5G

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Cloud: Not a Technology Upgrade, But a Lifestyle Change for IT

PROSE: For Everyday Communication of People, Networks, and Data

5G Enables New Capabilities to Accelerate **Digital Transformation**

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The End of Giants

Toni Eid,
founder
editor in chief
Telecom Review International

Smart technologies are taking over day after day, gradually replacing what was known as hi-tech devices which are on the verge of disappearing.

Smartphones wiped off the role of many tech giants including camera manufacturers, video players and content storage tools.

The sales of watches, alarm clock, photographic films, copy machines, among others, are decreasing sharply.

Latest statistics show that over 34 brands were on the brink of disappearing, going bankrupt, restructuring, or selling some assets or patents.

Kodak or Eastman Kodak, a brand we all remember, has gone incognito. Blockbusters was our movie night companion, which offered us a wide variety of films to rent. Polaroid, Minolta, and many other brands were dominating our daily life. Now they are from the past even if they still exist.

Smartphones are now our camera, with enhanced features upgraded with every generation. They have also replaced traditional alarms and hotel wake-up calls.

Calendars, notebooks, paper maps, and GPS have all been replaced and the list goes on.

Some of us are lucky for having witnessed this transition and tried both the traditional technology and its upgraded version.?

Kiren Kumar, Deputy Chief Executive (Development), Infocomm Media Development Authority, Singapore

Singapore
Forging the Next Wave of Digitalization

After being conducted virtually for two years, ATxSG was held in-person as Singapore's largest technology event since the reopening of borders. Jointly organized by Infocomm Media Development Authority, Singapore (IMDA) and Informa Tech, the event brought together more than 16,000 hybrid attendees from more than 80 countries, including senior government leaders from Singapore, Malaysia, Indonesia, Estonia and Mongolia. Telecom Review Asia Pacific took the opportunity to speak with Kiren Kumar, Deputy Chief Executive (Development), IMDA, to learn about efforts to accelerate Singapore's digital economy, focused on advancing 5G and ICT development.

Singapore has embarked on 5G. Can you tell us about Singapore's approach to 5G and steps to advance 5G development in Singapore? How will industries benefit from 5G adoption and how does IMDA facilitate this shift?

The power of 5G is not just about consumers, but enterprise growth and innovations. With IoT and network slicing, the ability of 5G to support various industries by providing dedicated connectivity like a private network, and allowing users to configure massive sets of sensors, opens up huge potential for commercial use cases. In addition, the virtualization and software-driven nature of 5G means it creates opportunities for companies to build enterprise platforms.

Therefore, to realize the potential of 5G, Singapore pushed for an aggressive rollout of 5G networks based on standalone (SA) network specifications, instead of 5G non-standalone specifications first, which was the approach in most other jurisdictions. This allows for the delivery of the full-fledged capabilities and performance of 5G such as network virtualization, intelligence at network edges, and dynamic provisioning of differentiated services for different use cases. The 5G SA networks today already cover at least half of Singapore, which is ahead of schedule, and Singapore is on track for nationwide 5G standalone deployment by 2025.

At the same time, Singapore is also actively seeding lead industry demand. Since 2019, IMDA has been working closely with industry players to experiment with new and innovative 5G solutions in areas such as cloud gaming, advanced manufacturing, port operations and smart cities. For example, IMDA has been partnering with IBM, Samsung and M1 to develop Singapore's first 5G Industry 4.0 trial. This involves having 5G enabled, AI "Smart Glasses" to help factory operators identify defects in real-time. IBM will deploy this 5G-enabled augmented reality solution, at their global manufacturing sites, starting in New York later in 2022.

We recognize that to enable our 5G efforts, people and R&D are key. IMDA has

> " The 5G SA networks today already cover at least half of Singapore, which is ahead of schedule "

been supporting Singaporeans to take on these emerging opportunities through training in 5G skills, to bring Singapore into the digital future. We have partnered with our Mobile Network Operators, the National University of Singapore and Singapore Polytechnic to set up a 5G and Telecoms Academy in 2020 to equip professionals with 5G skills. To date, more than 4,000 Singaporeans have already been trained through the academy.

Separately, S$70 million will be invested in future communications technologies such as 6G, specifically in the areas of research, innovation, training of local talent, and international partnerships. As part of our national Future Communications and Research and Development Programme, we have signed an MoU last year with the world's first and leading 6G research and development program funded by the Academy of Finland. A similar MoU with the Korean Institute of Communications and Information Sciences has been signed.

Spectrum is an important resource to support 5G growth and meet increased connectivity demands in the foreseeable future. How does IMDA carry out spectrum management and policy-making to ensure that spectrum is optimized to drive Singapore's continued growth in a digitalized era?
In a connected world where there is a constant need for data, faster communications and higher definition media, the demand for spectrum resources continues to outstrip the available supply. To support Singapore's digital economy and maximize the value of spectrum for economy and welfare of consumers, appropriate and efficient allocation of scarce spectrum resources and forward-looking spectrum planning processes is imperative.

To support future technological developments, IMDA monitors the trends and developments of new wireless technologies and reviews the frequency allocations, to better plan spectrum needs and demands. Moving ahead, it is anticipated that new technology trends, such as the next generation of mobile technology, advancement in the use of unlicensed spectrum e.g., Wi-Fi 6E and increased use of satellite services will continue to transform the ICT industry.

As Singapore is a small and open economy, IMDA formulates its spectrum allocation strategy and plans by aligning with international developments, ensuring harmonization of our national spectrum usage regionally and internationally, and adopting policy positions that maximize our domestic interests.

Can you tell us about partnerships or collaborations to foster enterprise transformation in Singapore to positively impact the economy? What are other initiatives taken to propel SMEs and accelerate digitalization across businesses?
COVID-19 has turbocharged digitization and many businesses now recognize that they can no longer do business in the traditional way. Businesses, including SMEs, see digitalization not just as a necessity for survival but also as an opportunity to reinvent and bring their businesses to the next level.

It can be daunting for SMEs to digitally transform their businesses. This is why the government has put in place support schemes and initiatives to help SMEs digitally transform. To increase baseline adoption, IMDA has rolled out a suite of schemes facilitating SMEs' adoption of digital utilities, such as e-payments and e-invoicing, at scale

with additional support for basic and advanced solutions that address the needs of SMEs in the various sectors and at different maturity levels under the SMEs Go Digital Programme. To date, more than 80,000 enterprises have benefitted from the program, including a quarter of them coming on board in 2021 alone. Three in four firms now adopt at least one digital solution.

To enable every SME to be a digital SME, IMDA has scaled up our efforts so that SMEs have the confidence to use digital technologies to transform their business models and take on new opportunities in the digital age. IMDA's Chief Technology Officer-as-a-Service (CTO-as-a-Service) enables SMEs to conduct self-assessment of their digital needs via a one-stop platform. It also provides SMEs with quick access to digitalization resources and a shared pool of digital consultants for comprehensive digital advisory and project management services.

For local companies that are more digitally progressive, we have launched the Digital Leaders Programme (DLP) that helps such companies, across all industries,

accelerate their digital transformation plans. To do this, the DLP supports companies in building in-house digital capabilities, and integrating digital into their core business strategy so that they can develop innovative business models and capture new growth opportunities.

For companies who want to start innovating, IMDA has a national platform for digital innovation, called the Open Innovation Platform (OIP). Enterprises with business problems can get support to define their problem statement, crowdsource for innovative solutions from tech companies, and be supported across the prototyping process. Since 2018, OIP has facilitated 300 challenges with more than $8.5M in prize monies, powered by a pool of more than 11,000 solution providers. Some companies which took part in challenges on our OIP have gone on to transform their operations and scale these solutions globally.

There is a global ICT talent shortage amid a rapidly-digitalizing landscape. What does IMDA do to address talent shortages to cope with future needs?
The demand for tech talent globally has

risen exponentially, largely driven by the growth of the tech sector and broad-based digitalization across industries and companies. Likewise in Singapore, we already see strong demand for tech talent across the entire economy, ranging from software developers and network engineers to cybersecurity and product development specialists. This is not just within the ICT sector, but also in sectors like finance, manufacturing and professional services. To ensure that companies have ready access to globally competitive tech talent, IMDA works closely with enterprises, institutes of higher learning (IHLs) and other stakeholders to maximize our tech talent pipeline and to ensure that Singapore continues to be a vibrant digital economy.

First, we equip graduates from IHLs with the right skills and experiences to be industry-relevant. We train them for areas of current need, as well as in emerging tech areas. For example, on top of established computing programs in our IHLs, we have worked with the Singapore Institute of Technology to create a new Bachelor of Science in Applied Computing with a specialization in FinTech. We are actively working with our IHLs and

companies to ensure that Singapore continues to produce competitive deep tech talent and graduates who are well versed in using technology regardless of their specialization.

Second, through the TechSkills Accelerator initiative (TeSA), we have supported over 7,000 companies, comprising local companies and foreign MNCs operating from Singapore, to hire, train and retain their tech team. TeSA collectively bridges companies' talent needs with a supply of skilled and ready-to-be-skilled talent, and further develops existing employees through support on tech courses and industry-recognized certifications. Since 2016, we have trained over 160,000 Singaporeans and placed more than 12,000 Singaporeans in tech jobs.

Third, together with Singapore's Ministry of Manpower, we have put in place a transparent framework to give businesses better clarity and certainty to facilitate the entry of global talent with in-demand tech-skills. Singapore remains open to global talent to complement the strong Singaporean talent pool to drive new innovations and digitalization of our economy. **TR**

Vick Mamlouk, Senior Advisor, Rosenberger Technologies

PROSE: For Everyday Communication of People, Networks, and Data

PROSE, the spinoff of Rosenberger Technologies' antenna and wireless product portfolio, was announced in early 2022. We connected with Vick Mamlouk, the Senior Advisor at Rosenberger Technologies, to shed light on the essence of this new brand, their current business environment, and the growth outlook within the wireless industry.

As one of the latest initiatives in developing Rosenberger Technologies' international business for

wireless products, can you explain the relevance and purpose behind the new brand identity PROSE?
PROSE means everyday language, and we noticed in the world today that communication is a comparable element to electricity and water. With life meant to

be connected and made up of the small yet unforgettable moments, we felt it was important to establish ourselves that we're in the industry to connect people.

Rosenberger Technologies, from its origins, focused on connectivity

solutions; making it one of the leaders in the industry. The wireless product portfolio was integrated into the mix in 2008 under the leadership of the same team that leads PROSE today. The focus is on wireless product portfolios that provide base station antennas and indoor wireless communications. We took the wireless communication vision and branded it as PROSE, allowing the company to focus on the mission to communicate in day-to-day life.

We have been in the telecommunications industry for a long time, and our product offerings have over 100 service providers worldwide. We have a clear understanding of the future market and how to adapt to change. Because of our market adaptability, we have been able to focus on communicating with people, networks, and data—all while providing great products and solutions.

With PROSE, we provide wireless solutions for service providers, enterprises, and private wireless networks. We want to be closer to our customers and help them make decisions quicker than ever. Customers now need unique solutions, and we can provide offerings based on their demands and needs.

In wireless communications infrastructure, the market is changing and the pie is getting bigger. Now you are not only serving service providers for their wireless needs, but you are also serving the enterprises that want their private networks. Our future is to help support the industry with Open RAN and active wireless DAS for indoor and outdoor solutions.

What is the current market position and business environment for PROSE?

We have four R&D centers in North America, China, India, and Australia, as we are focusing more on different future product demands for customers. We also have three manufacturing locations and more than 25 sales and project offices serving around the globe.

We focused a lot on Asia and expanded to the Middle East and India. Now with the expansion and the ability to be on our own, the market will allow us to open in Europe, Africa, as well as North, South, and Latin America. I am personally involved in Africa, which I see as the last frontier, and where we recently demonstrated an expansion in our customer base.

