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Security in the 5G World

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SHUBHENDU
PARTH

[OPENING NOTE]

Policy roadblocks hindering the growth of satellite-based IoT

India has seen some interesting use of satellite-based IoT in recent years – from remote sensing to precision agriculture, smart cities, and disaster management. The government is planning to use satellite-based IoT for monitoring and managing natural resources, such as forests and water bodies. Plans are also underway to use satellite-based IoT for monitoring and analysing environmental data, including air and water quality, weather patterns, and natural disasters like wildfires.

The industry is exploring its potential to track the location and movement of livestock in remote areas. This will help farmers improve their operations and reduce losses due to predation. It has also been put in use for maritime surveillance to track ships, cargo and fisheries, and monitor illegal activities such as piracy, smuggling, and fishing. Further, to enable satellite-based IoT services, the Government of India is supporting ISRO and BSNL in their endeavour and encouraging the private sector to develop and launch their own IoT satellites.

In 2019 ISRO launched the GSAT-29 satellite, which includes a Ka-band high throughput satellite payload for providing broadband connectivity to remote and rural areas. It also launched GSAT-30 in 2020 to provide continuity to operational services on some of the in-orbit satellites. ISRO has launched GSAT-6A and GSAT-6B satellites designed specifically for IoT applications. These are equipped with high-speed data transfer capabilities and machine-to-machine communication technologies. It has also been working on developing IoT technologies such as miniaturised sensors and actuators, which can be used for a wide range of applications.

So why has the technology not taken off and what is holding back India from rolling it on a scale?

While experts may point finger at the high cost, the limited coverage and the lack of standardisation and skilled professionals, the country's legal and regulatory frameworks are holding India back from harnessing its full benefits. The Indian Telegraph Act of 1885, for example, does not fully account for the unique characteristics and challenges of satellite IoT. Likewise, the Indian Wireless Telegraphy Act of 1933 that governs the use of radio frequencies does not provide a clear framework for allocating and using spectrum for satellite IoT.

Similarly, the Space Activities Act of 2017 that regulates the use of outer space and the launching of satellites does not address specific issues related to satellite IoT, such as the use of small satellites for IoT applications, or the need for secure and reliable communication links between satellites and ground stations. Also, the IT Act 2000 which deals with the legal aspects of e-commerce, e-governance, and cybercrime does not fully cover secure communication links between satellites and ground stations, or the use of small satellites for IoT applications.

For satellite-based IoT to truly take off in India, the country needs to quickly revise and update these laws and regulations, keeping in view the digital-era mindset, user behaviour, and challenges.

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SUNIL GOPINATH

FUELLING THE ENTERPRISE GROWTH

As hyper-globalisation ushers in an era of innovation and competition, connectivity and communication will continue to hold the key

The new year 2023 stands to be an exhilarating time for innovation across networking and connective technologies, with the new year expected to herald historic usage of direct-to-direct machine communication. As technology is a key driver of international growth and social empowerment, 2023 will witness a widespread proliferation of connectivity as business and consumer behaviours increasingly prefer digital or hybrid-led interactions.

Given that the demand for anywhere, anytime applications will likely dominate with online-first Gen-Z populations creating unprecedented data volumes and subsequently propelling demand for serverless value propositions, organisations can unleash untapped business potential through network transformation. The communication technologies that will empower the companies of tomorrow will be defined by their ability to deliver added bandwidth, develop new applications for current capabilities and promote continuous innovation across industries.

During the year, 5G technology will become essential for delivering superior customer experiences and securing viable, long-term market share. With the ever-expanding Internet of Things (IoT), 5G mobile technology reduces digital barriers by allowing different network protocols to seamlessly unify while meeting the needs of specific applications, across a wide spectrum of devices. As regulatory approval for 5G technologies is likely to see a sustained upward trajectory in 2023, its adoption will be fuelled by greater accessibility and its capability to manage mass data flows efficiently.

ENTERPRISES TO FUEL 5G GROWTH

Businesses in the Asia-Pacific region are predicted to give an impetus to enterprise-wide 5G deployment to offer stakeholders improved reliability, security and reach across geographies. By delivering additional speed and bandwidth, 5G becomes more scalable and predictable than the latest 4G and Wi-Fi networks; it is expected to have the maximum impact in precision engineering-focussed sectors like manufacturing.

Notably, 5G technologies encourage the development of Artificial Intelligence, Machine Learning, and Robotic Process Automation which can run flawlessly on the network. For example, 5G enables seamless remote-control use of robots over a wide range, allowing companies to maximise the gain from automation when dealing with staff shortages or when responsibility is diffused across flat hierarchies. It also has the biggest capability to revolutionise healthtech and telemedicine with robot-assisted surgical procedures that assure effective resource utilisation, procedure standardisation and reduced operational costs.

