

TELECOM **Review**

ASIA
PACIFIC

THE TELECOMS INDUSTRY MEDIA PLATFORM

JANUARY / FEBRUARY 2025

telecomreviewasia.com

Malaysia's Blueprint for AI Dominance in ASEAN

*Gobind Singh Deo,
Minister of Digital of Malaysia*



**Connectivity in Space:
LEO Satellites Help
Bridge the Digital Divide**

**Telecom Review
Excellence Awards**

**Transforming Disaster Response
and Agriculture with Drones and
Robotics**

GLOBAL FOOTPRINT
REGIONAL INFLUENCE
DIGITAL REACH



TELECOM Review
THE TELECOM INDUSTRY'S MEDIA PLATFORM
telecomreview.com

TELECOM Review ASIA PACIFIC
THE TELECOMS INDUSTRY MEDIA PLATFORM
telecomreviewasia.com

AFRICA **TELECOM Review** AFRIQUE
THE TELECOM INDUSTRY'S MEDIA PLATFORM LA PLATE-FORME MEDIA DE L'INDUSTRIE TELECOM
telecomreviewafrica.com

TELECOM Review AMERICAS
THE TELECOMS INDUSTRY MEDIA PLATFORM
telecomreviewamericas.com

تيليكوم ريفيو
مفصلة قطاع الاتصالات والتكنولوجيا
TELECOM Review
telecomreviewarabia.com

TELECOM Review EUROPE
THE TELECOMS INDUSTRY MEDIA PLATFORM
telecomrevieweurope.com

TELECOM Review 
virtual panels

TELECOM Review 
telecomreview.tv

SUMMIT
TELECOM Review
www.telecomreview.com/summit

TELECOM Review

THE TELECOMS INDUSTRY MEDIA PLATFORM

telecomreviewasia.com

4



■ Malaysia's Blueprint for AI Dominance in ASEAN

10



■ Connee Zhang Shares CypressTel's Blueprint for Future-Ready Networks

15



■ NEC: Harmonizing AI and Sustainable Development

19



■ TRS-24: A Continuation of ICT and Telecom Excellence That Knows No Bounds

- 12 TRS-24 Keynote: "The Telco Industry is Mission Critical for Every Country"
- 13 Connectivity in Space: LEO Satellites Help Bridge the Digital Divide
- 17 From Enablers to Solution Providers: The Telecom Industry's Next Frontier
- 35 Stasko Drives Telstra's AI-Optimized Infrastructure and Partnerships
- 37 Lintasarta Fuels Indonesia's AI Transformation through Strategic Collaborations and Innovation
- 39 Nokia Threat Intelligence Report: Enhancing Telco Security, Efficiency, and Innovation
- 46 The Alarming Reality: APAC Firms Experience Heightened Ransomware Attacks
- 48 Sri Lanka's Growing Remote Work Ecosystem

- 50 The Role of Telecom in Bangladesh's Urban Development
- 53 Six Key Drivers Behind the Surge in Shared Cloud Spending
- 55 Telecoms Role in Driving Progress Towards SDGs in India, Vietnam and Indonesia
- 57 Transforming Disaster Response and Agriculture with Drones and Robotics
- 63 Behind the Scenes of APAC's Growing (24% CAGR) Conversational AI Revolution
- 65 How India's Telecommunications Sector is Driving Digital Literacy
- 68 The Emergence of Holographic Communication in Asia-Pacific Telecommunications
- 70 How Singapore's APIs Hold the Key to Asia's 5G Telecom Potential



Turning Down the Heat: New Discovery Fuels the Future of Electronics

UVA researchers have confirmed a nanoscale heat flow principle, enabling cooler, faster, and more energy-efficient chips. This breakthrough in thermal management, supported by Intel and the Semiconductor Research Corporation, advances next-gen CMOS technology for sustainable, high-performance electronic devices.

[READ MORE](#)



Advancing AI Voice Technology for Emotional Connection

A USD 40 million-backed conceptual startup aims to transform human-computer interactions with AI voice systems that deliver natural, emotionally-engaging experiences, supported by advancements in real-time, interruption-management technology.

[READ MORE](#)



Germany Advances Autonomous Driving with Innovative C-ITS Strategy

Germany's new autonomous driving strategy leverages C-ITS technology and public transport to lead innovation in connected mobility solutions.

[READ MORE](#)



Study Proposes Radio-Frequency Localization to Improve Smartphone AR Accuracy

frequency-based localization as a solution to improving accuracy and stability in real-world environments.

[READ MORE](#)



Holiday Season Attacks Powered by AI

This holiday season, the retail industry is anticipating a rise in cyberattacks beyond the usual spike.

[READ MORE](#)



Investor Appetite for AI Ventures Grows

Leading investors worldwide are pouring funds into AI companies, captivated by their transformative vision of an intelligent and interconnected future.

[READ MORE](#)

Founder of Telecom Review Group CEO of Trace Media International Editor in Chief

Toni Eid
toni.eid@telecomreviewgroup.com

Content Manager

Corrine Teng
corrine@telecomreviewasia.com

Journalists

Novie Rose Nuñez
novie@telecomreviewasia.com

Clarissa Garcia
clarissa@telecomreviewasia.com

Editorial Team

Christine Ziadeh, Corrine Teng, Clarissa Garcia, Elvi Correos, Jeff Seal, Jessica Bayley, Jonathan Pradhan, Marielena Geagea, Mira Jabbour, Monika Jeleniak, Novie Nuñez, Pia Maria El Kady, Sherizze Acot

Copy Editor

Jessica Bayley
Jessica@tracemedia.info

Director of Content for Media & Events

Christine Ziadeh
christine@telecomreviewgroup.com

Chief Operating Officer

Issam Eid
issam@telecomreviewgroup.com

Advertising Enquiries

Mohammed Ershad - Sales Director – Group
ershad@telecomreviewgroup.com

Paul Tan - Regional Sales Manager – Singapore
paul@telecomreviewasia.com

Operations Director – Group

Anna Chumak

Graphic Designer

Tatiana Issa

News

Provided in cooperation with AFP
the global news agency

Singapore: Corrine Teng; Paul Tan

Trace Media Ltd.

Zouk Mikael, LEBANON, Kaslik Sea Side Road,
Badawi Group Building, 4th Floor,
P.O. Box 90-2113, Jdeidet el Metn
Tel. +961 9 211741
Fax +961 9 211742

Trace Media FZ.LLC.

Dubai Media City, UAE
Building 7, 3rd Floor., Office 341
P.O. Box 502498, Dubai, UAE
Tel. +971 4 4474890
Fax +971 4 4474889

© All rights reserved Publication of any of the contents is prohibited

- S111 -



Gobind Singh Deo,
Minister of Digital of Malaysia

Malaysia's Blueprint for AI Dominance in ASEAN

As Southeast Asia embraces digital transformation, Malaysia is emerging as a regional tech leader. With strong infrastructure, a strategic location, and a rapidly growing digital economy, the nation is driving innovation and economic growth.

Driving the nation's digital agenda, the Ministry of Digital was established in December 2023, formed from the former Ministry of Communications and Digital. Led by Malaysia's first Minister of Digital, Minister Gobind Singh Deo, the ministry aims to position the country as a regional digital powerhouse. In an exclusive interview, Minister Gobind shared key insights into the ministry's vision and strategies, as well as robust plans for the year ahead.

Can you share more about Malaysia's digital economy and your vision for Malaysia's digital landscape in the near future?



Malaysia's digital economy is rapidly evolving and expanding and we at the Ministry of Digital are committed to ensuring it becomes a key driver of sustainable economic growth. By the end of 2025, we aim for the digital economy to contribute 25.5% to the national GDP, in line with the Twelfth Malaysia Plan (RMK-12). This is crucial as digitalization is transforming not only our economy but also the way we interact, work, and conduct business in every sector.

Through the national strategic initiative, Malaysia Digital (MD), driven by an agency under my ministry, the Malaysia Digital Economic Corporation (MDEC), we aim to encourage and attract companies, talents, and investments, empowering Malaysian businesses and citizens to play a leading role in the global digital economy. MD focuses on nine high-growth sectors, which are vital to Malaysia's digital transformation: Digital Agriculture, Digital Services, Digital Cities, Digital Health, Digital Finance, Digital Trade, Digital Content, Digital Tourism, and the Islamic Digital Economy.

We want to transform Malaysia into a regional digital leader by fostering a vibrant, inclusive, and sustainable

digital ecosystem. We also aim to position Malaysia as a key player in the ASEAN digital economy, leveraging advanced technologies such as 5G, artificial intelligence (AI), and cloud computing to not only drive innovation but also ensure inclusivity for all Malaysians.

In 2024, we focused on regulation and legislation to align with international standards, strengthen cybersecurity, and protect data. The Ministry of Digital tabled two new bills in parliament: the Cyber Security Act 2024 and the Data Sharing Bill. We also amended the Personal Data Protection Act 2010 to include mandatory data breach notification provisions and increased penalties for non-compliance, amongst other important measures. In 2025, we will work towards further enhancing governance structures surrounding data, infrastructure, cyber resilience, and talent empowerment.

Which initiatives are positioning Malaysia as a leader in digital innovation within the region?

A landmark move to position Malaysia as a leader in AI innovation and competitiveness on the global stage was the establishment of the National Artificial Intelligence Office (NAIO) on



The Ministry of Digital tabled two new bills in parliament: the Cyber Security Act 2024 and the Data Sharing Bill





12 December, 2024. This marks the MADANI Government's commitment to accelerating the nation's digital transformation and governing AI development. NAIIO will focus on collaboration, policy and strategies, the efficient allocation of resources, and governance and security.

NAIO will be incubated by the MyDIGITAL Corporation (another agency under the Ministry of Digital) and will oversee the AI Technology Action Plan 2026-2030. The plan comprises the following: AI Adoption Regulatory Framework, Acceleration of AI Technology Adaptation, AI Code of Ethics, AI Impact Study for Government, National AI Trend Report, and Datasets Related to AI Technology. There will be a strong focus on two major projects, which are the AI Sandbox and National LLM Strategy.

Meanwhile, our digital innovation strategy will be driven by various programs and initiatives under the MD initiative:

The Malaysia Digital Catalytic Programmes (PeMangkinMD) are designed to accelerate growth in high-potential digital sectors through public-private collaborations. MD Tax Incentives offer competitive incentives that encourage investments in digital services and solutions and have been successful in drawing in major global players to set up operations in Malaysia.

Rolled out in August last year, the National E-Invoicing Initiative aligns with the digitalization agenda. This program allows different accounting software and Enterprise Resource Planning (ERP) systems to send and receive e-invoices in a system-to-system manner, enhancing operational efficiency, reducing costs, and improving accuracy and traceability in business transactions. Aligning with a global framework to streamline cross-border transactions will also encourage multinational companies operating in Malaysia to adopt e-invoicing.

Meanwhile, the Gateway, Amplify, Invest & Nurture (GAIN) initiative will continue to empower high-potential Malaysian companies with the tools, skills, and networks necessary for global expansion. By helping these companies scale quickly, we aim to elevate them on the global stage, ensuring Malaysia remains competitive internationally.

To support businesses in their digital transformation journey, various grants are being offered such as the Digital Content Grant (DCG), Malaysia Digital X-Port Grant (MDXG), and Malaysia Digital Catalyst Grant (MDCG).

Of course, all the work we do would be moot without comprehensive, reliable infrastructure. This includes accelerating the National 5G Rollout, which plays a critical role in revolutionizing industries such as agriculture, logistics, healthcare, and manufacturing.

By focusing on these strategic initiatives, Malaysia is driving a

comprehensive digital transformation process which promotes sustainable economic growth, enhances digital literacy, and positions the country as a premier digital economy within ASEAN.

What strategies is Malaysia implementing to attract foreign tech investments, and how is the government supporting local tech firms in expanding their presence in international markets?

Malaysia is actively implementing a mix of strategies to attract foreign tech investments while also supporting local tech firms in their global expansion.

Malaysia offers tax incentives through agencies such as the Malaysian Investment Development Authority (MIDA) and the MDEC for foreign investors in high-value industries such as AI, cybersecurity, and integrated circuit (IC) design. Additionally, the Digital Investment Office (DIO) facilitates end-to-end services for digital investments.

We are capitalizing on our strategic location as a gateway to ASEAN's 600+ million population as well as our advanced infrastructure—including investments in data centers, 5G networks, and smart cities—to attract high-tech industries. The Digital Free Trade Zone (DFTZ), established in 2016, was created to accelerate cross-border e-commerce, fostering trade opportunities for tech firms.

Tech-focused events happening this year such as the KL AI Summit and Smart City Expo (being held in Southeast Asia for the first time) serve as good platforms to showcase Malaysia as a tech destination. For example, a collaboration with Bloomberg will bring top CEOs and digital leaders to Malaysia. There are also ongoing collaborations with global tech giants such as Microsoft, AWS, Google, and others through which we are establishing research and development (R&D) and innovation hubs as well as joint ventures (JVs) in critical areas like IC design and blockchain technology.



We realize the timeliness of, and necessity for, policy reforms in keeping up with the latest developments, and are reviewing and ensuring that investor-friendly policies are in place, such as the need to ease foreign equity restrictions in high-tech sectors. This is in addition to aligning digital governance frameworks with global standards to ensure regulatory clarity and investor confidence. In line with this, the Malaysia Tech Entrepreneur Programme (MTEP) for the startup industry facilitates the Knowledge Workers Passes system for experienced tech professionals and investors.

As for our support of local tech firms in global markets, we promote our exports through market access programs via the MDEC and MATRADE, which provides grants, networking platforms, and advisory services, and includes local companies from trade missions to international tech expos such as CES and Web Summit.

Upskilling initiatives are executed in several ways. The TVET system is one of them, where we focus on building skills specific to emerging technologies



We are capitalizing on our strategic location as a gateway to ASEAN's 600+ million population as well as our advanced infrastructure—including investments in data centers, 5G networks, and smart cities





The government is actively building a talent pipeline. A notable effort is the recent allocation of MYR 50 million in the National Budget for AI education



to increase our workforce's competitiveness. The government is actively building a talent pipeline. A notable effort is the recent allocation of MYR 50 million in the National Budget for AI education.

Other funding and grants channels include the Digital Content Grant for creative tech and venture funding for AI and blockchain startups. The government is also advocating for more public-private partnerships to co-develop products, ensuring tech transfer and global exposure.

Last but not least, with Malaysia chairing ASEAN in 2025, we have the opportunity to take the lead in these initiatives, and at the same time, position Malaysia as a leading digital community and economic coalition, guided by the ASEAN Digital Masterplan (ADM) 2025 and its post-2025 vision. It is important for us to position local tech firms in regional supply chains, bolster their presence in ASEAN markets, and promote the region as a unified digital economy. Plans are underway to showcase local firms and

attract foreign investors through events like the Asia Investment Build-Up and LEVEL UP KL. Many more international conferences and industry events are in the offing this year.

What developments are in the pipeline to promote digital literacy and skilled digital talent across the country?

Developing digital talent is a key pillar of our national digital economy strategy. The Ministry of Digital, together with our agency, MDEC, has various initiatives in place, all of which aim to upskill the workforce and promote digital literacy across all levels of society.

The Saya Digital Campaign was launched in 2020 and aims to empower Malaysians with essential digital skills to thrive in the digital economy and manage the rising cost of living, especially in underserved urban and rural areas. The initiative supports the Ministry's three core pillars – Digital Government, Digital Economy, and Digital Society. This campaign is carried out via the nationwide Jelajah Saya Digital (JSD) program.

Public-private-academic sector initiatives like MyDigitalMaker aim to transform Malaysian youth from digital users into digital producers in the digital economy. This initiative provides exposure and hands-on activities that include coding, app development, AI, 3D printing, drone operating, robotics, embedded programming, and data analytics. More than 2.5 million students have taken part in this program and over 106 teachers have been certified as AI instructors.

The eUsahawan Digital Entrepreneurship initiative encompasses external and online learning exercises to train individuals, students, and micro-entrepreneurs in digital entrepreneurship to generate income, carry out product marketing, and increase sales.

Through a collaboration with the Ministry of Higher Education, the Premier Digital Tech Institutions (PDTI) initiative identifies and supports institutions that consistently produce graduates that are ready for the industry. With 42 faculties and seven polytechnics accredited, the PDTI has nurtured over 50,000 graduates, boasting a 95% employability rate.

In addition to this, the MD Workforce was launched in 2020 and focuses on enhancing the skills of individuals (particularly the youth) in key digital sectors such as cybersecurity, data analytics, and AI. More than 42,500 individuals have benefited from these programs, improving their employability and aligning their skills with market demands.

Through these initiatives, we are confident that Malaysia will create 500,000 high-quality digital jobs by 2025, further cementing our position as a leader in the ASEAN digital economy.

How do advancements in AI and IoT impact various sectors in Malaysia, and what strategies are in place to integrate them into the national development agenda?

Advancements in AI and IoT are significantly transforming various

sectors in Malaysia by enhancing efficiency, innovation, and sustainability.

In manufacturing, AI and IoT technologies drive smart automation and predictive maintenance, optimizing production processes, reducing downtime, and enhancing overall productivity. Precision farming in agriculture has enabled our palm oil plantation companies, for example, to monitor soil conditions and crop health, minimize resource usage, and implement more sustainable practices through AI solutions.

AI is revolutionizing healthcare delivery by enabling predictive analytics, personalized treatment plans, and improved diagnostics. The health minister recently mentioned that the Ministry is open to incorporating disease-detecting AI technology—particularly in cancer diagnosis—within public hospitals.

Other sectors in which AI and IoT will bring benefits include the logistics sector, using real-time tracking and data analytics to optimize routes and inventory management; and financial services, where AI can enhance fraud detection, risk assessment, and personalize customer experiences.


To effectively integrate AI and IoT into Malaysia's national development agenda, we have defined a clear strategy in the National AI Roadmap. This roadmap outlines our goals, investment plans, and ethical frameworks to ensure responsible AI development and deployment.

Key elements of our strategy include a collaborative effort led by the MDEC in partnership with the Ministry of Science, Technology, and Innovation (MOSTI) and the Ministry of Education, which aligns AI initiatives with national priorities.

Other elements include talent development programs to bridge the skilled workforce gap, industry collaborations, incentivized programs, and ethical AI development to ensure adherence to established ethical standards.

Meanwhile, the Ministry of Trade, Investment & Industry-led New Industrial Master Plan 2030 aims to nurture local technology solution providers and support the Technology Adoption Program, which will benefit 3,000 smart manufacturers by 2030 under SIRIM's Tech-Up Program.

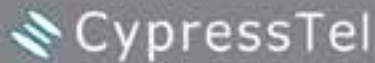
Public outreach programs are also underway to foster a culture of digital innovation and encourage the responsible use of AI technologies among citizens.

By leveraging these strategies and actively involving all stakeholders, Malaysia is poised to navigate its journey towards becoming an AI-ready nation, ultimately enhancing economic growth and improving the quality of life for all citizens. 



With 42 faculties and seven polytechnics accredited, the PDTI has nurtured over 50,000 graduates, boasting a 95% employability rate





Connee Zhang,
CEO CypressTel



Connee Zhang Shares CypressTel's Blueprint for Future-Ready Networks

Reflecting on Cypress Telecom's (CypressTel) remarkable 16-year journey of growth and innovation, CEO, Connee Zhang, elaborated on how the company has evolved into a leading global network service provider with Telecom Review.

In an exclusive interview, Connee delved into the strategic market focus, strong partnerships, and technological advancements that have driven the company's success. She also highlighted how CypressTel is leveraging AI and automation to enhance its SD-WAN and SASE solutions, paving the way for continued growth and the delivery of future-ready, secure, networking offerings.

CypressTel has celebrated its 16th anniversary. Can you give an overview of the company's development since its inception and elaborate on the factors that have shaped its growth and success over the years?

The establishment of our 16th

anniversary is a proud milestone for CypressTel. Since our inception, we have grown from a single-focus business into a diversified global network service provider. When we first started, our goal was to provide reliable, efficient, connectivity solutions. However, as the industry evolved, we knew we needed to adapt and expand. This led us to broaden our portfolio significantly, incorporating advanced solutions like SD-WAN, SASE, dedicated internet access, private networks, data center colocation, cloud connect, and WAN optimization.

Our commitment to innovation has been a key driver of our success. We have made significant advancements in SD-WAN and SASE, including the introduction of our self-developed

products, which have enabled us to offer a more comprehensive and varied suite of solutions to our clients. This focus on technological development has set us apart and helped us stay at the forefront of the industry.

Another major factor in our growth has been our global expansion. From our strong foundation in China and the Asia Pacific region, we have extended our service network to North America and Europe. This global presence has allowed us to support our clients wherever they are, while our deep expertise in China remains a key strength.

We have built a reliable global network. Service coverage has extended with a worldwide footprint, covering major countries such as China, Japan, the USA, Germany, the UK, Korea, Thailand, India, Australia, Singapore, Indonesia, Malaysia, and the United Arab Emirates. The rapid expansion of our global network of 140+ Network PoPs ensures high-speed, resilient connectivity across these regions. Furthermore, our strong partnerships with global leading network vendors, along with our extensive service coverage in over 300 cities, underscores our world-class service capabilities. Our network operation centers (NOC) and security operation centers (SOC) provide robust support, ensuring excellence in network management.

CypressTel stands out for its one-stop ICT solutions, low latency with 99.99% availability, and real-time monitoring and management. Our comprehensive operation and maintenance services include 24/7 managed support throughout the year, provided by a team of IT network professionals certified in CCIE, CCNP, CCNA, cloud computing, network security, and CISP. Additionally, we offer multilingual support, catering to clients in English, Chinese, Japanese and other languages. Additionally, we have been honored with numerous industry awards and have been recognized by our partners, highlighting the quality of our solutions and the dedication of our team.

Which key strategic markets and partnerships are driving CypressTel's growth? How do these align with your long-term vision for the company?

