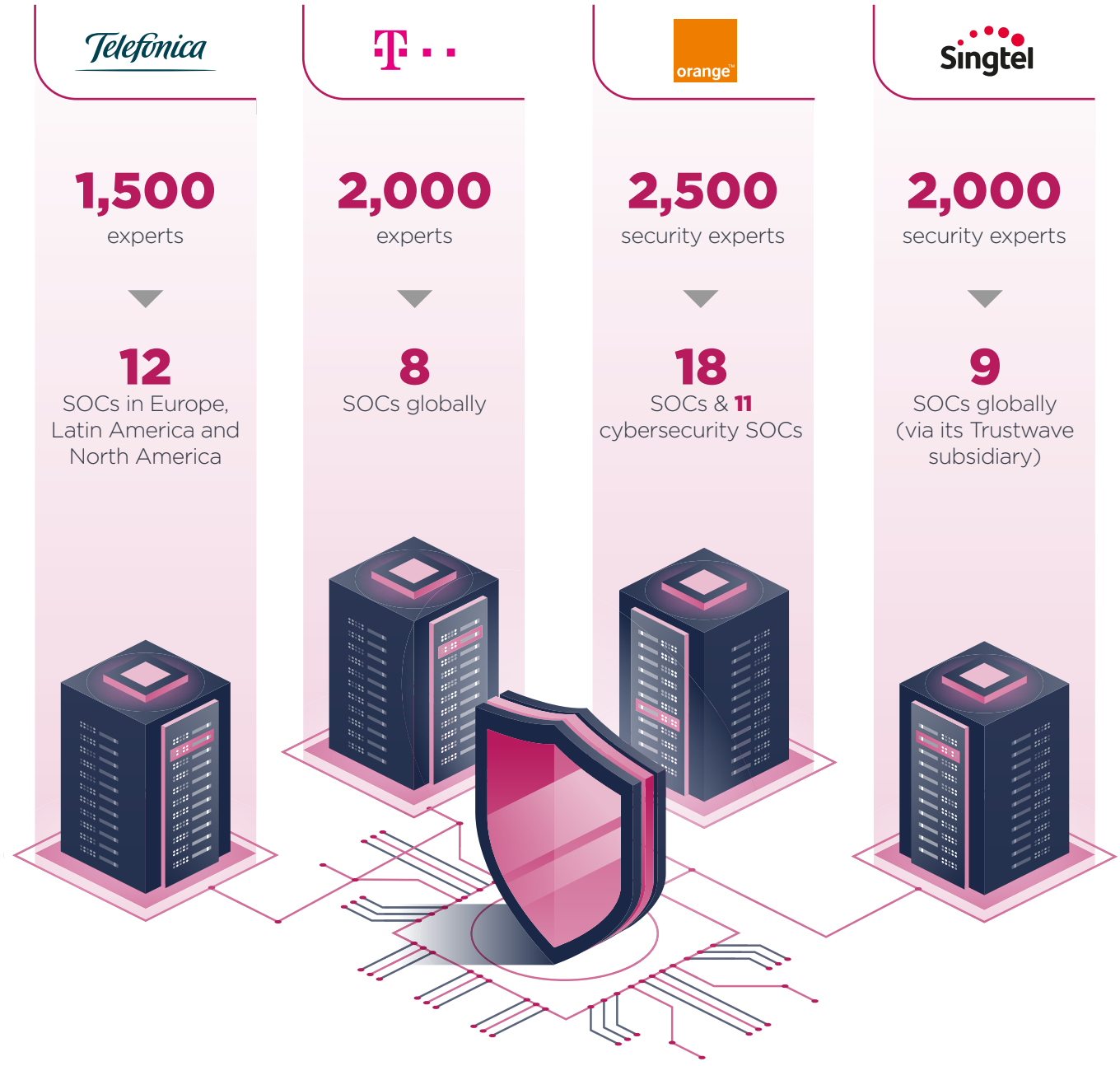
TM Forum, 2021

Security services revenue for selected CSPs 2018-2020 (USD millions)

	2018	2019	2020	2020 Security % of total revenue
T-Mobile	N/A	N/A	481	0.4%
orange	535	661	879	1.8%
Singtel	404	416	415	3.6%
SK telecom	260	1,073	1,204	7.2%
Telefónica	N/A	490	552	1.1%

TM Forum, 2021

Telcos deliver expert security



Telcos' businesses are particularly susceptible to security breaches. They face prolonged attacks, in some cases from foreign governments, which can go unnoticed for long periods of time. CSPs are targeted because they operate critical national infrastructure and deliver connectivity to a country's entire population. But in implementing policies, strategies and technologies to thwart cyberattacks, they have developed capabilities they can sell.

Many CSPs offer managed security services to enterprises of all sizes. To perform this role, they need to employ large teams of cybersecurity experts and offer products and services that enable enterprises to anticipate, identify, prevent, detect and respond to attempted security breaches. It is not uncommon for a telco to employ 2,000 or more experts in its security operations centers (SOCs).

Acquiring security expertise

Most large CSPs have bought security companies to get into the managed security services business or to bolster their strategies. In some cases the operators have allowed the companies to retain their brands and continue operating with a degree of autonomy.

Orange, for example, made two major acquisitions – Secure Link and Secure Data – and both continue to operate as standalone businesses. But the telco also offers security services via its Orange Business Services subsidiary.

While Secure Link and Secure Data offer pure-play security services and serve a whole range of medium and large companies, Orange Business Services mainly offers security as part of larger managed telecoms infrastructure projects. Such projects increasingly focus on the transition to cloud-based technologies, adoption of edge computing and new vertical market use cases.

Timeline of telco security acquisitions

JUNE 2013 – Telefónica
Informatica 64
Telefónica's Eleven Paths security subsidiary is the result

AUG 2015 – Singtel
Trustwave
Provides managed security services globally; $582m deal

NOV 2016 – TELSTRA
Cognevo
New Zealand-based cybersecurity analytics firm; $2m deal

MAY 2018 – SK telecom
ADT Caps
Physical security specialist; $1.2bn deal

JULY 2018 – AT&T
AlienVault
Provides cybersecurity detection & response

JAN 2019 – orange Business Services
SecureData Group
Largest independent cybersecurity service provider in the UK; $164m deal

JAN 2019 – verizon
ProtectWise
Provides a cloud-based network detection & response platform

FEB 2019 – swisscom
United Security Providers
Provides managed security services for enterprises; has 200 specialists

MAY 2019 – orange Business Services
SecureLink
Provides specialist services, consulting, maintenance; $629m deal

JULY 2019 – SK telecom
SK Infosec
Provides managed security services to 570,000 customers

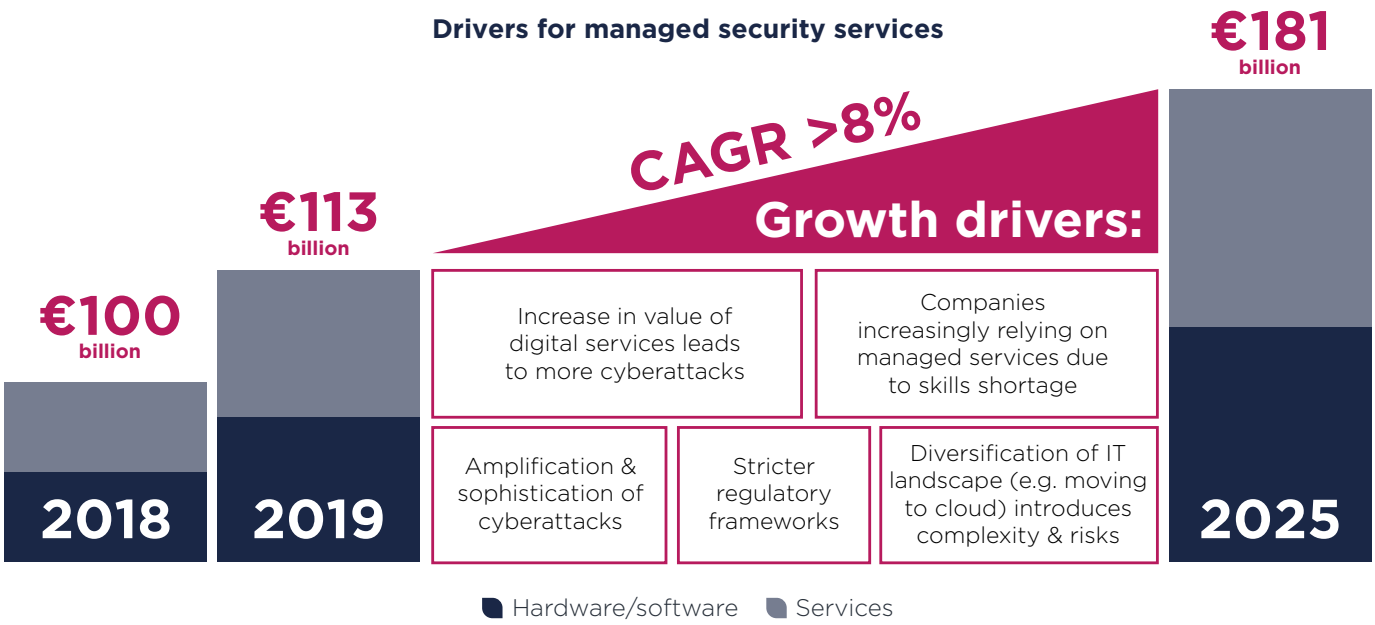
JUNE 2020 – etisalat
Help AG
Provides secure cloud enablement & secure access service edge

JUNE 2020 – Telefónica
Govertis
Advisory firm specializing in governance, risk & compliance

AUG 2021 – Telefónica
iHackLabs
UK company specializing in cybersecurity testing & training

AUG 2021 – BT
Safe Security
BT was the lead investor in a $33m round of funding

Drivers for managed security services



TM Forum, 2021 (source: Gartner & Orange)

Growing the business

The cybersecurity market is growing by 8% per year according to Gartner, which gives it an approximate value of $150 billion in 2021. If CSPs could capture just 10% of the total market, it would equivalent to almost 1% of total telecoms revenue.

CSPs are relatively small players in the security services market, which is dominated by global IT services companies such as IBM, Accenture and Atos, alongside specialist firms such as DXC Technology and Secureworks. However, several Tier 1 operators are already generating significant revenue from security services, either through acquisitions or acquisitions plus organic growth. They include AT&T, BT, Deutsche Telekom, NTT, Orange and Verizon which all provide a wide range of security services to large and medium enterprises. Based on the companies' publicly reported financial data and our estimates, we believe each is generating at least $100 million in revenue, and some could be generating close to $1 billion.

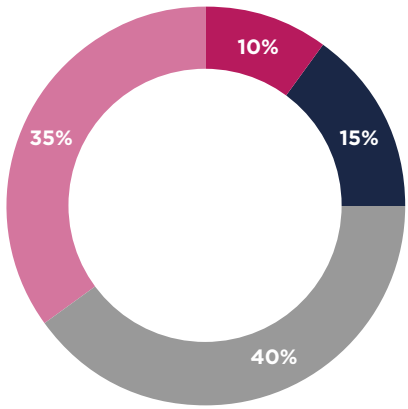
Types of services

Traditionally, enterprises have taken a siloed approach to security, spending separately on hardware security, identity protection and managed devices. But the growing threat posed by cyberattacks is leading many to adopt a more holistic strategy that includes buying consulting and auditing services.

Following are the areas that most enterprises want to protect from cybersecurity threats:

- **Networks** – many large organizations operate private networks that require the same kind of security as the public network. As enterprises increase their use of software-defined wide area network (SD-WAN) services, vulnerability to security breaches increases because each internal router connects into the public internet rather than a dedicated private network.
- **Remote workers** – the growing popularity of home-working, particularly during the pandemic, has exposed companies' employees to scams using emails, text messaging and voice calls. While the bring-your-own-device trend is not new, the increase in home working will necessarily result in wider use of corporate applications on employees' own devices.

Breakdown of Orange Business Services' security revenue by business model



TM Forum, 2021

- **Cloud networks** – enterprises are increasing their use of public and private cloud services. Hybrid cloud networks require the same kind of protection as private communications networks. Generally, the more suppliers, networks and systems involved, the greater the security risk.
- **IoT** – most large organizations are deploying or planning to deploy IoT networks, and given that such services will often support critical applications, security is a primary concern. Researchers have identified real or potential security risks through devices as diverse as light bulbs, printers, gas stations, smart speakers and security cameras.

Even if small and medium enterprises wanted to hire talent, they likely could not as a global shortage of security experts and the high cost of recruiting such talent are insurmountable obstacles. For these companies, using a managed security service is the most viable option.

Large enterprises, particularly in verticals such as financial services, have built considerable in-house cybersecurity expertise, but a large proportion of small and medium enterprises (SMEs) do not have internal expertise. Even if they wanted to hire talent, they likely could not as a global shortage of security experts and the high cost of recruiting such talent are insurmountable obstacles. For these companies, using a managed security service is the most viable option.

Telcos gain confidence

As noted, CSPs offer security services through SOCs, where experts identify, investigate, prioritize and resolve potential or real security issues. Operators build SOCs wherever they have large numbers of customers, so the telcos offering global services have the most SOCs.

Many operators now talk confidently to their shareholders about the performance and potential of their security businesses. For example, Orange Business Services held a half-day analyst event in August with a specific focus on security services.

Orange splits its revenue from security services into four categories: consulting, integration, managed security service and equipment resale. The first three, which represent 75% of Orange's total security revenues, include IT services and require the deployment of large teams of experts. Orange has 2,500 security experts worldwide.