How does the company support its customers? What are the main needs that should be met?

Different customers need different things. In Africa, we are still talking about 3G going to LTE, but in countries like Saudi Arabia and the UAE, we are already talking about 5G and 6G. In Europe, it's all about private networks. Manufacturers and enterprises are making their wireless networks.

I see that the future in the wireless industry would be connecting Open RAN to indoor solutions. You will have a brand new network that is not only controlled by the vendor or the service provider. Each enterprise can have its segment of frequencies and make its private network. And they want companies like PROSE to be able to serve these needs and say, "Okay, I can do LTE, I can do 5G, and our systems are ready for 6G."

Where would there be a huge demand increase and how would PROSE respond to this?

It depends on the market. When it comes to wireless networks, there are two things: capacity and coverage. The capacity is when you add sources like data centers and actual radios. While coverage is for indoor solutions and being able to cover public venues.

For instance, Asia has been more advanced in wireless communications because they have deployed 5G. Since there is a large population, capacity is required. While in Africa, there is less of a population but much larger areas— which require coverage. In Europe, dense areas require both better coverage and capacity.

In the future, I see heavy industrial companies as the most advanced in providing private networks. Whether located in Europe, China, or North America, you will hear companies have around 300,000 employees, on top of numerous data centers and factories equipped with robots. Those would require more private networks and wireless solutions.

Moreover, for indoor solutions, I see buildings set up with dedicated infrastructure to connect tenants and users. For outdoor solutions, they will prepare areas where they can put closets for telecommunication as data centers are coming to the edge.

All of this is happening to provide the PROSE way — everyday communication and easy services and installation for complete coverage.

What is the key to PROSE's success in the future?

First of all, I hope that COVID and supply chain issues can come to an end. Thus, the focus can go to bringing the investment back from the service provider and enterprise. What we have seen, in the last two years of the pandemic, is that we make sure communication is enabled everywhere.

Everybody is working from different locations, but they are communicating more and more, depending on the infrastructure. I see there is a major growth in the infrastructure, growing considerably between 10-15% a year, based on ABI and other worldwide market studies.

Service providers and enterprises are all part of the growth in the future. 5G will provide network slicing segments where each one will have its frequency spectrum. We hope that PROSE will be very successful by not only capturing customers and being able to meet their demand but also getting into more international markets. Each market has its particularities and challenges to keep things balanced and PROSE is here to provide the right wireless solution to serve its customers. TR

Xie Junshi, EVP and COO, ZTE

ZTE COO Xie Junshi: Digitalization is the Key to Greater Societal Resilience

At a sharing session organized by the GSMA, Xie Junshi, EVP and COO of ZTE, explored several exciting new trends in scenario-based 5G applications, mobile technologies, and industry development in an increasingly digitalized world.

Xie noted that digitalization in the volatile, uncertain, complex and ambiguous (VUCA) era is continuously strengthening the "immune system" of our society, playing an irreplaceable role in tackling not only the current pandemic but also long-term public health issues such as ageing populations while promoting sustainable development. With digitalization accelerating around the world, both the technology and market are changing disruptively, creating more innovations and greater potential. To maintain a competitive edge, CSPs are pursuing the transformation to DSPs. Focusing on scenarios and value creation, ZTE aims to work jointly with all partners to build a digital and intelligent ecosystem.

Below are the highlights of Xie's sharing:

Accelerating global digitalization is boosting the society's immune system

Digitalization is the key to greater societal resilience in the post-pandemic era. Whether in telecommuting, online collaboration, or digital factories, digitalization provides support for our lives and helps guarantee the health of the entire economy. Digitalization is also playing a pivotal role in tackling VUCA and population aging while promoting green, low-carbon, and sustainable development.

Driven by scenario and value, both the market and technology are changing disruptively. The diverse range of exhibitors and fascinating content at MWC 2022 highlight the evolution from mobile Internet to IoE and AIoE, marked by ubiquitous 5G connectivity, AI advancement, cloud-network convergence, and new technologies. Today, without a doubt, global digitalization is accelerating, creating more technological innovations and greater market potential. To maintain a competitive edge, CSPs are pursuing the transformation to DSPs.

In every industrial revolution, higher efficiency has always been the most critical factor. This current revolution of digitalization is no exception. At MWC 2022, most of the digital innovations presented by exhibitors, including ZTE, focus on higher efficiency. For instance, ZTE shared innovations for simplified infrastructure, efficient and intelligent operations, as well as agile innovations for achieving growth in the second curve of digital services. ZTE has also adopted scenario-based approaches to realize the ultimate experience and efficiency, promoting sustainable development and future technological advancements.

Sustainable development is the key goal of enterprises, while the key to promoting 5G application in the to-B field lies in three aspects
For 5G networks, consumers look forward to a better experience, while enterprises look for lower costs, higher efficiency, and business growth. So far, in the to-B field, 5G technology has been widely applied to verticals. For example, to assist or replace manpower, 5G-powered automated guided vehicles (AGVs) are used in flexible production lines, 8K machine vision for more efficient quality inspection, and unmanned or remotely controlled machines to assist in operations.

To facilitate greater breakthroughs in the to-B field, however, it is important to achieve collaboration with operators and enterprises where every party stands to benefit. Together, there are three aspects to work on: creating and sustaining competitive differentiation, developing effective business models to speed up value creation, and exploring the path to mass customization.

Competitive differentiation means that ZTE can provide unique and optimal solutions, and hence stand out from the competition. When delivering 5G solutions for verticals, it is important to determine whether 5G technology is indispensable, or whether the 5G-powered solutions have unparalleled advantages over others. This is how competitive differentiation can be sustained.

As for speeding up value creation in the early stage of 5G application, it is important to focus on customers' pain points and distinctive needs in fragmented scenarios. On this basis, ZTE can explore more scenarios in different fields, so as to accelerate the development of 5G application in the to-B field.

To achieve higher profitability, mass customization is the optimal choice. This is why ZTE aims to build underlying capabilities of digital infrastructure and component-based cloud capabilities. Through flexible orchestration of such capabilities, agile innovation can be implemented, meeting the requirements of different applications in various scenarios. In addition, this allows ZTE to continue to build successful experience across different scenarios and consolidate a strong digital foundation,

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ZTE shared innovations for simplified infrastructure, efficient and intelligent operations, as well as agile innovations for achieving growth in the second curve of digital services.

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to enable rapid iteration and continuous evolution.

Evolving consumer expectations drive 5G application in the to-C field, and joint efforts are required for building the infrastructure and ecosystem

The rapid development of the mobile Internet is driven by evolving consumer expectations and improving human capabilities. The same will be true for the application of 5G in the to-C field. For example, consumer demands boost the development of applications that can provide real-time, immersive, and interactive audio-visual experience, such as UHD videos, AR and VR applications, and cloud gaming. This has been a trend in countries with wide 5G network coverage, including China and South Korea. With 5G technology, we can now watch live sport events with a panoramic view, freely zoom in or out, and switch between different camera positions. In this way, consumers can stay at home and enjoy personalized and immersive experiences in real time. In order to make the much talked-about metaverse a reality, we need to enhance network capabilities, computing power, and storage capabilities, for which 5G technology plays a vital role.

To promote 5G applications in the to-C field, wide and deep network

> To gain a firm foothold in this process of network evolution, ZTE is always committed to building a "1+2+3" digital ecosystem, looking to address key pain points and create greater value for customers

coverage is of great importance. More specifically, we need optimal, cost-effective 5G solutions that can guarantee continuous and intensive network coverage both outdoors and indoors, even on high-speed trains, airplanes, and ships. ZTE has already made many innovations in the to-C fields. In addition, easy-to-use and cost-effective terminals, together with different kinds of content services, will help give rise to improved applications in a stronger and healthier ecosystem.

ZTE is committed to building a "1+2+3" digital ecosystem

The next major chapter of 5G development will start with the arrival of 5G-Advanced. While 3GPP Releases 15, 16, and 17 represent the first phase of 5G standards, 5G-Advanced marks the start of the second. Following up on 5G commercial deployment and empowerment of verticals worldwide, 5G-Advanced focuses on better user experience and more industry applications.

In December 2021, together with its industry partners, 3GPP approved a work package for its Release 18, marking the start of 5G-Advanced evolution. The work package includes 28 study or work items in a variety of scenarios, including eMBB, real-time interactive new media, network intelligence, IoT featuring high-precision positioning and low power consumption, IIoT, integrated sensing and communication (ISAC), fused location, and satellite-cellular network integration. These efforts will bring us brand new capabilities, applications, and experiences. Toward 5G-Advanced, ZTE will continuously work with industry partners to promote technological innovation and industrial transformation.

To gain a firm foothold in this process of network evolution, ZTE is always committed to building a "1+2+3" digital ecosystem, looking to address key pain points and create greater value for customers.

So what exactly is "1+2+3"?

"1" refers to a solid foundation consisting of chipsets, algorithms, and architectures. ZTE continuously strengthens its foundation to gain momentum for growth.

"2" refers to intelligence and security, which are crucial to 5G networks and business.

"3" refers to capability, performance, and efficiency, which should be continuously improved through innovations and are key to the prosperity of 5G.

With the evolution to 5G-Advanced, ZTE will work with industry partners and advance technological innovations to reinvent a digital world.

China's 5G development will make greater contributions to global industries and markets

As of January 2022, a total of 1.425 million 5G base stations have been built in China, making 5G networks available in over 98% of counties and 80% of towns. Mobile 5G connections now exceed 518 million. More crucially, over 10,000 innovative 5G use cases have been created, which span the fields of manufacturing, health care, education and transportation.

In the 5G era, China has been an active contributor in many aspects:
- The moderately advanced pace of network construction in China has boosted the growth of the 5G industry.

- China has continued exploring and promoting large-scale 5G application, consolidating the foundation of the entire industry.

- China actively pushes forward the co-building and sharing of networks for higher resource efficiency.

China has a wide range of wireless scenarios and a sound foundation provided by its digital economy, and is witnessing the growth of huge potential in consumer markets and various industries. With the moderately advanced pace of 5G network construction, excellent network coverage and guaranteed performance, China's unique environment is set to produce a range of more applications and continuous innovation, and contribute to global industries and markets. **TR**

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Gregor Hohpe, Enterprise Strategist, Asia Pacific, Amazon Web Services

Cloud: Not a Technology Upgrade, but a Lifestyle Change for IT

In conjunction with Asia Tech Singapore 2022, Gregor Hohpe, Enterprise Strategist, Asia Pacific, Amazon Web Services, speaks with Telecom Review Asia to shed light on cloud trends and important enterprise cloud strategies.

Globally, cloud adoption is on the rise. How does cloud adoption unlock value for enterprises?
We see companies moving to the AWS Cloud for several reasons. Cost continues to be a major motivator for moving to the cloud, and rightly so—customers like amaysim saw a 75% reduction in compute costs by using Amazon EC2 Spot instances and Amazon ECS. However, the rising levels of uncertainty faced by organizations today have triggered a rapid shift from optimizing for the steady state to optimizing for change. Cloud gives organizations much needed agility, from the elastic and economic scaling of resources based

on their needs to the ability to innovate and deliver solutions faster. And increasingly, we see customers move to the cloud as they look to reduce their IT carbon footprint. According to 451 Research, moving computing workloads from on-premises data centers to the cloud can reduce the carbon footprint associated with running IT workloads for companies in the Asia Pacific by more than 78%—just from energy efficiency gains alone, and the Customer Carbon Footprint tool helps customers understand and further optimize their footprint.