At CypressTel, our strategic growth is built upon a combination of targeted market expansion and strong, collaborative partnerships. We have a particular focus on key markets in the Asia Pacific region, China, North America, and Europe, where we see substantial demand for advanced network solutions. Our expertise in SD-WAN, SASE, cloud connectivity, and edge computing allows us to meet the evolving needs of enterprises in these dynamic markets.

By collaborating with leading technology vendors, cloud service providers, and industry leaders, we have created a robust digital ecosystem. These ecosystems enable us to integrate best-in-class solutions into our offerings, providing our clients with access to comprehensive and innovative products and solutions, helping them scale their operations effectively. For example, our work with major cloud service providers has accelerated the deployment of cloud and edge computing, enhancing our clients' network flexibility and scalability.

Innovation remains a core part of our long-term vision. We continuously invest in R&D to advance our SD-WAN, AI, big data, and intelligent computing capabilities. By integrating these technologies, we offer smarter, more efficient network management, allowing businesses to optimize performance, reduce costs, and adapt quickly to market changes.

How is CypressTel leveraging AI to transform SD-WAN and SASE solutions, and how will clients benefit from these innovations?

AI is a game-changer in our SD-WAN and SASE solutions, transforming the way we manage and secure enterprise networks. By integrating AI capabilities, we've shifted from traditional, static, rule-based configurations to intelligent, adaptive systems that can optimize performance and enhance security in real time. This leap forward is delivering tangible benefits to our clients, particularly in terms of network efficiency, cost-effectiveness, and security.

One of the key innovations is our AI-powered intelligent path selection.



Unlike traditional SD-WAN, which relies on pre-configured policies and fixed parameters like latency and jitter, our AI-powered solution employs self-learning algorithms. These algorithms dynamically adjust bandwidth allocation and routing strategies based on real-time network conditions, changing application patterns, and dynamic user behavior. As a result, clients experience faster response times, improved application performance, and reduced need for manual intervention, which ultimately translates into lower operational costs and enhanced user experiences.

Additionally, our AI capabilities enable comprehensive data analysis and more nuanced decision-making. While traditional SD-WAN focuses only on basic network metrics like latency and packet loss, our AI-enhanced system analyzes extensive historical data, user behavior, and application performance metrics. This deeper analysis provides insights that support predictive decision-making, allowing the network to proactively anticipate and respond to potential issues before they impact performance. This not only optimizes traffic management but also ensures a smoother, more reliable network experience for our client.

Security is another critical area where AI is making a significant impact. Traditional SD-WAN includes basic security features; however, it often struggles to adapt quickly to new or evolving threats due to its dependence on static policies. In contrast, our AI-powered SD-WAN and SASE solutions leverage real-time data analysis to detect anomalies and potential threats

automatically. The system can learn normal traffic patterns, quickly identify suspicious activity, and take immediate action, such as isolating threats or rerouting traffic to secure paths.

How will CypressTel continue to drive growth in the coming years, and how will AI and automation shape the future of networking and security solutions?

CypressTel focuses on leveraging AI and automation to drive our next phase of growth and deliver even more advanced networking and security solutions. The demand for scalable, secure, resilient, and efficient networks is greater than ever, and we are positioning ourselves to meet this need by evolving beyond traditional setups and embracing more dynamic, intelligent approaches.

Looking ahead, AI and automation will be at the core of our strategy. We are expanding our global network operation centers (NOC) and security operation centers (SOC) to provide continuous monitoring and proactive security measures. AI-powered analytics and intelligent computing will enable us to perform real-time threat detection and dynamic security adjustments, addressing the increasing demand for stronger network protection. By moving away from static security policies, our solutions can now offer a more responsive defense, quickly identifying and mitigating new and evolving threats.

We believe that the integration of AI and automation will redefine the way businesses connect, operate, and secure their networks, enabling us to support our clients in their growth journey and helping them achieve new levels of success in the digital age. **TR**



Vikram Sinha, CEO, Indosat Ooredoo Hutchison (IOH)

TRS-24 Keynote: “The Telco Industry is Mission Critical for Every Country”

Vikram Sinha, CEO at Indosat Ooredoo Hutchison (IOH), delivered the opening keynote ahead of the ‘Telecom Leaders’ Panel’ at the 18th Telecom Review Leaders’ Summit.

He congratulated Toni Eid, CEO, and Founder of Telecom Review, for organizing this important annual event, which “creates movement in a competitive industry to bring thought-provoking ideas and leaders together.”

Sinha added, “I have had the privilege of working with brands such as Huawei, Netcracker, Nokia, Cisco, among others and I have to tell you that the era is all about collaboration to create an ecosystem for the larger purpose, aligned to the value system.”

He pointed out that the telecom industry is not a “sunset industry.” He emphasized that the COVID-19 era drove the industry to acknowledge the importance of the telco industry and the emergence of artificial intelligence (AI). He highlighted the importance of infrastructure in the development of basic connectivity as well as AI.

“The telco industry is mission critical for every country,” Sinha stressed.

Citing the successful merger of Indosat Ooredoo and Hutchison 3 Indonesia to create Indosat Ooredoo Hutchison (IOH) in 2022 as an

example, he attributed the company’s accumulation of 100 million customers in a short time span to “working with a growth mindset.”

He also highlighted the company’s efforts in transitioning to an AI-native techco through the development of a sovereign infrastructure with core security elements.

He reiterated that Indosat is a reputable brand that aims to reinvent itself through a unique parentship model. “Our principle of partnership has helped us to make money with our partners and not from our partners,” he stressed. **TR**



*Ari Banerjee, Senior Vice President,
Strategy, Netcracker Technology*

Connectivity in Space: LEO Satellites Help Bridge the Digital Divide

The communications industry is working towards ubiquitous connectivity, and recent advances in satellite technology are making it easier to bridge the gap.

Satellite technology has played a vital role in global communications for decades. Starting with TV broadcasts and basic phone calls and evolving to broadband internet and mobile backhaul, geostationary Earth orbit (GEO) satellites and medium Earth

orbit satellites (MEO) have been filling the connectivity gaps in hard-to-reach areas not connected by traditional telecom networks. However, due to the distance these satellites cover from Earth, latency has become an issue, preventing their widespread use in real-time communications.

Low Earth orbit (LEO) satellites are much closer to Earth—ranging from

300m to 1,500km—resulting in much lower latency than GEO satellites. LEO satellites can also be linked together to increase capacity. The downside of LEO technology has been the cost, limiting their use in commercial networks. With recent technological advances like software-defined control and AI, as well as lower cost launches, LEO satellites offer an exciting and affordable option to bridging the digital divide, filling

mobile coverage gaps and equipping diverse industries with high-quality and mission-critical communications anywhere in the world. This is specifically pertinent when considering the increasing impacts of natural disasters, such as flooding caused by hurricanes, which can leave people isolated and unable to communicate. Using satellite communication to reach these areas could allow for aid to reach them more quickly.

However, the demands of highly dynamic LEO satellite networks place requirements on network and service operations that go above and beyond what any modern telco or satellite provider has been equipped to handle. In addition, given the on-demand nature of LEO satellite connections due to their low latency and finite capacity, operators need an efficient and scalable way to transact with customers and partners. Key issues include:

- **Highly Dynamic Operations:** Building a real-time view of the service topology is extremely complicated given the many moving parts in a satellite network.
- **Multi-Domain Services:** New operational systems are needed to model, manage and orchestrate services across space and Earth.
- **Complex Diverse Global Customer Base:** Different business models and better engagement models will be needed to address the specific needs of customers in different countries and adhere to the specific requirements of those countries including language, currency, taxation schemes and data privacy.

Another emerging technological innovation telcos need to consider is the ability to connect satellites directly to regular mobile, as well as IoT, devices using direct-to-device (D2D) technology. In place of dedicated satellite phones, ordinary smartphones can seamlessly switch from 4G/5G mobile networks to satellite to maintain connectivity and fill coverage gaps. In the IoT market, this presents opportunities to keep remote sensors and tracking devices connected at all times for use in agriculture,

transportation and environmental monitoring, among others, enabling operators to offer ubiquitous connectivity to consumers and a variety of industries.

Telcos and Satellite Operators Embrace the New Era of Communications

In order to take advantage of the communication potential introduced by LEO satellites, both telcos and satellite operators need to adapt to these new requirements. By ensuring their systems are able to handle the interconnection between satellites and telco networks, both parties can play a significant role in closing the connectivity gap.

Telcos can extend their coverage by placing 5G RAN in areas that are difficult to serve and using satellite for backhaul, employing a multi-orbit strategy. Fixed satellite access can address the consumer and business market in areas that are not economical for 5G, D2D or fiber.

To serve these telco markets, satellite communication providers need a new way to manage, optimize and monetize their business as they prepare to offer new types of services, expand into new markets and differentiate themselves in what is becoming a highly competitive market. Satellite operators require:

- The ability to deliver and guarantee the highest service quality at any time, helping them address mission-critical services in highly demanding verticals and the governmental market.
- Ways to engage with their customers and partners in a more digital and API-centric way, making it easier for customers to purchase or modify services and get the support they need.
- A method to easily create any type of service offer and support any customer type in any country in the world. Satellite operators need to be able to quickly adapt to changes in the market and take advantage of new innovations.

To meet these requirements, Netcracker has developed the industry's first

blueprint for multi-orbit satellite IT, incorporating new innovations to help satellite providers always guarantee the highest service quality.

The Netcracker Digital Satellite Solution encompasses significant innovations in real-time operations and sophisticated BSS applications and is deeply embedded with AI to help satellite operators extract the maximum value from their significant investments. With our solution, operators can deliver and guarantee the best service quality at any time, provide premium digital engagement for their customers, and expand their business with any type of customer and service offering, in any country.

Utilizing its Digital Satellite Solution, Netcracker is helping satellite operators to expand their communication offerings through deeper integration with telco domains, maximizing their value in this growing market and delivering differentiating communication experiences. **TR**

By Ari Banerjee, Senior Vice President, Strategy, Netcracker Technology



The Netcracker Digital Satellite Solution encompasses significant innovations in real-time operations and sophisticated BSS applications and is deeply embedded with AI





Kenji Takemura, Director, Service Provider Solution Department, Head of EMEA Transport Center of Excellence (COE), NEC Corporation, Japan

NEC: Harmonizing AI and Sustainable Development

In a keynote address delivered by NEC during the 18th edition of the Telecom Review Leaders' Summit, held from 10-11th December in Dubai, United Arab Emirates, Kenji Takemura, Head of EMEA Transport Center of Excellence (CoE) and Director, Service Provider Solution Department, outlined the company's commitment to leveraging AI technologies to advance sustainable development and redefine global connectivity.

The NEC executive emphasized the transformative potential of generative AI (GenAI), which is unlocking revolutionary services while simultaneously posing significant energy challenges, emphasizing the need for a holistic approach that includes renewable energy and power optimization.

Central Excellence and AI's Role in Sustainable Development

AI, although powerful, requires immense computational resources, consuming nearly ten times more energy than traditional technologies. This energy intensity demands innovative solutions to ensure AI's growth aligns with sustainability goals. NEC is tackling this issue through a multi-pronged approach, including renewable energy integration, energy-efficient product design, and AI-powered optimization of power usage within data centers.

A key component of NEC's strategy is the evolution of data center architecture. Traditionally centralized in major cities, data centers must now transition to distributed networks in suburban or rural areas, harnessing natural resources and renewable energy. This distributed model promises to balance power supply and ensure high-throughput, low-latency connectivity across interconnected data centers. NEC views this as a critical step toward creating a sustainable and efficient AI ecosystem.

Innovations in Data Center Architecture

Addressing the requirements for the evolution of sustainable data centers, Takemura pointed out the need for green design and solutions to make distributed data centers a reality.

Together with NTT and other industrial leaders, NEC is pursuing the possibility of all-optical networks for sustainable development. Through a groundbreaking initiative with NTT and other industry leaders, NEC's

establishment of an Advanced Photonic Network (APN) by 2030 aspires to achieve unparalleled efficiency, offering 125 times the transmission capacity and consuming significantly less power compared to existing systems by 100 times. The APN will support advanced applications, including real-time video production, synchronized robotics, and smart infrastructure management, reducing end-to-end latency by 200 times.


Key Vision and Principles of Sustainable Growth

Pioneering a smart and sustainable society with Innovative Optical and Wireless Network (IOWN), Takemura introduced the three key visions of their solution: open disaggregation, sustainable, and trustworthy and future oriented.

- **Open Disaggregation:** By fostering collaboration with industry stakeholders and adopting disaggregated solutions, NEC enables service providers to customize their networks without overhauling existing investments. This approach not only reduces costs but also accelerates deployment and innovation.
- **Sustainable:** According to Takemura, NEC has been ranked the second-most sustainable company in 2024, proving its commitment to green practices from production through operation. He also mentioned their extensive experience in manufacturing solutions and serving hundreds of customers worldwide.
- **Trustworthy and Future-Oriented:** Takemura also underscored NEC's active involvement in standardization activities with organizations like TIP, OIF, OpenROADM, and the IOWN Global Forum, aiming to lead official technology standards.

Envisioning a sustainable future where communication breaks all limits, Takemura cited several examples including the NTT Global Data Center Proof of Concept (PoC),

Africa's first TIP Phoenix Open Optical and Transport platform, and a strategic Oracle partnership whereby NEC and Oracle collaborated to optimize NEC hardware and software for seamless performance in the Oracle environment. Additionally, a large enterprise PoC showcased unified GPU clustering across multiple data centers, enabling GPU-as-a-Service (GPUaaS) capabilities.

By combining innovation with collaboration, NEC is paving the way for a future where AI-driven solutions and sustainable practices converge, delivering unique value and securing a brighter, more sustainable future for all. 



NEC's establishment of an Advanced Photonic Network (APN) by 2030 aspires to achieve unparalleled efficiency, offering 125 times the transmission capacity and consuming significantly less power compared to existing systems by 100 times





Marco Lichtfous, Managing Director of PMP Strategy Luxembourg

From Enablers to Solution Providers: The Telecom Industry's Next Frontier

The telecom industry has long been at the heart of technological innovation, driving progress with advancements such as 4G, 5G, and the Internet of Things (IoT). Yet, as the world continues to evolve at a rapid pace—shaped by digital transformation, sustainability goals, and the demands of a platform economy—the industry finds itself at a crossroads. For Marco Lichtfous, Managing Director of PMP Strategy Luxembourg, the answer is clear: it's time for telcos to go beyond networks and embrace a new role as solution providers.

Traditionally, telecom companies have defined themselves as enablers, delivering infrastructure, data, and connectivity.

This position, while critical, is no longer enough. Lichtfous believes telcos must shift their mindset to actively deliver solutions tailored to the unique needs of industries, from healthcare and manufacturing to energy and agriculture.

"We have unique capabilities," he explains. "It's not just about building networks or enhancing internal operations anymore. Telecom companies have the expertise and tools to bring comprehensive solutions directly to industries, and it's time to seize that opportunity."

Fintech: A Proof of Concept

The fintech sector offers a clear example of how telcos can successfully expand beyond traditional roles. By entering the financial services market, some telecom companies have transformed into active solution providers, delivering mobile payments, digital wallets, and financial solutions to retail customers. This evolution didn't stop at providing connectivity; it addressed a specific market need and created a new revenue stream.

This success in fintech demonstrates what's possible when telecom companies take bold steps to deliver value beyond networks. If telcos can become solution providers in financial services, why not replicate this approach across other industries?

A World of Untapped Potential

Across sectors, the potential for telecom-driven innovation is immense. Take healthcare, for instance, where technologies enabled by telcos, such as remote surgery and connected care, are already revolutionizing patient outcomes. Or smart manufacturing, where predictive maintenance and enhanced connectivity are reshaping

production processes. Energy management, agriculture, smart cities, and connected vehicles are further examples of industries where telecom solutions could drive real value.

Despite these possibilities, Lichtfous argues, telcos have been too focused on optimizing their existing operations rather than positioning themselves as strategic partners for industries. "We're still playing defense," he points out. "We see ourselves as infrastructure providers, not as innovators driving new solutions and revenue models. Isn't it time to play offense again?"

Building Ecosystems That Drive Value

For Lichtfous, the way forward lies in building ecosystems that integrate telecom capabilities with industry needs. Rather than simply offering the technological backbone, telcos should actively engage with businesses, understand their challenges, and deliver end-to-end solutions that create measurable value.

Imagine a car manufacturer, for example, working with a telecom provider to design smarter production lines, implement advanced maintenance systems, and enhance connected vehicle technology. Or a city partnering with a telecom company to build an integrated smart grid that optimizes energy usage and supports sustainability goals. These are not just theoretical opportunities—they are areas where telcos can lead, provided they embrace a solutions-oriented mindset.

"Telcos have the technology, the expertise, and the infrastructure," Lichtfous says. "What's missing is the willingness to step forward as solution providers, not just enablers."


Time for Bold Action

The path ahead requires a cultural and strategic shift within the telecom industry. Lichtfous challenges telecom leaders to adopt a more aggressive approach, one

that positions them as advisors, innovators, and drivers of change across industries.

The question is no longer whether telcos have the tools to deliver these solutions. It's whether they are ready to claim their role as architects of the future. The time for bold action, as Lichtfous emphasizes, is now.

In a world where industries are increasingly interconnected, telcos have a unique opportunity to drive synergy, innovation, and growth. By moving beyond networks and building transformative ecosystems, the telecom industry can unlock new revenue streams and reaffirm its place at the forefront of global progress.

The telecom industry has the chance to redefine its role and shape the future. The question remains: **Who will lead the charge?** 



In a world where industries are increasingly interconnected, telcos have a unique opportunity to drive synergy, innovation, and growth





TRS-24: A Continuation of ICT and Telecom Excellence That Knows No Bounds

Under the annual theme 'Global. Regional. Digital,' the 18th edition of the Telecom Review Leaders' Summit successfully wrapped up its two-day event, bringing together a diverse group of professionals, including telecom operators, vendors, industry regulators, government officials, content providers, cybersecurity experts, consultants, and other notable attendees.

— DAY 1 —



WELCOME NOTE
Toni Eid, Founder of Telecom Review, and CEO of Trace Media International



OFFICIAL OPENING KEYNOTE:
Eng. Tariq Al Awadhi, Executive Director, Spectrum Affairs Department, TDRA



Vikram Sinha, CEO, Indosat Ooredoo Hutchison (IOH)



Alex Xu, President of Carrier Business, Huawei Middle East & Central Asia

Prior to the summit, on December 9, 2024, Telecom Review hosted the International Telecommunication Union (ITU) CxO meeting in collaboration with the TDRA, du, and Huawei.

The Telecom Review Leaders' Summit solidified its status as one of the most prominent and highly anticipated ICT events in the industry. Thousands of distinguished guests participated, representing various facets of the ICT sector. The event was supported by the Telecommunications and Digital Government Regulatory Authority

(TDRA) and featured an esteemed roster of sponsors, including du, Netcracker, Huawei, PMP Strategy, Eurisko, Amazon Web Services (AWS), Cisco, Comarch, PCCW Global Console Connect, MYCOM OSI, NEC, Nokia, Salam, TELUS, Apptium, Fortinet, InfraX, Related, Sofrecom, Verizon, YUVO, AvanteBSS, Emircom, Pure Storage, Telcovas, Telecom Egypt, and ZTE.

From December 10–11, 2024, the Ritz-Carlton Dubai's expansive conference hall and exhibition area bustled with activity and served as a space for engaging sessions, meaningful networking, and brand promotion.

Telecom Review Leaders' Summit Opening the floor of the 18th edition of the Telecom Review Leaders' Summit, Founder of Telecom Review, and CEO of Trace Media International, Toni Eid, addressed the audience with a welcome note, sharing Telecom Review's milestones and highlighting the industry's most notable achievements.

This year's summit raised the bar higher than ever, thanks to the participation of leading figures in the ICT industry from across the globe, representing regions such as the Middle East, Africa, North America, and the Asia Pacific.



Gordon Thomson, EMEA SP VP, Cisco



Kenji Takemura, Director, Service Provider Solution Department, Head of EMEA Transport Center of Excellence (COE), NEC Corporation, Japan



FIRESIDE CHAT:

Sylvain Seignour, President, Netcracker Technology

Issam Eid, CMO Africa, Levant, KSA & Qatar, Telecom Review Group

Day one featured a keynote by Eng. Tariq Al Awadhi, Executive Director, Spectrum Affairs Department, TDRA, who officially inaugurated the summit. The day's first two fireside chats explored the impact of the integration of emerging technologies such as artificial intelligence in the 5G era and evolution of digital transformation.

The ICT Leaders' Panel spearheaded several exclusive discussions, tackling topics like autonomous networks, network cloudification, generative AI (GenAI), sustainability, cybersecurity, and digital transformation. The day concluded with a certificate of appreciation ceremony, recognizing the event's sponsors.

The panel entitled 'World's First 5G-A Region Sets Sail,' saw operators, regulators, vendors and industry stakeholders celebrate the efforts being made in 5G-A acceleration across the region.

On day two, Eng. Mohammed Jada, Director Wireless Networks and Services, TDRA, delivered the official opening keynote. Additional panels included the second ICT Leaders' Panel session and discussions on wholesale, infrastructure deployment, women in ICT, and artificial intelligence.