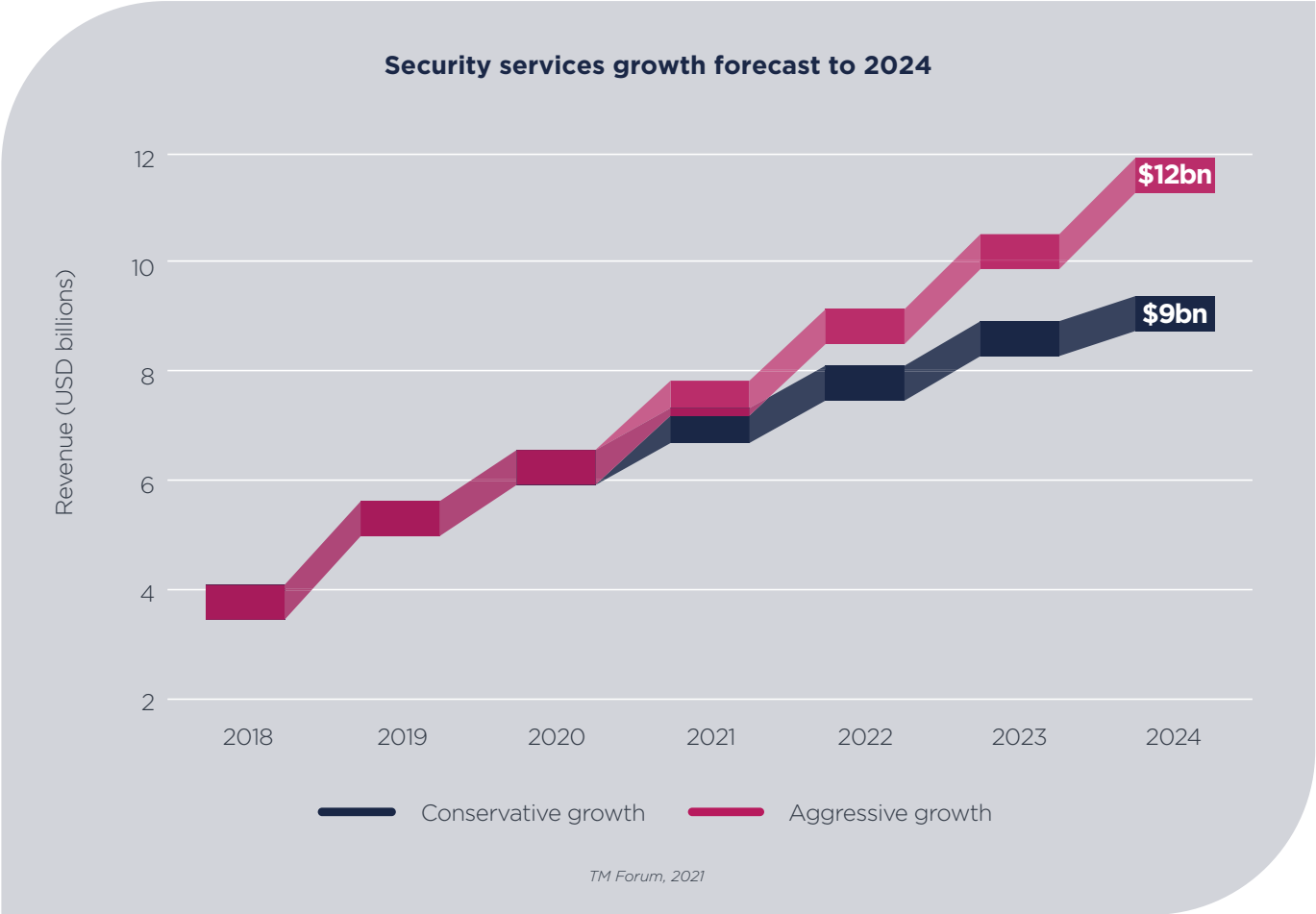
Security for consumers

While security services are principally aimed at enterprises, some CSPs offer security services in the consumer market. For example, Swisscom has launched a travel insurance service called Easy Cyber Insurance which offers customers legal protection while web-surfing and smartphone protection.

South Korea's SK Telecom has a dedicated security services subsidiary called SK Infosec which offers a full range of physical security products, software and services. The telco is planning an initial public stock offering for its security business and aims to position it as a "Life Care Platform Provider" that "assures safety and protects lives and properties of people…by encompassing physical and cyber security domains."

Orange, SingTel and Telefónica publish annual or quarterly revenue numbers for their security businesses, while other CSPs provide "snapshots" of their security businesses. For example, Deutsche Telekom's T-Systems professional services subsidiary discloses the percentage of its total revenue that comes from security services.

Swisscom reports that its security revenue doubled between 2016 and 2020. Telecom Italia's security revenue, which comes from its dedicated Telsy subsidiary, grew by 20% year-on-year in the first quarter of 2021. Vodafone, meanwhile, aims to triple its security revenue between 2021 and 2025.



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Security services outlook

CSPs' security services businesses will grow with more deployment of new connectivity and computing services such as 5G, cloud, edge, IoT and mobile private networks. The adoption of open architectures to support these services will increase the points of vulnerability in enterprise networks, systems and processes.

CSPs that have already invested heavily in security capabilities are confident about the potential for growth and synergy between their security and core network businesses. We believe that revenue growth rates of 10% annually are realistic for this group of operators.

As noted in the introduction to this report, this forecast and others are based on a combination of moving-average model forecasting from historic data, analysis of growth actuals from comparable segments (in telecoms and IT sectors), and adjustments for current market pressure resulting from the pandemic.

CSPs with smaller enterprise lines of business are likely to find it difficult to make a case for buying or building a security services business, but they can partner to develop capabilities. Vodafone, for example, is targeting the SME market through a partnership with Accenture.

Rather than partnering with firms that provide professional security services, some small CSPs may choose to partner with Tier 1 telcos. For example, earlier this year Telekom Malaysia announced that it is working with Telefónica Tech, an ICT services division that Telefónica launched in 2019 (see page 33), to develop a global cybersecurity strategy for the Malaysian market.

In the next section, we'll look at growth potential for IoT services.

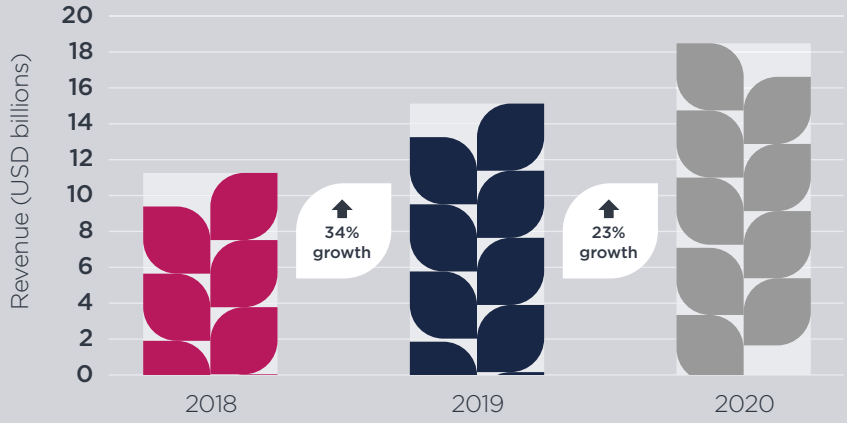
section 6:

IoT services continue to post strong growth

In the survey conducted for this report, more than 65% of communications service providers (CSPs) chose IoT as the second most promising sector for new revenue growth, just behind security services. While the last five years have not witnessed the explosive growth that many observers predicted for IoT devices and services, our research finds the sector performing well, posting double-digit percentage growth.

AT&T, China Mobile and Vodafone are hitting or nearing $1 billion in annual revenue from their IoT lines of business, with China Mobile showing significantly more growth in the number of new connections than telcos in Europe and the US. Due to the wide variation in types of products and services under the IoT banner, many operators are deploying an agile platform model from which to launch many flavors of service, with CSPs in China leading the way (see page 28).

Total IoT revenue for telecoms worldwide 2018-2020



TM Forum, 2021

IoT services revenue for selected CSPs 2018-2020 (USD millions)

	2018	2019	2020	2020 IoT % of total revenue
China Unicom	303	443	614	1.4%
kpn	53	62	68	1.1%
ooredoo	55	60	66	0.9%
Telefónica	221	231	236	0.5%
telenor	81	90	105	0.7%
Telia	90	113	135	1.6%
TELSTRA	138	145	151	1.0%
vodafone	747	920	1,149	2.2%

TM Forum, 2021

Operators in China lead on IoT architecture

The operational architecture that mobile operators are deploying to maximize IoT success is a good example of the future mode of operations that CSPs are targeting with the TM Forum Open Digital Architecture, part of the Open Digital Framework (see page 59). China Mobile and China Unicom are particularly advanced in their development.

The world's largest IoT provider, China Mobile is cooperating with nearly 1,600 member enterprises on IoT categories including transportation, logistics, power grid, home appliances, security protection, healthcare, industry, agriculture, and environmental protection. In order to address these diverse use cases, they have deployed an open and agile business platform for service innovation utilizing:

- Cloud native software
- Microservice architectures built to industry standards with TM Forum Open APIs
- Metadata drivers
- Layer-by-layer decoupling between services
- DevOps development methodologies

The roll out of service versions takes weeks instead of months, and China Mobile has been working on shifting the focus from being a data pipe to differentiated network capabilities, and from simple services to multi-services and convergence, which has been one of the key challenges for mobile operators looking to build their IoT business over the last decade.

To advance its IoT capabilities, China Unicom Group is using blockchain technology and APIs to develop a centralized data-sharing platform across 31 subsidiaries. The platform is based on the ODA and uses 25 Open APIs along with other TM Forum assets. It relies on using mobile numbers to verify users and allows data to be referenced between systems, rather than replicated.

China Unicom is using the platform to share data with over 1,000 enterprise customers in more than 20 industries, such as banking, insurance, technology, ecommerce, aviation, real estate, consulting, handset vendors, government, education, media, manufacturing and tourism. This includes 74 automotive companies responsible for around 15 million connected cars.

Read this case study to learn more about China Unicom's approach

Some telcos are specializing in industry verticals where they anticipate good growth. AT&T, for example, is making a push in the automotive sector, while Vodafone is marketing solutions for smart agriculture. The pandemic has affected IoT growth because most services include an end device that field engineers must install. So, CSPs' abilities to deliver were curtained slightly during 2020 and the first half of 2021.

Waves of connections

IoT has been a focus for many B2B mobile operators as it centers around their core competency of delivering wireless connectivity to devices with additional services on top. However, the first wave of mass-produced IoT devices were for applications like utility meters, smart buildings, inventory management, fleet management and smart manufacturing.

These use cases have presented a challenge for CSPs because connectivity can be provided by competing providers. The use cases require small amounts of data to be sent on a semi-regular basis, and the devices are usually in fixed positions within buildings, so alternative connectivity arrangements can be made using Wi-Fi or LoRa, for example.

While LTE has not been used widely for wireless IoT connectivity, use of 5G is growing for applications in the automotive sector. AT&T has brokered a deal with General Motors to bring 5G connectivity to millions of vehicles coming off the assembly line in the US over the next decade, while Deutsche Telekom has formed a partnership with BMW to provide 5G connectivity to all new connected vehicles via eSIM. This is the new wave of IoT which will require high bandwidth

connections to moving vehicles for telemetry data and entertainment packages.

CSPs are optimistic about growth in business models such as this, because much of the work going into perfecting connectivity for connected cars is paving the way for autonomous vehicles, where mobile operators could offer network slicing for vehicles in future, high-value service models.

The role of 5G will not be restricted to mobile devices, however. In the fixed wireless replacement model, 5G eSIMs may be embedded in consumer devices like smart TVs so that they can be connected to wireless networks instead of home broadband. Mobile operators are leveraging the characteristics of 5G to innovate new partnerships with manufacturers to establish new lines of business across many verticals.

IoT connectivity conundrum

However, a looming and potentially serious challenge for CSPs is that the IoT value chain is often best served by specialist integrators and platform providers, not the connectivity provider (see below). This means it is difficult for telcos to win a dominant share of total service revenue. Our research finds that the connectivity portion of the value chain is currently only worth around 5% of the total value of an IoT deal.

Drones-as-a-service shows potential roles for CSPs & partners

Devices
In some early proofs of concept, smartphones have been strapped into the drone. For full commercial deployments, 5G modules will need to be embedded into the electronics of the drone itself.

Applications development
Drones-as-a-service will likely involve the use of applications built on geographical information systems. These apps will need to be customized for sectors such as agriculture, utilities, and oil and gas production, and for segments within each vertical. For example, drone applications could be used to increase efficiency or improve security for utilities, or to monitor pest damage and identify growth in agriculture.

Applications deployment & enablement platforms
This role can be played by different types of companies, but it is often played by drone operators. Zipline, for example, specializes in delivery of medical supplies via drone.

Connectivity
Drones rely on wireless connectivity. Communication is needed for management to support authentication and authorization, while command and control communication is needed to fly the drone. Payload data transmission is also needed to support the applications onboard the drone, such as high bandwidth video streaming for news gathering. For collision avoidance, drones may require means to communicate with other nearby drones.

Software infrastructure
Drones can generate huge amounts of data based on the application and number of units deployed. Some of this may be extremely time sensitive and require immediate processing to generate real-time insights. Drone operations and data processing likely will take place in a public cloud to meet these objectives, ensure security and help applications scale.

Hardware infrastructure
Remote gateways to process, filter and upload real-time information to the cloud are needed, as well as a drone control station.

Systems integration
Today drone operators handle systems integration with help from specialist firms, but large global systems integrators are also beginning to build competence in this area. CSPs could partner or acquire expertise to offer management of drones-as-a-service.