What are some cloud trends that are on the rise?
There is a shift in the types of workloads that customers are moving to the cloud. While many organizations started with relatively modern, customer-facing systems, we are seeing more customers moving core systems, or what you might call legacy systems, to the cloud, often migrating off existing mainframe infrastructures. AWS has demonstrated cost and availability advantages for all types of workloads, and customers benefit from that.

Customers are modernizing existing workloads to take advantage of the elasticity and increased software delivery speed in the cloud. The agility those customers gain is a critical factor in today's "economies of speed", where organizations cannot rely on scale, but must foster fast learning and experimentation.

Cloud is no longer just seen as a place for only compute workloads and many customers use cloud for advanced data and analytics workloads. For example, Globe Telecom, a leading telecommunications provider in the Philippines, built a customer intelligence platform on AWS that collects and processes real-time customer data at scale to provide a 360-view of its customers.

Looking further out, Werner Vogels, Chief Technology Officer for Amazon, has observed macro trends around the technology industry, which include machine learning augmenting software developers' workstreams to help them

create more secure and reliable code, the rise of smart spaces that interact with their occupants, and developers beginning to make sustainability-conscious decisions about the systems and applications they are building.

What are important considerations when enterprises develop a cloud strategy?
As we engage with many customers on their digital transformation journey, we see two critical success factors. First, many challenges in large organizations are not technical, but about the people and culture. Senior leadership alignment and commitment are critical to set a clear direction and expectations with the rest of the organization based on top-down goals. Second, a strategy should not just consist of a set of goals, but a credible path on how to achieve those goals. That path will involve significant decisions and force important trade-offs. For example, will you first lift-and-shift applications and modernize later, or vice versa? Are you looking to make one giant leap or do you prefer incremental steps that deliver value sooner but might not be the shortest path overall? Gaining clarity on the path forward, ideally guided by a set of principles, avoids analysis paralysis and assures consistent decision making.

Lastly, cloud isn't a technology upgrade. It's a lifestyle change for IT. According to AlphaBeta research, cloud and cybersecurity skills will be the top two most demanded digital skills by employers by 2025. So, it's important that organizations are trained on the cloud and comfortable not just with the new technology but also with new concepts and ways of working. We train hundreds of thousands of people with new digital skills a year for that purpose. In Singapore, for example, AWS has trained over one hundred thousand individuals with cloud skills since 2017.

For enterprises that have already embarked on the cloud, how can they accelerate digitalization to ensure business continuity and security?
Migrating IT infrastructure to the cloud is a critical enabler for an

organization's digitalization, but it's only part of the picture. Many large-scale IT operations were designed to optimize existing business processes. And they have done an amazing job, making the business faster, more efficient, more accurate, and more repeatable. But they built what I call "digital copies" – they took something that already existed and made it digital. Customers who are successful in the digital economy work differently. They use IT to do things that the business could not have done before: new products, different customer experiences, and shift from a product to a service model. "Reprogramming" your IT to this new model is important, but also implies profound changes to its operating model.

Amazon founder and former CEO Jeff Bezos wrote in a shareholder letter a couple of years back about embracing external tailwinds. Cloud is a strong tailwind for your organization. But sometimes it can feel like changing the wheels on a moving car.

AWS maintains the highest security and privacy practices, which is one reason we are trusted by governments and organizations around the world to deliver services to millions of individuals. The cloud provides numerous security controls which offer unparalleled fine-grained control and visibility into your security posture that is impossible to replicate in on-premises environments. Additionally, AWS comprises 26 regions globally that are built on the same system infrastructure and are designed from the ground up by AWS. So, while moving to the cloud, we encourage organizations to not simply replicate their existing security and business continuity setup, but to fully utilize these new capabilities.

Most importantly, simplify. IT is used to adding ever more processes and mechanisms. The AWS cloud provides a uniform platform with integrated identity and access management, monitoring, and automation. By embracing this architecture, you can improve operational capabilities while also harmonizing and simplifying. **TR**

Dennis Wong, Vice President Enterprise 5G and Platforms, Singtel

5G Enables New Capabilities to Accelerate Digital Transformation

More enterprises are undergoing rapid digitalisation while exploring and developing tailored 5G solutions for deployment in their industries. Telecom Review Asia interviews Dennis Wong, Vice President Enterprise 5G and Platforms, Singtel, to learn about the value of cloudified 5G networks and Singtel's offerings for enterprise 5G.

5G is an enabler to accelerate industrial digitalisation. Can you tell us about the use cases of 5G networks and their impact on industries?

5G technology is not an incremental improvement of 4G, but a fundamental paradigm shift. Instead of thinking of 5G as a technology that delivers faster speed and lower latency, industries should explore how 5G can enable new capabilities to accelerate digital transformation.

For instance, by combining 5G and MEC, capabilities no longer reside solely on the device, but also at the edge, to serve multiple purposes. This way, 5G results in a quantum leap in device capabilities, to support high-bandwidth and low latency use cases that could not have been enabled before. With 5G, we can now power new capabilities including network slicing on-demand, mission-critical applications and AI to deliver new value and impact to industries.

Cloudification of 5G unleashes greater 5G potential and innovation. Can you tell us more about the benefits of a cloudified 5G network?

Cloudification of 5G networks delivers three key benefits. Firstly, cloudification raises scalability, allowing 5G use cases to roll out faster and adoption amongst enterprises to accelerate. Secondly, cloudification increases the capabilities of a virtualised device as its capabilities are no longer restricted to a mere physical device. Thirdly, a cloudified 5G network is more resilient as capabilities extend beyond a single location, such that even when a single location fails, there is the assurance of a backup.

How is Singtel working with enterprises in Asia to utilize 5G?

Singtel approaches 5G from a customer's perspective to provide end-to-end solutions. Apart from providing a 5G network, MEC and public cloud, we are also focused on providing a marketplace and orchestration platform. Through Paragon, we provide enterprises a platform that aggregates 5G networks, edge computing and public cloud, as well as access to an ecosystem of partner applications to leverage on AI and security capabilities inherent to the platform. This is one way Singtel helps enterprises adopt 5G to build the agility, flexibility and scalability needed to transform. In the region, Singtel also works closely with a group of associates to ensure that use cases are deployed in other markets.

What is Singtel's strategy to capture the enterprise 5G market in Asia?

Singapore is at the forefront of deploying 5G in the enterprise market, across verticals such as transportation, healthcare, advanced manufacturing and the government sector. So from a technology standpoint, one of our strategies is forging close partnerships with regional associates to impart technologies and drive innovations. From an enterprise market perspective, Singtel shares our takeaways with our associates and promotes cross-learning and cross-pollination of technologies. Through a platform like Paragon, Singtel allows associates to readily adopt 5G.

Finally, Singtel is focused on providing customers of enterprises the most benefits. As the market continues to grow and mature, we are committed to working closely with our ecosystem, device partners and application partners to deliver seamless 5G services for enterprises. **TR**

Peter Hadinger, Chief Technology Officer, Inmarsat

Push for Sustainability and Governance in Space

On one hand, the satellite communications industry is pressured to deliver universal connectivity. On the other, the industry has a part to play in mitigating potential damage of uncontrolled growth in space. Telecom Review Asia Pacific interviews Peter Hadinger, Chief Technology Officer, Inmarsat to learn about the pressing need for governance in space, as well as the future outlook of the GEO satellite operator.

Why is it important to ensure sustainability at the forefront of satellite network design and deployment?

When you start off small, you don't always pay attention to the environment that you're working in. This has been true for humanity over the millennia, when people didn't have to worry as long as the environment is big and their impact is small. This leads to the 'tragedy of the commons' when everybody assumes that somebody else will take care of the problem.

This is why for a long time, satellites have been a rare thing. You didn't have many of them and as space is big, there were no problems and not many rules. Similar to when aviation just started, there was no air traffic control. But when air traffic became more congested, mechanisms were needed to ensure that everyone was following the same rules. This is also true for maritime.

However, space has been an open territory without a lot of rules, even though there are bodies like the International Telecommunication Union to coordinate on spectrum. Some large countries—the United States in particular—have had some rules about orbital debris for a number of years. But it's not about satellites running into each other— it's more about ensuring that satellites do not leave a lot of debris behind.

But now, in an era of mega-constellations, we feel that it's incumbent on space operators to do what all other industries have done over time, which is to establish rules to ensure that space is collectively taken care of.

For geostationary satellite operators, this has been going on for a long time. There's one very narrow space which is the geostationary arc, and in that arc, there are essentially informal rules that govern how operators move around and coordinate positions with one another.

But once you enter the lower orbit, where there are more players and a far greater number of assets that are going every which way. Becoming disconnected from each other, it's important to ensure that we have rules in place to address conflicts when they occur — when satellites are decommissioned or if we lose control of them, or to ensure that we can avoid one another in space.

Today, we have to launch through the LEO belt to get to GEO. Our early operations of getting into the GEO orbit involve looping, in and out of the LEO space. We, as GEO operators, are very concerned about what happens in LEO because we cannot afford to have an accident that spreads debris, which has occurred in the past.

Can you tell us about Inmarsat's commitment to ensuring continued growth and innovation in space?
Inmarsat has always been on the leading edge as we are the first to introduce activities in a variety of frequency bands, as well as the first to debut new technologies for combining space-and-ground networks like what we do with the European Aviation Network.

We integrate these capabilities into new, innovative systems. For example, Iris is a system we're deploying in Europe to support air traffic navigation, with manned and unmanned platforms working side-by-side. The same problem that we're talking about in space is being addressed in Europe's aviation environment because they have too many planes and are getting into things like drones which have to operate in that same space.

They need to have a common communications infrastructure to share information on where they are and to reach where they're going safely.

Moving into an era where we are addressing the hotspots of the world, there's a combination of both satellite and terrestrial technologies, comprising mixed frequency bands and different kinds of satellites (GEO and LEO). However, end users do not need to understand these complexities – all that matters is that they are connected.

But for us, we must ensure that they receive the best possible service everywhere, independent of all the magic that goes on behind the scenes. This is our motivation for investing hundreds of millions of US dollars a year to stay at the forefront of mobility and safety. Since Inmarsat's inception, we have been offering transport mechanisms for global safety critical industries, starting from maritime and now aviation. We're also the largest supplier of communications services to governments worldwide. With more than 40 years of global satellite communications leadership, we

recognize the ability to not only facilitate air traffic and maritime navigation, but also space traffic navigation.

Recently, the trials for the terrestrial element of Inmarsat ORCHESTRA have just ended in Singapore. Can you tell us why was Singapore picked as the destination?
There are three reasons why. Firstly, you can't find a denser maritime environment than in Singapore – undeniably the world's most dense shipping route and a place that challenges capacity.

Secondly, Singapore has a very challenging radio environment impacted by the weather, where its humid and rainy climate adversely affects radio links. With our proofs-of-concept, we couldn't find a more challenging venue than Singapore. We knew that if it was going to work in Singapore, it would work anywhere else.

Thirdly, we receive tremendous support in Singapore. As these tests were conducted during the height of the pandemic, it was great that we have a local office in Singapore, with engineers and staff that supported us in placing our equipment in ships to run the trials. We also have had the support of the Maritime Port Authority (MPA) which saw the value in introducing new technologies in this dense environment.

How do the trial results support better connectivity solutions for Inmarsat in the future?
The fundamentals of ORCHESTRA are using different communication mechanisms to support a given user, which in this case is a ship. Because we have so many ships in a dense environment like Singapore, being able to take some of that traffic off from the satellite and connect it directly to shore frees up satellite capacity for other applications.

To deliver a huge amount of capacity domestically, we wanted to test a bunch of technologies to determine how they would work in this challenging environment. We used

the results to refine our technical approaches that will then bring the market ultimately to the terrestrial element of ORCHESTRA, not just in Singapore but everywhere else, targeting dense hotspots such as ports, straits, canals, airports, with high traffic.