Throughout the summit, the following prominent leaders in the ICT industry delivered keynote

speeches, adding further depth to the event's agenda:

- Vikram Sinha, CEO, Indosat Ooredoo Hutchison (IOH)
- Alex Xu, President of Carrier Business, Huawei Middle East & Central Asia
- Karim Benkirane, CCO, du and Saleem Alblooshi, CTO, du
- Gordon Thomson, EMEA SP VP, Cisco
- Kenji Takemura, Director, Service Provider Solution Department, Head of EMEA Transport Center of Excellence (CoE), NEC Corporation, Japan
- Mikko Lavanti, Senior Vice President, Mobile Networks, MEA, Nokia
- Mounir Ladki, President and CTO, MYCOM OSI
- Marco Lichtfous, Managing Director, PMP Strategy Luxembourg



FIRESIDE CHAT: Enabling growth in the Middle East and African Telecom sector: AWS's role in regional cloud innovation
Bernard Najm, Vice President Telco MEA, Amazon Web Services (AWS)
Zakaria Chouaib, Managing Director, PMP Strategy MEA



PANEL: THE TELECOM LEADERS' PANEL -Session 1-



PANEL: AI EMPOWERING HIGHLY AUTONOMOUS NETWORKS – Powered by Huawei



5G-A Launching Ceremony



PANEL: WOMEN IN ICT

— DAY 2 —



Mikko Lavanti, Senior Vice President, Mobile Networks, MEA, Nokia



Marco Lichtfous, Managing Director, PMP Strategy Luxembourg



PANEL: DEVELOPMENTS IN THE CLOUD INDUSTRY AND THE ROLE OF HYPERSCALERS



Telecom Review Excellence Awards



A key highlight of the summit was the annual Telecom Review Excellence Awards ceremony, which honored the outstanding ICT brands and leaders for their achievements over the past year. The awards were followed by the annual gala dinner.

Jeff Seal, Chief of the Awards Committee, Managing Partner, and Editor-in-Chief of Telecom Review North America, remarked, "In 2024, the Telecom Review Excellence Awards set a new benchmark, attracting significant industry interest with a

record-breaking number of global nominations. To accommodate this, we introduced more distinct awards on a global and regional scale. These awards remain the industry standard for peer recognition, thanks to the thorough deliberation by our esteemed panel of global experts. Congratulations to all the winners, and we look forward to another celebration of excellence next year!"

Reflecting on the summit's success, Toni Eid, Founder of Telecom Review, and CEO of Trace Media International,

expressed his gratitude, stating, "These milestones demonstrate not only our growth but also our unwavering commitment to recognizing the leaders within the telecom and ICT industry, year after year. I would like to express my deepest gratitude to all the ICT leaders who have been brought together through this summit. Join us next year for a groundbreaking 19th edition."

This year, the awards were divided into global and regional categories. The full list of winners can be found here. [TR](#)



Best Fiber Infrastructure Deployment Global - Best Technology Deployment Americas - TELUS



Best Fiber Infrastructure Deployment Americas - Verizon Partner Solutions



Best 5G Advanced Innovation (Vendor) Middle East - Huawei



Best 5G Advanced Innovation (Vendor) Africa - Telcovas Solutions and Services Limited



Best 5G Advanced Leading Network (Operator) Middle East - du (EITC)



Best 5G Advanced Business Innovation (Operator) Middle East - Zain KSA



Best 5G Advanced Business Innovation (Operator) Asia - China Mobile International



Best CSR Initiative Africa - Sofrecom & Orange Egypt



Best 'Telco-Techco' Partnership Award Asia - e& International Digital JV



Best Cloud Provider (Operator) Middle East - Ooredoo Oman



Best Wholesale Company Global - Airtel



Best Wholesale Company Middle East - Mobily



Best Fixed 5G Network Provider Middle East - Saudi Telecom Company KSA



Best Loyalty & Rewards Program Middle East - Asiacell / Related



Best Digital Transformation Provider (Vendor) Middle East - Comarch / du



Most Innovative Product/Service/Automation (Vendor) Global - NEC



Best Innovative Regulator Middle East - The Telecommunications and Digital Government Regulatory Authority (UAE)



Best CSR Initiative Middle East - du (EITC)



Best 5G Advanced User Experience (Operator) Middle East - e& UAE



Best Digital Transformation Provider (Vendor) Asia - ZTE Corporation



Best AI Use for all Verticals Global - AB Handshake



Most Innovative Product/Service (Operator) Global - Console Connect



Most Innovative Product/Service/Automation (Vendor) Middle East - Yuvo



Most Innovative Product/Service/Automation (Vendor) Americas - Netcracker Technology



Most Innovative Product/Service/Automation (Vendor) Asia - Mycom OSI / Globe Telecom



Most Innovative Product/Service/Automation (Vendor) Europe - Vox Solutions



Best AI Application for Telco (Vendor) Global - Huawei Autonomous Network



Best AI Application for Telco (Vendor) Middle East - Nokia Networks & Solutions / STC



Best BSS/OSS Solution (Operator) Middle East - Zain KSA



Best BSS/OSS Solution Asia - AvanteBSS



Best Technology Deployment Global - Mavenir



Best Technology Deployment Middle East - stc Bahrain



Best MVNO Middle East - Salam



Best App Digital Storefront Global - Apptium Technologies



Best BSS/OSS Solution Global - Netcracker Technology



Best Telecom Operator Middle East - e&UAE



Best Digital Transformation Provider (Vendor) Global - Huawei



Most Innovative Product/Service (Operator) Middle East - du (EITC)



Best MVNO (5G Secure First Response) Americas - GuardianSafetyNet



Best Data Center Provider (Operator) Middle East- center3



Best Data Center Provider (Vendor) Middle East - Cisco



Best Security Solution Provider Middle East - Fortinet Middle East



Best Security Solution Provider Americas - One37 Solutions Inc



Best Smart City Acceleration Initiative Middle East - InfraX A Digital DEWA Company



Best ICT Investment Asia - Power International Holding



Best Cloud Provider (Operator) Asia - du



Telecom Review Merit Leader Awards



Merit Leader CEO of the Year – Operator Global
Vikram Sinha, President Director and CEO Of Indosat Ooredoo Hutchison



Merit Leader CEO of the Year – Operator -Middle East
Fahad Al Hassawi, CEO, du (EITC)



Merit Leader CEO of the Year – MVNO-Middle East
Ahmed Mohammed Al-Anqari, CEO, Salam



Merit Leader CEO of the Year – Infrastructure Company Middle East
Fahad AlHajeri, CEO, center3





Telecom Review Hosts Influential ITU CxO Meeting for 6th Consecutive Year

Telecom Review hosted the high-profile ITU CxO meeting in collaboration with TDRA, du, and Huawei, for the 6th consecutive year in Dubai on December 9th, 2024, at the Ritz Carlton in Dubai.

In his opening speech, Seizo Onoe, Director of the Telecommunication Standardization Bureau at ITU, acknowledged the C-level participation, adding that such participation “influences the discussion.” He noted the significance of collaboration and expressed that he is “hopeful about the future” of international standards. Onoe also congratulated Toni Eid, Founder of Telecom Review and CEO of Trace Media International, for hosting its successful 6th consecutive ITU CxO meeting.

Eid expressed pride in Telecom Review’s partnership with the ITU and the consistent support from TDRA, du, and Huawei in organizing this significant event. He noted that these collaborations play a key role in making the event possible. He also congratulated the Telecom Review team and other TRS esteemed partners for their respective contributions.

The Business Impact of Standards

Dr. Bilel Jamoussi, Deputy-Director at ITU, and Charlyne Restivo, Programme Coordinator at ITU, co-moderated a

panel discussion titled ‘The Business Impact of Standards.’

The esteemed panelists in the session, included Eng. Saif Bin Ghelaita, Director Technology Development Affairs at TDRA; Saleem Alblooshi, Chief Technology Officer, du; Per Beming, Head of Standards and Industry Initiatives at Ericsson; and Xin Chang, Huawei’s VP of Standardization and Industry Development.

The discussion focused on ICT standardization, business and regulatory perspectives, and other

key priorities from vendors, solution providers, and operators who deploy telecom equipment and solutions. The panel aimed to gain insights from industry leaders on why they invest in standards and how these standards serve as a crucial tool in the ICT business.

From a regulator's perspective, Bin Ghelaita said that adhering to global standards and advocating for telecom standardization, especially concerning spectrum allocation, are major factors for organizing the global implementation of telecom services. He said that the Quality of Service (QoS) helps in measuring the relevance of service. He also stressed the importance of interoperability.

Bin Ghelaita noted that customers want standardized solutions and that it is very important to engage within a common global ecosystem. "Standardization helps in the overall innovation, improving the competition of market with standardized solutions, making it more affordable," Bin Ghelaita reasoned. He also pointed out that the integration of emerging technologies encourages research and development (R&D).

Operator Perspective

Commenting from an operator's perspective, Alblooshi said that the telecom industry has succeeded due to standardization bodies. He noted that standardization helps telecom operators compete with multiple players, which is good for innovation. He also said that the right standardization would help avoid vendor lock-in scenarios.

He recognized the importance of the ITU and 3GPP in driving digital transformation within the industry. He encouraged partners to push for standardization and consider issues related to cybersecurity and business continuation. He also said that du is collaborating alongside TDRA to establish a 6G roadmap, reiterating that standardization is key and advocating for active participation.

Alblooshi emphasized the importance of technology standards and urged

the transition from closed ecosystems to open interfaces, promoting greater interoperability. Regarding priority topics for standardization, Alblooshi opined that an Open RAN model simplifies complexity and helps add value, features, and new capabilities for technologies such as 5G-Advanced. "We are in a strong position to lead 5G and the early adoption of 6G, the integration of AI, and automation," said Alblooshi.

Vendor Perspective

From a vendor's perspective, Beming emphasized the need for the industry to collaborate on developing the ecosystem, defining the right set of products, ensuring high-level interoperability, and accelerating equipment development for global impact. He stated, "International standards are fundamental for our products."

Beming pointed out that 90% of research for solutions is not utilized due to incompatible standards. He explained that the right interfaces will benefit multi-vendor ecosystems because the market will be very cognizant of inconsistencies. In terms of priority, Beming stressed the importance of API standardization, leveraging AI, 6G, AI governance, and the interplay of open-source community standards.

He advocated for collaboration between the ITU, Linux foundation, government, developers, and customer support. Beming also highlighted the need for standardization tests and encouraged engagement with universities to make international standards more popular.

International Standardization for Innovation

Meanwhile, Xin Chang recognized the many members of the ITU submitting solutions related to sectors such as the metaverse or public infrastructure. She underscored the importance of international standardization to develop products that are more green, more intelligent, and more digitalized to improve products through better technology and production. Chang said that contribution from the vendor community will improve innovation and that it cannot be done without


the right standardization. "A unified standardization policy will help vendors and operators," Chang reiterated.

Dr. Jamoussi presented a brief overview of the outcomes of ITU World Telecommunication Standardization Assembly (WTSA-24), held in New Delhi, India, from 15-24 October, 2024; the governing conference for ITU standardization sector that provided a first-hand perspective of the ITU industry for regulators and other industry stakeholders. He explained that the latest ITU initiatives are revolving around AI governance, sustainable digital transformation, new technology policies, market demands, emergency responses, and female participation in ICT.

A brief Q&A between the attending CxOs and the panelists concluded the discussion.

ITU-T Group Consideration

CxOs from the following companies submitted their presentations to the ITU-T Group for consideration:

- NTT – Towards Sustainable ICT Infrastructure Fostering Future AI Systems
- Huawei – Insights into Optical Networks Towards 2030 for the AI Age
- CAS Quantum Network – Brief Introduction to Quantum Communication
- Rhode & Schwarz – QoS from Space: Potential QoS Assessment of Satellite Networks
- LoRaWAN – NTN for IoT
- Sateliot – Seamless Affordable 5G IoT
- GuardianSafetyNet – Saving Lives: A Modern Public Safety Network
- Nokia – AI in Networks
- Turkcell – AI for Networks and Networks for AI
- du – Arabic-First Telecom ChatGPT for MENA Region
- ABHandshake – Real-Time Call Validation Framework
- Somos – International Do Not Originate for Fraud Mitigation
- Shanghai Data Exchange - The Overview of China Data Factor Market construction 



*Roary Stasko,
CEO, Telstra International*

Stasko Drives Telstra's AI-Optimized Infrastructure and Partnerships

Roary Stasko, CEO of Telstra International, is leading the company's efforts in expanding its global digital infrastructure portfolio, overseeing wholesale and enterprise sales, as well as services spanning the Middle East and Asia Pacific. With over 15 years of experience in telecommunications, and more than 20 years in consulting and management, Stasko brings a wealth of expertise.

In a recent interview with Telecom Review Asia, conducted at ITW Asia 2024, in Singapore, Stasko discussed Telstra's role in enhancing international connectivity through its submarine cable network by leveraging artificial intelligence (AI) to optimize infrastructure and foster key partnerships with hyperscalers

and other industry leaders. His vision for Telstra International focuses on expanding its presence in the Asia Pacific by continuing to innovate and serve as a critical enabler of the digital economy. Through strategic partnerships and cutting-edge technological integration, Stasko is guiding Telstra to new heights in the global telecommunications landscape.

How does Telstra's submarine cable network contribute to enhancing international connectivity, and what role does it play in supporting the digital economy globally?

Telstra's submarine cable network significantly enhances international connectivity by operating at-scale and providing a comprehensive range of services. With over 50 years of experience in the subsea market,

Telstra strengthened its position in 2016 by acquiring Pacnet, making it the largest commercial digital infrastructure provider for trans-pacific integration. Currently, it manages about 20% of the internet traffic between the U.S. and Asia, and a third of intra-Asia traffic.

Telstra manages 400,000 kilometers of subsea fiber. This extensive network allows Telstra to offer not only point-to-point connectivity but also broader solutions that include diversity, resilience, and terrestrial backhaul integration, from cable landing stations to data centers. This comprehensive approach supports customers by handling their capacity end-to-end rather than providing isolated segments.

Globally, Telstra's digital infrastructure, which includes Telstra International and Australia-based InfraCo, connects markets and supports the digital economy by ensuring reliable and scalable connectivity solutions across multiple regions.

As AI becomes more integral, how is Telstra leveraging artificial intelligence to optimize its global infrastructure and improve service offerings?

As AI becomes more integral, Telstra is leveraging artificial intelligence in two main areas: optimizing internal operations and enhancing its international network infrastructure.

Within Telstra, including its international business, AI is being used extensively to improve efficiency and support employees. For example, Telstra boasts the largest deployment of Microsoft's Copilot in Australia, which is integrated with Microsoft 365 tools and allows employees to use AI for tasks like writing emails, preparing documents, and managing data. This foundational deployment helps employees understand and adopt AI in their daily workflows.

Additionally, AI and automation are used to optimize internal processes, particularly in the consumer business segment. Leveraging the capabilities of Microsoft Azure OpenAI Service and Azure AI Search, Ask Telstra provides AI-driven answers to employee inquiries

through a simple search interface. Another tool, 'One Sentence Summary, condenses customer issues into clear, actionable summaries, improving the speed and accuracy of responses. The focus is not on replacing human interaction but on empowering agents to provide fast, accurate, and effective support.

On the international side, Telstra is applying AI to achieve automation and an autonomous network. AI-driven tools are being used to digitize data such as inventory, capacity, locations, and sensor inputs. This enables Telstra to build a virtual model of its network to test, predict, and automate operations. For instance, AI helps reroute traffic dynamically, optimizing the network and ensuring reliable connectivity. These AI applications enhance both Telstra's operational efficiency and its ability to deliver high-quality service globally.

Can you share key AI-driven initiatives or innovations that Telstra is working on, and elaborate on some of the partnerships that have been forged?

Telstra is advancing several key AI-driven initiatives and forging strategic partnerships to enhance its capabilities. One of our largest partnerships is with Microsoft, which spans AI tools, digital infrastructure investment, and connectivity across both the international and Australian components. This collaboration underscores Telstra's commitment to integrating advanced AI capabilities with robust infrastructure solutions.

In Australia, Telstra has created a joint venture with Quantum, an AI-driven company; the result of which is Quantum Telstra. This partnership focuses on developing AI tools, building skill sets, and fostering innovation in an AI-first framework. Additionally, Telstra collaborates with traditional infrastructure vendors, working closely with them to embed AI into tools and systems that optimize operations.

On the international front, Telstra is partnering with customers to address the evolving network needs being driven by AI. This involves rethinking network topology to better accommodate AI traffic, which differs significantly

from the demands of traditional cloud traffic. Telstra's approach includes both enabling partner solutions and collaborating with customers to anticipate the future connectivity requirements being shaped by AI.

Telstra also maintains strong ties with the Australian government. While AI-specific collaborations are less prominent, past initiatives, such as our acquisition of Digicel Pacific, highlights our successful public-private partnerships. This endeavor involved funding from the Australian, U.S., and Japanese governments and demonstrated how commercial and government interests can align effectively.

In the cybersecurity sector, Telstra is working closely with security agencies in Australia and globally, employing both AI-driven and traditional approaches to ensure its network remains secure, sovereign, and reliable. These initiatives illustrate Telstra's comprehensive strategy, which prioritizes leveraging AI and partnerships across various domains.

What is Telstra International's vision? And what strategies are you employing to grow its presence in the region?

Telstra International's vision is to remain the leading digital infrastructure provider in the Asia Pacific. To achieve this, Telstra is focusing on three strategies: offering layer-zero services, including cable landing stations and network operations; partnering with hyperscalers and other investment partners to operate and enable new systems; and becoming the 'carrier of carriers' by creating CapEx-light models to support telcos' subsea and connectivity needs.

Partnerships are key to success. Hyperscalers, once skeptical about working with Telstra, now see value in these collaborations, recognizing that, in some markets, they benefit from a partner's expertise. As Telstra adapts, the focus shifts from doing everything in-house to being a good partner, leveraging engineering strengths and operational excellence. This approach ensures continued growth and scalability. **TR**



Bayu Hanantasena, CEO, Lintasarta

Lintasarta Fuels Indonesia's AI Transformation through Strategic Collaborations and Innovation

At the forefront of Indonesia's technological progress, Lintasarta is embracing the transformative power of artificial intelligence (AI) to reshape the future of the nation. A subsidiary of Indosat Ooredoo Hutchison (Indosat or IOH), Lintasarta played a key role in Indonesia AI Day 2024, held on November 14 in Jakarta, underscoring the company's effort to advance AI development and deployment in Indonesia. On the sidelines of the event, Bayu Hanantasena, CEO of Lintasarta, discussed the company's strategic vision in leveraging AI to drive innovation and growth across various sectors.

Public-private partnerships are important as no single entity can carry out AI transformation alone. How does collaboration with local and regional partners, including countries like Singapore, help create synergy in driving AI transformation?

Collaboration is at the core of our strategy. We recognize that driving AI innovation is not a task we can achieve alone. Beyond our partnerships within Indonesia, we are also expanding our collaborations across the region, including with key partners in Singapore, to create a broad ecosystem of innovation.

I recently returned from Singapore, where we signed multiple Memoranda

of Understanding (MoUs) with several strategic partners, including the National University of Singapore. One of our most recent partnerships is with 6Estates, a startup originally founded and developed in the U.S. Nexia in the U.S. is one of the key research labs involved, and we are collaborating closely with them. We pursue collaborations whenever they align with our goals and provide value.

Expanding our partnership ecosystem is a key part of our strategy for accelerated growth. They are vital for fast-tracking our journey and form a core pillar of our approach.

How is Lintasarta leveraging AI to grow its enterprise solutions portfolio? Can you share specific use cases?

Our company focuses on building

infrastructure, IT services, and ecosystem play. We provide integrated ICT solutions based on the 4Cs services: Connectivity, Cybersecurity, Cloud, and Collaboration (AI-based Ecosystem). Lintasarta's position as an AI Factory aligns with the strategy of our holding company, Indosat Ooredoo Hutchinson, as an AI TechCo. We are committed to adding value to Indonesia's digital ecosystem through integrated, secure, and sustainable technology, in line with the Golden Indonesia 2045 Vision.

This platform includes what we internally refer to as LAMP, which stands for Lintasarta AI Marketplace. Through LAMP, we offer AI solutions featuring our own innovations, partner-developed solutions, and third-party offerings. Essentially,

it's a marketplace for collaboration. Though it is still in the early stages, we offer a range of solutions for areas such as talent management, and KYC (Know Your Customer), amongst other essential services required by enterprises, especially in the financial sector, a key sector in Indonesia's economy.

As AI becomes a key enabler for digital transformation, what role do you see AI factories playing in Lintasarta's strategy, particularly in building scalable, AI-powered solutions for businesses across different industries?

The AI factory is essentially an intelligence hub that includes the infrastructure needed for AI production. We're focusing on developing our in-house talent as well as attracting new talent. As discussed, building AI requires collaboration, just like a factory relies on various components. You can't produce everything on your own; you need an ecosystem to support it. Once the ecosystem is established, we can create use cases. The AI is trained and produced by an engine powered by the AI factory.

We launched our engine, called 'GPU Merdeka,' in August this year. We will continue to enhance it with the latest technologies. Through Indonesia AI Day, we hope to extend an invitation for further collaboration. At this event, for instance, we collaborated with many NVIDIA Inception program startups since they require robust infrastructure, and the best infrastructure for AI is the one closest to the users. This proximity improves both training and inference processes.

Intelligence, like any natural resource, must be preserved and managed locally to maximize its benefits for the country. Keeping the infrastructure 'on soil' ensures better performance and value. We are committed to supporting the growth of Indonesia's economy through this collaboration, increasing the penetration of AI-based digital services, developing an ecosystem that prioritizes national digital sovereignty, and driving AI transformation in Indonesia.

In Indonesia, most users access AI through smartphones, with over 100 million smartphones in use. This widespread adoption will accelerate AI proliferation. We're a relatively young country, and the adoption of new technologies is strong. For example, we're one of the largest user bases for TikTok.

With this momentum, AI can help drive rapid advancements in various sectors. As highlighted by our new facility, only by leveraging the right digital technologies can we leapfrog and accelerate growth.

What role does regulation and policy development play in ensuring responsible AI deployment and use?

The country already has an AI roadmap in place. Like any powerful tool, AI needs to be properly regulated to ensure it is used responsibly and ethically. Regulations are in place to provide guardrails for its use. Technology can help enforce these boundaries.

There are general principles that many countries have agreed upon for responsible AI use, but specific regulations may differ based on cultural, religious, and social norms. Additionally, vertical policies are tailored to different industries. While the details of these industry-specific regulations are still being developed, the broader framework is already in progress.

Regulating AI is challenging due to the rapid pace of its development. Traditional approaches may not fully address these complexities, but it's encouraging to see regulators increasingly leveraging AI itself to develop forward-thinking guidelines

How does Lintasarta complement Indosat's broader AI-driven goals, especially in terms of infrastructure and enterprise solutions? How can the synergy between both entities accelerate Indonesia's ambition to become a global AI powerhouse under the Golden Vision 2045?