Breaking down the revenue potential of an IoT deal

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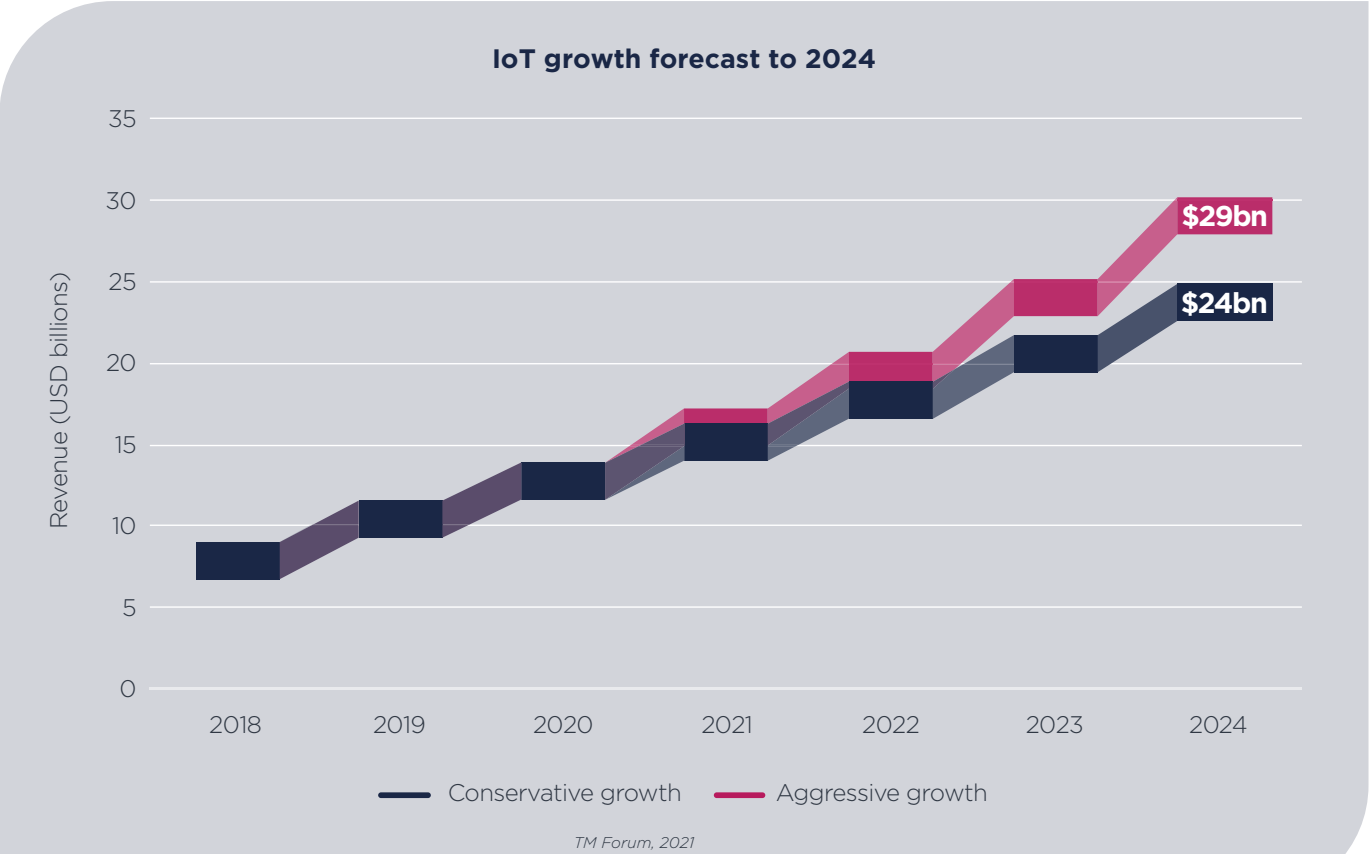


CSPs need to widen their influence, and the most likely way to do this is by delivering software applications. Indeed, this is where most revenue growth for mobile operators is happening – enabling B2B2X business models centered around connectivity offerings.

Vodafone Business, for example, is taking a platform approach to providing IoT connectivity, device management and application enablement all in one bundle. From these platforms, business customers are given a one-stop-shop to start building their own innovative offerings.

Many mobile private networks (MPNs) are industrial site deployments that include a large number of IoT connections. The problem for mobile operators, however, is that they are not the main contractor and therefore are not winning large portions of revenue from the deals. We'll discuss this more in Section 9.

IoT outlook

IoT has been the big hope for the telecoms industry over the last decade, and indeed it is the largest of the new service categories we have analyzed. The potential for growth in IoT is somewhat limited because CSPs are only delivering connectivity as part of the solutions. If they can start to add value in applications and enablement of applications, the potential for growth is huge.

The diverse nature of IoT use cases is an operational challenge for CSPs. But as operators continue to move towards a service platform model, they will be able to deliver turnkey solutions and lead partner ecosystems, which should appeal to enterprises. Standalone 5G will have a catalysing impact on IoT as many operators believe network slicing will unlock a new wave of opportunity for machine-to-machine communications.

In the next section, we'll look at the revenue potential for cloud services.

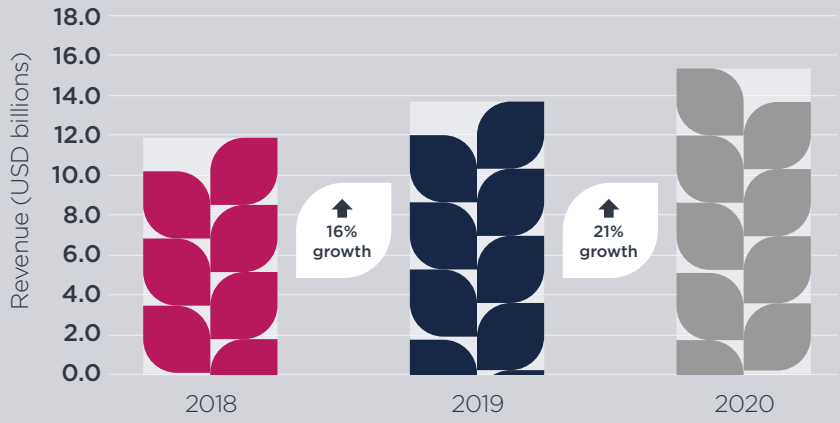
section 7:

could cloud services become big business for CSPs?

In our survey of communications service providers (CSPs), cloud computing services such as secure wide area networks (WANs) for large and small enterprises are another strong opportunity for revenue growth. Indeed, our research finds that, like IoT services, cloud services experienced double-digit percentage growth from 2019 to 2020, and we are forecasting that this trend will continue into 2024 as CSPs leverage their existing relationships with enterprises to increase loyalty.

CSPs are migrating their own IT workloads to the cloud as part of ongoing digital transformation programs. In doing so, they are building a large pool of skills that is transferrable to providing cloud services to business customers. Much of the sales activity in this segment is happening with telcos' existing customer base as CSPs draw on the relationships they have with companies to deliver business connectivity.

Total cloud services revenue for telecoms worldwide 2018-2020



TM Forum, 2021

Cloud services revenue for selected CSPs 2018-2020 (USD millions)

	2018	2019	2020	2020 cloud % of total revenue
China unicom中国联通	140	349	559	1.3%
NTT docomo	87	91	94	0.1%
Spark nz	248	295	297	12.3%
Telefónica	594	708	887	1.8%
Telia	52	58	64	0.7%
TELSTRA	301	303	306	1.9%

TM Forum, 2021

Edge & ecosystems

Several of the CSPs we interviewed for this report said they are exploring how to provide cloud platforms for multi-access edge computing (MEC). For example, Singtel is leveraging investments in MEC over the last few years to offer a high-speed, low-latency connectivity package bundled with edge cloud services. The aim is to address enterprise markets where customers need the cloud to run data analytics and AI applications at the edge.

Combined with 5G radio access networks, a platform model like this can address many new B2B service models. A good example is an industrial application such as robotics in manufacturing plants, where the operational data for the plant needs to be stored at the edge in order to lower latency and ensure super-fast reaction times.

Another growth area in CSPs' cloud services portfolios is connecting existing clouds, or augmenting cloud ecosystems with advanced connectivity options. For example Verizon's Secure Cloud Interconnect offers a private connectivity suite for connecting multiple clouds without using the public internet. The service provides the enterprise customer with a single interface to manage everything in the ecosystem, from cloud storage to management and orchestration.

With the increasing complexity and cost of point-to-point communications for private cloud and the security concerns of public internet connections, this kind of offering is resonating well with business customers looking for a trusted supplier to pull the whole arrangement togther. In many cases, these business models overlap with telcos' security businesses (see Section 6).

Building clouds

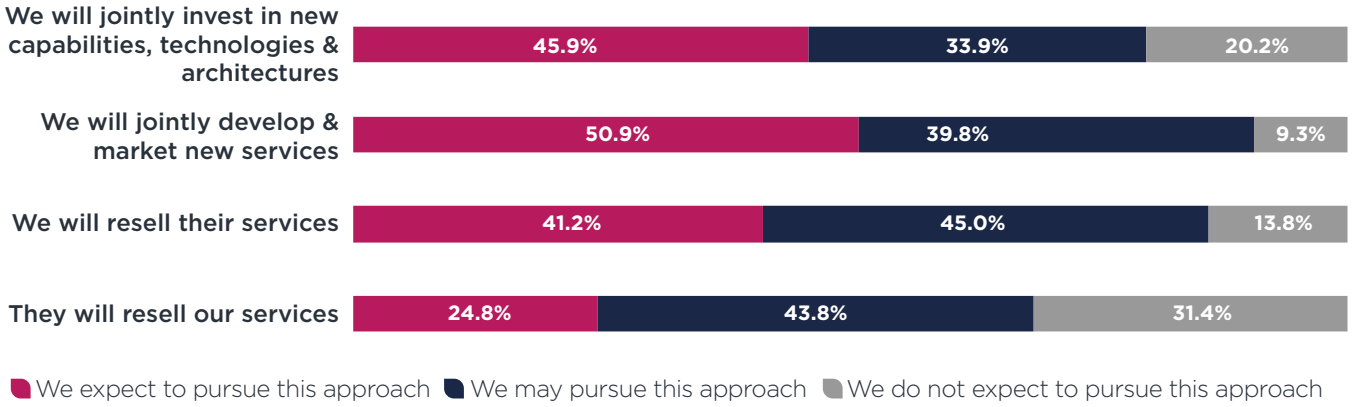
CSPs with a network of data centers have been able to leverage existing infrastructure by building clouds and delivering services using a blend of their own capacity and that of cloud providers including Amazon Web Services (AWS), Microsoft Azure and Google Cloud Platform. BT Global Services is taking this path to market to establish a wide geographical reach beyond its own domestic markets.

However, few operators been successful building a global network of data centers to deliver B2B services, and to some degree telcos' ambitions to reach beyond domestic or local markets have decreased. This is mainly due to the infrastructure costs involved at global scale, but cloud adoption may reset the return-on-investment calculation for operators with global reach.

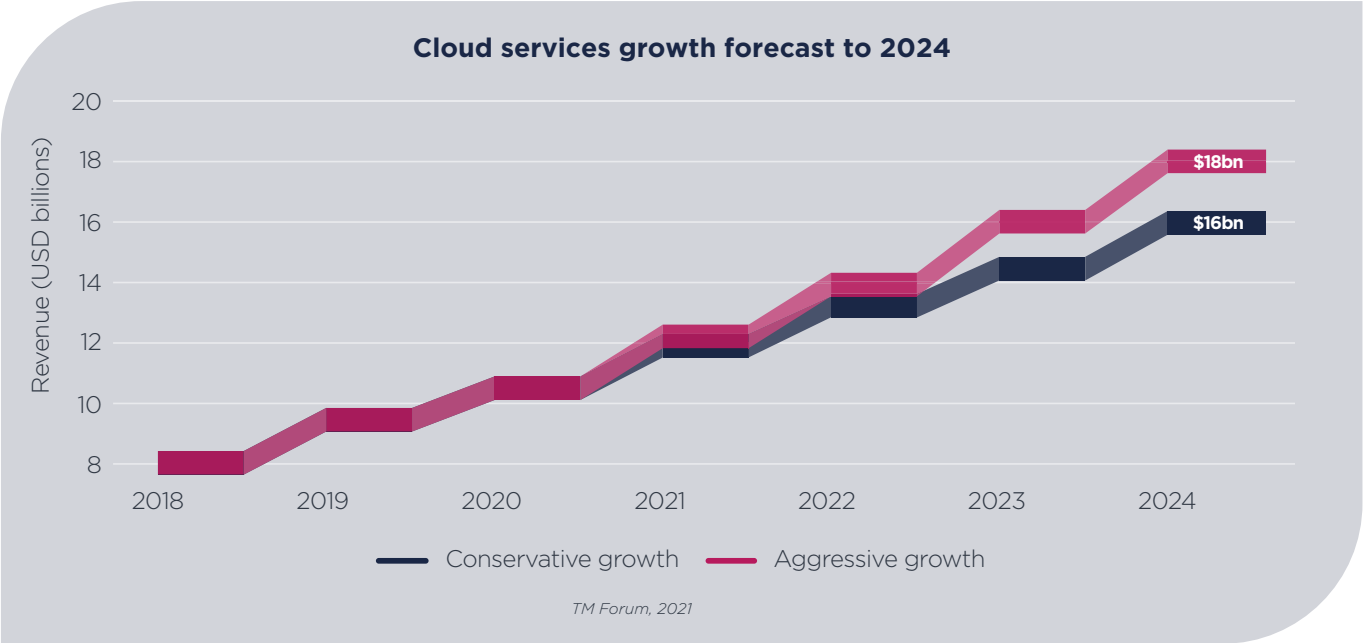
CSPs are still adjusting to commercial and operational relationships with hyperscale cloud providers. When we asked CSPs what role hyperscalers will play in their growth strategies, more than half said that telcos will jointly develop and market new services with hyperscalers.

Some large CSPs are aiming to supply cloud services to government bodies. Vodafone Business, for example, offers a private cloud solution called Flexible Computing for Government, which features hightened security for the storage and transport of sensitive data. Building industry-specific solutions like this is testement to the concept of a cloud delivery platform, where features of cloud configuration and connectivity can be fine tuned to meet a set of specific needs.

Role for hyperscalers in CSPs' growth strategies



TM Forum, 2021



Acquiring expertise

Telefónica used an acquisition strategy to create a new business unit to address the cloud services opportunity. Telefónica Tech helps corporations migrate their IT operations onto cloud platforms such as AWS, Google Cloud Platform and Microsoft Azure, and then sells its own services such as connectivity, cybersecurity and big data analysis on top.

Telefónica Tech acquired Altostratus Cloud Consulting, a multi-cloud expert and Google Cloud Platform partner, and Cancom, a UK-based professional and managed services company specializing in multi-cloud and security.

The strategy is paying off. Telefónica's revenue from cloud services increased by more than 20% in 2020, and cybersecurity sales rose 12%. Indeed, the company had the highest growth of companies we tracked in this sector. Interestingly, Telefonica is now considering selling a stake in Telefónica Tech.