With the democratisation of 5G, organisations can undertake digital transformation to capitalise on improved connection reliability and performance. Critically, in 2023 the major obstacle to 5G adoption remains the significant capital expenditure required for the development of specialised, multi-device friendly hardware, and the length it takes to see a real return on investment. As a result, the year will also see organisations increasingly seek tools that facilitate network transformation.

EDGE MOVES TO THE CENTRE

The business sector will also see a rise in edge computing, a distributed computing paradigm that bridges the gap between data, devices, and end-users. It involves placing computing resources at the edge of an existing network,

> A major obstacle to 5G adoption is the significant capital expenditure required for the development of specialised, multi-device-friendly hardware.

thereby simultaneously reducing the latency of processing data while improving the efficiency of transmission.

Edge computing is particularly useful for IoT applications, where devices are often engaged with networks through low-bandwidth, intermittent connections or from inaccessible locations. Not only does this help companies effectively analyse relevant data at low costs, but edge computing is also significantly advantageous to both operators and enterprises as it eliminates backhaul traffic to centralised repositories.

With a majority of organisations using multiple cloud servers, it also supports high-computing requirements like real-time decision-making with agility and speed. However, to effectively embed edge computing into your business model, it is essential to consistently monitor and observe data from multiple telemetry sources to anticipate anomalies, disruptions, or possible concerns in the consumer experience.

Armed with the ability to pre-empt issues before they occur, companies can provide quality digital interactions to clients, enhance company-wide digital proficiencies and nurture relationships between departments and network engineers. Moreover, by preventing time loss on debugging or trying to localise errors, people are empowered to focus on meaningful innovation and explore novel applications of advanced analytics that can breed sophisticated self-operating networks.

SECURITY AND METAVERSE

Critically, 2023 will also see a rise in cyberthreats and attacks, with protecting sensitive information and infrastructure becoming paramount. As a result, software-based management of wide area networks will be critical to defending communication and connectivity platforms. This technology supports in-house data centres and SaaS and IaaS applications; IT teams can enhance each user's and device's security regardless of their physical location. Additionally, network administrators can allocate more bandwidth to business-critical applications without compromising data privacy as network integrity is at the forefront of usage.

In 2023, the metaverse and its associated technologies such as augmented reality, virtual reality and experience reality will see rapid advancements in development, reminiscent of the smartphone revolution of the 2010s.

Primarily, the metaverse has dual-ecosystem priorities, catering to industrial efficiency through replicated workplaces and consumer metaverses for unparalleled experience marketing. With virtual and extended reality gaining greater market interest, the metaverse will be transformational in simulating physical experiences. For example, retailers can let shoppers try different outfits to see what looks best on them, architects and interior designers can bring blueprints to life with visualised seating plans, while manufacturers can capture data from mirrored realities to optimise process quality.

Poised to increase customer satisfaction and sales with personalised high-recall experiences; the metaverse can significantly aid visualisation-heavy sectors like media and defence to harness communication technologies for economic value delivery to global audiences. Additionally, the metaverse will be vastly influential in education as children can have access to a safe learning environment with quality standardised education. Hence, the social application of new-generation technologies is predicted to address digital divides and larger social inequality by reducing the exposure gap between the haves and have-nots.

Despite growing uncertainty and expected volatile market conditions in 2023, networking and communication will continue to pave the way for the digital transformation of tomorrow.

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LT GEN DR S P KOCHHAR

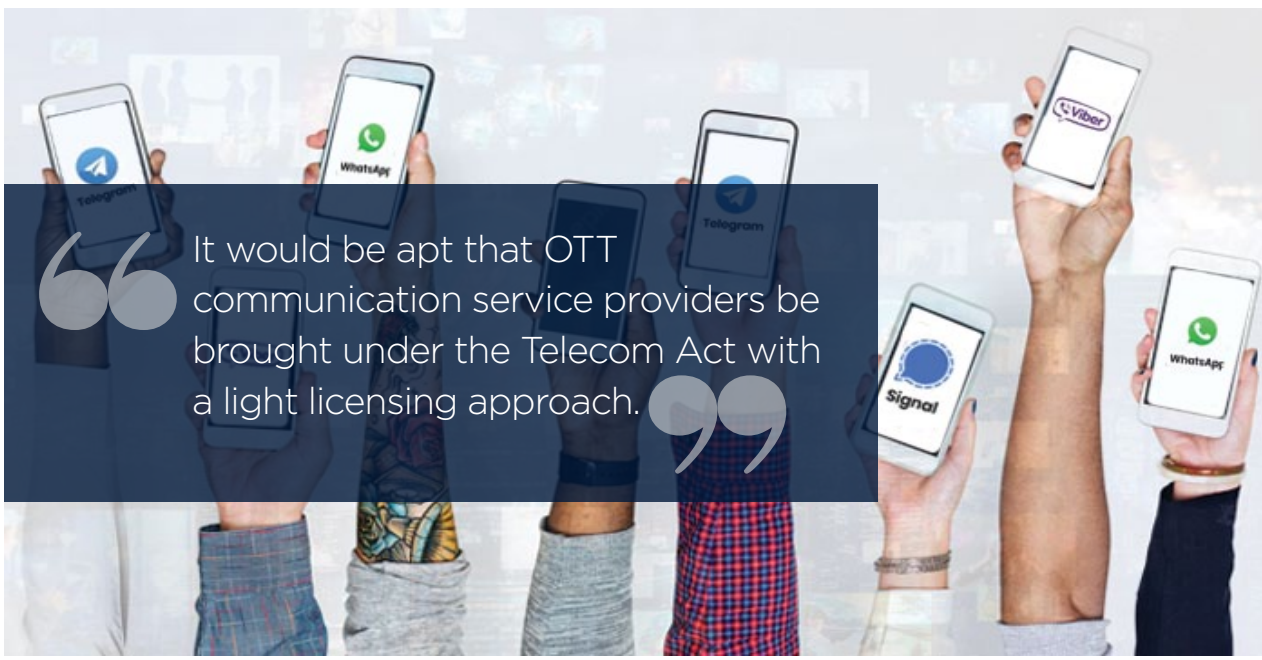
IT'S TIME FOR A FUTURE-READY REGULATORY REGIME