One of the key considerations when building infrastructure is efficiency—you don't want it to be scattered. It's

much better to centralize it in one place. This is why Indosat decided to establish its AI factory. For example, Sahabat-AI was designed and orchestrated by Indosat and trained using Lintasarta's GPU Merdeka. This is how we operate, while also focusing on collaboration and ecosystem development.

When we approach sectors like banking, we have strategic partners like Accenture, whose global expertise in banking and finance is invaluable. Their knowledge allows us to leapfrog, rather than taking a lengthy journey. By combining best practices with the needs of the local market, we can deliver powerful solutions that are faster, better, and more cost-effective.

The goal is to bring solutions to market quickly. With GPU capabilities, we can now train AI models much faster. While AI has existed for decades, the advancements in GPU technology have accelerated training speeds, allowing us to achieve results much more rapidly. This has opened up a wide range of possibilities, not just at the enterprise level, but also for individual users on their phones or laptops. However, for larger applications—such as healthcare, banking, and public services—we need robust, country-level infrastructure.

In smaller countries like Singapore, the size makes it easier to manage emergency services and public infrastructure. But in Indonesia, given the scale, it's a far greater challenge. That's why the national roadmap emphasizes talent development. While technology acts as an enabler and accelerator, it's the talent that is the true driving force.

At Lintasarta, we're working on two parallel tracks: developing AI and building a strong talent base to support it. To foster talent development, we're launching a new initiative aimed at exponential growth. Our strategy focuses on building talent, creating use cases, and strengthening the ecosystem. This is essential for driving forward the AI agenda and achieving sustainable growth. **TR**



Nokia Threat Intelligence Report: Enhancing Telco Security, Efficiency, and Innovation

Nokia has positioned itself at the forefront of telecom network security by leveraging artificial intelligence (AI) and strategic partnerships.

Nokia's commitment to maintaining network security and efficiency, while driving telecom innovation, is evident in its multifaceted approach, combining advanced threat intelligence, machine learning (ML), and deep industry collaboration.

Through its comprehensive 2024 Threat Intelligence Report, Nokia has shed light on emerging cybersecurity threats and actionable insights, highlighting the need for a proactive, AI-driven approach to protect telecom infrastructure worldwide.

Rodrigo Brito, Head of Security at Nokia, stated, "The use of generative AI and

automation for nefarious purposes is leading to a stepwise increase in malicious actors' capabilities and threat potential. The Threat Intelligence findings further reinforce the need for operators, vendors, and regulators to work more collaboratively to develop more robust network security measures, practices, and awareness."

The Expanding Threat Landscape in Telecom

From 2022 to 2024, Nokia's security experts identified a significant increase in cyberattacks targeting telecom operators worldwide, including within regions like the U.S., U.K., Germany, Ukraine, and China. These attacks have often resulted in severe service disruptions, data theft, and unauthorized access to online platforms, underscoring the critical role of cybersecurity in telecom networks.

In 2022, an incident involving a communications service provider (CSP) in the Asia Pacific (APAC) led to the exposure of sensitive personal information, including names, birth dates, addresses, and ID numbers. The breach was initially noticed on September 20, 2022, with conflicting claims between the CSP and an insider regarding the nature and extent of the exposure.

In 2023, another notable incident disrupted multiple services across the region, affecting customers on November 8, 2023. These incidents emphasize the persistent threat of cyber vulnerabilities within telecom infrastructures and the urgent need for communications service providers (CSPs) to adopt more robust security frameworks to protect user data and maintain service integrity across the Asia Pacific region.

The APAC region is proactively tackling its cybersecurity landscape, driven by both regional collaborations and specific national strategies. The Association of Southeast Asian Nations (ASEAN), via its ten member nations, is in the process of developing a comprehensive set of cybersecurity regulations that will be unveiled in 2025. This initiative reflects ASEAN's commitment to strengthening cybersecurity frameworks and enhancing regional resilience in response to rising cyber threats across the telecom sector.

In addition to ASEAN's efforts, significant security measures are also evident across east Asia, where economic advancement and digital capabilities have led to substantial cyber activities, drawing the attention of cybercriminals. Nokia's recent initiatives emphasize using AI and strategic partnerships to bolster telecom security, including through collaborations in east Asia, as part of a wider regional approach to address cybersecurity vulnerabilities.

Moreover, regulatory bodies within the Asia Pacific are intensifying their oversight, with countries like Singapore imposing strict Quality of Service (QoS) requirements through the Infocomm



Figure 1: Distribution by region of cyberattacks against the telecom sector

IT security	Telecom network security
Components	
Industry agnostic such as laptops, mobile devices, Internet, IT applications and data centers	Purpose-built networks such as core, RAN, transport, access network, OSS/BSS
Infrastructure and protocols	
Standard protocols like TCP/IP and TLS	Multi-vendor legacy technologies mixed with the latest cloud-based SBA and telco protocols like SS7, Diameter and GTP
Skill sets	
Skills in endpoint security (mobile, desktop servers), esp security, firewalls and secure gateways	Expertise in telecom network topology, communication protocols, attack scenarios for SBA, NE integrations to collect telemetry data and take actions
Tools and technology	
Homogenous security tools like IT SIEM, IAM, EDR and laptop antivirus	Specialized tools like telco XDR, mission-critical EDR, telco RAN, cloud-native architecture
Regulatory landscape	
Governed by standards like HIPAA, PCI and GDPR	Abides by 3GPP, GSMA and country-specific regulations such as TSA in the UK, NIS2 in Europe

Table 1: IT security versus telecom network security

Media Development Authority (IMDA). These regulations, along with Australia’s Security of Critical Infrastructure Act 2022, underscore a regional shift towards stronger cybersecurity governance.

Global Security Strategy

In 2024, a coordinated law enforcement effort targeting the LockBit ransomware group dismantled its network, seized cryptocurrency assets, and neutralized a significant threat to telecom networks worldwide. This cooperation highlights the importance of information sharing between the public and private sectors to prevent cyberattacks and enhance resilience against future threats.

Nokia also collaborates with CSPs and industry experts, including its

Advanced Consulting Services, Cybersecurity Consulting, and Nokia Bell Labs, to develop quantum-safe networks and prepare for the future of quantum computing. As quantum technologies advance, traditional encryption methods will become more vulnerable, making it essential for Nokia to innovate and invest in quantum-safe solutions.

The threat intelligence report highlights the GSMA Mobile Threat Intelligence Framework (MoTIF) as an essential tool for CSPs, enabling them to systematically address and mitigate security risks across mobile networks, from 2G to 5G. MoTIF focuses on adversary techniques, tactics, and procedures (TTPs) specific to mobile threats, covering critical areas like roaming, SMS, and VoIP. By integrating

with the STIX framework, MoTIF enhances interoperability, helping CSPs proactively address malware and phishing while safeguarding both network integrity and customer trust.

Meanwhile, the 2023 discovery of GTPDOOR malware, linked to the LightBasin group, underscores the necessity of vigilant monitoring and advanced security strategies. This malware, concealed within standard traffic, has compromised multiple telecom providers globally, highlighting the importance of multi-layered defense strategies against evolving threats.

In parallel, system-on-chip (SoC) technology, critical for 5G and IoT advancements, has become a new focus for cybercriminals. These integrated circuits, despite boosting performance and reducing power use, create expanded vulnerabilities. CSPs must adopt robust encryption, access controls, and AI-driven threat mitigation to safeguard against potential SoC-based attacks.

As SoCs integrate multiple functions onto a single chip, they increase device performance and efficiency but also broaden the attack surface. Cybercriminals now frequently target vulnerabilities within SoC components such as firmware, software, and hardware interfaces, resulting in potential unauthorized access, data theft, and system compromise.

The widespread adoption of connected devices, particularly in IoT, has accelerated SoC attacks. IoT devices, often focused on cost-effectiveness, may lack robust security measures, making them attractive targets. The consequences can be severe: an attack on SoC-based controllers in critical infrastructure could disrupt energy grids or transport systems, while compromised SoCs in automotive systems could lead to unauthorized vehicle control.

Furthermore, DDoS attacks continued to surge in 2024, with a 166% increase in DDoS traffic year over year (YoY), primarily driven by the rise in insecure

IoT devices. Multi-vector strategies and DNS amplification remain common, while other vectors like NTP and CLDAP amplification are declining. Botnets also pose a serious threat, with 60% of botnet DDoS attacks involving fewer than 100 bots. Carpet-bombing DDoS attacks, targeting multiple IPs, grew in scope, with some impacting thousands of IP addresses.

A shift towards shorter attack durations emphasizes the need for rapid, automated response. Attack sophistication has increased, often employing AI for adaptive targeting. AI-driven DDoS attacks saw a significant rise in 2024, marking a new era of advanced threat capabilities.

A Focused Approach to IT and Telecom Network Security

Telecom networks require unique security strategies compared to conventional IT security due to their extensive infrastructure and critical role in communication. Nokia recognizes the dual needs of CSPs, who must secure both enterprise IT systems and telecom network infrastructure. By converging IT and telecom security under a single Chief Information Security Officer (CISO), CSPs can adopt a unified approach to protect both domains effectively. In Nokia's model, advanced AI-driven tools and expert-led threat intelligence form a crucial foundation, enabling CSPs to address both IT-specific and network-specific vulnerabilities.

The potential impact of network security breaches can be severe, with consequences that extend to public safety, service availability, and even national security. Nokia's commitment to securing telecom networks through AI and strategic partnerships exemplifies its understanding of the unique requirements of this sector. For example, eavesdropping, signaling storms, and roaming interface attacks could lead to service disruptions affecting millions, whereas IT security breaches generally result in data theft and financial losses. Nokia's approach ensures comprehensive security for both telecom network infrastructure and user data, protecting both CSPs and their customers.

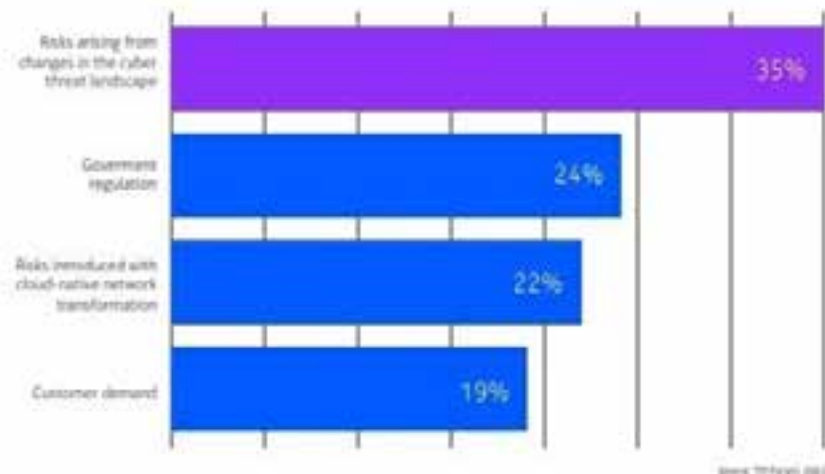


Figure 2: Most important factors driving CSPs' security strategy

At Nokia's global security operation centers, telecom experts manage over 360,000 incidents annually, including triaging more than 3,500 security issues and addressing over 20 critical global incidents across SOCs in the APAC, EU, MEA, and Americas regions. Monthly, these teams track hundreds of security incidents, with the Endpoint Detection and Response (EDR) team monitoring comparable volumes every six months. This extensive, continuous monitoring provides valuable insights into evolving security trends and identifies the strategies needed to address them effectively.

How CSPs Are Tackling Cybersecurity Challenges

Telecom operators are navigating a rapidly changing cybersecurity landscape shaped by the pressing need to manage evolving threats and meet government regulations. Compliance is increasingly viewed as a baseline requirement rather than a differentiator. However, proactive threat management remains crucial, with 34% of CSPs identifying it as a primary driver of their security strategies.

Effective risk management is revolutionizing how CSPs allocate their cybersecurity budgets. Over 60% of survey respondents ranked risk management as a top priority, surpassing the 50% who focused on regulatory compliance. This shift underscores the recognition that

effectively identifying and mitigating risks is vital for not just compliance but also for robust security and operational resilience. As threats become more sophisticated and regulations tighten, prioritizing risk management enables CSPs to proactively address vulnerabilities and protect their assets.

The role of the CISO is evolving to encompass both enterprise IT and telecom networks. Insights from the 2023 Nokia-commissioned TM Forum report indicate that 71% of respondents now have a single CISO or Chief Security Officer (CSO) overseeing both domains, exemplified by operators like Telefónica, KPN, and TELUS.

Despite these advancements, there remains a critical gap in continuous threat monitoring within the telecom infrastructure sector compared to enterprise IT environments. Effective threat monitoring is essential for reducing insider threats and enhancing data protection. By gaining full visibility into data access across their networks, CSPs can better defend against both internal and external threats. Investment priorities include Extended Detection and Response (XDR) and Security Orchestration, Automation, and Response (SOAR), with 51% of CSPs prioritizing these technologies to establish robust, automated defenses against evolving cybersecurity threats. **TR**

Vodafone Idea Plans 5G Rollout from March 2025



Vodafone Idea (Vi) CEO, Akshaya Moondra, has revealed plans for a gradual launch of 5G services, coupled with new and customized tariff options designed to cater to a wide range of customer preferences.

“Partnering with global leaders such as Ericsson, Nokia, and Samsung, we are driving a transformative three-year investment plan. By

March, 2025, thousands of new sites will enhance your connectivity, elevating your network experience to extraordinary heights,” Moondra said in a letter to Vi customers. “We are preparing for the phased rollout of 5G, bringing you blazing-fast speeds and unparalleled experiences.”

Network Upgrades and Progress

Moondra noted that, in 2024, Vodafone Idea enhanced its network by adding over 46,000 new sites and increasing capacity at more than 58,000 locations to improve quality, coverage, and user experience. He highlighted that a significant portion of the network now utilizes ‘indoor coverage plus’ technology, which greatly enhances indoor connectivity in spaces such as homes, offices, and malls.

Moondra added, “Your trust and unwavering support inspire us to deliver the very best every day.” He also hinted at exciting advancements in 2025, urging customers to stay tuned for further updates.

Vodafone Idea reached key milestones in its network expansion efforts, marking significant progress in enhancing connectivity and service quality.

The company also previously introduced spam detection solutions to enhance customer safety and security. In a move to expand its OTT offerings, the telecom operator has also announced a strategic collaboration with Lionsgate Play, providing subscribers with access to premium streaming content.

PLDT, Smart Lead National Drive to Protect Telecom Infrastructure



PLDT, Inc. and Smart Communications, Inc. are spearheading nationwide initiatives to protect the country's vital telecommunications infrastructure.

In partnership with public and private stakeholders, including local government units and communities, the companies aim to ensure reliable connectivity and uninterrupted service across the nation.

“Protecting our infrastructure is not just about safeguarding our business operations; it is about ensuring that our customers and communities can rely on uninterrupted connectivity and technology that are essential for our country's development within a

safe and secure cyber environment,” said Atty. Roy Ibay, Vice President and Head of Regulatory at Smart and convenor of PROTECTA Pilipinas, a public-private partnership dedicated to safeguarding technology and telecommunications infrastructure nationwide.

Multi-Faceted Stakeholder Engagement

PLDT, Smart, and the Cybercrime Investigation and Coordinating Center (CICC) spearheaded the launch of a coalition focused on telecommunications infrastructure protection. The launch brought together key stakeholders, including the Philippine Chamber of Telecommunication Operators; advocacy group, CITIZENWATCH Philippines; think-tank, Infrawatch PH; the PNP Anti-Cybercrime Group; the Federation of International Cable TV Association of the Philippines (FICTAP); and the Manila Electric Co. (Meralco).

In collaboration with the Metropolitan Manila Development Authority

(MMDA), PLDT has taken proactive measures to protect fiber optic cables from accidental damage during roadworks, particularly during excavation and digging activities.

Beyond partnerships with government agencies and industry players, PLDT Group has been encouraging its customers and communities to report illegal activities such as cable theft, breakage, and related incidents to local authorities.

These initiatives reflect PLDT and Smart's commitment to enhancing telecommunications infrastructure protection, improving customer experience nationwide, and supporting the United Nations (UN) Sustainable Development Goal (SDG) 9, which focuses on industry, innovation, and infrastructure.

These efforts also align with the government's push for digital transformation, which aims to bridge the digital divide and ensure internet access for more Filipinos across the nation.

Echelon Edge, BSNL to Deploy Private 5G for Coal India Ltd.



Echelon Edge has partnered with Bharat Sanchar Nigam Limited (BSNL) to implement a 5G Standalone (SA) captive network at Coal India Limited's (CIL) Amlohri Open Cast Coal Mines in Madhya Pradesh.

The project, supported by the Central Mine Planning & Design Institute (CMPDI) and the Centre for Development of Advanced Computing (C-DAC), is slated for completion by February, 2025.

The 5G network aims to revolutionize mining operations by providing high-speed, reliable, connectivity for applications such as voice and video communication, surveillance using 5G cameras, and asset tracking. The enhanced connectivity is expected to significantly improve operational efficiency and safety within the mines.

5G-Supported Innovation

Key innovations enabled by the 5G deployment include a virtual reality

model of the Amlohri Coal Mine, digital twin technology for Load Haul Dump (LHD) operations, and a 5G-based V2X collision avoidance system. AI-driven traffic control solutions will also streamline haul road crossings, ensuring safer and more efficient operations.

The advanced capabilities of 5G, including ultra-low latency and high-speed data transmission, will support real-time asset tracking and safety enhancements, offering operational improvements beyond the limits of older technologies.

Gaurav Gandhi, Founder and CEO of Echelon Edge, highlighted the project's significance, describing it as a testament to India's advancing technological capabilities, especially in the use of 5G solutions for vital industries such as coal mining.

"We are proud to lead the deployment of India's first 5G captive network for coal mines, advancing real-time communication, safety, and efficiency. It's a significant milestone in India's technological progress and a step forward in addressing the unique challenges of the mining sector," noted Gandhi.

Reliance Jio Boosts AirFiber, Driving 5G Monetization Ahead of 2025 IPO



Reliance Jio (Jio) is intensifying its efforts in the 5G fixed wireless access (FWA) sector through its Jio AirFiber service, aiming to achieve substantial customer growth in the coming year.

This move aligns with the company's strategy to capitalize on the benefits of 5G monetization as it gears up for a potential initial public offering (IPO) by the end of 2025.

Jio plans to onboard one million AirFiber customers within 30 days, leveraging increased data consumption and subscriber growth to build momentum for its IPO.

To achieve these ambitious targets, Jio has expanded its distribution network and simplified the onboarding process for AirFiber customers, enabling the connection of over one million homes monthly.

In September, 2024, Jio reportedly boasted 2.8 million AirFiber users and is estimated to have added another 1.9 million broadband customers in the December quarter.

Jio's AirFiber service offers significantly higher revenue potential compared to its mobile offerings. In July, 2024, Jio raised the minimum plan threshold for its 5G mobile broadband service, encouraging users to upgrade to higher-value plans.

Rapid 5G service monetization is projected to strengthen Jio's financial performance and enhance its investment appeal.

SK Telecom Expands AI Solutions with New Partnership



SK Telecom is collaborating with SK hynix and Penguin Solutions to advance AI data center solutions.

The agreement was signed in Las Vegas, with SK Telecom CEO, Ryu Young-sang; Penguin Solutions CEO, Mark Adams; and SK hynix AI

Infrastructure President, Justin Kim, present.

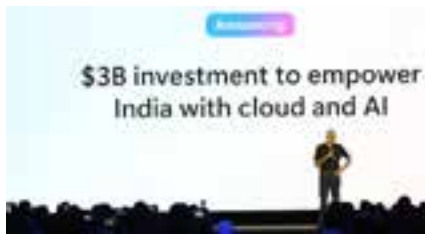
This collaboration highlights SK Telecom's dedication to using its advanced network capabilities and technological knowledge to lead the way in next-generation AI data centers.

Penguin Solutions, known for its expertise in AI data center development, will contribute tailored infrastructure solutions for AI services. This partnership aims to expand the market and further encourage the collective research and development (R&D) of AI data center innovations.

SK hynix will focus on creating cutting-edge memory products to improve performance and competitiveness in High Bandwidth Memory (HBM) technology, crucial for efficient AI data center operations.

SK Telecom will address challenges related to power efficiency and heat management in large-scale AI environments. By collaborating with SK hynix and Penguin Solutions, SK Telecom is solidifying its position as a leader in the global AI-driven telecommunications industry and driving innovation in AI ecosystem development.

Microsoft Commits USD 3B to Accelerate AI Growth in India



Satya Nadella, Chairman and CEO of Microsoft, has announced that the company plans to invest USD 3 billion in India over the next two years. This investment will focus on cloud and AI infrastructure, including the establishment of new datacenters.

The goal is to accelerate AI innovation in India, supporting Prime Minister Narendra Modi's vision of curating a developed nation by 2047. Microsoft also aims to train 10 million people in AI skills over the next five years through its ADVANTA(I)GE INDIA program.

Nadella stated, "India is becoming a leader in AI innovation, and our investments in infrastructure and skilling reaffirm our commitment to making India AI-first." Microsoft's responsible AI approach is based on six core principles: fairness, reliability, safety, privacy, inclusiveness, transparency, and accountability. The company will expand its cloud and AI infrastructure in India to meet the de-

mands of the growing AI startup and research community.

Boosting AI and SaaS in India

Microsoft's ADVANTA(I)GE INDIA initiative aims to train 10 million Indians in essential AI skills by 2030. The company has already trained 2.4 million individuals, with a focus on inclusivity and reaching underserved communities. Moreover, the Microsoft Research Lab announced the launch of an AI Innovation Network to foster the AI ecosystem in India. The network will collaborate with digital natives to develop usable business solutions. Microsoft also signed an AI MoU with SaaSBoomi to support B2B startups in India, aiming to boost the AI and SaaS ecosystem and contribute to India's economy.