We're also looking at future LEO satellites forming small constellations of fewer than 200 satellites to address mobility and sustainability. We're also investing in LEO satellites as they make financial sense in the long run.

Fortunately, we are not time-pressed to achieve this as we already have the world's best global network and a roadmap that goes well beyond 2030. In the near future, I foresee LEO playing a significant role. Our upcoming LEO capabilities would build on the foundation we've established, which is essentially core to ORCHESTRA to uniquely integrate LEO and terrestrial networks at hotspots to support sustainable satellite communications. **TR**

> In an era of mega-constellations, we feel that it's incumbent on space operators to do what all other industries have done over time, which is to establish rules to ensure that space is collectively taken care of

Sami Luukkonen, Managing Partner , NCS Telco+

Building an Industry with Digital Telcos

At Asia Tech Singapore 2022, NCS Telco+ signed a memorandum of understanding (MoU) announcing its partnership with Advanced Info Service (AIS) to address the telco's digital transformation needs, as well as those of enterprises in Thailand.
In an interview with Telecom Review Asia Pacific, Sami Luukkonen, Managing Partner of NCS Telco+, offered insights on the latest partnership and ways to scale transformation in the region.

In the telecom industry, digital transformation and 5G deployments are accelerating in tandem to deliver greater value to customers. In Thailand, for instance, where the government has rolled out Thailand 4.0 as a national digital transformation initiative, the telecom industry is well-positioned to transform from within and serve as the backbone for digital progress across industries.

Aligned with the nation's digital ambition, Thailand's leading telco Advanced Info Service (AIS) has formally embarked on a digitalisation journey with the signing of a memorandum of understanding (MoU) with NCS Telco+, a joint venture between Singtel and NCS, to help the telco transform business operations, capture value from data and drive applications of 5G.

NCS Telco+ and AIS Partner to Drive Transformation

Officiated by Sami Luukkonen, Managing Partner of NCS Telco+, and Tanapong Ittisakulchai, AIS Chief Enterprise Business Officer, the MoU seals the start of a partnership for NCS Telco+ to support AIS' transformation journey. This partnership is also part of NCS Telco+ strategy to expand in the Asia Pacific and enable telco enterprises across the Singtel Group to scale with digitalisation.

"Our partnership with AIS marks our entry into the Thai market and an opportunity to bring our domain knowledge and expertise in designing and implementing 5G and IoT solutions, enterprise cloud services platforms and automation services to AIS and its enterprise customers. NCS Telco+ will help improve their operational efficiencies by leveraging data-driven insights, and deliver enhanced customer experiences," Luukkonen commented.

On the sidelines of the ceremony, Luukkonen shared three key strategies for telcos to yield 5G success and digital transformation in a digital economy.

"The first is driving differentiation through network leadership. Telcos can look into optimising the existing network to roll out 5G as affordably and effectively as possible, leveraging previous network investments for ecosystem partners to derive value from capabilities such as network slicing, artificial intelligence and machine learning," Luukkonen said, "The second strategy is monetising 5G through B2B use cases, even if it means generating small revenue streams at first."

Citing advanced 5G markets where telcos scale and replicate use cases with much success across industry verticals such as healthcare, advanced manufacturing, mining and logistics, Luukkonen shared that other telcos should similarly bring viability to 5G investments to grow. Finally, telcos have to focus on developing 5G consumers' use cases with faster time-to-market.

With this understanding, NCS Telco+ envisions co-creating an industry comprising "digital telcos".

"This requires telcos to invest in technology, and rely on decoupled digital architecture for backend efficiency and quicker rollout of new services," Luukkonen said. "In addition, digital companies must optimise data-driven insights to gain a competitive edge over digital-native companies."

Beyond network capabilities, telcos should embrace a culture focused on delivering seamless digital consumer experiences and meaningful touchpoints, supported by a pool of digital talents. Luukkonen also stressed that telcos should work collaboratively with regulators to unleash the full potential of valuable spectrum resources and massive data to deliver greater value in the long run.

Doing so enables telcos to expand their product offering and scale them, monetise data and utilize insights from customers to better offer experience-centric services, Luukkonen opined.

For instance, AIS' transformation will provide a marked improvement in the speed and accuracy of key processes including the onboarding of new customers, ensuring seamless operations and issue resolution, as well as offering greater convenience with broader self-service options. It will also enhance AIS' employee competencies via talent development and training programmes, and drive AIS' internal capabilities as a cognitive telco.

NCS Telco+ draws on NCS' digital capabilities, as well as unique offerings of Singtel's Paragon – a 5G MEC platform that enables network slicing on demand for enterprise 5G use cases – to help AIS reduce tech costs and complexity, accelerate the time to market for new products and create new revenue streams. Together, NCS Telco+ and AIS will jointly pursue projects in 5G and IoT transformation, cloud and cybersecurity to drive transformation for enterprises in Thailand.

Leveraging AIS' market leadership and connectivity in Thailand, NCS Telco+ will provide a full suite of end-to-end enterprise solutions in the country. This signals more partnerships in the pipeline as NCS Telco+ joins hands with regional telcos to transform and scale digitalisation, Luukkonen noted. **TR**

> NCS Telco+ draws on NCS' digital capabilities, as well as unique offerings of Singtel's Paragon to help AIS reduce tech costs and complexity, accelerate the time to market for new products and create new revenue streams

Singtel Further Decentralises Business Structure with Optus Decision

In a move to further decentralise its organisational structure, the Singtel Group has announced that its Australian subsidiary Optus will directly oversee its Optus Enterprise division with effect from 1 July 2022. This move to transfer the management of this division to Australia will effectively give Optus more operational autonomy and direct accountability.

Singtel Group CEO Yuen Kuan Moon said, "Since our strategic reset a year ago, we've been evolving our operating model to stay relevant and maximise shareholder returns and this is another step in that direction. By adopting a decentralised opco-driven structure, we can empower our businesses to exploit commercial synergies and capabilities to drive growth. This is all the more

important in today's volatile macro-economic environment where business units need greater independence and agility to better navigate the market." He added, "Optus has been part of the Singtel stable for two decades and a leading player in the Australian consumer market. Given the hyper digitalisation that enterprises are currently experiencing, this is also timely as Optus can focus on advancing its growth as a B2B player."

Optus CEO Kelly Bayer Rosmarin said, "This change is about delivering better outcomes for all our customers, whether they are consumers, small business, enterprise customers or wholesale customers. With a more unified and collaborative approach across Optus, we will be able to better meet the localised need of our business customer and bring solutions to market more quickly. Importantly, we still will be able to leverage the insights and global reach of Singtel, while having the autonomy to make decisions quickly."

This decentralised organisational structure was first adopted in 2021, when ICT arm NCS was spun off from

Singtel's enterprise business and recast as a B2B digital services champion in Asia. In 2021, the Group set up another new company under this decentralised model – a regional data centre business that builds on Singtel's data centre operations in Singapore. Today, the Group announced the appointment of Bill Chang as CEO of this venture, with effect from 1 July 2022. Chang will assume this position in addition to leading Singtel's enterprise portfolio as CEO, a role he has held since 2012.

Chang said, "I'm very excited to lead the regional data centre growth business for the Group. This leverages our world class data centre expertise, excellent digital infrastructure and track record as Asia's leading network connectivity provider to offer an integrated proposition to enterprises. With companies racing to digitalise and transform their business models and processes in the wake of the pandemic, and consumer lifestyles getting ever more digital, the growth in data traffic and demand for data centres will be unrelenting. We're well-placed to capture the exciting growth opportunities across this region."

SK Telecom and Deutsche Telekom Join Hands for Metaverse

SK Telecom and Deutsche Telekom have forged a strategic alliance to bring ifland, the South Korean operator's metaverse platform to Europe.

In a statement, SK Telecom, South Korea's leading mobile carrier, announced that the two companies will be conducting a field test for metaverse operation in Europe by the end of this

year. The service will subsequently be expanded to other European cities.

Ifland was first unveiled by SK Telecom in July 2021 to tap on opportunities in the metaverse. With this alliance, discussions are ongoing to establish a joint venture in Germany to oversee the operations of ifland in Europe.

Apart from this collaboration, Deutsche Telekom will be partnering with SK Telecom's sister company SK Square in the areas of cybersecurity and mobile applications.

Representatives from both SK Telecom and Deutsche Telekom met at the latter's headquarters in Bonn, western Germany.

Nokia and Taiwan Mobile Partner for an Efficient 5G Coverage Deal

Nokia has been selected by Taiwan Mobile (TWM) in an expansion deal to enhance the operator's 5G coverage across the country. Under the deal, Nokia will provide its latest energy-efficient AirScale portfolio supporting TWM's commitments to RE100 and reaching 100 percent renewable energy by 2040. It will also provide a smooth network evolution path following the completion of the proposed merger with Taiwan Star.

Nokia will provide equipment from its AirScale portfolio, including base stations and massive MIMO antennas to boost network performance and capacity. The deal also covers the introduction of 4G/5G dynamic spectrum sharing to maximize the advantages of TWM's spectrum

assets, which include 700MHz and 2100MHz bands. Nokia will help the operator modernize its LTE infrastructure, as well as consolidate the network management and optimization under a centralized tool for a superior 4G/5G RAN network performance.

Nokia will also expand its existing 5G Standalone Core at Taiwan Mobile to enable the operator to provide advanced 5G applications, such as network slicing for enterprises and businesses and edge cloud deployments for low-latency services. The deployment will include Nokia AirFrame server hardware with Multi-access Edge Computing (MEC) capabilities, IMS Voice Core capacity expansion, and voice over new radio (VoNR).

Jamie Lin, President at Taiwan Mobile, said, "Nokia has been our go-to partner for more than two decades and their performance during the 5G era so far has been nothing but brilliant. By doubling down on their cutting-edge technologies with this newly awarded order, we aim to upgrade and expand our 5G network to deliver resilient connectivity and expanded coverage to our subscribers and enterprises alike while at the same time accelerate our sustainability agenda and contribute to a greener earth. By working hand in hand with Nokia, I have full confidence we can get the best of both worlds."

Tommi Uitto, President of Mobile Networks at Nokia, said, "This new extended coverage deal is a testament to the great progress we've made in the deployment of 5G services in Taiwan with our long-term partner, Taiwan Mobile as its sole supplier. I am also encouraged to see how our AirScale portfolio is helping to reduce energy consumption and pave the way for a sustainable future."

CBC Expands SD-WAN Offerings to Asia Pacific and Europe

China Broadband Communications (CBC) has announced that SD-WAN eNet Connect will be extended to cover Asia Pacific and Europe after its success in China, adding 15 global point of presence (PoPs) to the existing 35 PoPs in China.

"With the expansion of eNet Connect, CBC supports Chinese companies expanding overseas, or global MNCs looking to make their business foray into China," said Hoo Shu Yee, VP, product and solutions of CBC.

CBC eNet Connect SD-WAN is an agile cloud-based SD-WAN / Network-as-a-Service, that not only offers the benefits of SD-WAN technology (overlay) including centralized management, fast deployment, optimization, and security features, but also offers congestion-free and deterministic (underlay) network performance with eNet Fabric.

CBC eNet Connect ensures good end-to-end performance and great user experience from user to applications, including last mile, middle mile and first mile. It optimizes the middle mile internet by connecting customers to the nearest eNet Cloud Router that will on-ramp traffic to the eNet Fabric. Utilizing both public and private network resources on its proprietary CBC IP Network, the eNet Fabric achieves

an effective cost-performance ratio guaranteed by a global backbone and its patented Smart Path technology to route the middle mile traffic if performance in the primary route deteriorates.