The government must adopt a light licensing approach to create a level playing field for all CSPs, including the OTT communication service providers

The convergence and advancement of technologies and innovations have given rise to new breeds of services and products in today's digital age. ICT, which was formed as a union of telecom and IT services, has now further evolved into ICTEC, comprising complicated components of ICT, electronics and cyber.

Commercial offerings and applications of ICTEC solutions are bringing in newer segments with products for consumers and citizens. OTT is one such example of application services being offered on the application layer of the OSI model. The policy and regulatory environment in the country also needs to be simultaneously prepared and evolve to aptly accommodate the influx of such innovations and services. That is one of the primary objectives of the draft Telecom Bill that the Government of India is bringing out.

A lot of effort is underway to implement simple unambiguous laws, policies, rules, and regulations that can last long-term and yet be responsive to the changing, but not fully predictable, requirements of the intervening period. A combination of clear strategically worded laws, that can last at least 10-20 years, is what we are seeing emerging in the telecom space. Efforts are on to supplement itwith administratively formulated rules that can be modified on earlier timelines, depending on the changing environment but within the terms of reference of the legislation it is supplementing.



> It would be apt that OTT communication service providers be brought under the Telecom Act with a light licensing approach.

> Besides cannibalising the services of the telecom operators, OTT platforms consume humongous bandwidth, which stresses the telcos' networks.

It is in this context that we must analyse the new "boys" on the block, like OTT, specifically communication services which are not broadcastbutare bi-directional or multi-directional as is the case with similar services provided by the TSPs. This comes within the telcos' demand for "similar service, similar rules".It would be only apt that they are brought under the Telecom Act with a light licensing approach, whereby the security and regulatory requirements of the nation and the sectorcan be taken care of.

FACTUAL POSITION

The argument that OTTs are governed by the IT Act and hence need not be governed by the Telecom Act, even for communication services, is misplaced as provisions of the IT Act, within its scope, are equally applicable to TSPs and OTTs.What is not articulated is that IT Act does not regulate communication services. If the rules must be skewed slightly, then they must tilt towards Indian companies based and operating out of India. As crystal gazing, I would like to believe that all laws impacting ICTEC components will eventually converge for policy, regulations, and organisations.

It is also important that we do not overlook the critical aspect of security, both for the nation and law-abiding citizens. While there are adequate safeguards in the law to prevent perceived misuse or inconvenience to law-abiding citizens, the prevailing environment demands that the state must be empowered to deal with non-law-abiding personnel or inimical entities.

A normal law-abiding citizen should have no fear of such provisions in the trinity of Judiciary-Legislative-Executive formulation in a democracy. Doing a KYC, for example, is meant to identify a user and if required to hold him accountable for inimical activities. The privacy of an individual is not invaded as this is more of a forensic tool. A similar argument applies to lawful interception or keeping CDRs.

So why the clamour?

Are we as a nation so enamoured with financial earnings that we are willing to sacrifice national security for the purpose? No right-thinking Indian will buy this argument of subjugating national security to commercial activities that have even a 1% of probability of anti-national activity. The alarmingly rise in cases of fraud and scams on OTT platforms makes it imperative to focus on the security and privacy of the users.

OTTs adhering to the security requirements like KYC, as done by telcos, will help prevent and counter this menace effectively, as the culprits can be identified and traced fortaking appropriate legal action. The draft Telecom Bill aptly, provisions penalties and punishments for perpetrators of such unlawful activities via communication OTT platforms.