Microsoft is committed to supporting communities and advancing AI sustainably. The company is focusing on addressing the resources needed for the responsible growth of AI infrastructure. Microsoft is taking bold action to become carbon negative, water positive, zero waste, and protect more land than it uses by 2030. At the same time, Microsoft is empowering others with the technology necessary to create a more sustainable future.

Digital Transformation Initiatives

Microsoft is actively contributing to

local communities while driving global digital transformation. These efforts align with the company's global Datacenter Community Pledge, which recognizes its responsibility to be a good neighbor in India and other locations where Microsoft operates. For data centers, this means addressing the resources required to power AI, such as energy and water.

Recently, Microsoft announced that its new data centers will use zero water for cooling. The innovative design eliminates the need for water evaporation by recycling water through a closed-loop system. Microsoft has also secured renewable energy in India through long-term contracts with Amplus and ReNew, supporting its goal to be carbon-negative by 2030.

As part of the agreement with ReNew, around USD 15 million of revenue from the contract will go towards a community fund to support environmental justice initiatives. These initiatives focus on women's livelihoods, economic empowerment, energy access, rural electrification, environmental remediation, water quality improvement, and other issues affecting communities disproportionately impacted by pollution and climate change.

NCSA Plans Cyber Fraud Insurance Framework



The National Cyber Security Agency (NCSA) is crafting a framework for cyber fraud insurance to help organizations manage the risks associated with cyberattacks and data breaches.

According to AVM Amorn Chomchoey, Secretary-General of the NCSA, the initiative could enhance the nation's cybersecurity posture while spotlighting the Cybersecurity Act and the Personal Data Protection Act (PDPA).

Current Cyber Fraud Insurance Landscape

He noted that cyber fraud insurance remains rare in Thailand, and there is no established framework or guidelines for its implementation, despite the growing importance of personal data protection in the digital economy.

Leaked customer data, derived from business services, is a recurring problem often exploited by scammers to contact victims and cause financial and reputational damage.

Cyber fraud insurance provides financial protection against losses encountered as a result of cybercrime. This includes

threats like phishing, social engineering fraud, and data breaches. Available across numerous markets, the service helps businesses cover costs related to stolen funds, compromised data, damaged IT systems, and network disruptions, explained AVM Chomchoey.

AVM Chomchoey revealed that the NCSA is collaborating with the Office of the Insurance Commission (OIC) and other stakeholders to develop a structured cyber fraud insurance scheme. The OIC has been tasked with establishing criteria and guidelines, potentially making such insurance a standard requirement for enterprises.

The policy intends to extend to third-party coverage, protecting organizations against losses incurred by their business partners due to cybercrime. For individuals, it includes coverage for identity theft, online shopping fraud, and unauthorized publication of personal data.

Additionally, the insurance scheme aims to support incident management, assisting with cybercrime response and notifying affected parties of security breaches or data loss.

China to Build 10,000 5G-Powered Factories to Transform Industries



China plans to establish 10,000 5G-powered factories and at least 20 pilot cities for the integrated application of 5G+ industrial internet by 2027, as outlined by the Ministry of Industry and Information Technology (MIIT).

The factories aim to speed up the consolidation of data-driven information and communication

technology (ICT) through a new industrial network system centered around 5G.

By 2027, China aims to achieve widespread 5G industrial internet integration in key sectors of its economy, covering network infrastructure, technological products, integrated applications, industrial ecosystems, and public services.

Tang Libo, an expert at the China Academy of Information and Communications Technology, explained that in order to meet future industrial needs, technologies like 5G-A, AI, new industrial control systems, and industrial computing power will be considered collectively to advance

the development of a new industrial network system.

This approach will improve coordination between the industrial internet and key industrial chains, creating a high-quality development ecosystem for the industrial internet, noted Libo.

Currently, China has more than 17,000 5G+ industrial internet projects spanning all 41 major industrial sectors. The country has constructed over 4,000 5G-powered factories, with 700 designated 'high-level 5G factories' by MIIT, all of which are demonstrating significant potential within applications in industries such as manufacturing, mining, power, and ports.



The Alarming Reality: APAC Firms Experience Heightened Ransomware Attacks

Businesses across the Asia Pacific (APAC) are facing a relentless rise in cyber threats, with ransomware attacks becoming a particularly pervasive danger. These attacks are not only impacting large corporations but are also significantly affecting small and medium enterprises (SMEs), creating an alarming reality for businesses that rely on interconnected digital systems.

As the frequency of ransomware attacks escalates, companies in the region are grappling with both the financial and reputational consequences of these malicious cyber incidents.

Data Security in the Modern Era

The 2024 Thales Data Threat Report, which surveys nearly 3,000 IT and

security experts from 18 countries and 37 industries, highlighted the latest data security challenges, trends, and emerging issues. This year, 93% of IT professionals reported that they believe security threats are growing in both frequency and intensity, a sharp increase from the 47% recorded in the previous year.

Ransomware has emerged as a primary weapon for cybercriminals, often driven by financial- or espionage-focused

motives. In fact, data from Verizon's 2023 Data Breach Investigations Report revealed that ransomware was responsible for a majority of system intrusions and one-quarter of all data breaches globally. The attacks are not just increasing in number but are also becoming more sophisticated, making it difficult for businesses to detect and prevent them.

This threat is particularly pressing in APAC, where the region is experiencing

a higher rate of cyberattacks than Europe or North America. In 2022 alone, the region accounted for a substantial share of global cyberattacks, with a striking increase in ransomware targeting organizations.

Cybercriminals are exploiting various methods to infiltrate networks, with social engineering, system intrusions, and web application attacks accounting for 93% of breaches in the region in 2022. The increasing sophistication of these attacks is driving organizations to take a more proactive stance in addressing cybersecurity risks. However, despite efforts to bolster defenses, the financial motivation behind these attacks continues to make ransomware a lucrative option for cybercriminals.

SMEs at High Risk

The impact of ransomware on SMEs is particularly concerning. SMEs, which make up approximately 90% of businesses worldwide, are increasingly targeted due to their perceived vulnerabilities. Many of these businesses lack the resources and expertise to combat sophisticated cyber threats, making them attractive targets for cybercriminals. As highlighted by experts, SMEs face unique challenges in addressing cybersecurity, with limited budgets for advanced security tools and insufficient in-house expertise to fend off attacks.

A recent report by the International Data Corporation (IDC), titled 'The State of Ransomware in Asia/Pacific: A Comprehensive Analysis of Ransomware Trends, Payment Dynamics, Data Exfiltration, and Cybersecurity Solutions,' highlighted a troubling landscape for small and medium enterprises (SMEs) in the region. In 2023, 59.6% of enterprises in the Asia Pacific faced ransomware attacks, with a significant rise in AI-powered techniques like double extortion and Ransomware-as-a-Service (RaaS). These tools allow even unskilled attackers to execute highly sophisticated attacks, increasingly targeting critical sectors such as healthcare, supply chains, and operational technology environments.

To mitigate these risks, SMEs are encouraged to adopt AI-driven cybersecurity tools, strengthen vendor risk management, and comply with global frameworks like NIST and ISO to improve resilience and secure favorable cyber insurance terms. Enhanced disaster recovery strategies, particularly cloud-based backups, are also critical in countering the growing ransomware threat in APAC.

Current Threat Landscape

One of the key vulnerabilities for businesses of all sizes in APAC is the supply chain. Cybercriminals are exploiting weaknesses in third-party vendors and partners, creating a ripple effect that can compromise multiple organizations at once. In a survey conducted by OpenText, 62% of respondents reported that they experienced ransomware attacks stemming from their software supply chain partners, with the risk of supply chain vulnerabilities continuing to rise. Ninety-three percent of respondents expressed concern over ransomware threats targeting downstream software supply chains and connected partners.

The growing reliance on third-party vendors for software and services means that a single breach in the supply chain can have far-reaching consequences. This highlights the importance of closely evaluating the cybersecurity practices of suppliers and partners. In response, many organizations are ramping up their collaboration with software suppliers to enhance security measures.

As the threat landscape evolves, so too does the sophistication of cybercriminals' tactics. One of the most concerning developments in the rise of ransomware attacks is the role of artificial intelligence (AI). The use of AI by cybercriminals has made these attacks more convincing and harder to detect, further complicating the task of protecting sensitive data.

Combating Cyberthreats

Despite these challenges, businesses are taking steps to combat ransomware attacks. Investment in cybersecurity measures, particularly in cloud security, has surged, with 66%

of organizations reporting increased investment in cloud security in 2024. Additionally, employee training and awareness programs are becoming a vital component of defense strategies.

To combat rising cyber threats, enterprises in the Asia-Pacific (APAC) region are leveraging national and regional initiatives focused on cybersecurity capacity building. Singapore's ASEAN-Singapore Cybersecurity Centre of Excellence and Japan's ASEAN-Japan Cybersecurity Capacity Building Center provide critical training, knowledge-sharing platforms, and policy support. Vietnam has implemented robust measures like its National Malware Detection Campaign, while Australia has allocated AUD 1.67 billion for its Cyber Security Strategy, emphasizing a skilled workforce and secure digital infrastructure. India and Indonesia are strengthening cybersecurity education and integration across government and private sectors to address vulnerabilities. Regional cooperation plays a pivotal role in APAC's cybersecurity landscape. Initiatives such as the ASEAN-Japan Cybersecurity Policy Meeting and public-private partnerships enhance intelligence sharing and incident response capabilities.

In the face of growing ransomware threats, organizations in the APAC region must adopt a multi-layered approach to cybersecurity. This includes securing software supply chains, strengthening partnerships with vendors, investing in cloud security, and providing ongoing training to employees. While the threat is daunting, businesses that remain vigilant and proactive in their cybersecurity efforts will be better positioned to mitigate the risks posed by ransomware and other malicious cyber activities.

The reality of ransomware attacks in APAC serves as a wake-up call for businesses to reassess their cybersecurity strategies. As cybercriminals continue to evolve their tactics, it is crucial for organizations to stay ahead of the curve, implement robust defense measures, and foster a culture of security awareness to protect their data, finances, and reputation. **TR**



Sri Lanka's Growing Remote Work Ecosystem

Remote work has revolutionized the global labor market, enabling professionals to work from anywhere with reliable internet and digital tools. Sri Lanka, renowned for its breathtaking landscapes and cultural richness, is positioning itself as an ideal destination for remote work.

The telecom sector is playing an essential role in this transition by providing the necessary infrastructure and services for remote workers to thrive. With advancements in high-speed broadband, affordable mobile data plans, and co-working spaces, the country is building a robust ecosystem for remote professionals.

The Rise of Remote Work

Historically, the shift began with the expansion of broadband access and investments in IT services, particularly after the country's digital transformation strategy launched in 2017. Today, Sri Lanka boasts 61.48% internet penetration, with initiatives like "Digital Sri Lanka" enhancing connectivity even in rural regions.

Interestingly, data from Sri Lankan job portal, XpressJobs, showed a

45% increase in remote job postings in 2023, particularly in sectors like IT, customer service, and digital marketing.

The rise of remote work in Sri Lanka is being driven by factors such as affordability, scenic locales, and an influx of digital nomads seeking a balance between work and leisure. That being said, Sri Lanka's proposed digital nomad visa, gingerly approved in 2021, is yet to be launched. In the meantime, digital nomads can apply for a 30-day Electronic Travel Authorization (ETA), which can be extended for 30-90, 90-180, or 180-270 days.

Bolstering the essential connectivity needed for remote work is Sri Lanka's telecom industry, which is, similarly, evolving rapidly, through investments in 4G LTE, fiber optics, and early explorations into 5G. Telecom operators like Sri Lanka Telecom (SLT-MOBITEL) and Dialog Axiata have introduced Fiber-to-the-Home (FTTH) services, affordable mobile data plans, and public Wi-Fi zones, ensuring widespread connectivity essential for remote work success.

Telecoms Supporting Remote Work

Sri Lankan telecom companies have made significant strides in enhancing remote work infrastructure through strategic partnerships and innovations. Dialog Axiata PLC, Axiata Group Berhad, and Bharti Airtel Limited recently agreed to merge their Sri Lankan operations, a move expected to strengthen the country's telecommunications sector. This merger aims to boost network capacity, ensuring more reliable and faster connectivity for remote workers across the nation.

Dialog Axiata has been at the forefront of innovation, launching Sri Lanka's first eSIM service, enhancing flexibility for mobile users. Additionally, Dialog Enterprise collaborated with Microsoft and H One to introduce Operator Connect—a pioneering service that integrates directly with Microsoft Teams. This launch marks a significant step forward in providing seamless communication tools essential for remote work environments.

Similarly, SLT-MOBITEL has embraced digital transformation to cater to the growing demands of remote work by deploying Microsoft 365 productivity and security solutions. By integrating tools like Microsoft Teams, Microsoft 365 F3, E3, and E5, SLT-MOBITEL has created a seamless and secure environment for its employees to collaborate remotely. This shift has empowered frontline workers and executives alike, allowing real-time access to essential applications and secure data protection from anywhere.

Furthermore, SLT-MOBITEL is leading the way in 5G development, laying the groundwork for next-generation remote connectivity. Moreover, partnerships with companies like Nokia have accelerated nationwide fiber network expansion, ensuring broader access to high-speed internet. Another key development includes the groundbreaking Maldives-Sri Lanka Cable project, completed in 2020, which enhanced regional telecom infrastructure, improving international connectivity through a Wavelength Division Multiplexing (WDM) subsystem and an 863-kilometer fiber optic cable.

Further strengthening its position, Dialog Axiata partnered with Rakuten Viber in 2021, becoming Sri Lanka's largest A2P (Application-to-Person) messaging provider. These advancements collectively demonstrate Sri Lanka's commitment to fostering a robust telecom ecosystem, essential for supporting the growing remote work sector. The partnership enabled more than 300 Rakuten Viber carrier partners to comfortably communicate with more than 16 million Dialog Axiata customers using the Rakuten Viber A2P bilateral service, further enhancing remote working capabilities.

Dialog Axiata has significantly advanced rural connectivity in Sri Lanka, presenting new opportunities for remote work by deploying its 4000th LTE network tower in the Thihawa village (located within the Kurunegala District). Since March 2020, the company has invested LKR

50.9 billion (USD 255.8 million) to address rising connectivity demands, particularly during the pandemic, when mobile data traffic doubled, and fixed broadband usage tripled.

Dialog Axiata upgraded over 2,800 4G towers and added spectrum capacity to meet these demands. By year-end, it plans to increase capacity across 75% of its sites and deploy 450 new towers in rural areas to achieve 4G coverage for 95% of Sri Lanka's population, supporting the government's Gamata Sanniwedanaya initiative to enhance connectivity in remote regions.

Barriers and Opportunities in Remote Work Penetration

Sri Lanka's unique value proposition as a remote work destination is further enhanced by its diverse landscapes and affordable living costs. Sri Lanka aptly captures this phenomenon, showcasing how reliable telecom services have enabled professionals to transition from boardrooms to beaches, balancing productivity and leisure.

Co-working spaces in cities like Colombo and Kandy now offer high-speed internet, video conferencing tools, and cloud storage, ensuring seamless collaboration for global teams. However, challenges like inconsistent connectivity in rural areas and the high cost of importing telecom equipment need to be addressed to fully harness the potential of remote work.

In addition to infrastructure, digital literacy is key to Sri Lanka's success in the remote work economy. As emphasized, developing skills in fields like web development, digital marketing, and graphic design is crucial for locals to tap into remote job opportunities. Telecom companies can play a pivotal role by partnering with educational institutions, creating awareness campaigns, and facilitating access to e-learning platforms. These initiatives can not only empower Sri Lankans with global opportunities but also position the country as a competitive player in the remote work market.

Despite the progress, challenges remain, particularly in ensuring consistent connectivity across rural areas. These challenges present opportunities for targeted investments in broadband expansion and innovations such as 5G. Government collaboration with telecom operators, coupled with policies incentivizing innovation and tax breaks, can accelerate technological advancements.

The economic benefits of remote work for Sri Lanka are immense. A strong telecom infrastructure can increase foreign exchange earnings by attracting digital nomads, create new jobs in sectors like IT and hospitality, and alleviate urban congestion by enabling professionals to work from less crowded areas. Moreover, remote work can provide resilience in times of economic uncertainty, offering diverse income opportunities for Sri Lankans. With continued investment in digital and physical infrastructure, Sri Lanka is well-positioned to emerge as a global hub for remote work.

New Generation of Workers

Looking ahead, the telecom sector will remain central to Sri Lanka's remote work ambitions. Innovations in connectivity, such as the rollout of 5G, will enhance remote work experiences, while government policies supporting digital entrepreneurship will drive long-term growth. It was highlighted that Sri Lanka already has the elements needed to thrive in the remote work landscape, provided it continues to invest in its digital capabilities. By addressing existing challenges and leveraging its strengths, Sri Lanka can unlock new pathways to economic prosperity.

Sri Lanka's telecom sector is at the forefront of this transformation, enabling a new generation of workers to embrace flexibility and connectivity. From fiber-optic networks to mobile data plans, the industry is laying the foundation for a thriving remote work ecosystem. With strategic investments and skill-building initiatives, Sri Lanka can position itself as a global leader in remote work, fostering a more inclusive and prosperous future for its citizens. **TR**



The Role of Telecom in Bangladesh's Urban Development

The telecommunications sector in Bangladesh has seen a significant evolution, marked by increased access to mobile networks and broadband services. As of recent reports, the sector is estimated to be worth USD 4.87 billion in 2024, and is expected to reach USD 5.86 billion by 2029, growing at a CAGR of 4.31% from 2024 through 2029, accounting for a substantial share of the country's GDP, contributing to employment, and fostering digital inclusion.

The expansion of mobile connectivity and internet services has empowered individuals, businesses, and government entities, particularly in urban areas where demand for digital services is

surging. Dhaka, Chittagong, and Khulna have experienced extensive telecom infrastructure development, such as the deployment of fiber-optic networks and the proliferation of 4G services.

Bangladesh's urban development has been significantly bolstered by advancements in telecommunications,

with 100% 4G and 99.57% 3G coverage driving 52.84% internet penetration. As of 2024, the country boasts 188.6 million mobile connections (surpassing its population size) and 22.27 million households with internet access. The rapid growth in fixed broadband (9.3% annually) and internet user penetration (12% annually) from 2024 to 2031

highlights a transformative digital shift. This robust infrastructure supports an evolving mobile market where data usage outpaces traditional voice and SMS, empowering 52.9 million social media users and fostering greater connectivity, economic activity, and social engagement in urban areas.

The government's collaboration with private telecom operators has driven significant investments in the sector, ensuring that urban residents have access to high-speed internet and reliable mobile connectivity.

The Impact of Telecom on Urban Growth

Telecom infrastructure serves as the backbone of economic activity in urban Bangladesh, facilitating business transactions, e-commerce, and financial services. The proliferation of mobile payment systems, such as bKash and Nagad, has revolutionized the way urban residents conduct financial transactions, reducing reliance on traditional banking and promoting financial inclusivity. Mobile networks have become key players in the digital economy, providing services that cater to urban dwellers' needs for convenience, connectivity, and efficiency.

In addition, the presence of reliable telecom services has attracted foreign investment into the country's urban centers. Businesses are more inclined to establish their operations in areas with strong communication networks, as they provide a foundation for e-commerce, remote work, and digital marketing. The telecom sector's contribution to GDP growth has been reinforced by the increasing demand for digital services, making it a vital component of Bangladesh's urban economic framework.

Facilitating Smart Cities and Urban Planning

The concept of smart cities has gained traction in Bangladesh, with telecom playing a pivotal role in its implementation. Urban areas are leveraging telecom infrastructure to enhance city management, transportation, public safety, and environmental monitoring.

For instance, the deployment of IoT (Internet of Things) devices and smart sensors in urban centers relies heavily on robust telecom networks, enabling real-time data collection and analysis for efficient city planning. Projects like Chattogram's IoT-enabled smart street lighting optimize energy use and enhance public safety through automated lighting adjustments based on ambient conditions, while the Bangabandhu Hi-Tech City integrates IoT and AI solutions for efficient urban management.

Telecom-enabled traffic management systems have reduced congestion in urban zones like Dhaka. By integrating mobile data analytics and GPS services, city authorities can monitor traffic flow, reduce congestion, and optimize public transportation routes. As part of the Asian Development Bank-financed SASEC Road Connectivity Project-II, Dhaka has introduced intelligent transport systems on the Joydevpur to Rangpur corridor. This includes real-time traffic monitoring, automated incident reporting, and LED-enabled variable message signs. A Traffic Management Center (TMC) in Dhaka coordinates these efforts, enabling swift responses to traffic disruptions and emergencies, reducing delays and improving flow on major roads like Mirpur and Airport Road.

Moreover, the use of telecom-based platforms for public service delivery has streamlined processes, making services more accessible and reducing bureaucratic delays. The Aspire to Innovate (a2i) program has played a pivotal role in digitizing government services, with over 6,500 digital centers across the country acting as one-stop service hubs. These centers offer essential services such as birth registrations, passport applications, and access to land records. Other platforms like EkPay simplify payment services for utilities and other fees, while the National e-Government Procurement Portal (e-GP) streamlines procurement processes for government projects.

Telecommunications has become a vital sector for enhancing social connectivity in urban Bangladesh. The widespread use of mobile phones

and internet services has bridged communication gaps, connecting urban residents with their families, friends, and workplaces, even during the COVID-19 pandemic, when remote communication became essential. Digital platforms, facilitated by the telecom sector, have also played a significant role in promoting social inclusion, offering services in local languages and catering to diverse user needs. Mobile financial platforms like FinLab BD have expanded access to banking and social safety nets, while apps like myGov streamline access to over 2,000 government services. The 'Zero Digital Divide' campaign further extends digital access through voice-enabled helplines and training programs for digital literacy, ensuring inclusivity across all segments of society.