Acquisitions can bring new talent into the CSP, and generally it is better for the telco to allow these units to retain their autonomy in order to promote innovation and brand awareness. We expect to see more acquisition activity as CSPs look to exploit their current growth into the cloud services space.

Managing multi-cloud

In their own migration to the cloud, CSPs are concerned about the idea of being locking into a relationship with a single cloud provider for certain IT systems. To address this, they are partnering with vendors like Red Hat which provides a management layer for multiple public clouds using a multi-cloud aproach. Now telcos are looking to use their multi-cloud experience to offer similar services to enterprises.

Businesses often don't do a good job of tracking the resources they are using compared against their bills. CSPs can help by enabling them to pay for exactly what they use. Telstra, for example, offers a suite of cloud management services designed to give customers choice and flexibility in using multiple cloud providers while optimizing costs based on usage.

Cloud outlook

Not all CSPs are sold on providing cloud services because they worry that new service models could cannibalize existing B2B revenue in areas like data storage. However, progressive operators such as Telefónica and Verizon have taken what they are learning on their own journeys to the cloud and packaged it as services for large and small enterprises.

We are forecasting reasonably strong revenue growth from a small number of CSPs for the medium term. Success beyond that will depend entirely on the competitive landscape.

If business customers can get world-class cloud services from their existing connectivity provider as part of a bundle, they likely will. However, if the services on offer from hyperscale cloud providers are superior, with low-friction onboarding and integration, then CSPs may struggle to grow their cloud services businesses.

In the next section, we'll look at some other new ICT services that are likely to lead to revenue growth.

section 8:

MPNs, data-as-a-service & verticals also promise revenue growth

In addition to security, IoT and cloud, other enterprise services hold the promise of new revenue for communications service providers (CSPs). Some are services in emerging B2B segments like mobile private networks (MPNs) and data- or data analytics-as-a-service, while others are new ICT services targeting specific verticals such as healthcare or media and entertainment.

Finding a role in MPNs

As noted, mobile operators plan to provide enterprise 5G services over their macrocellular networks using network slicing and edge computing, but it likely will be two to three years or more before they have the capabilities to deliver slicing end to end across their access and core networks. In the meantime, a new market has emerged for MPNs where there is no existing LTE or 5G coverage, or where coverage is insufficient or unreliable.

Research for our recent report, *Mobile private networks: Exploring the CSP opportunity*, found that more than 150 MPNs have already been announced globally. The sectors seeing the most activity are manufacturing with automotive manufacturers, leading the way; transportation hubs, principally airports and ports; and energy and utilities including mines and electricity companies.

Read the report to learn more about MPNs:

Speaking at an industry conference earlier this year, Verizon Chief Revenue Officer Sampath Sowmyanarayan predicted that the MPN market could be worth between $7 billion and $8 billion by 2025. But only a portion of this is available to telecoms operators because most MPNs are being built by traditional network equipment providers including Ericsson, Huawei and Nokia or emerging technology vendors such as Parallel Wireless, Mavenir and Athonet in partnership with hyperscale cloud providers.

Telcos are competing with professional services firms and specialist MPN service providers such as Edzcom and Geoverse to lead the services contracts for MPNs. They are offering enterprises multiple options, from managing their entire core network to managing only certain core network elements.

Large network equipment providers such as Ericsson, Nokia, Huawei and Samsung are winning close to 60% of MPN deals, while CSPs are chosen as the main contractor just 19% of the time. So, while private networks may be a growth market, the current addressable portion of the opportunity is small.

To boost their share, CSPs need to demonstrate that they can add value beyond what an enterprise could source from a systems integrator working with network equipment providers or from a specialized niche service provider. For example, operators could offer different pricing approaches and mechanisms such as MPN-as-a-service, which would allow the enterprise to pay for the network with a monthly fee rather than an upfront cost. Telcos also have existing skills in managed services which they could extend to MPNs.

Some mobile operators are focusing on the MPN opportunity. Three UK, for example, recently won contracts for the large shipping port in Felixstowe and London's Heathrow

Airport. Indeed, the private network model may be the answer to much of the business around industrial IoT and fixed site deployments, so there is a large amount of overlap in the departmental structure being formulated within IoT-focused mobile operators.

Making money from data

Mobile operators collect a wealth of data from their subscribers who are constantly connected to networks through smartphones and other devices. They can resell aggregated, anonymized data about customers and data-enabled insights to third parties as a service.

Our research has not identified any CSPs that publish revenue for data-as-a-service specifically. Based on the low visibility of such services on operators' websites and the use cases and customers they have disclosed, our impression is that it is a growing business but one that is making only modest revenue contributions.

Telefónica's O2 Motion subsidiary in the UK is one of the most prominent examples of data monetization. The company uses anonymized data from millions of individual smartphone users to provide insights, including:

- Audience insights for media agencies, advertisers and retailers
- Real-time travel insights for transport operators
- Movement insights aimed at organizations making planning decisions based on how where people are located
- Micro-location insights for organizations seeking to understand people's movements in a specific location such as on a street or in an apartment building.
- Travel and destination insights such as for rail travel to help railway operators model future passenger behavior and plan infrastructure investment

Other large CSPs are beginning to offer similar services. They may simply provide raw data, but often it's enhanced with a dashboard showing powerful visualizations. For example, Vodafone Analytics is a platform that analyzes telecommunications data based on users' geolocation and behavior. Vodafone partners with insight and visualization partners, Citi Logik and Carto to deliver data to business customers.

Singaporean telecoms group SingTel is increasing its data analytics capabilities as part of its broader push into new ICT and cloud-based services. In September it acquired Singapore-based ClayOPS and Hong Kong firm Velocity Business Solutions. Both are specialized providers of data analytics services.

> **"Mobile operators collect a wealth of data from their subscribers who are constantly connected to networks through smartphones and other devices. They can resell aggregated, anonymized data about customers and data-enabled insights to third parties as a service.**

Another opportunity to use location data is emerging as a result of the Covid-19 pandemic. Australian telecoms group Telstra has launched a service called Smart Spaces which is designed to help workforces return to the workplace more securely by using data from video cameras and sensors in buildings. For example, a company might be able to determine if social distancing is practical or being enforced in a space.

Along these lines, there is potentially a much bigger market for CSPs to sell data services to businesses to help them analyze their own data such as from IoT devices. Telcos can help companies use data to make business decisions and improve operational efficiency.

A vertical view

Traditionally CSPs have developed enterprise product portfolios horizontally so that they can be used across industries, and they have developed services for companies of a particular size. Now they are also developing services for specific verticals, which is consistent with their use-case driven approach to leveraging 5G and associated technologies.

We will be assessing CSPs' vertical approaches in our upcoming report *Enterprise verticals: Placing the right bets* which will be published in November. We will explore how much progress operators have made in various verticals and where they have genuinely developed new business as opposed to merely making statements of intent to target sectors.

In our survey for this report, we asked CSP respondents which verticals present the best opportunities for generating revenue growth for their organizations. The graphic below shows how they rank. Healthcare, media and entertainment, and payments services lead, with about half of respondents putting them in their top three picks.

Healthcare is already a hugely important market for telecoms operators to deliver their existing connectivity and communications services. Operators such as Telstra in Australia and TELUS in Canada are leading the effort to grow professional and IT services capabilities in the healthcare sector, with the focus very much on B2B rather than consumer services.

Financial services and media and entertainment sectors are interesting because the focus for

Best verticals for telco revenue growth

TM Forum, 2021

CSPs is more on B2C than B2B. Even though TV is a consumer service, the monetization of TV services includes both B2C and B2B revenues. As an example of B2B, many operators have sought to expand into the TV advertising market, but success has been mixed.

Swedish telecoms group Telia acquired TV group Bonnier Broadcasting in 2019, and advertising now accounts for 6% of the company's total revenues. But Verizon, which acquired the AOL and Yahoo! online businesses in 2017, sold them earlier this year. Similarly, SingTel acquired mobile advertising startup Amobee in 2012 but then announced in May that it was considering options for the restructuring or sale of the business.

We'll look more closely at the relationship between CSPs and enterprises in the next section.

section 9:

changing enterprises' perception of telcos

Understanding new value chains does not come naturally to communications service providers (CSPs). Many of them struggle with the concept of partnering in B2B and B2B2X scenarios and are uncertain how to use technology in new business models. But perhaps the biggest issue is that it is unclear whether enterprises view them as a potential provider of services beyond connectivity. Many CSPs presume that if they build cloud and security services, enterprises will buy them simply because they exist, but this may not be the case.

Consider mobile private networks (MPNs). As explained in the previous section, they are a hotspot for new service models mixed with connectivity. Since the primary contractors for the multi-technology deals are often network equipment manufacturers, CSPs are finding themselves thrust into a new competitive landscape where they must compete directly with their closest technology partners.

This puts CSPs in a difficult position because they have an image problem based on their legacy. Technology providers don't suffer from this perception because they are constantly re-inventing themselves as technology progresses and changes.

This is leading some large CSPs to create new business units to address opportunities such as IoT, the health sector and MPNs. The goals are to differentiate with a new brand but leverage advantages like spectrum licenses.

"CSPs are finding themselves thrust into a new competitive landscape where they must compete directly with their closest technology partners. This puts CSPs in a difficult position because they have an image problem based on their legacy.

The promise of 5G

Telcos are optimistic that the roll out of 5G, using their newly acquired spectrum, will give them an advantage over competitors when it comes to connectivity services. They believe that the programmability of software-defined 5G networks will enable them to offer much more attractive total solutions for enterprises, and they hope that a new wave of 5G IoT solutions in verticals such as automotive, agriculture and manufacturing could help enterprises view telco brands as the de facto service provider for all wireless technology solutions.

However, a large piece of market research by Omdia and Bearingpoint shows that CSPs are now the lead partners in only 16% of enterprise 5G projects globally, down from 21% in 2020. The decline is also set against the context of a growth market with the number of enterprise 5G projects doubling in the same time period, compounding concerns among operators.

But 5G rollout is still in its early non-standalone phase. Many CSPs believe that once standalone 5G is widely available the competitive landscape will tip in favor of telcos.

In interviews for a new TM Forum white paper called *The tech-driven telco* (see page 52), some CSP executives pointed to connectivity as the cornerstone of fundamental changes in business diversification.

"Connectivity is our core business, and we believe it is more and more vital as we go beyond connectivity, as it is the fabric that will power new ecosystem partnerships and services for consumers and businesses," said Michaël Trabbia, Chief Technology and Innovation Officer at Orange. "We need to find solutions to bring real resilience to the network; make it more agile to enable delivery of these services."

Transformational steps

CSPs are addressing their "image problem" not with marketing, but with demonstrative new abilities. Indeed, many CSPs' transformational journeys are based on their ability to drive new business, and a set of common approaches is developing:

- Evolve networks and IT ecosystems utilizing cloud native technologies
- Deploy AI-driven, autonomous operations to make zero-touch operations a reality
- Push the deployment schedule of standalone 5G
- Focus on zero-touch partnering and adopt an ecosystem mentality
- Capitalize on the central position of telcos within society
- Consider breaking out new subsidiaries with distinct brands to address different opportunities
- Remain as agile as possible so that the new service platforms can pivot quickly and inexpensively to new opportunities

CSPs must work together to go beyond connectivity

TM Forum members are collaborating to develop and facilitate connectivity-as-a-service (CaaS), marketplace platforms and zero-touch partnering, which all share a customer-centric approach to simplifying service delivery and usage that relies on automation to enable self-service.

"As an industry we have not made it simple to consume connectivity and value-added services such as security, guaranteed bandwidth and priority routing," says Joann O'Brien, Vice President, 5G Digital Ecosystems at TM Forum. "And the traditional processes for providing connectivity – covering ordering, fulfillment, orchestration and assurance – will not continue to satisfy consumer needs in a hyper-connected world."

The goal of CaaS is to reduce the complexity of service management and improve quality of service, while standardizing how customers consume services. In a recent white paper, the collaboration team defines CaaS as "the delivery of connectivity/IP presence solutions to meet the specific demands of different applications and users, defined programmatically."

TM Forum's work on software marketplaces also tackles the question of how to make service delivery to customers more dynamic, automated and flexible, but from the wider angle of cross-platform partnerships. Both marketplaces and CaaS will rely on CSPs' ongoing efforts to automate processes and service delivery. Offering CaaS involves being able to interpret their customers' connectivity intent, using intent-based networking and automation.

Read the white papers to learn more about CaaS, marketplaces and zero-touch partnering:

CSPs that are taking these steps now are beginning to stand out of the pack. But while their motivation in the past for adopting new technology and business models may have been to achieve competitive advantage, cost cutting or operational efficiency, the driver now is preventing a long period of declining revenue and capital.

In the next section on consumer services, we'll look at telcos' TV and mobile money services.

section 10:

re-examining consumer strategies

In the excitement about the potential for B2B services to spur revenue growth, it's easy to forget that most of telcos' revenue today comes from services provided to consumers. Among *disruptor* and *prospector* service providers (see page 11), the percentage can be as high as 90%. But most innovation in consumer services is not happening within telcos, rather it is coming from over-the-top (OTT) content providers.

For the last five to ten years communications service providers (CSPs) have used bundling of fixed, mobile and broadband access with voice, messaging and TV services as their primary strategy for addressing the consumer market. This approach has been effective for companies with strong multi-play propositions because it has reduced churn, particularly among mobile users.

Incumbent operators in markets including Belgium, Denmark and Spain, for example, have seen mobile churn for customers subscribing to bundles fall into single-digit percentages, whereas 20% of standalone mobile users churn every year. Furthermore, the cost of servicing bundled customers should logically fall over time as back-office systems and processes become aligned to multi-play service propositions.

Revenue in retrograde

However, while it's clear that multi-play strategies have been effective at lowering costs for CSPs, they are not resulting in more revenue. In fact, in countries with mature multi-play markets such as Spain, where Orange, Telefónica and Vodafone all offer multi-play services, revenues have declined.

Data from the Spanish market compiled by research firm Omdia demonstrates that over a four-year period from 2017 to 2021, the three Spanish operators recorded a compound annual growth rate (CAGR) of -1.87%. The CAGR is even lower (-2.22%) when the companies' TV businesses are removed from the calculations.