CONCERNS IN INDIA

It is globally known that besides cannibalising the services of the telecom operators, OTT platforms consume humongous bandwidth, which stresses the telcos' networks and necessitates their continuous and speedy upgradation and development. This is in addition to the fact that TSP networks are already overstretched due to the growing volume of mobile and fixed broadband traffic. The network also needs to be expanded continuously to cover the connectivity requirements across the country and cope with the exponential growth in usage. This expansion involves the deployment of the latest technologies for a better customer experience.

Interestingly, while telecom services are strictly monitored and regulated by TRAI to ensure a quality experience is delivered to the customers, OTTs can upgrade and downgrade their services since they have no QoS obligations. Therefore, it is only a reasonable ask that OTT players contribute towards the creation of the telecom network infrastructure in India.

It is also a factthat OTT platforms earn colossal revenues from advertisements based on data analytics and other monetising strategies of data collected from

> The alarmingly rise in cases of fraud and scams on OTT platforms makes it imperative to focus on the security and privacy of the users.

subscribers of its platforms. Besides, enterprise or business customers are charged a fee by OTT players for using their platform for business and commercial purposes. To attract more subscribers, OTTs offer their services "free"but earn huge profits by monetising the user data.

Ironically, most of the OTT platforms are owned and operated by large foreign entities and, hence, the data of Indian consumers resides on foreign shores and is monetised to improve the GDP of their basecountries. Since these platforms are not covered by the Telecom law, their revenues do not add up to India's economy or the telecom sector growth because there is no Indian taxation on these operations.

The TSPs, on the other hand, are Indian companies and their revenues are subject to Indian taxation, levies, fees and laws. They must incur huge Capex to set up, maintain and technologically refresh their networks. Apart from the telecom network (on land), Indian TSPs have invested heavily in laying undersea cables for setting up international network connectivity, while the OTTs ride free on these networks. Moreover, the huge subscriber data captured by TSPs as part of their operations, and stored in India, cannot by law be monetised. But OTTs do that at will.

What this means is that even TSPs and OTTs provide similar communication services in India under similar prevailing environments engineered over the same application layer of 7-layer OSI-based IP networks set up by TSPs. However, the rules are different for them, which puts TSPs and the country at a disadvantage. The new Telecom Bill aims to rectify this anomaly.

PLAUSIBLE SOLUTION

A practical approachwould be that OTT communication services pay a network usage charge to the TSPsfairly and equitably. This could be based on the actual measurable traffic carried by the OTTs on the TSP's network. This usage charge will contribute towards the development, maintenance and upgradation of the network infrastructure and can be mutually agreed upon by the TSPs and OTT players. In case a mutual agreement cannot be reached, an appropriate licencing and regulatory framework should be in place to govern the contribution of OTT players towards the creation of network infrastructure. This is somewhat similar to the way TRAI regulates SMS termination charges.

The revenue thus accrued by TSPswill count towards their AGR calculations. Hence, the OTTs will effectively be paying indirect dues based on AGR to the government through the TSPs, contributing to the Telecom Development Fund as proposed in the draft bill. This will benefit the citizens and the national economy.

At the same time,giventhe government's position that a supportive framework needs to be provided to nurture startups, MSMEs and small enterprises in the OTT ecosystem,such smaller players with low usage need not be required to pay the usage charge, to aid their growth. In this way, innovation and entrepreneurship would not get affected; the objective is certainly not to discourage OTT services. The proposal for a usage charge hasa simple objective to justly meet the funding requirements for creating a robust telecom infrastructure in India, increased revenue for the exchequer, and continued innovation.The fact that economies across the world are advocating the need for OTTsto contribute towards digital infrastructure development, hence, cannot be undermined.

India has set global precedents in taking forward-looking and prudent decisions in recent times. The rapid technological evolution that the country is witnessing may pose similar policy challenges in the future as newer services with more complex applications emerge. It is, therefore, desirable that appropriate provisions be made to ensure that the policy, regulatory, and security mandates of the nation are upheld in the emerging technological scenario.