Furthermore, the integration of telecom services with education has been transformative for students. Online learning platforms and educational apps have become prevalent, enabling students to access resources and participate in virtual classrooms. The JAAGO Foundation's 'Digital School Program' connects classrooms in remote and urban areas to qualified teachers in Dhaka via video conferencing. This ICT-driven approach provides education aligned with the national curriculum, particularly benefiting underprivileged students, while also supporting their nutrition and mental health needs.

Challenges and Opportunities for Urban Telecom Development

Despite the positive impact of telecom on urban development, several challenges remain. The rapid pace of urbanization in Bangladesh has put pressure on existing telecom infrastructure, leading to network congestion and service disruptions. Additionally, the digital divide between urban and rural areas persists, with urban residents having significantly better access to high-speed internet and telecom services compared to their rural counterparts.

To address these challenges, the government and private sector must endeavor to expand telecom

infrastructure further, particularly in underserved urban neighborhoods. Current efforts include the ongoing Dhaka Urban Regeneration Project, which focuses on enhancing urban infrastructure and addressing the needs of densely populated areas. Additionally, the Livelihoods Improvement of Urban Poor Communities Project (LIUPC) project under the UNDP's National Urban Poverty Reduction Programme (NUPRP) aims to foster economic growth and address poverty in underserved urban areas, ensuring better access to essential services like telecom.

Investments in 5G technology, enhanced fiber-optic networks, and increased spectrum allocation are crucial to support the growing demand for data services and enable advanced applications like autonomous vehicles and smart home systems in urban areas. Unified spectrum licenses awarded by the Bangladesh Telecommunication Regulatory Commission (BTRC) have streamlined 5G deployment and telecom operations, laying the groundwork for advanced connectivity. Partnerships like those between Banglalink and Robi to enhance 4G coverage and network efficiency further solidify the nation's commitment to advancing telecom infrastructure. Other notable advancements include Summit Communications's deployment of Juniper Networks's 400G optical routing solutions and the world's first commercial virtual base station controller, which was launched by Dialog Axiata and Ericsson. Moreover, BTRC's decision to allow spectrum fees to be paid in local currency and Veon and Banglalink's applications for digital banking licenses underscore the sector's strategic commitment to economic and technological growth.

Moreover, regulatory reforms are necessary to encourage competition and investment within the telecom sector. Substantial developments in connectivity and the establishment of special economic zones, have been prioritized. These investments align with the Smart Bangladesh Vision 2041, which aims to modernize the digital economy and reduce urban-rural divides. By creating an environment conducive to new entrants and reducing

bureaucratic barriers, Bangladesh can attract more investment and foster the development of cutting-edge telecom solutions tailored to the needs of its urban population.

The Role of Telecom in Urban Governance and Public Service

Telecom services have revolutionized the way public services are delivered in urban Bangladesh. E-governance initiatives, supported by mobile and broadband connectivity, have enhanced transparency and efficiency in government operations. Citizens can now access a wide range of services online, from paying utility bills to registering complaints, without the need to visit government offices physically. Notable platforms include the Bangladesh National e-Government Portal, which serves as a gateway to various citizen services, and the Service Portal, which offers facilities like complaint registration, police clearance certificates, and health-related services. Additionally, platforms like Titas Gas's e-Sheba portal enables citizens to manage gas bills and services online.

Additionally, telecom-based platforms have facilitated better communication between governments and urban residents. During emergencies, such as natural disasters or public health crises, telecom networks play a critical role in disseminating timely information and coordinating response efforts. Projects like the Cyclone Preparedness Programme (CPP)—a disaster management program of the Government and Bangladesh Red Crescent Society—utilizes mobile networks to disseminate cyclone warnings via SMS and IVR systems. During the COVID-19 pandemic, operators like Grameenphone and Teletalk managed vaccination registrations and public health alerts through mobile platforms. This enhanced communication capability has proven essential in densely populated urban areas, where rapid response can significantly mitigate risks and save lives.

The Path Forward for Urban Telecom Integration

Looking ahead, the telecom sector is poised for continued growth, driven by

increasing urbanization, technological advancements, and rising consumer demand. The upcoming rollout of 5G services is expected to bring about a new era of connectivity, with ultra-fast internet speeds and low latency, enabling innovative urban applications such as smart grids, connected vehicles, and enhanced public safety systems.

The government's Vision 2041, which aims to transform Bangladesh into a developed nation, includes plans to leverage infrastructure to support sustainable urban growth. This vision encompasses initiatives to expand broadband access, promote digital literacy, and foster innovation through public-private partnerships. By prioritizing telecom as a key driver of urban development, Bangladesh can ensure that its cities remain competitive, resilient, and inclusive in the face of future challenges. **■**



The rapid growth in fixed broadband (9.3% annually) and internet user penetration (12% annually) from 2024 to 2031 highlights a transformative digital shift





Six Key Drivers Behind the Surge in Shared Cloud Spending

According to data from the International Data Corporation (IDC), cloud infrastructure spending soared by 18.5% year-over-year (YoY) in Q4 2023, reaching USD 31.8 billion.

Shared cloud infrastructure, which accounts for the largest portion of the cloud market, grew by 27% in Q4 2023 alone, reflecting its prominence in the region's digital landscape.

SNS Insider also stated that the Asia Pacific shared cloud infrastructure market is poised to reach a staggering USD 784.2 billion by 2032. The market is expected to experience robust growth, with a compound annual growth rate (CAGR) of 11.7% during the forecast period of 2024 through 2032.

But what exactly is driving this surge?

Cloud Accelerators

1. Artificial Intelligence and High-Performance Computing

The growing interest in artificial intelligence (AI) and machine learning (ML) has also fueled the demand

for robust cloud infrastructure. AI-related investments, which require high-performance computing (HPC) capabilities, are expected to continue driving cloud infrastructure spending in APAC.

IDC noted that cloud infrastructure spending is being increasingly influenced by AI-related projects, with high-performance servers and GPUs in demand to support these advanced applications. As companies leverage AI to enhance their operations, the need for cloud solutions that can handle complex computations and large datasets will only grow.

2. E-Commerce and Online Retail

The e-commerce boom is one of the primary catalysts for cloud infrastructure demand in APAC. The region's increasing internet connectivity, mobile penetration, and rapidly growing online retail ecosystem have made cloud infrastructure a necessity for businesses.

Alibaba Cloud, China's leading provider of cloud services, has witnessed substantial growth in its e-commerce segment, capitalizing on the rising number of online shoppers across the region. As digital retail continues to expand, more businesses are turning to shared cloud solutions to handle the traffic, data storage, and computing power required for seamless transactions and customer experiences.

3. Financial Technology (Fintech)

Another driving force behind the surge in shared cloud infrastructure spending is the rapid growth of the fintech sector. Mobile payment systems, digital banking services, and blockchain technologies have gained widespread adoption in APAC, creating an urgent demand for secure, scalable, and reliable cloud solutions. According to a study by IDC, the fintech sector is expected to spend USD 10 billion annually on cloud infrastructure by 2025. Given that fintech companies handle sensitive financial data, secure cloud solutions offer the necessary security, flexibility, and performance required to support their operations.

4. Gaming and Digital Entertainment

The gaming industry is playing a pivotal

role in the region's cloud infrastructure growth. Cloud gaming services, which allow users to play games without requiring high-end hardware, have gained traction due to high-speed internet and the increasing number of gamers. Niko Partners reported that the APAC cloud gaming market was worth USD 3 billion in 2023, and is projected to reach over half a billion users by 2028. This growth is further amplified by the digital entertainment sector, including video streaming services like Netflix, which rely heavily on cloud infrastructure for content delivery and streaming at scale.

The increasing adoption of cloud gaming and content streaming platforms is spurring the demand for powerful and efficient cloud solutions capable of handling large amounts of data and providing a smooth, uninterrupted user experience.

5. Government Initiatives and Digital Transformation Policies

Governments across the region are also playing a role in driving cloud adoption. Policies promoting digital transformation are fueling the demand for cloud services in the public sector. Singapore's "Cloud First" policy, for example, encourages public sector agencies to adopt cloud technologies, which, in turn, stimulates the growth of the cloud market. With governments and enterprises alike prioritizing cloud-based digital solutions, the infrastructure needed to support these initiatives continues to expand.

6. Hybrid- and Multi-Cloud Strategies for Flexibility

Enterprises in APAC are increasingly adopting hybrid- and multi-cloud strategies to maximize flexibility, performance, and risk mitigation. In fact, at least 90% of enterprises in the region have adopted multi-cloud strategies, allowing them to distribute workloads across different cloud platforms.

This approach not only optimizes performance but also ensures continuity in operations by reducing the risk of vendor lock-in. Leading companies like Singapore Airlines and Toyota are already benefiting from hybrid cloud setups, using a combination of public and private cloud services from providers like AWS, Microsoft Azure, and Alibaba Cloud.

Conclusion

The soaring demand for shared cloud infrastructure in the Asia Pacific is a reflection of the region's rapid technological advancement and digital transformation. Factors such as the rise of e-commerce, fintech, gaming, government cloud initiatives, and AI investments are driving businesses and governments to embrace cloud solutions to stay competitive. As the cloud infrastructure market continues to evolve, shared cloud services will play a central role in supporting APAC's economic and technological growth.

With expectations for continued double-digit growth in the coming years, the region's cloud infrastructure landscape is set for an exciting future. Cloud adoption is no longer a luxury; it is a necessity for companies seeking to optimize their operations, scale efficiently, and stay ahead in an increasingly digital world. **IT**



APAC cloud gaming market was worth USD 3 billion in 2023, and is projected to reach over half a billion users by 2028





Telecoms Role in Driving Progress Towards SDGs in India, Vietnam and Indonesia

The United Nations (UN) Sustainable Development Goals (SDGs) consist of 17 goals established to address global challenges such as poverty, inequality, climate change, environmental degradation, peace, and justice.

Notably, telecommunications can facilitate progress in 70% of the SDG targets, impacting areas such as education, health, gender equality, and economic growth. The International Telecommunication Union (ITU) emphasized that digital technologies are crucial for enhancing the effectiveness of development initiatives, providing

essential infrastructure for data collection, communication, and the implementation of programs aimed at achieving these goals.

The ITU is actively supporting the implementation of the 2030 Agenda and SDGs in the Asia Pacific region through various normative, analytical, and capacity-building activities. By emphasizing the role of information and communication technologies (ICTs) as enablers of sustainable

development, the ITU is assisting member states in mainstreaming SDGs into their development plans and strategies. The ITU's Telecommunication Development Bureau (BDT) has facilitated the creation of innovative policies and regulations designed to leverage ICTs for developmental work, underscoring its significance in achieving the SDGs.

To ensure inclusivity, the ITU is committed to connecting the world and leaving no one behind, especially in developing nations facing financial and technical constraints. The organization promotes international cooperation in the areas of radio spectrum, satellite orbits, and communication infrastructure, which are crucial for fostering seamless interconnectivity across diverse systems. By organizing global events such as the Global Symposium for Regulators and initiatives like the Girls in ICT celebration, the ITU engages stakeholders from various sectors to empower youth and promote gender equality in technology, thereby contributing to sustainable growth in the region.

Recognizing the existing digital divide that affects vulnerable populations, the ITU has reinforced the importance of reliable and affordable digital services. The organization has taken significant steps to ensure that digital infrastructure and services are accessible to all, particularly in the Asia Pacific. The ITU's efforts include launching the Global Network Resiliency Platform to maintain the robustness of telecommunications networks, and facilitating collaboration among governments, industry, and civil society to enhance digital access and inclusion.

Moreover, the ITU is leveraging partnerships with organizations such as the World Bank, the GSMA, and the World Economic Forum to promote immediate actions designed to strengthen connectivity and capacity. By engaging in various initiatives, such as the COVID-19 Global Education Coalition and the Digital Development Joint Action Plan, the ITU aims to address the unique challenges posed

by connectivity issues while ensuring that ICTs continue to play a vital role in achieving the SDGs across the Asia Pacific. Through these collective efforts, the ITU remains steadfast in its commitment to fostering a digital society that benefits all.

Enhancing Connectivity and Reducing Inequality

Enhancing connectivity and reducing inequality is a primary SDG goal, specifically 'Goal 10,' which aims to address disparities within, and among, countries. Access to quality telecommunication services is crucial for bridging the digital divide, especially in rural and underserved areas. In the Asia Pacific, significant connectivity disparities exist, with urban areas often well-served while rural populations lack access to basic mobile services.

India's Digital India initiative, launched in July 2015, seeks to transform the nation into a digitally empowered society by improving online infrastructure and increasing internet accessibility, particularly in rural areas. With objectives focused on secure digital infrastructure, essential digital services, and universal internet access, this initiative aims to boost various sectors, doubling the contributions to the core-digital-industries GDP by 2025.

Despite advancements, India still faces a digital divide that contributes to economic disparities. The Digital India initiative addresses this gap through key programs like Aadhaar, BharatNet, and public Wi-Fi hotspots, particularly benefiting small towns and rural areas.

As of March 2024, internet penetration reached 67%, with states like Kerala and Telangana leading in connectivity.

Collaborations with technology firms like Google and Amazon Web Services further support the initiative by enhancing digital literacy and fostering innovation.

Looking ahead, Digital India is set to propel the economy toward a projected USD 1 trillion by 2025, driven by a cultural shift toward digital lifestyles and increased adoption of digital payments.

By leveraging technologies like artificial intelligence and blockchain, the government aims to create millions of jobs and equitable opportunities, positioning Digital India as a vital component of the nation's strategy for reducing inequality and promoting sustainable development.

Advancing Healthcare

Telecommunications also plays a vital role in improving healthcare access and outcomes, directly contributing to 'Goal 3: Good Health and Well-being.' Telehealth services and mobile health applications have become essential tools for delivering healthcare, especially in remote areas.

Vietnam has made significant strides in integrating telemedicine into its healthcare system. Telemedicine in Vietnam has emerged as a transformative solution for improving healthcare access and outcomes. Defined as the provision of healthcare services remotely through information and communication technology, telemedicine allows healthcare professionals to diagnose, treat, and prevent diseases without in-person interactions. Since the implementation of the Healthcare Law and Circular No. 30 in 2023, which established a legal framework for telemedicine, Vietnam has displayed a notable digital transformation within its healthcare sector.

The introduction of the VTelehealth platform has enabled the integration of various healthcare systems, facilitating seamless access to high-quality medical care, particularly for patients in remote areas. By enabling the continuous monitoring of chronic diseases, reducing administrative burdens, and optimizing resource utilization, telemedicine significantly enhances service accessibility and efficiency within the healthcare sector.

Moreover, it plays a vital role in public health by facilitating the early detection of diseases and ensuring timely interventions. Despite challenges related to compliance, data security, and competition among healthcare facilities, telemedicine's potential to revolutionize Vietnam's healthcare

landscape remains promising, paving the way for improved health outcomes and greater equity in healthcare access.

Fostering Economic Growth

Telecommunications is a key driver of economic growth and job creation, aligning with 'Goal 8: Decent Work and Economic Growth.' The digital economy relies heavily on telecommunications infrastructure, enabling businesses to operate efficiently and access global markets.

E-commerce in Indonesia is a dynamic force contributing to 'Goal 8: Decent Work and Economic Growth' in the SDGs. The Indonesian e-commerce market, projected to grow from USD 52.93 billion in 2023 to USD 86.81 billion by 2028, is the largest in Southeast Asia, accounting for over 52% of the region's total e-commerce revenue in 2022. This growth is fueled by increasing digital adoption, particularly in tier-two and tier-three cities where e-commerce penetration remains relatively low.

The government's regulatory framework, including Government Regulation 80 of 2019 and the recent Minister Trade Regulation No. 31/2023, aims to streamline e-commerce operations while protecting local businesses and ensuring consumer safety.

As e-commerce platforms like Shopee, Tokopedia, and Lazada lead the market, they create substantial job opportunities and stimulate economic activity by facilitating transactions across various sectors, including fashion, electronics, and food.

Moreover, the rise of social commerce reflects shifting consumer preferences, as platforms like TikTok and Instagram enhance the shopping experience and provide entrepreneurs, especially women and small business owners, with new avenues for income generation.

Ultimately, Indonesia's e-commerce sector not only drives economic growth but also fosters decent work opportunities, contributing to the nation's overall development. **TR**



Transforming Disaster Response and Agriculture with Drones and Robotics

The Asia Pacific (APAC) region has become a global hub for drone and robotics innovation. With countries such as China, Japan, South Korea, and Singapore investing heavily in research and development (R&D), the region is at the forefront of technological adoption.

In particular, drones are proving to be invaluable in sectors like agriculture, disaster response, and logistics, while robotics is reshaping manufacturing and healthcare.

APAC Drone/Robotics Landscape

China, driven by initiatives like Made in China 2025 and support for tech hubs such as Shenzhen, dominates the global drone market, with companies like DJI at the forefront. Japan, a long-time leader in industrial robotics, is advancing its robotics sector through initiatives like Society 5.0 and the Robot Revolution Initiative, which focuses on automation in healthcare, logistics, and manufacturing to tackle labor

shortages and an aging population. South Korea and Singapore are also pushing boundaries in the robotics and drone sectors. South Korea's Intelligent Robots Development and Distribution Promotion Act and integration of 5G technologies into drones are accelerating innovation in smart manufacturing and autonomous systems. Meanwhile, Singapore's Smart Nation Initiative and National Robotics Programme (NRP) are fostering a growing ecosystem of robotics startups, with significant focus on urban mobility, healthcare, and logistics.

In India and Australia, drone and robotics innovations are transforming agriculture, mining, and defense. India's

Make in India initiative is fostering a thriving drone and robotics ecosystem, with drones playing a critical role in agriculture and surveillance. Australia, known for its vast landscapes, is using drones for precision agriculture and environmental monitoring, particularly in the mining and farming sectors.

Agricultural Innovations

One of the most notable applications of drone technology in the APAC region is in the agricultural sector. Drones are being used to monitor crops, assess soil health, and even apply pesticides, offering significant time and cost savings for farmers.

For instance, Japan is addressing its agricultural labor shortage, driven by

an aging workforce and a shrinking number of skilled farmers, through the integration of robots and drones. The average age of farmers in Japan is 68, and over 65% of farmers are aged 65 or older. To maintain the productivity and sustainability of its agricultural sector, Japan has embraced advanced robotics since 2018, deploying unmanned tractors, rice transplanters, and drones for tasks such as weeding and pest control. These robots operate autonomously, and are equipped with sensors to detect obstacles, although human supervision is still required.

The Ministry of Agriculture, Forestry, and Fisheries has established safety guidelines to ensure the safe operation of these machines. In recent years, Japan has also begun developing remote-controlled robots that can work in multiple fields simultaneously, with a single operator managing several robots from a control room. This shift toward smart agriculture is further bolstered by research into AI and 5G networks, which, when combined, can enable precise applications of fertilizers and detect the presence of disease in crops timeously.

In China, the integration of robots and drones in agriculture is transforming traditional farming practices, particularly in regions like Zigui county, which is famous for its navel oranges. Farmers now use drones to transport harvested oranges from steep mountain orchards to collection points, significantly reducing transportation time from 40 minutes to just one minute. At processing facilities, robotic arms and AI-powered systems handle the sorting, cleaning, and quality assessment of oranges, analyzing sugar and water content with high precision.

This automation has revolutionized the local orange industry, boosting productivity and supporting e-commerce platforms that connect farmers with national and global markets. Zigui's digital transformation, aided by cutting-edge technology, has revitalized the rural economy and attracted young people back to farming, offering new opportunities in both agriculture and logistics.

This smart agriculture trend, also seen in nearby regions like Yuanan county, is bolstered by cloud technology that automates greenhouse management, optimizing water, fertilizer, and pesticide use while reducing labor. ASEAN Senior Vice President at HCL Tech, Sandeep Sarkar, noted, "There is a consensus among senior executives on the role of cloud technology in supporting sustainability strategies. Cloud has not just been an efficient business platform but a resilient technology backbone, facilitating energy usage through innovative and optimized infrastructure deployments."

In Malaysia, the deployment of drones and robotics is being explored to solve local challenges. The Malaysia Flying Labs initiative, for example, focuses on using drones and robotics to address local challenges, particularly in agriculture, disaster response, and environmental monitoring. Flying Labs collaborates with communities to provide hands-on training in drone operation, empowering locals to map flood-prone areas, monitor environmental changes, and improve agricultural practices through aerial data collection.

These initiatives foster innovation and capacity-building at grassroots levels, allowing communities to develop sustainable solutions to pressing regional issues. Through the Flying Labs Network Council, Malaysia's Flying Labs also contributes to shaping strategies and decisions that impact the growth and governance of the global network.

Expanding Applications

Beyond their current uses, drones and robotics are expected to play an even larger role in infrastructure development and environmental monitoring. In countries like Indonesia and the Philippines, where natural disasters are a constant threat, drones will likely become an integral part of disaster preparedness strategies.

In the Philippines, UAVs can swiftly survey disaster-affected areas, monitor road conditions, and locate survivors, all while overcoming communication challenges in remote or inaccessible

locations. Equipped with high-resolution cameras and advanced payloads, drones are also used to map safe evacuation routes and deliver essential data for decision-making during emergencies.

Projects like the Internet Society Philippines Chapter's (ISOC- PH) initiative, which deploys drones to establish resilient communication networks and gather critical information, demonstrates how this technology enhances disaster response capabilities and aims to ultimately achieve zero casualties. A drone's ability to function as an aerial sensor, relay communication, and transport emergency supplies makes it an invaluable tool in disaster preparedness and recovery efforts worldwide.

Meanwhile, in Indonesia, the expanding application of drones in disaster preparedness is exemplified by the Precision Medic Drone, developed by Faqihza Mukhlis and Robby Azhari from the Bandung Institute of Technology (ITB). This innovative UAV was created in response to the logistical challenges encountered during the 2022 Cianjur earthquake, where disrupted ground transportation hindered the delivery of medical supplies. The drone, capable of carrying up to 10 kilograms of critical resources, is designed to navigate disaster zones with precision using advanced digital technology and QR-coded helipads, making it a cost-effective alternative to traditional aircraft. With its ability to travel up to 60 km/h, the Precision Medic Drone significantly reduces the time required to deliver essential medical equipment, which can be life-saving in emergencies.