In China and overseas, CBC eNet Connect is providing Fortune 500 companies with high-performance SD-WAN services on a single service level agreement (SLA), powered by CBC eNet Fabric, to meet the technical and business challenges associated with the Chinese market.

"We are expanding our strategic partner ecosystem and leveraging the ecosystem to extend our reach and enhance our portfolios to meet our customer requirements in China and internationally," said Ricky Chau, chief strategy officer of CBC.

SES and Vodafone PNG partner for 4G and 5G services via Satellite to Papua New Guinea

SES and Digitec Communications Limited (Vodafone PNG) have partnered up to provide 4G and 5G high-speed mobile broadband services to Papua New Guinea. The reliable high-speed data service will be delivered via SES's O3b medium earth orbit (MEO) satellite constellation, which will further enable economic opportunities and bridge the digital divide in the world's second-largest island. Under this partnership, the O3b MEO satellite constellation will provide Digitec with high-speed mobile backhaul services for 5 locations in PNG.

With over 86% of its population residing in rural areas, much of PNG's population

is still underserved despite an increase in internet penetration across the country at 15% and mobile connections at 34% as of January 2021. Having started services in April, Vodafone is the third largest and newest mobile operator in PNG. Its entry into PNG's telecommunications market addresses the demand among consumers and businesses for reliable high-speed connectivity and broadband Internet access.

"Papua New Guinea's mobile and internet market has enormous growth potential, but this has been hampered by geographical challenges, limited

speed and connectivity choices. We are pleased to partner with SES to provide reliable high-bandwidth mobile connectivity of up to 5G speeds delivered through their MEO satellites. This connectivity will enable more people here to fully embrace the digital age," said Ivan Fong, Director at Vodafone PNG.

"With our O3b constellation we've been connecting communities and industries around the world for almost a decade, positively impacting their lives and their businesses. Our partnership with Digitec brings their customers with a reliable, high-throughput and low-latency solution, underscoring the value of our unique satellite connectivity. We are proud not just to be an enabler of Digitec's plans to bring more services and opportunities to the population of Papua New Guinea, but also to serve as the backbone for fuller participation in the digital era and greater digital inclusion," said John Turnbull, Vice President Pacific, Networks Sales at SES.

PoC Communications Enhanced Through Pryme and Streamwide Partnership

PoC communications (push-to-talk over cellular) for industries in both public and private sectors will be enhanced through the streamlined collaboration between Pryme and Streamwide.

Demanding work environments require powerful communication devices, reliable connectivity, and real-time

information in order to operate at peak efficiency. Whether in an office or in the field, on a mission or on the run, today's teams need next generation applications and advanced audio technologies to communicate effectively.

El Mehdi Sodki, Streamwide Director of Sales, North America said, "Our Team on mission platform is an all-in-one solution that enables united, secure PoC communications for verticals like public safety, emergency services, medical, defense, public transit, and construction. Pryme's wireless PTT accessories elevate user experience and augment mission-critical operations."

In addition to Team on mission (TOM), Streamwide also offers Team on the run (TOTR) for commercial applications in fleet management, home healthcare, manufacturing, retail, and facilities. The solution is designed to keep teams connected and help solve many organizational challenges.

Dave George, President and Chief Technologist of Pryme said, "Our goal is to help expedite and enhance communications. Pryme's wireless PTT buttons and remote speaker microphones make it possible for users to immediately activate TOM or TOTR and communicate without having to hold a phone or tablet or touch a screen."

Kacific Deploys Over 2,500 Sites for Indonesia's Government

Kacific Broadband Satellites Group, along with local partners PT Bis Data Indonesia (BIGNET) and PT Primacom Interbuana (PRIMACOM), has completed the deployment of over 2,500 sites, in a record five month timeframe, to provide satellite internet access to government infrastructure in remote areas of Indonesia. This project is led by the nation's Telecommunication and Information Accessibility Agency (BAKTI) using funds from the Universal Service Obligation.

BAKTI manages the Universal Service Obligation (USO) fund and the provision of telecommunications infrastructure and services. One of its major projects is to provide public internet access,

through satellite services, in areas that have little or no access to affordable internet services: the 3T (disadvantaged, frontier, outermost) areas, border areas and other areas that are not considered economically viable by terrestrial service providers.

Under this extensive and rapidly completed project, Kacific, BIGNET, and PRIMACOM worked with BAKTI to provide high-speed internet access to schools, vocational training centres, community health centres, tourist locations, village halls and government offices. The deployment of sites at remote destinations in multiple islands throughout the length of Indonesia was a logistical challenge.

The Kacific sites are pooled, allowing BAKTI to secure guaranteed bandwidth at every single site. Each terminal can achieve fast speeds of over 85 Mbps, easily meeting BAKTI requirements of 10 Mbps speeds from operators. Satellite services will also be used to support an improvement in the quantity and quality of transmission services for BAKTI's Lastmile BTS program and other programs.

"The Government of Indonesia display great leadership in their vision to connect all Indonesians. They are swiftly executing their impressive planning for nationwide connectivity with BAKTI successfully managing connectivity projects. Many countries would greatly benefit if they had a similar approach to addressing the digital divide," said Christian Patouraux, CEO, Kacific.

"With this satellite connectivity project, we take a significant step forward to our goal of the equal distribution of information and communication technology, to strengthen national unity, fuel economic growth and strengthen national resilience for disasters and emergencies," said Bambang Noegroho, the Director of Infrastructure from BAKTI.

ZTE and MMU to Build Malaysia's First 5G SA System for Education

ZTE Corporation has signed a memorandum of understanding with Multimedia University (MMU), to build the labs with Malaysia's first 5G SA end-to-end system for local 5G network development. Once completed by December 2022, the system will cover networks such as core network, transport network, access network and so on.

Prof. Dato' Dr. Mazliham Mohd Su'ud, President of MMU, said, "This is a bold attempt to create an in-depth cooperation model integrating production, learning, research, engineering, and innovation. The

integration of production and education is an effective means for universities to achieve talent training."

Since early 2017, ZTE has completed the construction of the 5G NSA lab in MMU, followed by the 5G SA lab. The company has been striving to explore a new education model that bridges enterprises and universities.

In terms of theoretical knowledge sharing, ZTE has actively developed a series of innovative technologies courses in MMU, including advanced 5G technologies, IoT, cloud computing, smart manufacturing. In addition, the academic forums on 3G/4G/5G technologies and applications have been held and special scholarships are available for outstanding students.

"It is of social significance for ZTE to work together with MMU to train local technical talents," said Ge Yuqiao, Managing Director of ZTE Malaysia. "As the world's leading provider of telecommunications, enterprise and consumer technology solutions, ZTE has actively shouldered its social responsibilities and contributed to the development of the global telecommunications industry. "

"ZTE's efforts in cooperation with universities and enterprises are in line with the vision of Malaysian education, boosting the development of telecom education in Malaysia." said Prof. Dato 'Dr. Husaini Omar, Director of Ministry of Higher Education of Malaysia.

Brook Wong, CEO, CITIC Telecom CPC

New CEO Brook Wong Leads CITIC Telecom CPC into the Future

CITIC Telecom CPC is under the leadership of a new CEO, effective since February 2022. Telecom Review Asia interviews Brook Wong, CEO, CITIC Telecom CPC on his stewardship and future plans

You possess tremendous insights in telecommunications and have undertaken leadership roles in CITIC Telecom Group for over a decade. How has the group evolved and grown during this period?

In the past decades, our group (CITIC Telecom) has continued to enhance its platform capability and diversify into new business sectors offering swift, efficient and reliable services to support telecommunications carriers' global business expansion.

The pandemic has changed the way companies in all sectors and regions do business. It also speeds up the adoption of digital transformation of many companies around the globe. In view of these global trends, our group also continues to enrich the functions of our product platform and procure the development of the platform and the building of an ecosystem.

Meanwhile, digitalization also raises new security and privacy risks, as enterprises are exposed to cyber threats, especially those whose remote workforce lacks cybersecurity awareness. CITIC Telecom CPC has collaborated with different ecosystem partners to offer a range of security solutions covering email security, cloud backup and disaster recovery to ensure business continuity.

CITIC Telecom CPC also continues to expand its global network coverage to provide seamless, high-quality network to our customers around the globe. We have over 160 PoPs in our global network covering over 160 countries.

What is your vision for CITIC Telecom CPC as it navigates an increasingly digitalized landscape?

To complement the group's development strategy of keeping Mainland China as the foundation of our business, with Hong Kong and Macau serving as both base and springboard to accelerate our digital footprint internationally and global network coverage.

Fostering a culture of innovation and embracing intelligence are our core values essential to our future success.

My vision for CITIC Telecom CPC is global and future-oriented; we need to be more agile in response to this constantly evolving industry and digitalized world.

CITIC Telecom CPC is a leading intelligent Technology-driven ICT enabler to multinational and large companies worldwide. To have sustainable traction in intelligent and innovative technologies development, we will continue to enhance our full spectrum of managed ICT solutions with algorithm expertise and AI intelligent capabilities. To embrace innovative R&D, technologies, knowledge, and insights, which will ultimately increase operational efficiencies of the industries, uplift user experience, and create value to the community.

We lead our key markets at the forefront of pioneering ICT development, embracing artificial intelligence (AI), augmented reality (AR), big data, IoT and other cutting-edge disruptive technologies to transform technical potential into real-world value for our customers, helping them achieve higher productivity, agility and, ultimately, digital globalization.

It is aligned with our company motto "Innovation never stops" – we need new skills, new innovations, and technologies to leapfrog the current state of the art.

We leverage our industry insights to deliver the promise of constant innovation, creating new products and services while refining existing offerings and best practices.

Data science has been widely utilized in various industries, its intelligent power and rapid development have reshaped traditional enterprises for digital transformation.

How is CITIC Telecom CPC capturing new markets and expanding its footprint in China and the rest of the world?

CITIC Telecom CPC will continue to enhance the development of our global corporate service business, improve servicing capabilities and keep innovating cooperation models

to increase the scale and value of our corporate service business. We are keen to be the trusted global-local intelligent DICT (data, information and communications technology) service partner of all the enterprises in China and around the world.

To realize our motto "Innovation never stops", CITIC Telecom CPC has embarked on an innovative and intelligence transformation journey to cater to the changing needs of the future. At the heart of this transformation is the Intelligence and Communications Transformation MiiND (ICT-MiiND) Strategy. This strategy is guiding the company to transform from being a successful ICT solution provider into an intelligent technology-driven digitalization enabler.

Integrating the latest technologies with innovative ideas, ICT-MiiND is the brain that leads enterprises to successful digital transformation. Building intelligence through advanced container technology; together with network, information security, and cloud computing solutions experience; fused years of practical experiences in digital transformation and resources from global technical partners, ICT-MiiND has developed the company's latest AIOps (artificial intelligence for IT operations) platform, in which integrated with latest technologies like big data, AI, AR, IoT and blockchain, to provide different innovative and intelligent modules integrating tailor-made and customized industry service scenarios to bring enterprises a smarter IT service management platform.

We will continue to enhance technological innovation to foster new core competitiveness with innovative networks, products, services and ecosystem and expedite the progress of "Internet-based", "cloud-based" and "intelligence-based" development to support high-level development and digital transformation of enterprises.

Digital transformation is under the global spotlight. What are key strategies to deliver high-performance solutions to meet growing and more stringent demands in the enterprise market?
Our strategy involves embracing innovation and intelligence, building digital talents and engaging with

digital ecosystems to accelerate digital transformation initiatives.

A digital transformation strategy must address innovation and integrate emerging technologies to power up digital strategies. It might involve changing operating and business models, the company should build up strategic direction and offer insights based on a deep understanding of technology's evolution. Lastly, it is important to think how to create value for enterprises and bring new experiences that meet their demands.