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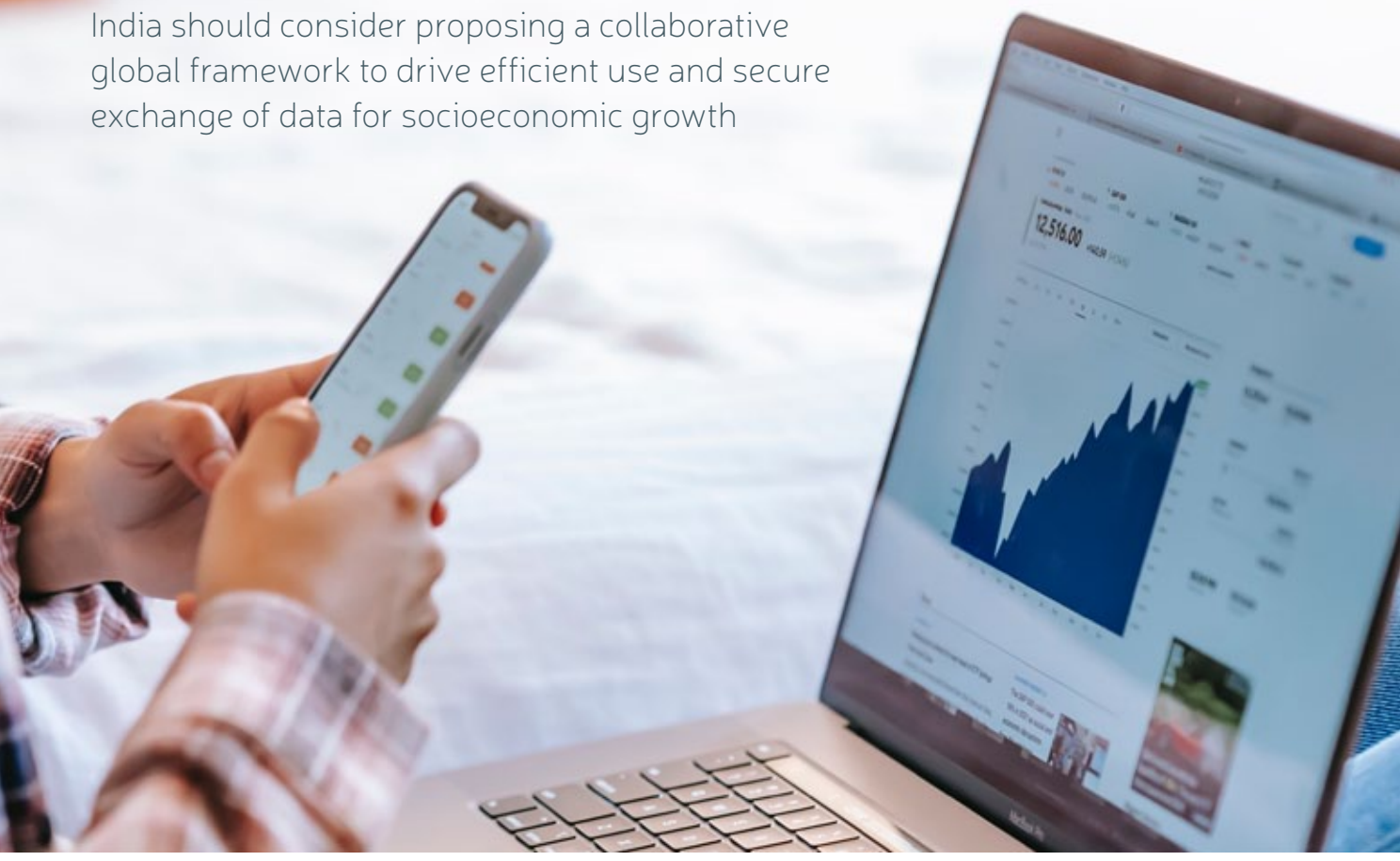
[COMMENTARY]
POLICY

Data for development @ G20

India should consider proposing a collaborative global framework to drive efficient use and secure exchange of data for socioeconomic growth



BY DEEPAK MAHESHWARI

The G20 presidency offers India a unique and strategic opportunity to set global agenda that is progressive, aspirational, and inclusive. Considering its success in using digital technologies for driving economic growth as well as advancing social equity, inclusion, and development India should consider proposing Data for Development (D4D) as one of the priority agendas or themes.

This is also a logical evolution of digital transformation, one of the three priority issues of the ensuing Indonesian presidency of G20. Moreover, synergistic diplomatic endeavours may find resonance as India will also assume leadership of both the United Nations Security Council (UNSC) and the Shanghai Cooperation Organisation (SCO) in quick succession to the commencement of the G20 Presidency.

> It is important that data can and must be used for development including the pursuit of social equity and inclusion, economic growth and sustainability.

> A governance framework for use of data must be developed and adopted by G20 members based on shared values, common understanding, and rule-based global order.

SETTING UP THE TONE

Organisations across sectors and domains are deploying digital technologies around the world. In the process, an enormous amount of data is generated, transmitted, processed and consumed. Traditionally the preserve of a few elite organisations and under the command of a few technical experts, data is being democratised.

Data types may vary but their usage is even more diverse. For example, businesses can use data for customised products, pricing and advertisements; civil society can use data to track progress and demand accountability; and, the governments can use it for identifying policy priorities and budget allocations as well as monitor and evaluate effectiveness and efficiency of various programmes and projects.

It is also important that data can and must be used for development including the pursuit of social equity and inclusion, economic growth and sustainability. At the same time, there are concerns about issues such as privacy, surveillance, competition, misrepresentation, and even exclusion. Hence, a conducive and consensus governance framework must be developed, adopted and deployed by G20 members based on shared values and common understanding as well as rule-based global order.

The Digital India programme has been instrumental in driving the data revolution in the country, with one of the lowest mobile data rates and the highest data consumption globally. In addition to the policy frameworks for data sharing and accessibility, National Digital Communications Policy (NDCP), BharatNet, PM-WANI, Digital Empowerment and Protection Architecture (DEPA), Account Aggregators (AA), and Responsible Artificial Intelligence are also worth highlighting.