Supported by Indonesia's Kedaireka program, the drone has already been deployed in other vital missions, including mangrove reforestation in West Java, showcasing its versatility. As the technology continues to evolve, collaborations with agencies like the Regional Disaster Management Agency are expected to further enhance Indonesia's disaster response capabilities, underscoring the growing role of drones in humanitarian missions. **ITB**

Indosat, ZTE Enhance Indonesia's Connectivity with Advanced Microwave Technology



Indosat Ooredoo Hutchison (Indosat) and ZTE Corporation have joined forces in a landmark initiative to enhance digital connectivity across Indonesia.

Utilizing ZTE's microwave technology, the partnership aims to provide reliable, high-speed communication to remote islands and rural regions, granting more Indonesians access to IOH's 4G network.

Region-Specific Technology

Indonesia faces significant challenges in building communication infrastructure due to its rugged terrain and high costs. Traditional wired communication solutions often fall short, leaving many areas disconnected and limiting economic and social growth.

To address this, Indosat and ZTE have deployed more than 550 ultra-capacity backbone microwave links nationwide, connecting nearly 80% of major cities and remote regions. ZTE's innovative technology, designed for Indonesia's specific needs, ensures long-distance, high-capacity transmission, providing previously isolated communities with reliable connectivity.

Kevin Chen, Sales Director of PT., ZTE Indonesia, said, "ZTE are committed to seizing strategic opportunities in digitalization, intelligence, and low-carbon development. ZTE microwave backbone connects ZTE, IOH, and Indonesian residents together, [and] will explore more new possibilities in communication ways, contributing to the digital economic growth of Indonesia and the global community."

The solution incorporates advanced features tailored to Indonesia's environmental conditions. ZTE's multi-frequency Ultra Broadband Antennas (UBA) facilitate flexible frequency selection, reducing infrastructure costs. Customized branching units enhance efficiency and performance, while

durable equipment withstands harsh weather conditions such as heavy rain, strong winds, and corrosion.

Additionally, the integration of 4T4R modem boards and energy-saving technology ensures rapid deployment with minimal resources. The system's scalable design supports future upgrades, enabling up to eight times the capacity and extended coverage to new areas.

Expanding Backhaul for Improved Connectivity

Indosat's subscriber base has seen substantial growth, especially in remote regions, due to a strategic initiative that has expanded backhaul capacity in areas like Sumatra and Kalimantan to 2-3 Gbps, with peak speeds reaching up to 6 Gbps. This improved connectivity enables residents to access real-time information, online education, and digital entertainment seamlessly. Moreover, the initiative has spurred local economic development by generating employment opportunities, enhancing tourism, and encouraging knowledge exchange, while also driving progress in healthcare and education.

Thaicom Gains IN-SPACe Approval for India Satellite Services



Thaicom Public Company Limited (Thaicom), a leading satellite and space technology company in Asia, announced that its subsidiary, IPSTAR (India) Private Limited (IPSTAR India), received approval from the Indian National Space Promotion and Authorization Center (IN-SPACe) on December 5, 2024, to provide satellite services using Thaicom's satellites in India.

IN-SPACe is an agency under the Department of Space, Government of

India, responsible for promoting, enabling, authorizing, and supervising non-government entities that engage in space activities. According to the new Indian space policy, IN-SPACe has authorized IPSTAR India to provide satellite services using existing Thaicom satellites, including Thaicom 4 at 119.5° East and Thaicom 8 at 78.5° East.

Additionally, the agency has further authorized Thaicom's upcoming satellite, Thaicom 9, which features advanced technology and is set to launch in 2025. Thaicom's satellite services will focus on delivering broadband solutions to improve India's digital infrastructure, targeting rural and under-served areas with connectivity challenges.

This initiative aims to reduce the digital gap in the region and meet the increasing demand for satellite services in India.

Patompob (Nile) Suwansiri, Thaicom's CEO, highlighted the significance of this milestone for Thaicom, emphasizing the company's longstanding commitment to the Indian market.

Thaicom has been offering satellite services in India since 1997 and is dedicated to serving the country in the long run. Suwansiri believes that Thaicom's expertise in the satellite industry and dedication to delivering broadband services will enable the company to meet India's growing demand for connectivity.

NEC Thailand Partners with Umong to Improve Elderly Care



NEC Corporation (Thailand) Ltd. has signed a Memorandum of Understanding (MoU) with Umong Municipality in the Lamphun Province to work together on developing a digital technology platform that will improve elderly care and support dependent patients, including those who are homebound or bedridden.

Nationwide Cooperation

This partnership aligns with plans to transform Umong Municipality into a smart city. As part of the project, a digital healthcare platform that connects to local medical facilities

will be created. This will play a crucial role in providing ongoing care for the elderly and chronically ill patients. The platform will be designed to enhance the efficiency of medical staff and caregivers.

Ichiro Kurihara, President of NEC Corporation (Thailand) Ltd., noted that the company aims to extend this partnership to other municipalities nationwide in cooperation with the Association of Subdistrict Administrative Organizations of Thailand and the Digital Economy Promotion Agency (DEPA) under the smart city framework. This collaboration will also involve incorporating new solutions like fall detection technology to improve safety in elderly care.

Modernizing Healthcare

Furthermore, there are plans to

introduce advanced technologies and IoT (Internet of Things) devices to support remote healthcare through conceptual smart hospitals, which will modernize and offer comprehensive healthcare services.

Kurihara emphasized that this partnership demonstrates a significant step towards achieving NEC Thailand's vision of using technology to create a sustainable society. Enhancing the health and quality of life for the elderly in local communities is crucial and the success of this project will serve as a model for other municipalities in Thailand.

Kitipat Thaninpittinan, Mayor of Umong Municipality, Lamphun Province, noted that by leveraging new technologies, the efforts of public health officers and teams will become more efficient.

Keppel, Sovico Plan Vietnam-Singapore Subsea Cable Project



Keppel, an asset management firm from Singapore, and Sovico Group, a Vietnamese conglomerate, are pursuing the possible development of new underwater fiber-optic cables, which aim to connect Vietnam with Singapore and other areas.

Currently, there are four operational submarine cable systems linking Vietnam to the rest of the world: AAE-1, AAG, TGN-IA, and APG. The SEA-ME-WE 3 cable system previously connected with Vietnam, however, it was retired in early December.

Three new cables are under construction to connect Vietnam: ADC, ALC, and SJC2. Moreover, Viettel and Singtel have signed a Memorandum of Understanding (MOU) to construct

the Vietnam-Singapore Cable System (VTS).

Combatting Internet Disruptions

Vietnam has experienced frequent internet disruptions due to faults in its underwater cables. For instance, both the APG and AAE-1 cables are currently not functioning and awaiting repairs. In June, three out of five undersea cables connecting Vietnam to the world (APG, AAE-1, and TGN-IA) encountered issues, causing internet speed reductions across the country. The repair of the AAE-1 cable is still pending. In January 2023, four out of five undersea cables (AAG, IA, APG, and AAE-1) were not operational, leading to slow internet speeds across Vietnam.

In January 2024, the Prime Minister of Vietnam issued Decision 36/QĐ-TTg (Decision 36), approving Vietnam's Digital Infrastructure Master Plan 2030. According to this plan, Vietnam aims to add two-to-four international internet cables by 2025 and another four-to-six international undersea fiber optic cables by 2030.

Furthermore, by 2030, Vietnam plans to increase the total number of submarine cables to 15, each with a total capacity of at least 334 Tbps. Sovico Group will focus on providing high-quality products and services in various sectors to meet customer needs and integrate with the global economy. In September, Sovico Group signed an MoU with U.S.-based tech company, Supermicro, to develop a hyperscale data center in Vietnam.

Implementation Challenges

According to SCMP, Keppel and Sovico Group are considering laying a cable that will directly connect Vietnam with Singapore, predicted to cost an estimated USD 150 million.

The new projects led by Keppel and Sovico Group will be separate from previous investments announced by Vietnamese companies in four new undersea cables. These include the ADC and SJC2 cables, built by Japan's NEC; ALC, built by China's HMN Tech; and the Vietnam-Singapore submarine cable system announced by Vietnam's Viettel and Singapore's Singtel.

THAICOM-9A Secures 50.5°E Slot



Thaicom Public Company Limited has announced the successful relocation of the THAICOM-9A satellite to the 50.5 degrees east orbital position.

The satellite arrived at its designated slot on November 22, 2024, just days before Thailand's rights to the orbital slot were set to expire on November 27.

The relocation forms a crucial part of Thaicom's mission to safeguard

Thailand's claim to the orbital position. TC Space Connect Company Limited (TCSC), a Thaicom subsidiary, secured a 20-year license for the slot through the National Broadcasting and Telecommunications Commission's (NBTC) selection process. The move underscores efforts to preserve Thailand's orbital rights while enabling long-term satellite operations.

Faced with time constraints that make building a new satellite unfeasible—an average process of over three years—Thaicom has collaborated with an international partner to reposition an existing in-orbit communication satellite to the 50.5 degrees east orbital slot.

Patompob (Nile) Suwansiri, Chief Executive Officer of Thaicom, noted that this achievement would enhance Thailand's competitive standing, open new market opportunities for Thaicom, and support the growth of the country's space industry.

The satellite, now named THAICOM-9A, is set to begin operations in the first quarter of 2025.

The satellite's service coverage spans Europe and Asia, including Thailand. Thaicom's initial focus will be on providing satellite services to Thailand and select Asian markets, with plans to explore business opportunities in Europe, Africa, and the Middle East in the near future.

China Reveals Plan for Next-Generation BeiDou System



The China Satellite Navigation Office (CSNO) recently announced plans for the future of the BeiDou Navigation Satellite System (BDS), which will include advanced technologies and improved services.

The plan involves launching three pilot test satellites around 2027 and completing the system by 2035. This announcement was made at a symposium in Beijing celebrating the 30th anniversary of the BeiDou project, which garnered an attendance of 100 participants.

The new plan outlines the development of China's satellite navigation network, which aims to create a more advanced, robust, and user-friendly next-generation BDS. Key technological

breakthroughs are expected by 2025, with three pilot satellites launching in 2027 to test new technologies. By 2029, the deployment of the system's network satellites will begin, with full completion expected by 2035. The next-generation BDS will offer global users real-time, high-precision, and reliable navigation, positioning, and timing services with accuracy ranging from meter-level to decimeter-level.

LEO Integration

The system will cater to various user terminals on Earth and in space, integrating with other navigation and timing technologies. The new system will optimize the constellation architecture and establish an efficient ground system for continuous operations. China is also exploring

emerging technologies like low Earth orbit (LEO) satellites to enhance the BDS system. By integrating LEO satellites with the existing medium Earth orbit (MEO) and high Earth orbit (HEO) satellites, the system will offer faster positioning speeds and better accuracy.

China has expanded its international cooperation by signing BDS agreements with countries like Russia, Pakistan, Belarus, and Arab nations. BDS products are now exported to over 140 countries and integrated into international standards for civil aviation, maritime, and mobile communications. The BDS system stands out for its comprehensive services, including high-precision timing, satellite-based augmentation, and short message communication services. It is recognized for its positioning accuracy and reliability, comparable to the U.S. GPS system.

BDS applications are rapidly growing in key sectors of China's economy, with coverage rates exceeding 90% in areas like transportation, energy, natural resources, and emergency response. Industry experts see vast potential in BDS applications, anticipating future integration with advanced technologies like artificial intelligence (AI).

Nokia, Intuitive Machines Integrate 4G Network for Lunar Mission



Nokia and Intuitive Machines, Inc. have successfully integrated Nokia's Lunar Surface Communication System (LSCS) into the IM-2 mission lander, Athena.

The goal is to deploy the first cellular network on the Moon during the upcoming mission to the lunar south pole region. After extensive testing and validation with Nokia Bell Labs, Intuitive Machines engineers installed the LSCS 'network-in-a-box' onto one of Athena's upper carbon-composite panels. Precautions were

taken to ensure the network's safe journey to the Moon, survival during take-off and landing, and optimal operation on the lunar surface.

Futuristic Capabilities

The network is thermally isolated at 14 mounting points to protect it from deep space's extreme temperatures. Additionally, the network is integrated into Athena's Thermal Protection System to regulate heat during operation and protect it when idle. Nokia's LSCS includes two device modules installed in lunar mobility vehicles: Intuitive Machines' Micro-Nova Hopper and Lunar Outpost's Mobile Autonomous Prospecting Platform (MAPP) rover. These vehicles will deploy on the lunar surface upon landing and use the Nokia device modules to connect to the network on Athena.

The LSCS uses 4G/LTE cellular technology adapted by Nokia Bell

Labs for lunar missions. It will facilitate high-definition (HD) video streaming, command-and-control communications, and telemetry data between the lander and vehicles. Intuitive Machines plans to transmit data from the LSCS back to Earth using its direct-to-Earth data transmission service.

Cellular for Spatial Connectivity

Thierry Klein, President of Bell Labs Solutions Research at Nokia, stated that cellular technologies can provide reliable, high-capacity connectivity for future missions to the Moon and Mars. Nokia Bell Labs developed the LSCS, and Intuitive Machines created the Micro-Nova Hopper in collaboration with NASA's Space Technology Mission Directorate. The second lunar mission aims to test new sensor instruments using the Micro-Nova Hopper and LSCS to identify and map resources like water and ice on the Moon.

Maxis Unveils Mobile Identity Solution for Secure Authentication



Maxis has introduced its Maxis Mobile Identity solution to provide mobile users with easy, secure, and streamlined authentication experiences.

This solution utilizes a set of advanced telco verification APIs. The Number Verify API verifies mobile devices by confirming that the provided phone number matches the registered number on the device using real-time telco data. This ensures a simpler user experience from app sign-up to password resets and logins, replacing SMS-based one-time passwords (OTPs) or transaction authorization codes (TACs).

Reducing Exposure

With this solution, mobile numbers can be securely verified against valid and active numbers in the background without leaving the platform. This creates a smoother and more intuitive user journey. Additionally, the solution enhances security by reducing customers' exposure to scams and fraud through SMS verification, making it ideal for banks and e-commerce customers.

Maxis Mobile Identity was presented at the Smart Nation Expo 2024 in the presence of Minister of Digital, YB Gobind Singh Deo. Following this showcase, Maxis Business—the B2B division of Maxis—aims to collaborate with financial institutions, e-commerce platforms, and app developers to promote the adoption of advanced API solutions for better user experiences.

"We are excited about the possibilities offered by telco APIs to enhance customer experience. This solution not only simplifies the process for users but also protects them from fraud and scams. We believe that implementing more API-based solutions will open up new opportunities for businesses and industries to provide seamless and secure digital interactions from start to finish," said Prateek Pashine, Chief Enterprise Business Officer of Maxis.

Ensuring Interoperability

The Maxis Mobile Identity solution ensures interoperability and collaboration among operators. Maxis is partnering with Singtel to create a regional federation of telco APIs for network-based authentication of mobile subscribers. This partnership stems from the Bridge Alliance API Exchange (BAEx) initiative, supported by 13 leading telcos in Asia, including Maxis.



Behind the Scenes of APAC's Growing (24% CAGR) Conversational AI Revolution

The Asia Pacific (APAC) region is on the cusp of an AI revolution, with the conversational AI market projected to grow at an impressive compound annual growth rate (CAGR) of 24.1% from 2024 through 2032.

This projected growth is not merely a reflection of increased interest in technology; it embodies a profound transformation in how businesses engage with their customers and streamline their operations. As organizations across various sectors adopt AI solutions, understanding the drivers behind this growth is crucial for stakeholders looking to capitalize on emerging opportunities.

Factors Catalyzing the Conversational AI Revolution

One of the foremost catalysts driving the rapid growth of conversational AI in APAC is the quest for improved customer

engagement. Companies such as Google and Microsoft have pioneered intelligent chatbots and virtual assistants that offer personalized interactions and real-time support. By understanding natural language and responding contextually, these systems foster deeper connections between brands and consumers. The resulting enhancement in customer satisfaction and loyalty is evidenced by positive feedback and increased retention rates. As businesses realize the value of personalized customer interactions, the demand for conversational AI technologies is expected to soar.

Conversational AI is not only enhancing customer experiences but also significantly improving operational efficiency and driving cost savings. Organizations like Amazon and

Facebook utilize AI-driven chatbots to automate routine inquiries and tasks, liberating human resources to focus on higher-value activities. This shift towards automation has proven to be advantageous, leading to improved workflow efficiencies and measurable reductions in operational costs. As companies continue to embrace these technologies, the market for conversational AI is likely to expand, reinforcing its role as an essential tool for business success.

The synergy between conversational AI and emerging technologies such as machine learning (ML) and natural language processing (NLP) serves as another key growth driver. Major players, including Apple and Alibaba, are developing sophisticated virtual assistants that adapt to user preferences, providing a tailored experience over time. The advancements in NLP and sentiment analysis enable conversational AI systems to understand user emotions and subtleties, thereby enhancing interactions.

In China, the conversational AI market generated a revenue of USD 1,051.5 million in 2023 and is expected to reach USD 5,192.5 million by 2030. This expansion is heavily supported by government initiatives, including China's ambitious AI Development Plan, which seeks to make China a global AI leader by 2030. In India, demand for chatbot and voice assistant solutions is strong, with the market expanding at a CAGR of 17.8% as companies use AI to cater to a burgeoning digital consumer base in banking and customer support settings.

In Southeast Asia, conversational AI adoption is also on the rise. Thailand and Indonesia are seeing growing interest in customer service automation within the ecommerce and banking sectors, where user satisfaction metrics indicate high consumer demand for AI-driven solutions. This trend is reinforced by regional data privacy regulations, such as Singapore's PDPA (Personal Data Protection Act), which ensures the secure deployment of AI systems and protects consumer data, fostering trust in AI applications. Additionally, Singapore will invest more than SGD 1 billion (USD 743 million) over the next five years to boost AI implementation.

"The SGD 1 billion allocation towards AI, which also includes secure implementation of the National AI Strategy 2.0, demonstrates the government's commitment towards fostering a trusted and responsible AI ecosystem," noted Sujith Abraham, Senior Vice President and General Manager of ASEAN at Salesforce.

The APAC market for conversational AI is also shaped by the shift toward cloud-based AI models and voice-activated interfaces, as seen in Japan and South Korea. Japan's AI development is bolstered by a large domestic demand for solutions that assist the aging population, such as AI-driven virtual assistants that provide support in healthcare and daily activities. Notably, earlier this year, the Ministry of Science and ICT announced that South Korea was set to invest KRW 710.2 billion (USD 527 million) across 69 sectors within 2024 to foster innovation/s driven by artificial intelligence (AI).

APAC's Current Conversational AI Penetration

The Asia Pacific conversational AI market is expanding at a rapid pace, projected to grow from a market revenue of USD 2,387.6 million in 2023 to USD 11,465.9 million by 2030. The most significant segment is 'solutions,' while 'managed services' leads in growth, emphasizing the region's need for scalable, AI-driven customer engagement tools. The 'solutions' segment is expected to dominate in terms of revenue in 2024, reflecting widespread adoption. However, the 'managed services' segment is projected to exhibit the highest CAGR, indicating a shift towards the outsourced management of AI systems. This trend underscores the increasing demand for expertise and ongoing optimization in the management of conversational AI solutions.

As of 2023, the Asia Pacific contributed to approximately 25.4% of the global conversational AI market. Key market players driving this growth include Alphabet Inc., Microsoft Corp., Amazon, Inc., International Business Machines Corp., Oracle, Fidelity National Information Services Inc., SAP SE, Artificial Intelligence Technology

Solutions Inc., Zoom Inc., Rasa, Nuance Communications, Kore.ai, Avaamo, Conversica, Haptik, Pypestream, Kasisto, and Cognigy GmbH.

Forecast to surpass other global markets by 2030, the APAC region's conversational AI sector is expected to capture revenue dominance, supported by both large-scale technology providers and specialized startups focused on customer experience innovation.

Additionally, the market can be categorized by type, with chatbots leading in revenue and growth potential. However, intelligent virtual assistants (IVAs) are anticipated to outpace chatbots in growth during the forecast period, reflecting the demand for more advanced systems capable of handling complex queries and providing context-aware responses.

Successful Conversational AI Implementation in APAC

In the APAC region, companies have effectively harnessed conversational AI to enhance customer engagement and streamline operations across various sectors. For instance, Alibaba employs its AI-powered chatbot, AliMe, to manage millions of customer inquiries daily, significantly improving service efficiency. Similarly, HDFC Bank in India uses its AI chatbot, Eva, to provide instant responses to customer queries related to banking services, facilitating smoother account management and transaction details.

In Singapore, DBS Bank has integrated a voice-activated AI assistant that allows customers to perform banking transactions and receive financial advice through voice commands, enhancing accessibility and convenience. Ecommerce platforms like Lazada and ZALORA also utilize conversational AI to engage customers effectively. Lazada's chatbot, LazzieChat, offers personalized marketing messages based on shopping behaviors, while ZALORA provides personalized styling advice through AI-driven interactions.

Moreover, organizations in the healthcare sector are adopting AI-powered solutions to improve patient interactions. These chatbots assist with appointment

bookings and medical inquiries, ensuring timely and efficient care. Additionally, Exotel's 'House of AI,' leverages AI voice assistants for various tasks, such as appointment scheduling and intelligent call routing, further enhancing customer satisfaction by reducing wait times.

Factors Hindering Adoption

Despite the remarkable potential of conversational AI, challenges such as bias and inaccuracy in responses remain a significant concern. Instances of biased language understanding in AI systems have highlighted the necessity for rigorous ethical standards and algorithm refinement. Companies are actively working to mitigate these issues by investing in AI ethics and employing sophisticated monitoring mechanisms. For example, solutions like BiasAsker—a framework designed to detect and mitigate biases—are being employed in the region to monitor AI interactions across demographic groups. This tool generates diverse questions that expose potential biases, which companies then use to refine their algorithms for better social alignment.