The lesson is that while multi-play is an effective strategy for driving customer loyalty, it ceases to become a differentiator once competitors have responded with similar offers. In addition, customers expect lower prices for buying multiple services, which means that multi-play can actually lead to lower overall revenue for operators competing in a single country.

While it's clear that multi-play strategies have been effective at lowering costs for CSPs, they are not resulting in more revenue. In fact, in countries with mature multi-play markets such as Spain, where Orange, Telefónica and Vodafone all offer multi-play services, revenues have declined.

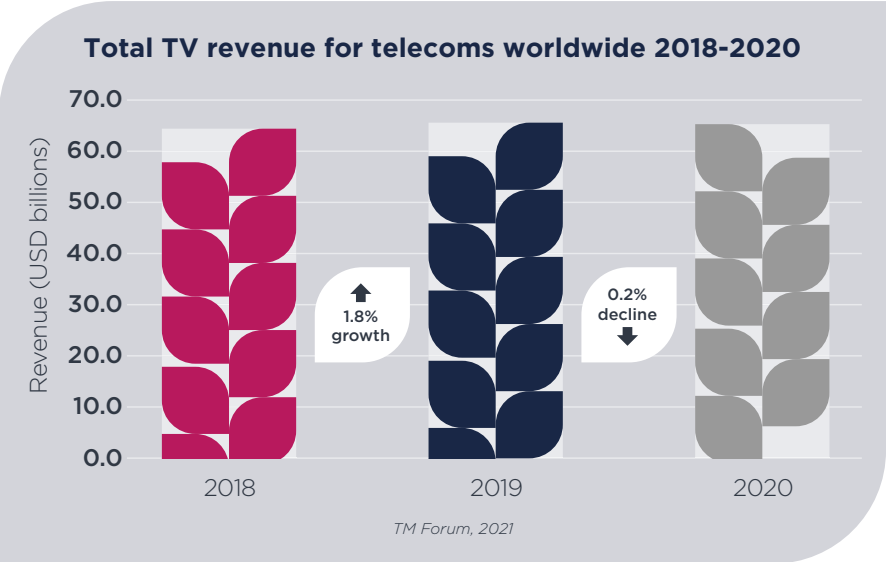
Even 5G is unlikely to command a premium in the medium term. Evidence from across the world shows that the first operator to launch 5G services can charge a premium for early adopters, but the premium disappears as soon as other operators enter the market.

Strategies to help

In competitive markets it is extremely difficult for a CSP to raise prices successfully unless other operators follow suit. In most markets, one or two operators enjoy a combined market share of 50% to 75% while a challenger has a 10% to 15% share. As soon as one company increases prices, the others target its customers.

However, CSPs are taking some steps to improve the performance of their multi-play businesses:

- **Focus on convenience** – it is easier to increase prices for multi-play services when migrating to another operator represents a huge inconvenience. In markets where number portability is allowed switching mobile networks can be as simple as sending a text message to the former operator. But switching multi-play service providers can be a difficult process because it involves a visit from an engineer, which requires an appointment. Potentially the subscriber will have to go through a period with no home broadband if the end of one contract and the start of a new one cannot be synchronized. They may also lose access to some TV content because pay-TV operators have different ownership rights.
- **Upsell** – getting customers to buy more mobile data or increase broadband speeds can lead to more revenue. However, in many countries consumers have come to expect faster speeds and bigger data buckets as part of the renewal/ upgrade process or as a reward for switching.



TM Forum, 2021

TV services revenue for selected CSPs 2018-2020 (USD millions)

	2018	2019	2020	2020 TV % of total revenue
BT	589	590	546	2.0%
kt	1,353	1,438	1,550	7.2%
Singtel	274	231	210	1.8%
SK telecom	105	117	126	0.8%
telenor	360	314	244	1.7%
Telia	391	604	808	9.3%
TELSTRA	628	561	542	3.4%

TM Forum, 2021

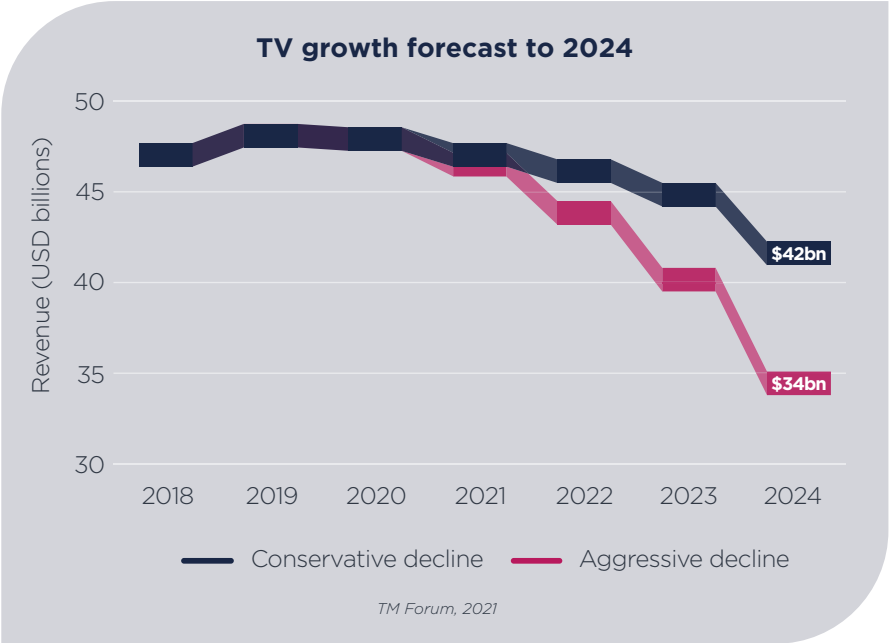
- **Bundle content** – bundling third-party content and services or loyalty programs can be effective strategies. For example, mobile operators in Japan offer content, magazines, video, emojis and children's games bundled with connectivity. They also offer loyalty programs that provide discounts on purchases of third-party goods and services, and they offer the ability to pay for goods and services using a mobile phone.

The trouble with TV

CSPs' investment in TV has been another strong trend during the past decade. However, the structure of TV markets varies enormously, and no blueprint exists to address new opportunities. The very nature of television has changed dramatically over the last 10 years, leaving CSPs to consider and reconsider the business cases and models that underpin their strategies, which have ranged from buying or investing in existing pay-TV businesses to creating startups.

CSPs' success in the TV business has mirrored that of the sector as a whole. Over the last five years the outlook for pay-TV has deteriorated as a direct result of the growth of online video platforms, and this is reflected in our revenue estimates for TV services.

While our research looks only at CSPs providing TV services, Omdia has evaluated the entire pay-TV market. The resesarch firm forecast in 2017 that the total pay-TV market would grow from $203 billion in 2015 to $246 billion in 2022 but three years later downgraded its projections significantly to just $195 billion in 2022 and flat revenue from 2017 to 2024. During the same period, revenue from OTT TV services is forecast to grow from $36 billion to $107 billion.



Our research shows that the value of TV varies hugely from CSP to CSP and country to country. Telcos that get more than 5% of total revenue from TV are mass-market TV broadcasters. They compete aggressively for premium content rights (mainly sports) and in some cases are their country's dominant pay-TV provider.

CSPs that get only 1% to 2% of revenue from TV are followers in their local TV markets. Their customers may use them to provide terrestrial TV services (which they do not make money from), but they also provide additional content and may have deals with OTT providers to resell their services.

Swedish telco Telia is an example of a mainstream national broadcaster that generates significant revenue from advertising. However, it is clear from the data that for the rest of the telcos, TV is no longer a significant growth business. This does not mean that CSPs will shut down their TV businesses – TV's main value lies in helping operators protect and grow their retail broadband business – but it does mean that telcos will find it increasingly difficult to justify competing for high-priced content (see panel on page 42).

Pay-TV outlook

Our conservative estimate for TV revenues shows some market shrinkage as an extrapolation of the current trend post-pandemic. Our aggressive forecast shows a possible market future where the trend toward consumer adoption of OTT video-on-demand services, which grew during the pandemic lockdowns, continues with customers cancelling pay-TV services provided by CSPs.

> **Over the last five years the outlook for pay-TV has deteriorated as a direct result of the growth of online video platforms.**

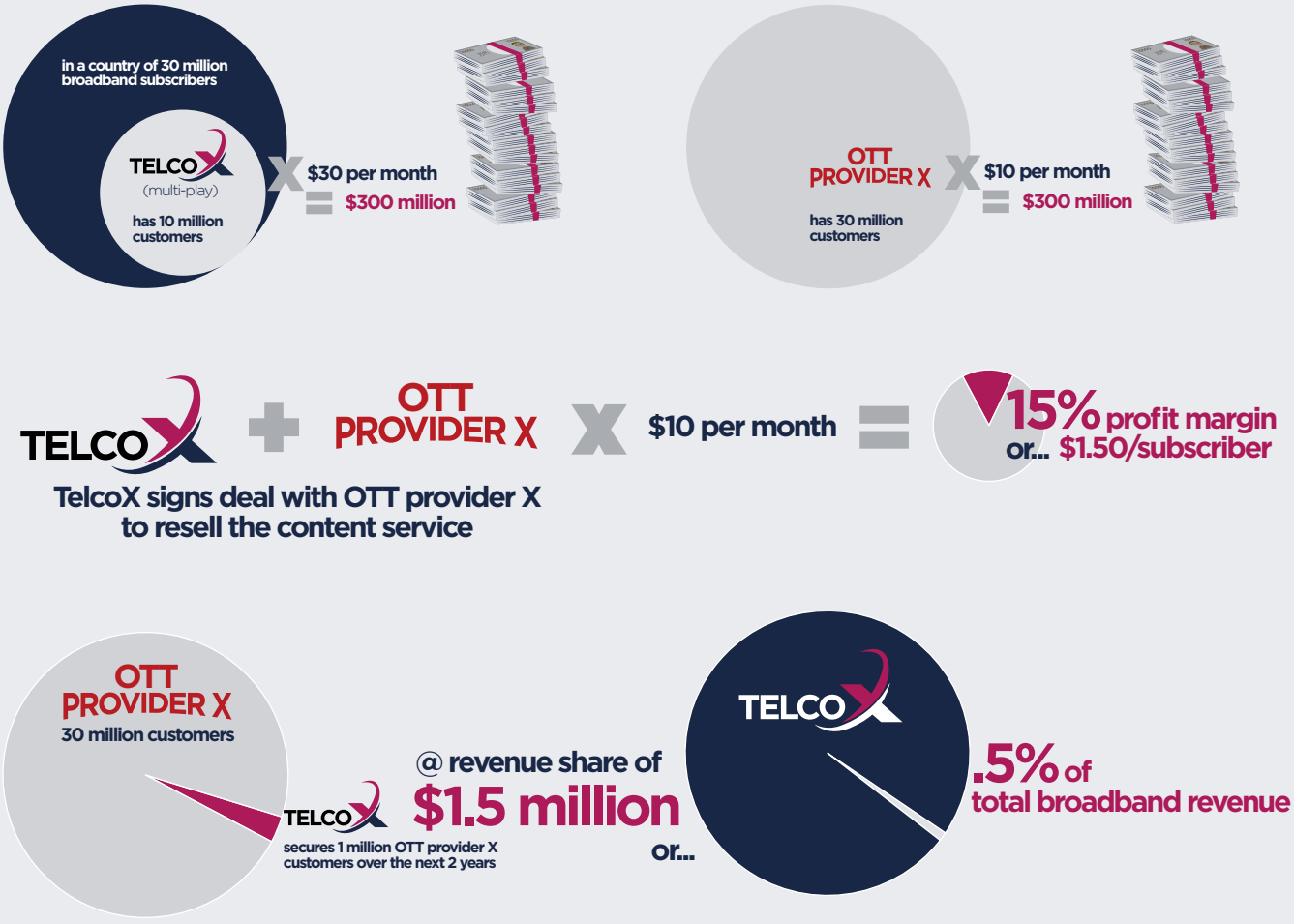
CSPs partner for content, but revenue is elusive

Many telcos have forged relationships with OTT content providers like Netflix, but they have not approached these relationships in the same way that a classic retailer would build a viable, standalone business. Rather CSPs are using the partnerships to augment their overall TV or broadband value proposition.

A quick analysis of the commercial models behind partnerships with OTT content providers demonstrates the relatively small amount of revenue they bring to the business (see below). Platforms like Netflix or Apple TV don't need to offer big margins to telcos because they can grow their businesses without partnerships. From a customer's perspective, however, the benefits of subscribing through a CSP or cable company rather than directly are the convenience of a single bill and integration of the service into an existing electronic program guide.

The only ways for telcos to significantly boost revenue from reselling OTT services are to resell multiple services – for example, Netflix, Apple TV and Disney Plus – or partner with content providers that are prepared to offer higher profit margins. For example, Disney offered higher margins when the company began rolling out its video platform in 2019.

What's a content deal worth?



TM Forum, 2021

Mobile payments

For many CSPs in Sub-Saharan Africa and other developing regions where conventional banking is out of reach for many people, mobile financial services are an important and growing line of business. The outstanding performer in this sector is Safaricom, the largest mobile operator in Kenya in which Vodafone has a minority stake. Safaricom generates a third of its revenue from the M-Pesa service, although revenue declined in 2020 after the operator waived fees during a period of lockdown resulting from the Covid-19 pandemic.

The four operator groups that dominate the African telecoms market – Airtel, MTN, Orange and Vodacom, which is majority owned by Vodafone – all operate successful mobile financial services businesses. Airtel Africa, Orange and MTN generated 10%, 9% and 8% of their revenues respectively from mobile financial services in the region.

Usage data for mobile payment services demonstrates that they are well-established businesses. Orange has more than 55 million Orange Money customers representing 38% of its subscriber base in the region (although less than half are active users). ARPU is increasing among active users and currently stands at €1.90 ($2.25) per month.

Airtel has 23 million active users and an ARPU of $1.80, while MTN has 47 million active users of its MoMo mobile payments service. Safaricom has 28 million M-Pesa users in Kenya where it has just over 30 million mobile customers.