India can share its experience of the decadal census, national sample survey office (NSSO), National Family Health Survey (NFHS) as well as transformative programmes like Aadhaar, Unified Payments Interface (UPI), Electronic Transaction Aggregation and Analysis Layer (e-TAAL), CoWIN, Natural Language Processing (NLP), and the upcoming Open Network for Digital Commerce (ONDC).

DEFINING THE DATA

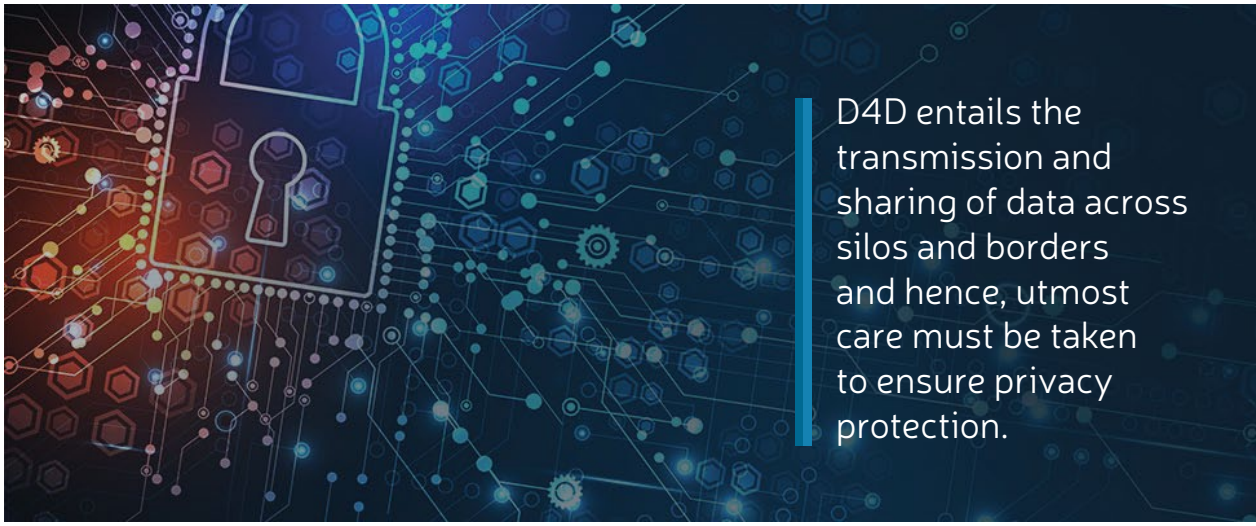
Data is an artefact to represent, observe, record, explain or convey information, describe quantity, quality, fact, statistics, other basic units of meaning, or simply sequences of symbols that may be further interpreted. Digital data is information that has been translated into a form amenable to electronic sensing, transmission, storage or processing.

Often referred to as the three Vs, the velocity, volume, and variety of data have been growing exponentially as it traverses within and across national boundaries. However, another two Vs – veracity and vitality – are equally, if not more important. Moreover, it is non-rivalrous in nature even as it is often compared to oil or gold, thanks to its underlying or potential value.

Data that directly or indirectly identify an individual is considered Personal Data (PD). Else, it is considered Non-personal Data (NPD). However, there are other ways to classify data as well. These include but are not limited to at-rest and in-transit data; on-the-edge and in-the-cloud data; encrypted and unencrypted data; structured and unstructured data.

It also includes low-frequency and high-frequency data; real-time and historical data; national and transnational data. Other classifications like physical and physiological data; public sector and private sector data; individual and community data; raw and processed data; and observed and synthetic data.

This mutually exclusive binary is useful in appreciating different aspects of data but the divisions at times blur. For example, interlinking multiple aggregated anonymised datasets that are traditionally regarded as non-personal data can re-identify individuals with up to 90% accuracy.



Hence, such classifications must be used with caution and context.

THE D4D POLICY FRAMEWORK

For any governmental initiative to take root and bear fruit, a framework defining the need and approach is critical. In addition to the generic principles of data protection such as accountability and transparency, the D4D policy framework must also include attributes like pervasiveness, privacy, security, public-private partnership, etc.

- **Pervasive:** The policy must facilitate universal, ubiquitous generation and use of data across all spheres of life. It should also ensure that vulnerable, marginalised or deprived individuals, communities or regions are not excluded, misrepresented or under-represented while also mitigating potential biases.

- **Productive:** It must incentivise and ensure affordable and participative access to data for legitimate purposes allowing innovations by one and all.

- **Privacy-preserving:** D4D inevitably entails the transmission and sharing of data across silos and borders. Hence, utmost care must be taken to ensure privacy protection throughout the data lifecycle, a fundamental right. The approach should include privacy by design. This should also apply even if the case of cross-border data flows through trusted mechanisms.