Data privacy and regulatory compliance are prominent concerns, with policies like Japan's Act on the Protection of Personal Information (APPI) and Singapore's Personal Data Protection Act (PDPA) imposing strict data-handling requirements. These laws often restrict data-sharing across borders, making it difficult for companies to develop robust AI models that rely on diverse datasets.

Linguistic diversity further complicates the implementation of conversational AI in APAC. With over 2,300 languages across the region, accurately interpreting and responding to local dialects is challenging, impacting the precision and user satisfaction of these systems. For instance, conversational AI models in India, the Philippines, and Indonesia require extensive localization, which can be costly and demand continuous updates to maintain effectiveness across diverse languages.

In conclusion, the successful adoption of conversational AI within the APAC region will depend on overcoming regulatory, linguistic, infrastructural, and talent-driven barriers. **TR**



How India's Telecommunications Sector is Driving Digital Literacy

India's journey toward digital literacy has gained significant momentum in recent years, largely driven by its telecom sector. As the world's largest democracy transitions into a digital economy, the role of telecom companies in enabling digital literacy and reducing the digital divide is crucial. These efforts have not only transformed access to information but also shaped the future of education, healthcare, and finance.

Digital literacy goes beyond basic computer skills; it involves the ability to access, evaluate, and use digital platforms effectively. With the rapid digitization of essential services like education, healthcare, and financial systems, digital literacy has become indispensable. However, for a vast and diverse country like India, the digital divide remains a significant challenge, especially in rural areas where access to technology is limited.

According to the Oxfam India Inequality Report 2022, the digital divide in India remains a significant issue, with large portions of the population facing poor or no access to digital services. Approximately 50% of the population lacks access to devices, internet services, or the digital literacy necessary to navigate a digital environment. This divide exacerbates inequalities, as only 32% of households in India are considered digitally literate.

The Digital Divide: A Problematic Element in Achieving Digital Literacy

The first point of call for addressing digital literacy, is ensuring that users are adequately equipped with access to digital technologies. Bharti Airtel, Reliance Jio, and Vodafone Idea are leading this effort through strategic campaigns and collaborations.

Bharti Airtel has undertaken several initiatives to reduce the digital divide, particularly in rural and underserved areas of India. Through its 'Project Leap,' the company has committed significant investments to expand network infrastructure, improving 4G and 5G access in remote regions. Airtel's 'Airtel Payments Bank' also plays a key role in financial inclusion by providing digital banking services to people in rural areas, helping to bring them into the formal financial system. Additionally, its 'Mera Pehla Smartphone' initiative offers affordable smartphones and data plans, making digital services more accessible to first-time internet users. These efforts reflect Bharti Airtel's commitment to bridging the digital divide.

Reliance Jio's 'Jio Digital Life' program has focused on providing affordable 4G data and voice services, significantly increasing internet penetration and enabling access to education, telemedicine, and government services. Reliance Jio's introduction of low-cost data plans has been transformative in making mobile internet accessible across India, especially for educational purposes. Since its launch, Jio's aggressive pricing strategies have made high-speed internet affordable, dramatically increasing internet penetration. Furthermore, the company's 'JioGigaFiber' initiative aims to bring high-speed broadband to homes in smaller towns and rural communities, enhancing digital connectivity in previously underserved regions. These efforts are part of Reliance Jio's mission to ensure widespread digital inclusion.

Vodafone Idea has launched several initiatives aimed at reducing the digital divide across India, especially in rural and underserved regions. Its 'GIGAnet' initiative focuses on expanding 4G network coverage and enhancing data speed, ensuring that more people in remote areas have access to reliable internet.

Telecom Addressing Digital Literacy

Telecom companies in India are making significant strides in promoting digital literacy, especially in rural and underserved areas, through various targeted initiatives. Bharti Airtel's 'Mera Pehla Smartphone' offers low-cost smartphones bundled with affordable data plans, helping first-time internet users get online. Reliance Jio's 'JioPhone' initiative delivers affordable, 4G-enabled phones to first-time internet users, and its 'Jio Digital Life' program makes digital content and educational resources accessible, helping millions gain essential digital skills. Vodafone Idea's 'Jaadu Ginni Ka' promotes digital financial literacy, and 'Vodafone Idea Learning,' alongside Vodafone, supports digital learning for school children in rural regions.

Other telecom players like BSNL and MTNL are contributing through collaborations with government initiatives like Digital India and the

National Digital Literacy Mission (NDLM), providing affordable internet and training in rural areas. BSNL's digital literacy centers and MTNL's outreach programs aim to train low-income communities in accessing digital services and e-governance. Collectively, these efforts are driving digital inclusion and fostering a more digitally literate society across India.

Private and Public Sectors at the Forefront of Digital Literacy

India has made significant progress in digital literacy through a variety of government and private sector initiatives. The Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) and the National Digital Literacy Mission (NDLM) are key government programs aiming to train millions in rural areas with essential digital skills, including internet use, e-governance services, and digital payments. Similarly, corporate initiatives like Intel's 'Unnati Program,' Microsoft's 'Project Sangam,' and Dell's 'Aarambh' are expanding digital literacy in rural and educational sectors, offering training and access to technology that fosters digital inclusion.

Private sector efforts have also been instrumental in targeting specific communities. Google's 'Internet Saathi' focuses on empowering rural women with internet skills, while the Common Service Centers (CSCs) under the Digital India campaign serve as rural digital hubs, offering training and access to online services. The Infosys Foundation and NABARD's 'eShakti' initiative are also working to increase digital literacy and financial inclusion in economically weaker sections of society.

The Digital India initiative, launched by the Indian government, aims to transform the country into a digitally empowered society and knowledge economy. One of its key components is BharatNet, which is among the largest rural telecom infrastructure projects globally. BharatNet's objective is to provide high-speed broadband connectivity to around 2.5 lakh Gram Panchayats (village councils), enabling the delivery of services like e-health, e-education, and e-governance to remote and rural areas.

BharatNet is being implemented in multiple phases, with Phase I completed in December 2017, connecting over 1 lakh Gram Panchayats. Phase II, which began in 2017, employs a variety of models, including state-led, private sector, and CPSU models, to extend connectivity further into rural India. As of October 2024, BharatNet has connected 2,14,065 Gram Panchayats, laid over 6.9 lakh kilometers of optical fiber, and installed over 1 lakh Wi-Fi hotspots to ensure last-mile connectivity. This ambitious project, alongside Digital India's broader goals, is helping to empower rural communities with access to information and services.

Alongside this, Bharti Airtel has been awarded the cloud and content delivery network (CDN) mandate for the DIKSHA (Digital Infrastructure for Knowledge Sharing) initiative, which is part of the Digital India Corporation's efforts to promote open education. The DIKSHA platform offers digital educational content to students and teachers across India, supporting school curricula with high-quality resources available online. Airtel's robust cloud infrastructure and CDN services will ensure efficient and seamless delivery of educational content, enhancing the accessibility and reach of e-learning to rural and urban areas alike.

Challenges in Promoting Digital Literacy

According to the India Internet Report 2023 by Nielsen, rural India has surpassed urban regions in internet usage, boasting over 425 million internet users—44% more than urban India, which had approximately 295 million regular internet users. This striking contrast highlights the growing digital penetration in less populated areas, driven by advancements in infrastructure and government initiatives aimed at bridging the digital divide. Rural India, traditionally characterized by limited access to technology, has seen a rapid 30% growth in internet adoption, with nearly half of its population now online. This upward trajectory suggests that there is still substantial potential for further expansion in rural internet usage, as large portions of the population remain untapped.



In comparison, urban India, while having a smaller user base in absolute numbers, continues to maintain robust internet activity with a more saturated market. The government's definition of rural areas—regions with a population of fewer than 5,000 people and a population density of under 400 per square kilometer—underlines the challenge of expanding internet services in these sparsely populated areas. Yet, as of December 2022, India as a whole had reached 720 million internet users, showcasing the nation's significant progress toward digital connectivity.

However, despite the growing internet penetration, infrastructure limitations remain a key issue. Poor network coverage, inconsistent electricity supply, and lack of digital literacy hinder widespread internet adoption. The sparse population in rural areas, coupled with economic constraints, also makes it less commercially viable for telecom companies to invest in robust infrastructure. Many rural users still rely on basic mobile

phones with limited data access, which restricts their ability to fully benefit from digital services.

Urban India, on the other hand, faces the issue of digital saturation. While a significant portion of the urban population is online, access remains uneven, with disparities based on socioeconomic status. Although internet infrastructure in cities is generally more developed, issues such as affordability, data privacy concerns, and cybercrime are growing challenges. Moreover, urban areas are grappling with the digital divide within communities, where lower-income households may have limited access to high-speed internet and digital tools, further widening the gap in digital literacy and opportunities.

In both regions, despite the overall growth in internet users, the challenge remains in ensuring that everyone has equal access to reliable, affordable, and secure internet services. Addressing these issues will be crucial to leverage the full potential of India's growing digital ecosystem. **TR**



The Emergence of Holographic Communication in Asia-Pacific Telecommunications

The rise of holographic communication can be attributed to several technological advancements, including the development of 5G and upcoming 6G networks, edge computing, and artificial intelligence (AI). These technologies provide the necessary bandwidth, low latency, and computational power to enable real-time holographic transmissions.

The Asia-Pacific (APAC) countries, particularly China, Japan, South Korea, and Singapore, are leading the development and adoption of holographic communication. These nations have already invested heavily in 5G infrastructure, a critical component in enabling the high-speed, low-latency requirements for hologram technology. As 6G research progresses, APAC telecom companies are well-positioned to continue this momentum, further accelerating the adoption of holographic communication across the region.

Regional Strides in Holographic Communication

China, in particular, has been at the forefront of this development. With its strong commitment to 5G and AI,

China has made significant strides in holographic communication. The country is rapidly advancing its holographic research and development, driven by strong collaboration between the International Hologram Manufacturers Association (IHMA) and the regional Security Identification Union (SIU). The holographic market in China is vast, with UnionPay alone using 500 million holograms annually, valued at USD 55 million.

The SIU is playing a key role in promoting holographic technology across China, emphasizing its benefits for brand authentication, anti-counterfeiting, and product enhancement, especially in sectors like currency, tobacco, pharmaceuticals, and secured documents. By increasing local awareness and attracting more Chinese members to the IHMA, the SIU is helping integrate China's holographic

industry into the global market, fostering cross-border trade and technological advancements. The SIU's deep local knowledge, combined with the IHMA's expertise, is expected to spur further growth and development in China's holographic sector, unlocking new opportunities for innovation.

Japan and South Korea have also been key players in the region's holographic communication initiatives. Both countries have well-established 5G networks and are placing a strong focus on futuristic 6G deployment. These infrastructures provide a foundation for experiments with holographic services in both business and consumer markets.

South Korea, for example, is making significant strides in holographic research and development (R&D), focusing on advanced hologram technologies that project fully three-dimensional images into the air. This technology has evolved beyond traditional 3D displays, now enabling users to touch and interact with holographic images. The number of patented applications for hologram technologies in Korea has surged, with 343 cases filed between 2012 and 2016, a substantial increase from earlier years. Korean companies are now leading the charge in developing innovations such as floating, plasma, and haptic holograms.

Notably, Samsung has developed a haptic hologram that allows users to feel and interact with virtual objects, a breakthrough with potential applications across industries like architecture, education, healthcare, and gaming. The Korean government is actively supporting the expansion of this sector, aiming to tap into future markets through continued research and patent acquisitions.

Meanwhile, Japan is advancing rapidly in the development of medical holography, a field that is poised for significant growth in the healthcare sector. With applications in areas such as holographic microscopy, medical education, biomedical research, and medical imaging, Japan is leveraging holographic technology to transform

diagnostics, treatment planning, and education. Holographic microscopy is enhancing cellular imaging in labs, while medical education is benefiting from immersive, interactive learning experiences.

Biomedical research uses holography to provide detailed, three-dimensional views of biological structures, offering deeper insights into complex phenomena. Additionally, Japan's advancements in non-invasive, high-resolution holographic medical imaging are improving diagnostic capabilities and surgical planning, contributing to the country's leadership in medical holography innovation.

Operator Strides in Holographic Communication

Holographic communication is gaining traction in the APAC region, driven by collaborations between telecom giants and tech innovators.

China leads the way with companies like China Unicom and Huawei showcasing 5G-enabled holographic calls, while firms like WIMI Hologram Cloud are pioneering holographic solutions, including holographic AR automotive application, 3D holographic pulse LiDAR technology, holographic vision semiconductor technology, holographic software development, holographic AR advertising technology, holographic AR entertainment technology, holographic ARSDK payment, interactive holographic communication and other holographic AR technologies.

Japan is also making strides, with NTT DOCOMO collaborating with Magic Leap to pioneer immersive communication technologies.

South Korea has been a significant player, with SK Telecom demonstrating the practicality of 5G holographic calls for real-time interactions, and KT Corporation leveraging holographic technology for immersive entertainment experiences like virtual concerts.

Singtel's collaboration with Azure Public MEC exemplifies the emergence of holographic communication in health. Together, the entities have enabled high-resolution 3D holograms for real-

time medical analysis in the National University Health System, enhancing surgeries and research with immersive visualization tools.

Similarly, AIS Fibre's trial of ultra-fast broadband supports the growing demand for low-latency applications like hologram calls and virtual reality, while China Unicom and NetDragon are transforming education with 5G-enabled holographic classrooms, creating interactive learning environments.

Technological Advancements Driving Holographic Communication

Several technological advancements have been crucial in the development of holographic communication. One of the most significant drivers is the ongoing deployment of 5G networks, which offer ultra-low latency, high-speed data transfer, and enhanced reliability. These attributes are critical for transmitting high-quality holograms in real-time without significant delays or interruptions. Notably, AIS is testing broadband speeds of up to 25 Gbps, which would allow seamless holographic communication and applications like hologram calls in the mainstream.

Moreover, research into 6G networks, which are expected to support even faster speeds and greater data capacity, promises to take holographic communication to new levels of efficiency and accessibility.

Another essential component is edge computing, which allows data processing to occur closer to the user, reducing latency and improving the responsiveness of holographic applications. One company pioneering holographic edge computing is Vuzix Corporation, which has been exploring holographic communication and edge computing capabilities by enabling real-time data processing and transmission through their wearable devices. Vuzix smart glasses, like the Vuzix Blade and M4000, utilize edge computing to enhance AR experiences, allowing users to interact with holographic projections in real-time without relying heavily on cloud-based processing.

AI and machine learning (ML) also play an important role, enabling the creation


of more sophisticated and realistic holograms. AI can help to compress the vast amounts of data needed to generate high-quality holograms, making the technology more feasible for widespread use. SenseTime, a leading AI company in China, is applying its computer vision and AI technologies to holographic displays for business communication.

The Future of Holographic Communication in APAC

As the technology matures and the necessary infrastructure is put in place, holographic communication is likely to become a mainstream component of the telecom industry in APAC. The region's strong commitment to 5G and 6G development, coupled with advancements in AI and edge computing, ensures that APAC will play a leading role in this transformation.

Several pioneering research papers are exploring the development of future holographic communication technologies. One notable study explored "Holographic MIMO Surfaces for 6G Wireless Networks: Opportunities, Challenges, and Trends" and was conducted by Huang Chongwen from Zhejiang University, Sha Hu from Huawei Sweden, and others. The study explored the integration of holographic communication within 6G networks, addressing challenges related to bandwidth, latency, and edge computing.

Research published by the ITU entitled, "Holographic-Type Communication: A New Challenge for the Next Decade" outlined a framework for deploying these technologies in urban environments, focusing on scalability and data privacy, while also dissecting holographic telepresence in the coming decade.

In the coming years, we can expect to see holographic communication applications expanding across various sectors, from healthcare and education to entertainment and business. As more countries in the region adopt the necessary infrastructure, holography has the potential to bridge geographical distances, enhance communication, and create new economic opportunities across APAC. 



How Singapore's APIs Hold the Key to Asia's 5G Telecom Potential

APIs serve as the bridge between various software systems, enabling real-time communication, seamless integration, and enhanced functionalities. In the context of telecommunications, they are becoming indispensable for driving new services, improving security, and supporting the rapid deployment of 5G technologies.

Singapore's telecom giants are harnessing the power of APIs to build a more connected and secure digital ecosystem that could set the benchmark for other Asian markets.

The Role of APIs in 5G Innovation

Singapore's approach to APIs aligns with global trends in the telecommunications industry, where APIs are critical for unlocking the potential of 5G. Telecom APIs allow service providers to create a

more dynamic and flexible network infrastructure. Through APIs, operators can offer services like real-time data access, authentication, and location tracking, which are critical for industries such as finance, e-commerce, and smart city development.

In collaboration with Bridge Alliance, a consortium of 34 mobile operators across the Asia Pacific, Singtel has developed the Bridge Alliance API Exchange (BAEx). This initiative uses Singtel's Paragon platform to streamline the deployment of new services, providing a unified API

network that allows for seamless integration across multiple operators.

The Paragon platform not only simplifies the process of launching new services but also enhances the ability of enterprises to access and utilize real-time telecom network data across the region. This is particularly beneficial for fast-tracking innovations in fintech and Over-the-Top (OTT) services, which require robust, scalable, and secure telecom solutions.

The BAEx represents the first international federation of telco APIs,

involving operators from Singapore, Thailand, and Malaysia. This cross-border collaboration is set to accelerate the rollout of 5G applications across Asia, supporting enterprises that operate regionally by offering them high-quality, consistent connectivity. By providing a common interface for multiple telco networks, the BAE significantly reduces complexity for businesses that would otherwise have to navigate varying API standards and telecom infrastructures in each country.

Enhancing Security and Fraud Prevention with APIs

One of the most significant ways that APIs are transforming the telecom landscape is in the area of security and fraud prevention. With digital fraud on the rise, telecom companies are leveraging APIs to create more secure networks that protect consumers and businesses from emerging threats.

Singtel's SingVerify, built on the GSMA's Open Gateway framework, is prime proof of how APIs are being used to enhance fraud detection and prevention. SingVerify uses the Number Verify API to check digital identities against telecom data in real-time, offering a seamless and secure authentication process for online services such as banking and e-commerce platforms. Phishing scams, one of the most prevalent forms of fraud in the region, can be mitigated by such API-based solutions, which provide more accurate and timely verification processes. With scam cases in Singapore rising by 49.6% in 2023 alone, the importance of robust API-driven fraud prevention systems cannot be overstated.

Singtel's partnership with M1 further amplifies this effort. The two telecom operators have agreed to federate a suite of APIs focused on authentication and fraud detection. This collaboration will enable enterprises to access vital network data for real-time fraud prevention, helping safeguard both businesses and consumers from digital threats. The use of APIs for fraud prevention is becoming increasingly common across Asia, with many telecom providers looking to implement similar solutions as part of their 5G deployments.

Accelerating Innovation Through Standardization

The adoption of APIs is also central to the standardization of telecom services across the region. With 5G poised to be a game-changer in industries ranging from healthcare to transportation, having a standardized API framework is essential for ensuring interoperability between different telecom networks and service providers.

The GSMA's Open Gateway initiative, which Singtel and M1 are both part of, aims to create a common API framework that telecom providers can use to develop and deploy new services. This is particularly important for industries such as smart cities and IoT, where devices and networks need to communicate seamlessly across different platforms and regions. Standardized APIs also reduce the time and cost involved in launching new services, allowing businesses to bring their innovations to market more quickly.

Singapore's Leadership in the Telecom API Market

Singapore's commitment to telecom API development is reflected in its rapid market growth. The Singapore telecom API market is expected to reach USD 7.12 billion by 2028, driven by its Smart Nation initiative, which prioritizes infrastructure investments in digital technologies. Telecom APIs provide the flexibility, stability, and scalability necessary for supporting the country's growing digital economy.

Singapore is driving innovation across sectors through its leadership in API integration, particularly within 5G, smart cities, and digital transformation. APIX, an open platform created by the Monetary Authority of Singapore (MAS), allows financial institutions and fintechs to collaborate and test APIs, while the 5G Innovation Programme supports companies developing applications in areas like smart manufacturing and urban mobility, with a focus on API-centric solutions.

Singaporean telecom operators like Singtel and StarHub have embraced APIs to enhance their 5G services. Singtel's Multi-access Edge Computing

(MEC) platform uses APIs for low-latency cloud services, while StarHub's 5G IoT platform connects thousands of IoT devices across various industries.

Additionally, Singapore's Smart Nation initiative integrates APIs to enable seamless data sharing across government systems, supporting services like traffic management and healthcare. These developments solidify Singapore's position as a leader in API innovation, setting a benchmark for other countries in Asia.

As Singapore continues to lead Asia in telecom innovation, its embrace of APIs is laying the groundwork for a more connected and secure future. With 5G poised to revolutionize industries across the region, APIs will remain a key enabler of this transformation, offering new opportunities for businesses and consumers alike. By focusing on security, standardization, and cross-border collaboration, Singapore's telecom giants are ensuring that the country remains at the forefront of Asia's 5G revolution. **TR**



Singapore telecom API market is expected to reach USD 7.12 billion by 2028, driven by its Smart Nation initiative, which prioritizes infrastructure investments in digital technologies



— 2025 —

Asia Tech x Singapore

Asia Tech x Singapore (ATxSG), organized by IMDA and Informa Tech with support from the Singapore Tourism Board, is an Asia tech event featuring two main segments: ATxSummit and ATxEnterprise.

Place: Capella, Singapore



27
-
29

MAY

MWC Shanghai

An international event connecting global operators, vendors, and the Chinese connectivity ecosystem, fostering collaboration and business growth.

Place: SNIEC, Shanghai, China



18
-
20

JUNE

Latest updates on:
www.telecomreviewasia.com

**WATCH THE ICT CONTENT
ON THE ONLY TV WEBSITE**
WWW.TELECOMREVIEW.TV



Visit **telecomreview.tv** and get enlightened about the latest news, trends, services, projects and plans in the ICT industry, featuring fundamental interviews with esteemed leaders in the telecom and ICT sector.

Leading Global ICT Media Platforms

Middle East



Arabia



Africa



Americas



Asia



Europe