Mobile payment services revenue growth for selected CSPs 2018-2020 (USD millions)

	2018	2019	2020	2020 mobile payments % of total revenue
airtel (Africa)	243	318	404	9.9%
MTN	543	702	893	7.6%
MTS	184	459	536	7.0%
orange (Middle East & Africa)	336	448	560	8.8%
TURKCELL	199	202	149	2.9%
vodafone	252	349	402	1.0%
vodacom (South Africa)	69	114	138	2.9%
Safaricom	731	827	810	33.0%

TM Forum, 2021

Hazy smart-home vision

CSPs' visions for building lines of business for smart home services have disappeared from corporate strategy presentations over the last couple years. This is not because telcos have lost out to competitors, but rather because consumers haven't fully bought into the smart home idea.

In the US, AT&T and Comcast have traditional home security businesses, but they remain standalone businesses rather than a route into the smart home. In addition, many CSPs are experimenting with selling home IoT gadgets such as Google Nest, however success has been limited.

Still, homes are getting smarter as people acquire new devices and services that require connectivity – typically Bluetooth and/or Wi-Fi – and whose point of convergence is usually a smartphone. For this reason, home Wi-Fi connectivity is growing massively in value. According to research from Deloitte, the average US home has 25 connected devices today, up from 11 in 2019.

Telcos can monetize this surge in demand either by selling customers faster home broadband connections, guaranteed Wi-Fi connectivity throughout their homes, or second lines for back-up/resiliency or home working.

In the next section, we'll discuss the outlook for connectivity services and whether they will continue to offer opportunities for growth.

section 11:

is connectivity dying – or isn't it?

An important discussion in the telecoms industry centers around whether the connectivity business can remain profitable for communications service providers (CSPs). Even telco executives themselves sometimes send mixed messages, complaining in one breath that connectivity has become a commodity while in the next lauding the potential for 5G network slicing and mobile private networks (MPNs) – both of which are connectivity services.

There is no question that CSPs' traditional connectivity business is under pressure. But is it really dying?

EBITDA (earnings before interest, taxes, depreciation and amortization) margins for CSPs' core connectivity businesses globally are between 30% and 40%. That's not bad considering that EBITDA margins for the services provided by IT services firms – the market many CSPs want to enter – are closer to 20%.

Optimism grows

Most telcos are growing more bullish about connectivity for three primary reasons:

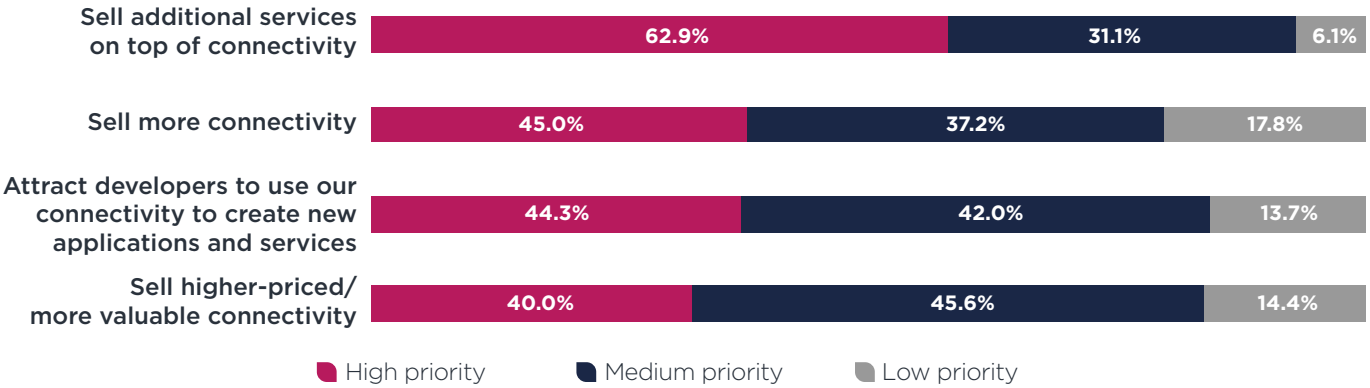
- In recent years, investors have rewarded telcos that have invested aggressively in deploying fiber. For example, pure fiber companies have performed better than CSPs with large mobile businesses.
- The pandemic has demonstrated the value of reliable, high-speed broadband connectivity and the need, from societal and economic perspectives, to provide affordable broadband services to the entire global population.
- Enterprises are demanding more control over their connectivity and want CSPs to provide secure, reliable services. Telcos are responding by investing in network security and capabilities such as network slicing.

In the survey conducted for this report, we asked CSP respondents how they expect their companies to derive new revenues from 5G and what the drivers are for QoS and network slicing. We listed four potential ways as shown in the graphic below, and all were strongly endorsed by respondents. Analysis of each follows.

Selling more connectivity

The main growth in connectivity will come from IoT services. While many

Drivers for QoS & network slicing



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predictions about the number of connected devices have proven to be wildly optimistic, connections continue to grow steadily. IoT research firm Transforma Insights reports that the top 35 operators in the world had 1.55 billion IoT connections at the end of June 2021, a 6% rise in the quarter.

However, average revenue per user (ARPU) for IoT connectivity is falling rapidly as CSPs deploy new low-power wireless access networks including LTE-M, NB-IoT and LoRa. It is not clear whether the growth in connections will outpace the decline in ARPU. For example, there will be some new IoT applications enabled by 5G that were not viable using LTE. Video will be the main driver, particularly in combination with edge computing, enabling the processing of data close to the point of consumption.

Beyond IoT there is still some growth in home broadband in most countries, particularly fiber broadband. Growth is strongest in emerging markets where, in the last five years, many consumer-focused telcos have built good businesses delivering fiber connectivity to high-end residential customers and the B2B market.

5G could drive some connectivity growth at least initially. One of the main benefits of 5G is that it can support use cases for broadband connectivity that weren't feasible using fixed landline connections, such as when the application is in a location where a fixed connection is not possible or the connection needed is only temporary. Examples include holiday rental properties, seasonal businesses or festivals.

Another 5G use case is providing secondary connections into residences or small businesses such as when a customer has concerns about the reliability of the main broadband connection or poor Wi-Fi coverage in specific rooms or locations. Integrated ethernet/5G routers to support this connectivity are starting to appear on the market.

While many predictions about the number of connected devices have proven to be wildly optimistic, connections continue to grow steadily. IoT research firm Transforma Insights reports that the top 35 operators in the world had 1.55 billion IoT connections at the end of June 2021, a 6% rise in the quarter.

Higher-priced connectivity

It is unclear whether CSPs will be able to sustain a premium for 5G. The first two years of 5G launches have demonstrated the same pricing trends as for LTE. In most markets the first operator to launch 5G charges a premium over the cost of LTE, but as soon as second and third operators enter the market, the premium disappears. The only exceptions are when operators offer bigger data buckets or unlimited data for 5G, or when operators bundle 5G with other services or devices to justify charging a premium.

As operators deploy new 5G connectivity capabilities like edge computing and network slicing, they may be able to introduce a sustainable premium using service level agreements (SLAs), which could be based on variables such as latency, throughput, location or other quality-of-service (QoS) metrics. CSPs will need to decide whether to offer these benefits to large market segments – for example, cloud games – or individual companies.

Value-based pricing is a concept that operators have been toying with for several years and one they may revisit with 5G. The basic principle is that prices are set based on the value that a product or service delivers to a customer. For example, the provider of IoT products or services might be paid based on the savings that the enterprise incurs from deploying a solution.

There may also be potential for operators to better monetize connectivity if they can give customers the ability to control, manage and customize their connections, which is one of the promises of network slicing. For example, a media company could order bandwidth on demand to cover a special event or breaking news.

Attracting developers

CSPs have long aspired to build developer ecosystems, but so far they have not been very successful. In the early 2010s, AT&T had the most advanced developer program of any telco, but the only service that gained any real traction with developers was SMS. AT&T's developer program has since fizzled out.

CSPs could breathe new life into developer programs if they are able to offer access to different levels or categories of connectivity – for example, access to edge-based connectivity and applications that require low latency. From a monetization perspective, operators would derive benefits by charging developers for access to different network APIs.

Beyond connectivity

Even if revenues from existing connectivity services are flat or if new connectivity services fail to generate significant profits, telcos may be able to sell other services alongside or on top. As discussed throughout the report, demand for services such as security, IoT, cloud, private networks and edge computing is growing. As a result, connectivity is becoming a vital, enabling capability rather than a separate service, and the way in which it is sold and delivered is starting to change.

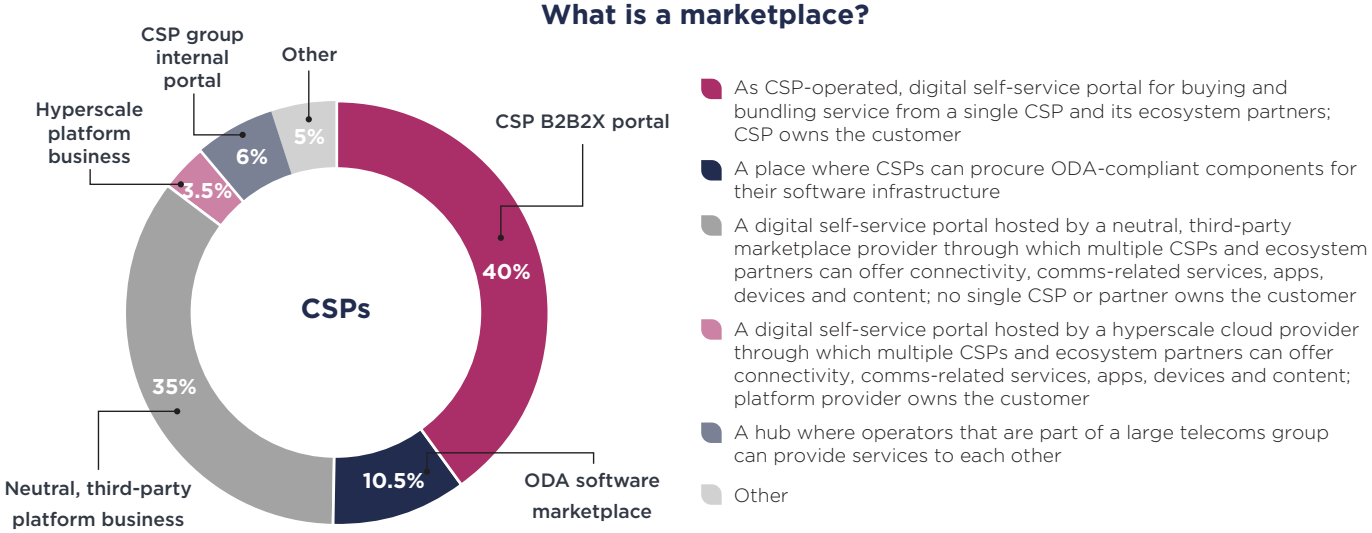
Many CSPs are considering the role for platform business models and marketplaces in selling connectivity as a standalone product or integrated within different applications. They are also evaluating this model for procuring technology.

Recent research for our report *Exploring marketplaces for software and services* finds that while CSPs view as marketplaces a good way to sell their services, the don't agree on who should own and operate the marketplace. For example, Amazon Web Services already sells connectivity from many different CSPs in its marketplace, but when we surveyed operators about their preferences, respondents were decidedly against the idea of a hyperscale platform provider owning the marketplace. Most CSP executives are much keener on telcos setting up their own marketplaces or participating in neutral, third-party marketplaces so that they can "own" the customer.

Learn more about marketplaces:

In the next section, we offer guidance to help CSPs realize opportunities to grow revenue.

What is a marketplace?



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section 12:

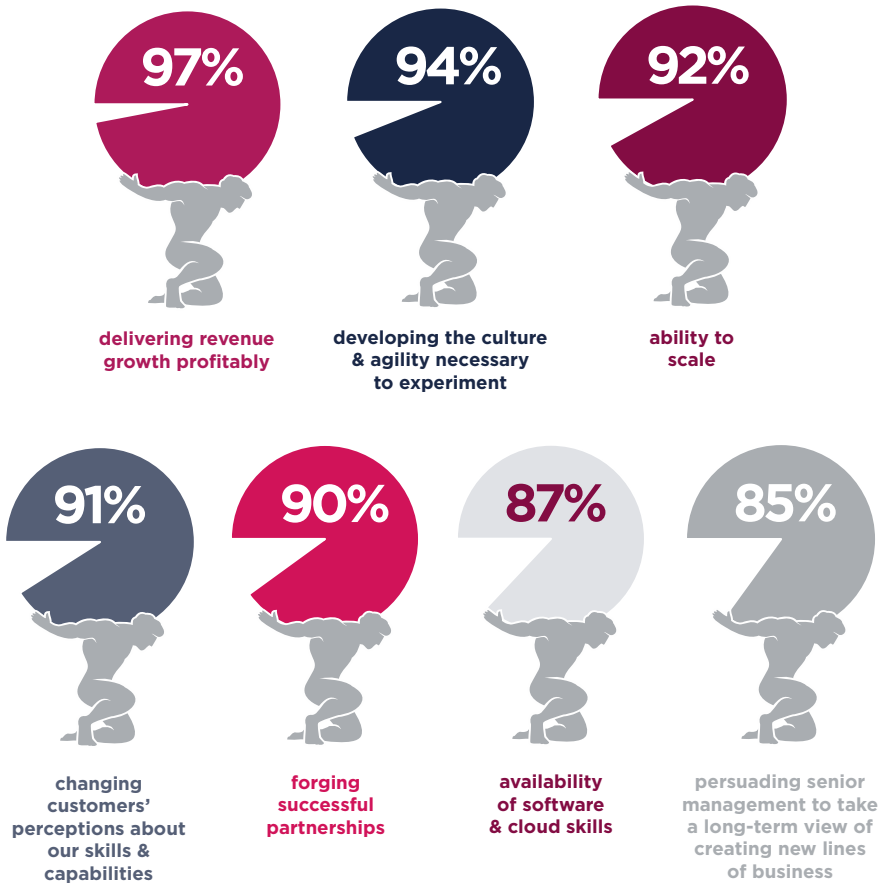
how to realize growth opportunities

The last 20 years have demonstrated how difficult it is for communications service providers (CSPs) to break free of their legacy products and services and build new lines of business. Many multi-year digital transformation initiatives designed to create a foundation for growth have stalled or lost momentum. To give prescriptive advice that will help telcos realize opportunities for growth, it is necessary to understand the challenges they are facing.