- **Protected:** Data must be protected against unauthorised access, use, sharing or interlinkages. Accordingly, suitable frameworks for cyber security must be adopted and data centres hosting critical data must be treated as Protected Systems.

- **Planned resilience:** Considering dependence on data for almost everything, data transmission and storage must be planned to ensure the resilience of the infrastructure and access, irrespective of natural disasters, accidents, sabotage or cuts in cable or power supply disruptions.

- **Participative:** The policy framework must be developed through an open, participative and inclusive consultation process allowing the participation of all the stakeholders.

- **Public-Private Partnerships:** The policy framework should facilitate and encourage voluntary partnerships across the public sector, private sector and civil society.

- **Programme support:** Members need to discuss and decide frameworks around competition, cooperation and capacity building.

Going ahead, India must seize this opportunity to design, develop and deploy a cooperative, collaborative, and consistent global framework in the broader pursuit of Data for Development. G20 Presidency is a good place to seed the thought and build consensus even as the road ahead is not exactly straight.

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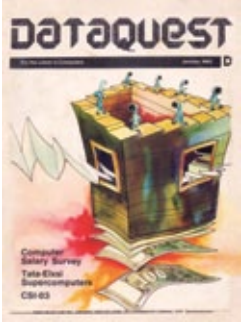

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- 1984 — The New Electronics Policy (NEP) unveiled in January 1984.
- 1986 — National Software Policy came to India
- 1991 — Liberalisation, National Telecom Policy, Internet came to India
- 2000 — India's exports of software services were just less than US $ 3 billion
- 2010 — Rise of Start-ups, Smartphones & Digital India
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- 2020 — New Education Policy, Covid came with UPI and e commerce Boom
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TECHNOLOGY TRENDS THAT WILL DRIVE BROADCASTING THIS DECADE

Remote production, direct-to-mobile, HbbTV, and ad-driven consumption are some of the technologies that are transforming the sector

Indians have an undeniable affinity for IT in general and, for online video content in particular. There is an explosion in the consumption of entertainment through smartphones and other mobile devices. While the traditional linear television market is steadily declining, the Indian media and entertainment industry, which is estimated to be valued between $2,729 billion in 2022 and an expected $5,565 billion by 2030, is being powerfully propelled by growth in OTT and gaming.

India is the world's fastest-growing OTT market and it looks like Indian consumers, both urban and rural, are ever hungry for more and more. With 800 million broadband connections, probably translating to about 500 million unique subscribers, India has tremendous headroom for growth and this can only raise online media consumption far higher.

Technology trends are powerfully shaping and driving the growth of broadcasting. The dividing line between mobile communication and broadcasting is blurring due to the onset of convergence. The future trends would be around the four pivotal points: remote broadcast, ad-driven consumption, direct-to-mobile, and data-driven personalised content.

The value of any content is driven by delivery to everyone, anywhere, anyhow, any day, and any time, be it linear, sound, metaverse, 3D, etc. Metaverse is a shared, online 3D space where users can interact with each other and with computer-generated objects and avatars. A virtual environment that interconnects the physical world to virtual worlds, the Internet, mixed reality, and emerging technologies. The world is on the verge of entering into the metaverse and experiencing it by being there as part of it.

TECHNOLOGY DRIVES THE CHANGE

With an increase in the adoption of newer Connected TVs (CTV), which can connect to the internet, advertisement-driven consumption is expected to rise. Developments in telecom are further enabling the introduction of broadcast technologies like Free Ad Supported TV (FAST) in the living room, a form of linear TV. Linear TV offers viewers

> With the help of reliable telecom infrastructure, sports events are being produced remotely using high-performance, high-throughput fibre links worldwide.

access to content via subscription to cable or satellite services or through over-the-air broadcasts. The OTT is also moving toward Advertisement-supported Video on Demand (AVOD). Providing targeted content and targeted advertisement, based on the analytics, will drive the targeted approach on all the sectors of broadcast, linear, FAST as well as OTT.

It is interesting to note the impact of OTT on the final FIFA match which had 11 million concurrent users and 32 million viewers. A mind-boggling 100 million users visited Jio Cinema during the period it streamed the World Cup matches. This indicates the future of sports viewership in India and the globe. Of the 1.12 billion global viewers, there were 884.37 million viewers on linear TV and 231.82 million on out-of-home/OTT and digital and smart TVs.

Digital Terrestrial Television (DTT) initially could not pick up in India as consumers already had DTH, PayTV, OTT, and IPTV. The adoption of the Advanced Television Systems Committee (ATSC 3.0), a standard for digital television transmission over terrestrial, cable, and satellite networks, is enabling linear television directly to mobile, thus reducing the load on the Content Delivery Networks (CDNs) and addressing scaling issue in case of high demand.