As mentioned earlier, ICT-MiiND is an intelligence-driven strategy for the future. It rides on CITIC Telecom CPC's practical IT operations experiences, in-depth business knowledge and expertise in network, security and cloud into building different AIOps modules to provide exceptional IT services through intelligence.

Supported by our global experiences, years of business know-how and dedicated R&D capabilities for different industries, ICT-MiiND Strategy is not only a platform for intelligent IT service management, but the brain to empower digital success.

At CITIC Telecom CPC, we understand that digital transformation is about talent, not just technology only. Our data science and innovation teams in Mainland China, Hong Kong, Singapore and Europe possess comprehensive capabilities in algorithms modelling expertise and AI analysis, dedicated to innovation and integrating the latest technologies into business values.

To build a broader set of talents pool across regions for the next phase of growth, we are combing technical ability, coding and applications specialist, mathematics and data sciences professionals to support our global digital footprint. We will continue to sharpen the professional skills of our data science team to prepare for our strong engagement in future research and innovation projects

To engage with digital ecosystems to accelerate digital transformation initiatives, we need to have sustainable

traction in intelligent and innovative technologies development and an integrated ecosystem approach and strong partnership with stakeholders in various sectors and industries.

CPC's extensive coverage, technical capabilities, and years of industry experience collaborating with ecosystem partners' core competence and expertise can offer crucial benefits and unlock more value to the digital community.

For instance, we partner with Hong Kong Applied Science and Technology Research Institute (ASTRI) for using AI and augmented reality (AR) innovation to deploy data center AR remote hand services.

Other collaborations with digital ecosystem partners include AI-AR remote hands for seamless collaboration from a distance. This enables streamlining maintenance and inspection for utilities. The AI-AR integrated service will provide field workers with better computer vision capabilities. Field users can access manuals and analyzed data or graphs for maintenance using the AR glasses while receiving immediate alerts of any wrong steps. 5G-enabled cloud connectivity can enable supervisors to guide field users during installation and maintenance verbally.

Another collaboration is computer vision and cognitive analytics solutions for better decision-making. This is critical for business operations planning such as supply chain management. The integrated service can provide workers with extra information during operations. Frontline staff can use data visualizations and object mapping to identify goods quickly and accurately for loading and unloading.

Finally, we collaborate on predictive customer experience for maximizing customer value to enhance customer services experience in all industries. AI and AR allow companies to use predictive and prescriptive data to understand what customers want before they know themselves, delivering exceptional customer experiences. **TR**

Scott Minehane, Managing Director, Windsor Place Consulting Pty Ltd

Partitioning 6 GHz Band to Unleash Economic Benefits in Asia-Pacific

In line with the APT web dialogue titled "Spectrum management series: The 6 GHz band and the optimal approaches in Asia-Pacific", Telecom Review Asia interviews Scott Minehane, Managing Director of Windsor Place Consulting Pty Ltd on the importance of 6 GHz band partitioning to maximize national benefit in the Asia-Pacific.

Mid-band spectrum is a vital component to address a growing reliance on mobile bands for connectivity and an essential engine to stimulate the digital economy. An optimal mid-band frequency that delivers seamless wide-area coverage and experience, the 6 GHz band needs to be prioritized, utilized and managed to deliver full socioeconomic values to countries.

An international regulatory and strategy consultant who extends advisory to governments, leading corporates and international organizations including the International Telecommunications Union (ITU) and the GSMA, Scott Minehane delved into key points, challenges and customized approaches for the use of the 6 GHz band in the Asia-Pacific.

6 GHz trends in the region
Ahead of the WRC-23, spectrum regulators worldwide are engaged in ongoing analysis and debate as attention gravitates toward the 6 GHz band (5925 – 7125 MHz) and optimal approaches to allocating this band to realize its maximum benefits.

Shedding insights on what regulators are doing in the region, Minehane noted three approaches for the 6 GHz band allocation – allocating all 6 GHz band to Wi-Fi or IMT, and partitioning the 6 GHz band to both Wi-Fi and IMT. For instance, China has allocated the entire 6 GHz band for IMT services. Conversely, South Korea has allocated the entire band for Wi-Fi.

In recent months, Minehane shared that countries including Malaysia, Thailand and Australia have unveiled 6 GHz decisions to allocate the lower 500 MHz to Wi-Fi, while reserving the upper 700 MHz to WRC-23 processes.

"Countries such as Japan, Hong Kong, Singapore, Indonesia, Vietnam and New Zealand are currently evaluating their approach, with consultation papers out in Japan and Hong Kong. India, Pakistan, Philippines and Cambodia are still in the early stages of reviewing available options," Minehane added.

However, aligned with the GSMA recommendations, Minehane

proposed the early undertaking of 6 GHz partitioning between Wi-Fi (5925-6425 MHz) and IMT (6425-7125 MHz), particularly in the Asia-Pacific.

Compared to the US for instance, where C-band spectrum (including 3.45-3.55 GHz and 3.7-4.0 GHz) has been allocated for IMT purposes (and the FCC exploring further releases including 3.1 – 3.45 GHz), Minehane commented that Asia-Pacific countries lack adequate 3.5 GHz band for IMT services to support quality 5G services and future 6G services. However, 6 GHz equipment with massive MIMO antennas has been assessed in field studies to be a good substitute for 3.5 GHz as it delivers similar performance.

"There is a compelling need for additional mid-band spectrum given the shortfall in C-band and low-band spectrum in Asia-Pacific," said Minehane. "Band partitioning ensures that not all the eggs are in one basket."

In terms of addressing a digital divide in the region, Minehane cautions that allocating more 6 GHz spectrum to Wi-Fi will not consequently improve data speeds as these would be limited to fixed broadband speeds. Instead, band partitioning 6 GHz allows low band spectrum like 700 MHz to serve rural areas and while IMT services using 2.6 GHz, 3.5 GHz and 6 GHz can be used to enhance connectivity in large urban cities such as Manila, Hanoi, Bangkok and Jakarta.

Also on the point of bridging the digital divide, Minehane mentioned, "Making more spectrum available ensures that price per MHz/Pop is reasonable, which in turn ensures affordability of services to address a rural-urban divide."

Speaking about the economic benefits derived from the 6 GHz band, Minehane noted that even the Wi-Fi industry economic studies of markets like the UK showed that most of the economic benefits were derived from making an additional 500 MHz allocation to Wi-Fi services in the 6 GHz band. An additional 700 MHz allocation in the 6 GHz band to Wi-Fi (to 1,200 MHz) offered only marginal economic benefits. By comparison, the allocation of an additional 700 MHz to IMT generated significantly greater economic benefits. Only by partitioning the 6 GHz band can Asia-Pacific countries fully secure the socioeconomic benefits associated with additional spectrum being allocated to both Wi-Fi and IMT services.

Catering for Wi-Fi and growth in IMT services

According to the GSMA, there were 489 operators in 146 countries and/or territories investing in 5G networks as of the end of January 2022. The GSMA also forecasted that 5G subscriptions will reach 4.4 billion in 2027. For 5G network to harness its full capabilities over the next decade, research has shown that countries require 2 GHz of mid-band spectrum to meet the IMT user experienced data rates of 100 Mbit/s (downlink) and 50 Mbit/s (uplink) for quality, citywide coverage between 2025 and 2030.

Coupled with a surge in data consumption, which has increased by about a third between 2019 and 2020, consumers are demanding faster and more secure wireless data beyond public Wi-Fi.

"Moreover, we tend to underestimate how much spectrum we need," Minehane added. "Providing additional IMT mid-band spectrum allows for spectrum refarming to cater for options to future proof 5G, for 5G advanced due in 2025 and 6G expected in 2030."

Strong regional fixed wireless access growth and the retiring of legacy 2G/3G networks also contribute to growing IMT spectrum demand in the region.

Citing another strong case for the allocation of the upper 6 GHz band for IMT, Minehane shared that the 3GPP RAN Plenary has rolled out standardization work of upper 6GHz (6425-7125 MHz) band as a new IMT frequency band earlier this year.

"This step leapfrogs the development of a 6 GHz IMT ecosystem. What it means for the industry is that products for use with Wi-Fi 6E/7 and IMT in the 6 GHz range will be released almost simultaneously as early as later this year or early 2023."

With accelerated digitalization, momentum is noticeably building on spectrum to meet present and future demands. Regulators are challenged to foresee and keep their options open for future connectivity, and undertake long-term spectrum planning and executions.

Concluding, Minehane stressed the "important role played by regulators to champion the allocation of 6 GHz for licensed IMT and unlicensed use, and steer collaborative works amongst industry stakeholders and vendors to achieve maximum impact on communities and economies." **TR**

> Aligned with the GSMA recommendations, Minehane proposed the early undertaking of 6 GHz partitioning between Wi-Fi (5925-6425 MHz) and IMT (6425-7125 MHz), particularly in the Asia-Pacific

Asia Pacific: Breeding Ground for a High-Growth 5G Experience

South Korea and the United States were amongst the first countries to introduce 5G in early 2019. Many countries have since jumped onto the 5G bandwagon and have continued to speed up their 5G adoption. By the end of 2021, Ookla reported 5G deployments in 116 countries, compared to 99 countries at the end of 2020. The GSMA estimates that by the end of 2025, a quarter of mobile connections will be operating with 5G, increasing threefold from the end of 2021, accounting for 8% of all global mobile connections.

While 5G connections are expected to surge, much of this growth will be dominated by 5G penetration in China, where Asia Pacific will continue to witness significant 5G growth compared to Europe, the United States, and Canada. By the end of 2025, Asia Pacific is expected to lead the world in 5G connections. The GSMA estimates that China will record 828 million 5G connections — or half of all global connections — surpassing 236 million 5G connections in Europe and 219 million in the United States and Canada combined. Meanwhile, the remainder of Asia Pacific will contribute to another 202 million 5G connections.

While 5G adoption in new markets is likely to bring down the global average 5G download speed and lead to wider disparities across markets, Opensignal noted that 5G has risen the average download speeds in most countries where it has been deployed. Between

the first quarter of 2019, before 5G was introduced, and the last quarter of 2021, smartphone users in 95 out of 100 global markets have witnessed incremental average download speeds.

Home to some mature 5G countries, as well as countries that have yet to formally roll out, Asia Pacific understandably offers a mix in terms of overall 5G experiences, connections, and speeds.

South Korea
In the region, South Korea ranks top spot for all three measures of speed, namely 5G download speed, 5G peak download speed, and 5G upload speed. In the region, South Korea is the sole country to provide smartphone users with average 5G download speeds over 300 Mbps, with speeds reaching 438 Mbps.

Notwithstanding, South Korea offers the best 5G games experience globally, followed by the Netherlands. South Korea reports the best 5G voice app experience, trailed by Indonesia and Taiwan, in second and third place, respectively. In South Korea, smartphone users can access 5G in almost two-thirds of locations they visit, with users spending roughly 30.7% of their time with an active 5G connection.

Indonesia
Indonesia has one of the fastest-growing digital economies in the region. To improve the country's digital competitiveness, the Indonesian government rolled out the "Digital Indonesia Roadmap for 2021-2024," offering directions to build the country's digital infrastructure, digital administration, digital community, and digital economy.

However, spectrum holdings in the country currently do not include key 5G bands, forcing operators to rely on less supported bands. Three operators, namely Indosat, Telkomsel, and Axiata XL, have launched 5G in major cities around the country in mid-2021, with 5G download speeds reaching 69.3 Mbps, hence placing Indonesia tenth in the region. Compared to other markets such as Australia; Singapore; Japan; Thailand; and the Philippines, Indonesia is clearly still in the infancy stage of

5G connections, with much room for improvement as operators ramp up on 5G services. In a recent report, the GSMA recommends that policy-makers allocate the entire 700 MHz band IMT to meet the future growth of 5G.