We asked survey respondents to rank challenges to delivering revenue growth in new lines of business, and all seven issues we listed were deemed a moderate or serious challenge by at least 85% of respondents. The biggest is figuring out how to deliver growth profitably.

As discussed in Section 4, most new opportunities for CSPs lie in professional and IT services, but the EBITDA (earnings before interest, taxes, depreciation and amortization) margin for these services in many cases is below 10%. So, the ability to drive scale is the key challenge to delivering growth profitably in services businesses.

main challenges to achieving growth in CSPs' new lines of business



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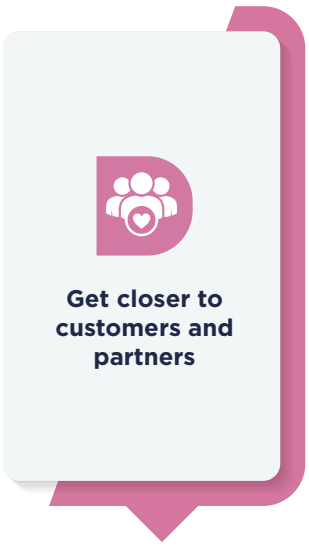
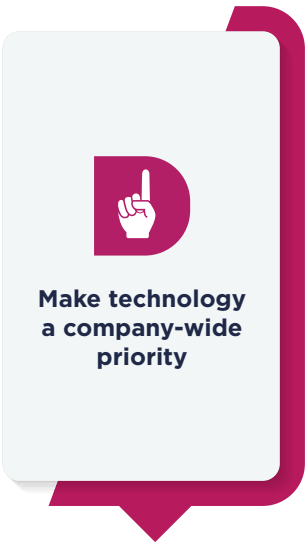
Helping CSPs scale their services

The recommendations we offer in this section are aimed at helping CSPs scale their services and overcome the other challenges highlighted in the survey.

We have divided them into four categories, but in practice they overlap:



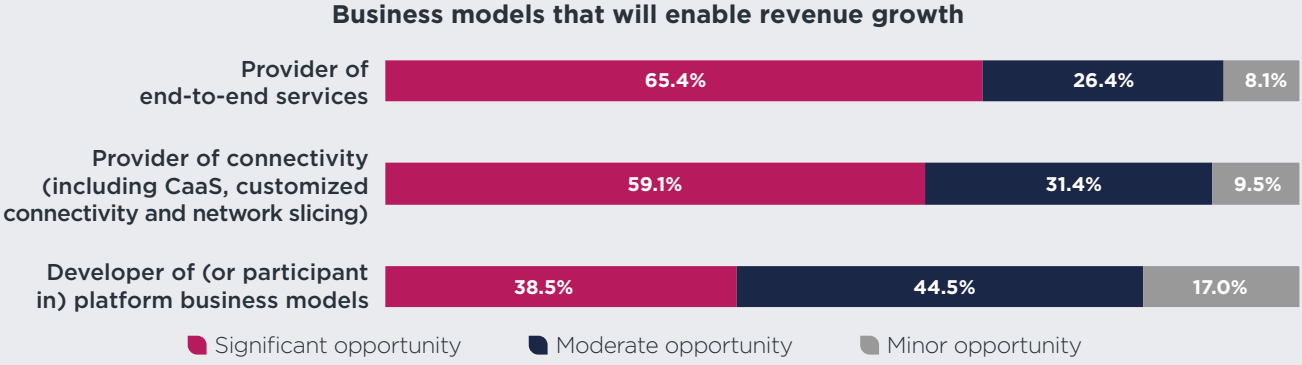


Focus on strategy, business models & organizational alignment

CSPs should be prepared to play different roles, from wholesaler and enabler to platform provider and end-to-end solution provider, and they should be prepared to partner to deliver services beyond connectivity.

Much of our recent research has explored potential business models for CSPs to move beyond connectivity. In the survey for this report, we asked which business models CSPs favor, and they have a clear preference for offering end-to-end solutions. But in practice, even Tier 1 CSPs that invest heavily in capabilities to provide full-service solutions will be unable to deliver them to their entire customer base. Business models necessarily will vary based on the operator's expertise in a given market, how enterprises want to engage with them and the partnerships they create.

Platform business models are the least attractive option, according to respondents, although this may be because CSPs do not understand clearly how they would generate revenue from a platform business. There is no single business model for platform businesses – the platform owner can make money by taking a small percentage of revenue from each transaction, charging the producer, the consumer or both. But from a CSP's perspective, it is often not immediately obvious who the producers are.



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CSPs should focus on building horizontal capabilities that can be exposed vertically, rather than developing vertical-specific solutions that cannot scale.

To serve vertical markets, CSPs will need to understand the business challenges and opportunities that companies operating in the vertical face. But this does not necessarily mean that they need to develop products and services that are specific to a vertical. Rather CSPs should seek to adapt horizontal solutions for different verticals in order to build scale and replicability.

Classic telecoms services such as voice, broadband, unified communications and collaboration tools are all products that companies in many verticals can use, but professional services tailored to the needs of a company in a specific vertical are not. Given that many of the new opportunities in segments such as cloud, IoT and security include significant requirements for professional services with integration, CSPs may need to focus on a small number of verticals.

CSPs should be prepared to acquire companies to serve a particular sector or market segment and be clear about whether the company will be integrated into the core business and if so, how.

Mergers and acquisitions help CSPs expand into new markets by providing instant market knowledge, established brands and specialist skills. M&A activity is accelerating as telcos seek to offer new ICT services such as cloud, security and IoT. Indeed, the CSPs that are targeting security services most aggressively have all based their strategies on significant acquisitions (see page 23).

Deciding how to integrate these businesses into the existing telecoms business can be difficult. If an acquisition is fully integrated, the group may lose its entrepreneurial drive and ability to innovate. But if it is allowed to remain fully independent, the team will be unable to leverage the benefits of being part of a larger organization, such as ability to cross-sell and upsell and investment in new technologies.

CSPs should determine which organizational model is best for new lines of business: running them as separate divisions or as part of an existing one.

Over the past decade, CSPs have gone back and forth between the two models, but recently the trend has been towards separation. As noted in Section 8, Telefónica launched Telefónica Tech as a separate division responsible for the telco's IoT, cloud and security businesses. Similarly, BT has created BT Digital. However, its scope is different from Telefónica Tech's in that part of the division's role is to drive digital transformation across all of BT.

Many large CSPs are also setting up their own digital brands for the consumer market – for example, Verizon (Visible), Videotron (Fizz), SingTel (Gomo), Vodafone (Voxi) and Ooredoo (Ana). Essentially, they are in-house MVNOs (mobile virtual network operators), and most have taken a greenfield approach to developing support systems.

In the Asia-Pacific region, SingTel has moved its NCS division – an ICT services company with a focus on selling services to the public sector – out of its enterprise division to give it greater autonomy and management focus. And South Korean telco SK Telecom has gone a step further by splitting into two companies – the existing telecoms business and a new company called SK Square which focuses on semiconductors and new ICT businesses including security.

These business units face the same challenges that acquired companies do, namely losing the ability to cross-sell and upsell and the possibility that the unit's requirements won't be factored into future CapEx projects.

Get closer to customers & partners

CSPs need to understand the business challenges and opportunities enterprises face and how to address them using both traditional and new services.

CSPs are trying to transition into companies that embed connectivity into solutions for enterprises, but doing this requires business and technology know-how. Professional services firms such as Accenture and Infosys have teams of skilled consultants who understand their B2B customers' businesses and goals, unlike telcos whose expertise is all around connectivity.

Telcos must acquire the necessary skills, and indeed, many are recruiting large teams of consultants and making acquisitions to bring in talent. They will also need to invest in new BSS capabilities to better serve their customers and deliver more real-time, data-driven insights.

CSPs should make partnering a cornerstone of their strategies and treat partners like customers.

Partnerships among CSPs, cloud providers, equipment manufacturers and software specialists are necessary to deliver many emerging enterprise use cases, and businesses expect to order end-to-end solutions through a self-service platform. All the complexity must sit behind the interface with the customer, which requires technical integration of services and commercial models with revenue sharing for all partners.

CSPs have struggled in the past to partner effectively, partly because their core business model is to deliver end-to-end services without help from other companies, but also because teams responsible for enterprise business are under constant pressure to deliver financial wins.

To partner effectively, telcos need to start thinking of partners as customers. This includes hyperscale platform providers. For example, partners need access to real-time data about how their services are being used, and they need to be able to integrate their products with telecoms services easily.

While in some cases partnerships with cloud providers are simple buyer-seller relationships, often a shared risk/shared reward approach is needed, where the parties share costs and revenue. This is the case with edge services, for example.

As discussed in Section 7, respondents to our survey indicated willingness to participate in several commercial models with hyperscale cloud providers. However, our conversations with CSPs indicate more caution because of the uncertainty around new services. Multi-access edge computing is a brand-new market, for example, and telcos risk striking deals that wildly over- or under-estimate the size of the market.

Make technology a company-wide priority

CSPs' IT teams need business knowledge, and business teams need knowledge about technology. This may require hiring new talent or training employees.

Today, telco leadership often views IT operations as strictly a cost center, yet operations teams are in the best position to understand how technology can generate new revenue. Consider network-as-a-service (NaaS), which operations teams are using to simplify and accelerate the integration of new technologies and/or suppliers. NaaS could also open a new line of business for telecoms operators to sell APIs to developers or enterprises, who can use them to create new services.

Furthermore, technology and business leaders often come into conflict when decisions are made about the deployment of new support systems and the extent to which they must support legacy products and services. We have spoken to many CIOs who lament the fact that new systems are too focused on maintaining legacy rather than creating new services.

CSPs should strive to become software-driven organizations.

Many large CSPs are intent on becoming "techcos" (see page 52). They are aggressively recruiting digital skills in software, cloud and analytics, and they are developing some of their own software, mainly to plug gaps between suppliers' solutions.

But becoming a techco may not be the right option for smaller telcos, particularly in emerging markets where there is a lack of digital skills. Large operator groups can spread investment in digital capabilities across the whole organization. Vodafone Group, for example, has centralized its technology organization and no longer supports separate groups for each operating company. Small CSPs will need to decide whether the "openness" espoused by their vendors truly enables creation of new products and services with the necessary agility and responsiveness to customers' needs.

Finding new revenue as a techco

Most large CSPs believe they must transition from telco to techco in order to tap new revenue beyond connectivity. But what does it mean to be a techco?

One of the biggest distinctions between telcos and techcos like Amazon, Google and Microsoft is that techcos serve global markets, while telcos are mostly limited to serving customers in countries or regions where they have a network presence. In addition, cloud operators' ability to innovate and scale their services far outpaces telcos' because they are completely software-based.

Even the most ambitious CSPs are a long way from becoming techcos with global product capabilities, but some telcos are beginning to resell or franchise their tech capabilities to other CSPs. This could be viewed as a simple wholesale model, but it's worth considering it in a broader context as an attempt to build global tech businesses outside network-defined markets. Examples include:

- Telefónica Tech is partnering with Telekom Malaysia to help it build a cybersecurity business in its home market.
- As part of Vodafone Group's global partner program, the company licenses other telcos to resell its products and services. For example, in 2019 Vodafone entered into a marketing and technology partnership with Oman's new mobile operator, Oman Future Telecommunications (now branded Vodafone Oman).
- US telco Verizon acquired video conferencing platform BlueJeans in 2020. Shortly after the acquisition was announced, Verizon struck a deal with Indian telecoms group Bharti Airtel, allowing the company to sell the service under the Airtel BlueJeans brand.
- Japanese mobile operator Rakuten Mobile has established a business called Rakuten Symphony to sell its network and IT solutions and capabilities to other CSPs. As part of this process Rakuten has acquired open-vRAN vendor Altiostar. This follows the acquisition of OSS vendor Innoeye in 2020. In August Rakuten Symphony entered into a partnership with Germany-based United Internet to build and operate the network for its new LTE/5G mobile operator 1&1.
- Korea Telecom has acquired global wholesale and connectivity provider Epsilon, which provides cloud connectivity, ethernet, remote peering, access, SD-WAN, colocation and voice service from hubs in 41 cities worldwide.

A new white paper from TM Forum's Collaboration Community urges telcos to use the Open Digital Architecture (ODA) to become techcos. The ODA, part of the Open Digital Framework (see page 59), defines standardized, interoperable software components, which are independently deployable pieces of software typically built out of one or more microservices. These components expose business services through Open APIs, which are built on a common data model.

This approach enables CSPs to evolve to a fully automated, cloud native operations environment that relies on analytics and AI to deliver zero-touch services. But widespread agreement, collaboration and contribution among many CSPs and vendors is necessary to advance it.

"The telecoms industry is too fragmented for individual telcos to effect the necessary changes alone," the white paper explains. "CSPs must work together, forming robust partnerships, coordinating efforts and leveraging standards, so that the industry can act as a single force to accelerate change and deliver new digital services."

Read the white paper:

Take a more agile approach towards procurement, cost allocation & KPIs

CSPs should overhaul the process for procuring technology to facilitate better partnering with small and large vendors.

Very few large CSPs partner with startups or small technology vendors; most work only with very large vendor partners. This is partly because small suppliers can't afford to participate in slow, costly procurement processes. And for CSPs, working with smaller vendors can be risky because there is a higher likelihood that they will go out of business.

However, by failing to address this issue CSPs are cutting themselves off from a major source of innovation. CSPs should move to a procurement model that relies less on lengthy RFPs (requests for proposal) and instead adopt a proof-of-concept model that invites suppliers of all sizes to demonstrate their capabilities in a real-world environment.

Even if CSPs are unprepared or unable to change their approaches to procurement (perhaps because of corporate governance requirements), they should at least seek to narrow the gaps and align teams better. For example, CSPs could add technology specialists to procurement teams and people with financial skills to technology teams.

CSPs should take a more enlightened approach to technology spending and move toward an asset-light business model.

Finally, CSPs should reconsider the CapEx model for procuring technology. As they increase spending on public cloud services, cost allocation will naturally shift from CapEx to OpEx.

Some operators are uncomfortable with this transition because it represents a change from how they have made large technology purchases in the past. But it is part of a gradual transition to an asset-light business model used by MVNOs (mobile virtual network operators). These service providers do not own their network and procure many other functions "as a service".

CSPs should adopt this model when it comes to new lines of business and new investments in areas including mobile private networks and edge computing, rather than building out networks first and then seeking to sell access to them later.

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Huawei "Five Star Best Billing Benchmark" Model: Building Five-Dimensional Monetization Advantages to Capitalize on the Present and Win in the Future

Amid Uncertainty, We Need Concrete Solutions

5G will undoubtedly bring new opportunities for services such as B2C, B2B, and IoT. However, which service will grow revenue on a large scale remains unclear at present. There are no high-grossing 5G B2C applications currently, and 5G B2B and IoT are still in the early stages. This business uncertainty poses challenges to operators' monetization. To monetize the new 5G productivity, what do carriers need? What are the current gaps? And how can carriers inch closer to their objectives?

To address these questions, Huawei developed the "Five Star Best Billing Benchmark" model, designed based on industry best practices and latest technology trends. We applied this model to evaluate a number of global sites. The resultant data shows that most operators still need to strengthen many aspects of their billing systems to meet future challenges.

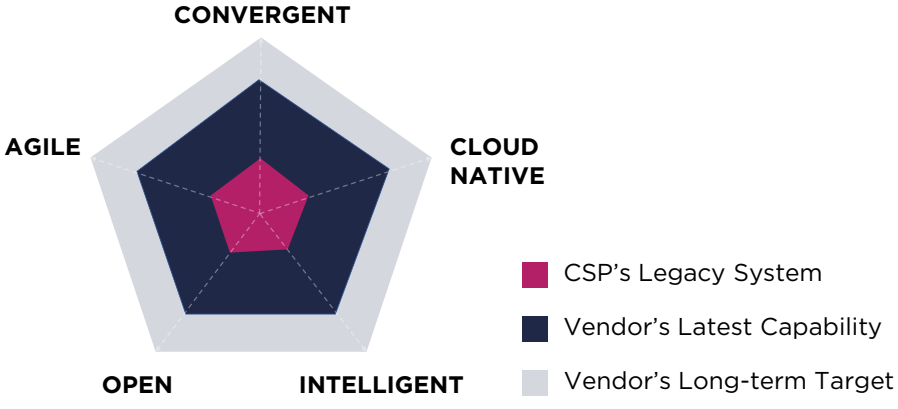
"Five Star Best Billing Benchmark" Model: Identify Gaps and Define Next Steps

We believe that billing systems look to offer five core advantages: Convergent, Cloud Native, Agile, Open, and Intelligent. The Huawei Convergent Billing Solution (CBS) will continue to build product competitiveness based on these core pillars.

Five Core Pillars Breakdown

We can subdivide the core pillars into smaller dimensions at different stages of maturity. Then, we can map each item to the radar chart and clearly visualize the current and target stages of each pillar. It is also possible to see the existing gaps in the billing system capabilities provided by suppliers and carriers' needs. This allows us to map a path to the target stage.

Convergent: System architecture is constantly evolving toward further convergence. This includes networks, services, customers, and architecture itself. This means moving from siloed systems, to doing more and more on a single platform. This simplifies management, facilitates innovation, improves efficiency, and lowers TCO. Currently, CBS offers a single platform for both people and things. Carriers can add new services while retaining their legacy system.



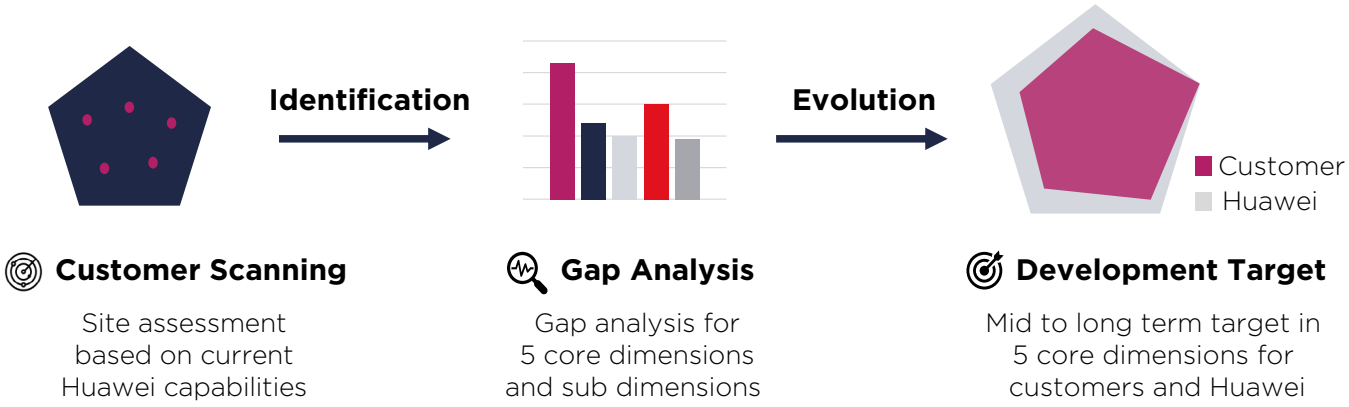
Core Pillars	Sub-Dimension	Stage 1	Stage 2	Stage 3	Stage 4
Convergent	Network Convergence	2/3/4G/PSTN	2/3/4G/5G NSA/FTTX	2/3/4G/5G NSA/FTTX	2/3/4G/5G SA/FTTX
	Service Convergence	Mobile, Fix	Mobile, Fix, TV	Consumer, Home, Business, New	
	Customer Convergence	B2C	B2C,B2B, B2H	People & Thing	
	Architecture Convergence	Separate construction for charging, billing, settlement	Unified construction for charging, billing	Convergent for charging, billing	Convergent for charging, billing, settlement
Cloud Native	Cloud Infrastructure	Private cloud /Physical machine	Selected public cloud	Cloud agnostic	Multi-cloud
	Containerization	Non-containerized	Selected application containerized	Application fully containerized	Application & database fully containerized
	Auto Scaling	Manual resource allocation	System resources based auto scaling	Service KPI-based auto scaling	
	High Reliability	Manual fault locating and recovery, no DR	Auto fault locating, manual recovery, A-S DR	Auto fault locating, semi-auto recovery, A-A DR	Auto fault locating and recovery, N-Live
Agile	Version Delivery	1-3 months	7 Days	1 day, anytime, anywhere	
	Version Evolution	Non-smooth evolution with data migration		Backward compatibility and smooth upgrade	
	Configurability	Product, offering and template	Plus: Charging factor, interface, etc.	Plus: Invoicing process and template	
	Diversified Monetization	Static dimension: Traffic and duration	Dynamic calculation dimension: Rate	Network quality dimension: SLA	Anything rating
Open	Openness to Service Provider	Non-standard interface	Non-atomized standard interfaces	Orchestrated atomic standard interfaces	
	Openness to SI partner	Closely coupled architecture	Decoupled architecture	Customization open to SI	CI tool chain open to SI
Intelligent	Flexible Network	Static planning, deployment, scheduling	Rule based planning, deployment, scheduling	Flexible connection, optimal routing	Flexible architecture, AI based tidal scheduling
	Intelligent O&M	Reactive	Manual Preventive	Condition-based predictive	Forecasting predictive

Cloud Native: Cloud native has become a hot topic among carriers in recent years, as it can significantly lower costs. For example, CBS was able to reduce its hardware costs by 50% after adopting the bare metal container architecture. Cloud native also improves operations and maintenance (O&M) efficiency. After implementing containerized databases, CBS is able to expand data nodes within 10 minutes — a task that used to take weeks to complete. In addition, cloud native enhances reliability. After CBS upgraded to N-live multi-active DR mode, system stability improved tenfold to 99.9999%, meaning that service interruptions last a total of no more than 31.5 seconds per year. As operators become more willing to adopt public clouds, we predict that operations platforms such as BSS will not only move to the cloud, but also be deployed on multiple clouds simultaneously.

Agile: Time to Market (TTM) is an important indicator for carriers. Agility can be measured by the speed at which new versions are delivered, evolution capability, configurability of products, and diversified monetization methods. Most operators still need several months to deliver a version. However, CBS can achieve this in only 7 days once grey release and continuous delivery (CD) methods are implemented.

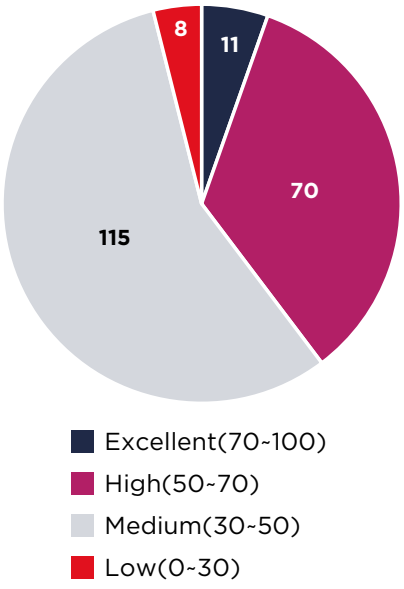
Openness: Industry leaders in the future cannot be unicorns — they should be companies with successful, cohesive ecosystems. The cohesion of the ecosystem demands more openness for operations platform. CBS has been adopted for several innovative cases in insurance, finance, gaming, and other industries. It assists third-party service providers and partners by opening billing capabilities through open APIs. For our SI partners, CBS is in the third stage (shown in the preceding figure), enabling them to successfully deliver several projects in Asia.

Intelligent: 5G will bring exponential growth of service traffic. The number of IoT services is huge and the service growth is extremely fast. Operators need a stable, flexible, and efficient platform more than ever before. CBS has a flexible architecture



that currently supports the world's largest IoT platform in China with more than 1 billion connections and a huge sharing group with 5 million members. There are more intelligent methods being planned, such as data adhesion and tidal scheduling. In terms of intelligent O&M, Zero-Touch maintenance is currently available, fault locating and recovery with no human intervention.

Site Score Percentage



Network Scanning and Evaluation

Mapping the capabilities of operators' legacy billing systems to different stages enables us to determine system maturity. We can then obtain an overview of the operators' capabilities. By expanding the scope of scanning, we can see who the all-around leaders are and how they became leaders. In this way, we can ascertain what capabilities other operators need to strengthen in the future.

To date, we have scanned more than 200 customers around the world. The average score is about 40, while the latest CBS R21 reaches an average score of 89. Low scores are mainly due to a lack of evolution agility (because versions are close to EOS), legacy technical architecture, and no convergence for 5G services.

This benchmark model can also be used for other vendors' sites.

Gap Analysis and Evolutionary Path

After scoring each site, we identify the gaps in different dimensions between operators and vendors. We can then depict the customer portraits combining with operators future planning.

Although an operator's target is not always identical to a vendor's target, our approach provides vendors with a clear picture for operator so that can give the unique evolutionary path suggestion. This is not an operator-only solution; rather, it is a mutual agreement between operators and suppliers about future development.

Be the Telescope for Operators: Find the Galaxy Illuminated by Five Stars

Following the "Five Stars" principle, Huawei's monetization platform will implement mid to long term planning. We hope that these five dimensions of concrete advantages can help operators build comprehensive capabilities for future-oriented monetization. In today's constantly changing world, we will be your telescope. Let the five stars guide you on your journey to the future.

Appendix - Abbreviations

CaaS: Container as a service

CDR: Charging data record

DR: Disaster recovery

EOS: End of service

EOFS: End of full support

EOM: End of marketing

GA: General availability

N-Live: Multi-site active/active DR technology by Huawei

NSA: Non-standalone

SA: Standalone

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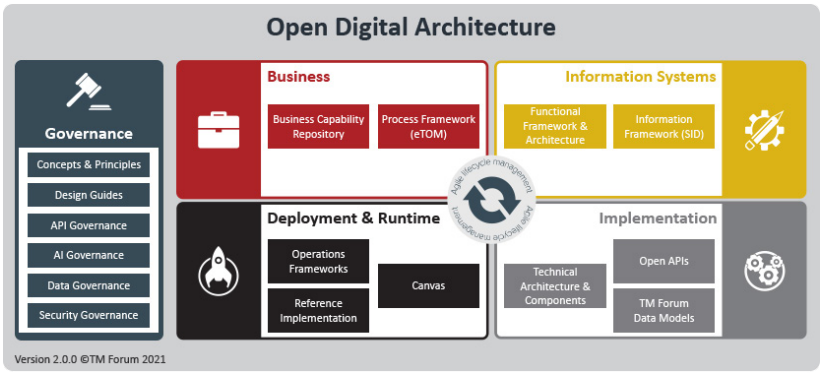
TM Forum Open Digital Framework

A blueprint for intelligent operations fit for the 5G era

The TM Forum Open Digital Framework (ODF) provides a migration path from legacy IT systems and processes to modular, cloud native software orchestrated using AI.

The framework comprises tools, code, knowledge and standards (machine-readable assets, not just documents). It is delivering business value for TM Forum members today, accelerating concept-to-cash, eliminating IT & network costs, and enhancing digital customer experience.

Developed by TM Forum member organizations through our Collaboration Community and Catalyst proofs of concept, building on TM Forum's established standards, the Open Digital Framework is being used by leading service providers and software companies worldwide.



The framework comprises TM Forum's Open Digital Architecture (ODA), together with tools, models and data that guide the transformation to ODA from legacy IT systems and operations.

Open Digital Architecture

- Architecture framework, common language and design principles
- Open APIs exposing business services
- Standardized software components
- Reference implementation and test environment

Transformation Tools

- Guides to navigate digital transformation
- Tools to support the migration from legacy architecture to ODA

Maturity Tools & Data

- Maturity models and readiness checks to baseline digital capabilities
- Data for benchmarking progress and training AI

Goals of the Open Digital Framework

The aim is to transform business agility (accelerating concept-to-cash from 18 months to 18 days), enable simpler IT solutions that are easier and cheaper to deploy, integrate and upgrade, and to establish a standardized software model and market which benefits all parties (service providers, their suppliers and systems integrators).

Learn more about member collaboration

If you would like to learn more about the Open Digital Framework, or how to get involved in the TM Forum Collaboration Community, please contact George Glass.

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TM Forum research reports

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