Taiwan
Following South Korea, Taiwan claims the second spot for 5G download speeds in the region, with speeds reaching 263.1 Mbps. According to Opensignal, Taiwan tops the region for 5G video experience, with a score of 83 on a 100-point scale, marginally ahead of South Korea with a lower score of 80.3.

By the end of last year, 5G penetration rate reached about 30%. Compared to 4G, 5G mobile networks offered Taiwan users average download speeds that are 7.2 times faster. Taiwan also ranks amongst the top few in 5G games and voice app experience. In the first quarter, Taiwan's largest network operator, Chunghwa Telecom, reported higher post-paid ARPU owing to rising 5G adoption.

Philippines
The Philippines secures the top spot for the greatest uplift between the 4G and 5G mobile network experience, with users in the country experiencing average 5G download speeds that are 8.9 times faster. This is followed by Thailand.

5G adoption is growing rapidly in the Philippines. According to Viavi Solutions, the Philippines ranks third globally with the majority of 5G cities, falling behind China and the United States with 356 and 296 5G cities, respectively.

Thailand
Thailand ranked second on the chart for the greatest uplift between the 4G and 5G mobile network experience, with users in the country experiencing average 5G download speeds that are 7.5 times faster. Comparatively, Taiwan, South Korea, New Zealand, and Singapore saw download speeds of 7.2, 6.3, 6.0, and 4.0 times faster.

In Thailand, all operators have been using 700 MHz spectrum to broaden 5G coverage, which has helped given

Thailand 5G when compared to countries such as Singapore and New Zealand. 5G deployment is underway; however, at differing paces throughout the region. As a result, 5G experiences and speeds vary widely.

Even as 5G adoption widens, 4G will continue to co-exist in many of the countries well into the 2030s. In the Asia Pacific, where countries such as Cambodia, Pakistan, and Bangladesh have over half of all subscribers on 2G or 3G mobile networks, favorable policy-making and spectrum planning are important to facilitate a gradual transition to 5G. While some countries including South Korea, Japan, China, and Taiwan have progressed well in their 5G journeys, India; Vietnam; and Malaysia are lagging behind and need to play catch up.

Comprehensive government policies towards 5G must be enhanced and much needs to be done to close up on gaps with 5G forerunners in the regions as they make the "5G leap" in the coming years. **TR**

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Market Imbalances to Cause Internet Value Chain Growth to Plateau

A new GSMA report warns market imbalances between network operators and online services providers may put global growth prospects at risk across multiple sectors of the internet-based economy. Policymakers, the report urges, must consider the interdependence of online services and other growth sectors on the underlying infrastructure investment.

The GSMA 2022 Internet Value Chain Report reveals factors including

asymmetric regulation and restrictions, sector-specific taxes, and spectrum costs are squeezing the business models of infrastructure providers whilst allowing big tech to thrive.

The study finds that revenues across the internet value chain nearly doubled in five years, from $3.3 trillion in 2015 to $6.7 trillion in 2020. Much of this growth comes from online services; they saw a 19% increase in revenue per annum in 2020.

According to the study, paid-for online services will soon exceed $1 trillion in revenues, driving huge capacity demand on global networks. With an annual growth rate of 7.5%, the number of users being connected to the internet globally shows no sign of slowing. Traffic per user grew at 27% per year, with almost 80% of that being driven by video traffic.

Yet, the return on investment in infrastructure for network operators was far lower, between 6% and 11%. The report highlighted average sub-10% returns on capital as a concern due to pressure on telecom operators to keep investing CAPEX at rates of up to 20% of revenue.

The GSMA's chairman José María Álvarez-Pallete said, "The internet connects 4.6 billion people and drives the global economy. It is transforming business models, unlocking new opportunities, and uplifting communities across the world. But as some sectors in the internet value chain thrive, the demands of investing in the infrastructure those sectors rely on for growth are squeezing network operators. We welcome the growing recognition of this issue by policymakers, and as the internet-based economy expands across all sectors over the next decade."

Global Enterprise WLAN Continues Strong Momentum

The enterprise segment of the worldwide wireless local area network (WLAN) market continued its strong growth in the first quarter of 2022 (1Q22) with revenues increasing 17.1% year over year to $1.95 billion, according to results published by the International Data Corporation (IDC).

The 17.1% annualized growth builds on the enterprise WLAN market growing 20.4% in 2021 compared to 2020. Growth in the enterprise WLAN market continues to be driven by the latest Wi-Fi standard, known as Wi-Fi 6 or 802.11ax. Wi-Fi 6 access points made up 70.3% of the revenues in the Dependent Access Point (AP) segment and accounted

for 59.3% of unit shipments within the segment. Wi-Fi 5 products, also known as 802.11ac, made up the remaining balance of Dependent AP sales.

The consumer segment of the WLAN market declined 3.6% in 1Q22 with the quarter's unit shipments declining 2.2% on an annualized basis. Adoption of Wi-Fi 6 continues in the consumer segment of the WLAN market too: In 1Q22, Wi-Fi 6 made up 31.4% of the market's revenues, up from 28.2% in the fourth quarter of 2021.

"In the first quarter of 2022, enterprises around the globe continued to invest in WLAN technology as a key

component of their network and digital transformations. Meanwhile, the Wi-Fi 6 standard continues to be a significant driver of growth in the enterprise WLAN market as enterprises deploy in the newest Wi-Fi technology," said Brandon Butler, research manager, Network Infrastructure at IDC. "After a rocky macroeconomic environment over the past two years due to the COVID-19 pandemic, the enterprise WLAN market continues to be resilient as organizations invest in wireless connectivity."

From a geographic perspective, the enterprise WLAN market grew across most regions of the world. Growth was particularly strong in Asia/Pacific, where the market in the People's Republic of China grew 55.6% year over year in 1Q22. In the broader Asia/Pacific region (excluding Japan and China) (APeJC), the market increased 22.3% in the first quarter; Japan's market declined 4.8% in 1Q22.

India's Public Cloud Services Market to Grow at 24% CAGR

The revenue for Indian public cloud services (PCS) market, including infrastructure-as-a-service (IaaS), platform-as-a-service (PaaS) solutions, and software-as-a-service (SaaS), totaled $4.6 billion for 2021. The overall Indian public cloud services market is expected to reach $13.5 billion by 2026, growing at a CAGR of 24% for 2021 to 2026.

"With digital innovation leading the top business objectives for Indian organizations, cloud adoption is set to accelerate in 2022. Driven by the need for agility, flexibility, and faster access to digital technologies, cloud continues to gain momentum across segments. Additionally, the need to leverage data intelligently, is supreme and enterprises are able to do so with access to technologies that are built on a cloud foundation," says Rishu Sharma, Associate Research Director, Cloud and Artificial Intelligence, IDC India.

SaaS continued to be the largest component of the overall public cloud services market, followed by IaaS and PaaS in 2021. Public cloud spending continued to increase among enterprises, with the top two service providers holding more than 45% of the Indian public cloud services market.

India continues to be among the fastest-growing market for public cloud service providers due to the robust demand from large enterprises, digital natives, and also from small and medium businesses in the country. In 2021, enterprises continued to invest in public cloud to ensure business continuity, improve resilience and productivity, and drive digital innovation.

"Public cloud adoption continued to surge in 2021 as enterprises invested in public cloud as part of their digital transformation initiatives to improve business resiliency and become a digital-first organization. The increased spend is expected to continue in the upcoming years as enterprises invest in emerging technologies like AI/ML, IoT, blockchain, etc., to automate processes and drive innovation with public cloud as the foundation. The increasing investments in areas like edge computing and IoT will drive the demand for public cloud infrastructure services, especially storage and data management," says Harish Krishnakumar, Senior Market Analyst, IDC India.

APEJ AR/VR Spending to Reach $16.6b by 2026

Asia/Pacific (excluding Japan) (APEJ) spending on augmented reality (AR) and virtual reality (VR) technologies will grow with a CAGR of 42.4% from 2021 to 26 and reach $16.6 billion by 2026, according to a report by the IDC. The penetration of the wireless-first strategy amongst enterprises, industries, and public sector organizations will drive AR/VR technology investment. However, from a retail consumer perspective, there is a lack of consumer-friendly AR/VR technology, which will change over the next couple of years. Vendors will improve VR goggles and AR for smart glasses and phones, and disrupt augmented audio technology, thereby offering promising growth opportunities to the consumer market.

"The impressive market growth for AR/VR technologies is driven by organizations' demand for a new immersive experience in the way they do business and interact with clients and employees. But vendors also need to respond to AR/VR consumer applications to not miss out on high growth opportunities in the next few years," says Dr. Lily Phan, Research Director for Future of Work, IDC Asia/Pacific.

Education, healthcare, discrete manufacturing, process manufacturing, and professional services are the highest spending industries, and will dominate over the forecast period. These five industries registered 65% of 2022 spending for commercial use cases among the 19 industries covered by IDC. Training emerged as one of the top three investment priorities for four out of five industries listed above. Collaboration is gaining incremental impetus, with education, discrete manufacturing, and professional services being the forerunners in adopting AR/VR technologies.

"Customer agility is one of the primary aspects driving investment in AR/VR technology. It helps in improving the customer journey by offering an immersive experience," says Abhik Sarkar, Market Analyst at IDC Asia/Pacific IT Spending Guides, Customer Insights & Analysis.

Investments in VR contributed to around 66% of the total market in 2022. It is driven primarily by the growth of consumer market adoption of virtual reality games. Spending on VR training and collaboration will also lead to VR technology investments during the forecast period. As far as AR is concerned, training, retail showcasing, and industrial maintenance will lead to increased investments. In both the reality types, hardware showcases maximum investment in 2022 followed by software, and services. This trend is expected to stay the same over the forecast with hardware growing at a CAGR of 48.1%, software at 47.1%, and services at 20.8%.

A Milestone in Global Mobile Money Development

Mobile money has been on an upward trajectory as the world's mobile population grows and gravitates toward faster and more efficient payment methods.

In the GSMA's published "State of the industry report on mobile money", the global mobile money industry reached a new milestone with record transactions amounting more than $1 trillion in 2021. There were 1.35 billion registered accounts, increasing by about 18% from the preceding year, or tenfold the number of accounts registered from a decade ago.

Peer-to-peer payment accounted for the main bulk of transactions, totaling $387 billion, up 28% year-on-year. This signifies another landmark with

P2P transactions reaching more than $1 billion daily or 1.5 million such transactions made every hour on average.

Merchant payments recorded the highest jump in 2021, increasing by 94% from the previous year to reach $66 billion. This is in line with more businesses accepting mobile money as a payment method, as well as higher adoption with greater incentives and efficient remote onboarding processes. Favorable policy and regulatory measures also played a part in spurring businesses to offer mobile money as a payment mode.

Other mobile money transactions include cash-out, bulk disbursements, international remittances, cash-in, bill payments and airtime.

Understanding mobile money markets in Asia

Based on region breakdown, the report stated that south Asia recorded $8.9 billion in transactions, up by 9% from the previous year, with the number of registered accounts reaching 283 million. In east Asia and Pacific, transactions amounted to $6.9 billion, scaling 23%. The number of registered accounts reached 328 million, increasing by 30%. Comparatively, Sub-Saharan Africa claims the largest

market with 605 million accounts and $36.6 billion worth of transactions.

While mobile money first targeted the Sub-Saharan region, this industry is catching up in different parts of Asia, albeit at different rates. Mobile money can bring about positive socio-economic outcomes, particularly in low- and middle-income countries (LMICs). Given a rapidly growing population in these countries, the rise in mobile money markets is unlikely to wane. From a decade ago, the number of live mobile money services has nearly doubled, growing from 169 services to 316 services, as well as being accessible in more countries. However, there are still barriers for some groups of the population to adopt mobile money.

In India, preference for cash for payments and security proves to deter some from embracing the use of mobile money. Similarly, in Indonesia, the preference for cash is the biggest show-stopper for more widespread use of mobile money.

The GSMA cited a persistent gender gap in mobile ownership. In Bangladesh, a comparatively mature mobile money market in the region, 84% of men own mobile phones, while just 65% of women have mobile phones ownership. Of which, 41% of men and 20% of women own a mobile money account. In Pakistan, the gender gap in terms of mobile money account ownership reaches 71% of the total adult population. This goes to show that beyond providing outlets for mobile money, more needs to be done to educate and create awareness amongst people on the conveniences and benefits of mobile money, and address gender biases for greater financial inclusion to take place.

In Pakistan, for instance, where a large percentage of adults do not have a digital identity, the GSMA rolled out Biometrics for All (B4LL), a non-commercial multimodal and multi-use case biometric solution, jointly with Easypaisa to facilitate voice-enabled authentication in its users to bridge gaps in the market.

In Vietnam, the Ministry of Information and Communication (MIC) has reported that 463,000 people are using mobile money, with over 77,2000 establishing accepting this payment mode nationwide. This service was first launched by Viettel and Vietnam Posts and Telecommunication Group (VNPT) at the beginning of this year.

In a country where the underbanked remains high, this encouraging uptake pushes the ministry to catalyst efforts to build mechanisms to promote, manage and supervise mobile money services in the country, aimed to accelerate digital transformation and contribute to the country's digital economy and society.

The mobile money market has a profound impact on LMICs, serving as an enabler that positively impacts individuals, public and private sectors to elevate countries' socio-economic status and shape new digital landscapes. **TR**

Huawei Debuts Full-Stack Data Center Solution in APAC

In the opening speech of Huawei's "Fast, Reliable, and Green Data Center" Forum during Huawei APAC Digital Innovation Conference 2022, Aaron Wang, Senior Vice President of Huawei Asia Pacific Enterprise Business said, in the digital economy, data is one of the core competitive edges for enterprises. As such, data centers play a critical role in helping enterprises go digital. By 2030, data volume will increase 30-fold and enter into YB era, enterprises have run into huge challenges on data governance and interconnection while also trying to lower carbon emissions.

Professor LEE Poh Seng (PS LEE), Executive Director of the Energy Studies Institute at the National University of Singapore, shared his insights about the data center trends and challenges in the Asia Pacific region. He noted that sustainable data center development is one of the key issues, requiring an effective sustainability reporting system to properly support carbon neutrality goals. He also highlighted the need for relevant industry standards. He explained that on average, data centers in Asia Pacific have a relatively high power usage effectiveness (PUE) of 1.69, above the global average of 1.59. Hence, more should be done and one possible strategy is the introduction of liquid cooling technologies. To wrap up, He summarized the four key factors in the development of new data centers: service acceleration, sustainable development, data security, and innovation.

In the IT innovation part, Bill Raftery, senior storage expert from Futurewei, showcased Huawei's OceanStor all-flash acceleration solution, which uses flash-to-flash-to-anything (F2F2X) to help customers expedite production transactions, analyze high-performance backup and recovery data in real time, and otherwise innovate. In particular, he mentioned the unique advantages of Huawei's wide product portfolios. For example, the NOF+ solution for storage and IP networks replaces the conventional FC network, and the SOCC solution for storage and optical networks implements quick failover between data centers within seconds. These innovations are closely related to Huawei's continuous R&D investment in the ICT field.

Philip Lai, Huawei's Chief Data Center Architect, introduces multiple solutions, such as L3.5 autonomous driving network (ADN) and WDM transmission Data Center Interconnect (DC OptiX). It uses advanced technologies like AI to create intelligent connectivity, deploying network self-organization, repair, and optimization. Ultimately, these actions lead to a simplified network architecture, high performance, intelligent O&M, and cost reduction.

In the green data center part, Sun Xiaofeng, Vice President of Huawei Digital Power, introduced Huawei's next-gen simplified, green, intelligent, and secure data center infrastructure solution. The new solution integrates several innovations, including a reconstructed architecture, temperature control, O&M, and power supply. Huawei FusionDC uses pre-configured modules to roll out large-scale DCs in just six to nine months, reducing carbon emissions by 90%. For small- and medium-sized DCs, Huawei FusionModule adopts a modular and intelligent model to deliver high integration, plug-and-play, and remote, centralized O&M.

ITU and UN Tech Envoy chart path to universal meaningful connectivity

The office of the United Nations secretary-general's envoy on technology and the International Telecommunication Union (ITU) have announced a new set of UN targets for universal and meaningful digital connectivity to be achieved by 2030.

The 15 aspirational targets, developed as part of the work of the UN secretary-general's "Roadmap for Digital Cooperation" roundtable group on global connectivity, co-chaired by ITU and UNICEF, prioritize universality, technology and affordability to ensure that everyone can fully benefit from connectivity. The roadmap had called for establishing a connectivity baseline and targets to aid in advancing a safer, more equitable digital world and a brighter and more prosperous future for all.

"Universal connectivity alone is not enough to achieve the sustainable development goals and ensure that every person has safe and affordable access to the Internet by 2030," said ITU secretary-general Houlin Zhao. "These targets will help countries guide their efforts towards effectively ensuring we meet our goal of universal and meaningful connectivity by the end of the decade."

UN assistant secretary-general and acting secretary-general's envoy on technology, Maria-Francesca Spatolisano, said, "By setting clear targets, we give ourselves goals and aspirations to work towards, especially in this Decade of Action to achieve the SDGs. Though certainly these indicators may be refined further, as expectations evolve and the world changes; it is important that we take a bold step forward now to set a basic understanding of what universal meaningful connectivity should look like, especially as we work towards next year's global digital compact."

The targets reflect the spirit and ambitions of the SDGs, the UN secretary-general's roadmap for digital cooperation, and the ITU's Connect2030 agenda, setting out specific values to achieve each action area measured. They are also meant as a contribution towards the forthcoming "Global Digital Compact", as proposed in the UN secretary-general's "Our Common Agenda" report.

The new targets are meant to help countries and stakeholders prioritize interventions, monitor progress, evaluate policy effectiveness, and galvanize efforts around achieving universal and meaningful connectivity by 2030.

CSA Singapore Starts Licensing Framework for Cybersecurity Service Providers

The Cyber Security Agency of Singapore (CSA) has launched a licensing framework for cybersecurity service providers under its Cybersecurity Act (CS Act). The licensing framework took effect from 11 April 2022.

The intent of the framework is to better safeguard consumers' interests and address the information asymmetry between consumers and cybersecurity service providers. At the same time, the regulatory regime is also envisaged to improve service providers' standards and standing over time. For a start, CSA will license two types of cybersecurity service providers, namely those providing penetration testing and managed security operations centre monitoring services. These two services are prioritised because service providers performing such services can have significant access into their clients' computer systems and sensitive information. In the event that the access is abused, the client's

operations could be disrupted. In addition, these services are already widely available and adopted in the market, and hence have the potential to cause significant impact on the overall cybersecurity landscape.

CSA sought industry feedback on the proposed licence conditions and draft subsidiary legislation through a 4-week consultation process from 20 September to 18 October 2021. A total of 29 responses were received from a mix of local and foreign industry players, industry associations, as well as members of the public. The feedback was considered and taken into account when finalising the licensing framework.

Under the new framework, existing cybersecurity service providers who are already engaged in the businesses of providing either or both licensable cybersecurity services will be given six months to apply for a licence. Cybersecurity service

providers who do not apply for a licence in time will have to cease the provision of licensable cybersecurity service until a licence is obtained. Any person who engages in the business of providing any licensable cybersecurity services to another person without a licence after 11 October 2022 shall be guilty of an offence and liable on conviction to a fine not exceeding $50,000 or to imprisonment for a term not exceeding 2 years or to both. However, a cybersecurity service provider who applies for a licence by 11 October 2022 may continue to provide its service until a decision on their licence application has been made.

The licence is valid for a period of two years and the licence fees for individuals and businesses are $500 and $1,000 respectively. A one-time 50% waiver of the licence fees will be granted for all licence applications that are lodged within the first 12 months.

A Tech Crackdown Hits Alibaba Profit by Nearly 60%

China's economy has been battered by the fallout from strict COVID-19 curbs including lockdowns and transport restrictions that have kept consumers home, pushed up unemployment, and tangled supply chains. Alibaba has also had to contend with a wide-ranging regulatory crackdown on alleged anti-competitive practices by China's tech giants.

The Hangzhou-based group cited "macro challenges that impacted supply chains and consumer sentiment" as it announced a loss of 16.2 billion yuan ($2.56 billion) for the January-March quarter.

It warned it would not give forward-looking financial guidance due to Covid risks and uncertainty.

Alibaba has seen its market value plummet since Beijing launched its sweeping crackdown in 2020 on some of China's largest home-grown companies.

The crackdown included a last-minute cancellation of a planned IPO by Alibaba's financial arm Ant Group, which would have been the world's largest public offering at the time. The company was also hit with a record $2.75 billion fine for alleged unfair practices last year. But Alibaba Group said that its revenue grew around 9% in the last quarter to 204.1 billion yuan, better than expected in a Bloomberg forecast. The company's revenues -generated mainly by its core e-commerce operations - were up 19% for the fiscal year ending March 31.

Meanwhile, its full-year profit came to 62 billion yuan ($9.8 billion).

"Since mid-March 2022, our domestic businesses have been significantly affected by the Covid-19 resurgence in China, particularly in Shanghai," the company said. "Considering the risks and uncertainties arising from Covid-19... we believe it is prudent at this time not to give financial guidance as we typically do at the start of the fiscal year," it added.

Alibaba's earnings follow a series of sluggish results by prominent Chinese tech firms, with internet giant Baidu reporting a net loss of 885 million yuan ($140 million) in the first quarter. Baidu's business has been "negatively impacted" by China's recent Covid-19 resurgence since mid-March, co-founder Robin Li said in a statement. Virus-related challenges continue to pressure Baidu's near-term operations, Li said.

25ᵗʰ Submarine Network

The largest annual event for the global subsea industry, this event delivers over 100 of the most forward-thinking subsea leaders along with premier subsea technology companies from across the world. Happening in person in Singapore.

Place: Singapore

07 - 08 SEPTEMBER

Byond Mobile

Connect with the 5G ecosystem, where industries convene with established suppliers and disrupting start-ups across the world, to provide insight and strategies for business leaders seeking to explore and evaluate the latest technology solutions and services.

Place: Bangkok

28 - 29 SEPTEMBER

Futurenet

FutureNet Asia focuses on the strategic and commercial priorities in today's digital world and the considerations for the future of the network, dedicated to driving the agenda around 'Network Automation and AI'. This event returns in 2022 as an in-person, networking and thought-leadership event, broadcast virtually too

Place: Singapore and Virtual

18 - 19 OCTOBER

Latest updates on:
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Telecoms World Asia

Telecoms World Asia is the premier conference focused entirely on digital solutions and services for Asian Telcos. An incredible line-up of over 120 Asian C-suite telecom leaders is being curated to discuss and debate the future of telco networks, 5G roll out progress, the digitization of customer services/processes and much more.

Place: Centara Grand & Bangkok Convention Centre at CentaraWorld, Bangkok, Thailand

07 - 08 NOVEMBER

Telecom Review Leaders' Summit 2022

The 16th edition of the leading ICT gathering will be held in a hybrid mode where the latest industry trends will be tackled.

Place: InterContinental Dubai Festival City, UAE

07 - 08 DECEMBER

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