These technologies can be implemented using Low Power/Low Tower (LPLT) and single frequency networks (SFN). The mobile handset needs to cater to and receive these broadcast signals from the terrestrial transmission. Being a mobile-based deployment, the consumer would benefit from the linear broadcast as well as OTT on the same handset.

5G PAVES THE WAY

In view of emerging technologies, platforms and innovative products, customers have many choices to meet their preferences. To meet customer requirements, broadcasting services as well as OTT platforms have to continuously innovate. Further, consumers prefer hand-selected, customised, and human-curated information in this digital age.

With the evolution of market dynamics of global content access, there is a shift to a cloud-based content delivery model. AI- and Blockchain-based business models are coming up to address potential problems with security, payments, and maintaining digital rights.

5G broadcasting will change how events and programmes are captured, produced and transmitted to people around the world. With 5G broadcast, a transmitter serves an unlimited number of users without an Internet connection and further and without any loss of quality. 5G technology could help to broadcast to improve three key aspects of television production: having permanently connected cameras, being able to make multi-camera productions in the cloud (or on the edge), and implementing new forms of broadcasting that are capable of making an impact on new devices (smartphones, tablets) and enabling new forms of digital consumption.

Another enhancement in 5G, evolved Multimedia Broadcast Multicast Service (eMBMS) does not require a SIM card for reception, which means that it can deliver to devices other than smartphones or say tablets and laptops equipped for access to cellular services. This will be increasingly relevant in the 5G era with growth in cellular-based Fixed Wireless Access (FWA) services in more remote areas not served well, or at all, by fixed-line broadband options. Interestingly, in June 2022 the European Space Agency (ESAQ) signed a 5G Emerge agreement to work with the European Broadcasting Union (EBU) and move towards unified and ubiquitous connectivity by combining satellites with 5G networks.

The "Remote" production concept is changing the Broadcast world. With the help of reliable and robust telecom infrastructure, today even sports events are produced remotely using high-performance, high-throughput fibre links worldwide. Commentary is added by a commentator who is not on the ground. Interviews

> HbbTV, an industry standard for hybrid digital TV, is an initiative aimed to provide open standards for the delivery of advanced interactive TV services.

are done with a player on the ground whereas the host is in the air-conditioned soundproof studio; all perfectly synchronised and seamless even though it is "Live".

Remote production is further getting extended in the field with the use of highly portable "5G in a box" systems, while for broadcast there is an active debate between two alternative architectures, one enhancing the existing mobile infrastructure and the other imposing an overlay via the High Power/High Tower (HPHT) model. The HPHT model can also be seen in the context of longer-term convergence between legacy broadcast and mobile broadband services, especially since it moves closer to DTT infrastructure. Another open-source technology that is likely to change the rules of the game is AV1, as it has a better compression ratio, backed by major chip vendors like Intel, AMD, Broadcom and Arm.

From an Indian perspective, here are some of the perceptible trends that are noticed to enable free choice in customer viewing.

#1
DIRECT-TO-MOBILE TECHNOLOGY

This has been in the works since 2007 when the then-trending DVBT2 technology was piloted by Prasar Bharti. However, even as the technology evolved, the infrastructure costs became more and more prohibitive, with the result that the option was not pursued. With the transformation in technology from analogue to digital and the emergence of ATSC 3.0, technology change and reduction in infrastructure cost underwent a massive transformation.

In 2019, the homegrown Saankhya Labs developed the world's first chipset based on this technology which permitted separation of the communications and the broadcast payloads and permitted higher efficiencies of spectrum utilisation and better throughputs with better quality of service. The technology is based on the convergence of broadband and broadcast, using which smartphones will receive terrestrial digital TV and broadband communications concurrently This is called 'Direct-to-Mobile' (D2M) broadcasting and allows the broadcast of video and other multimedia content directly to mobile phones, without even an active Internet connection.

2
HYBRID BROADCAST BROADBAND TV

HbbTV is an initiative dedicated to providing open standards for the delivery of advanced interactive TV services. It is the industry standard for hybrid digital TV that helps harmonise the broadcast, Internet Protocol Television, and broadband delivery of entertainment to the end consumer through connected TVs and set-top boxes.

With the advent and proliferation of Smart TVs in India, viewing content – both through Linear TV and Streaming OTT platforms – is now possible on a single convergent Smart TV device. Rather than eliminating the need for linear TV, the emergence of non-linear platforms such as Hybrid TV is driving the need for hybrid networks.

#3
CONTENT AD REPLACEMENT TECHNOLOGY

It is a no-brainer that monetisation of content is of prime necessity. Content Ad Replacement Technology enables the advertiser to replace the content by placing Ads in a Live environment. It simply manages the rights of Live feeds and creates a seamless, customised replacement solution for non-licensed content, which is both relevant to the consumer and leads to high content retention.

A phenomenal growth in the broadcasting sector and paradigm shift in technologies entails appropriate changes in the regulatory framework through a light-touch regulation approach, enabling innovations and further growth.

The future of broadcasting is bright.

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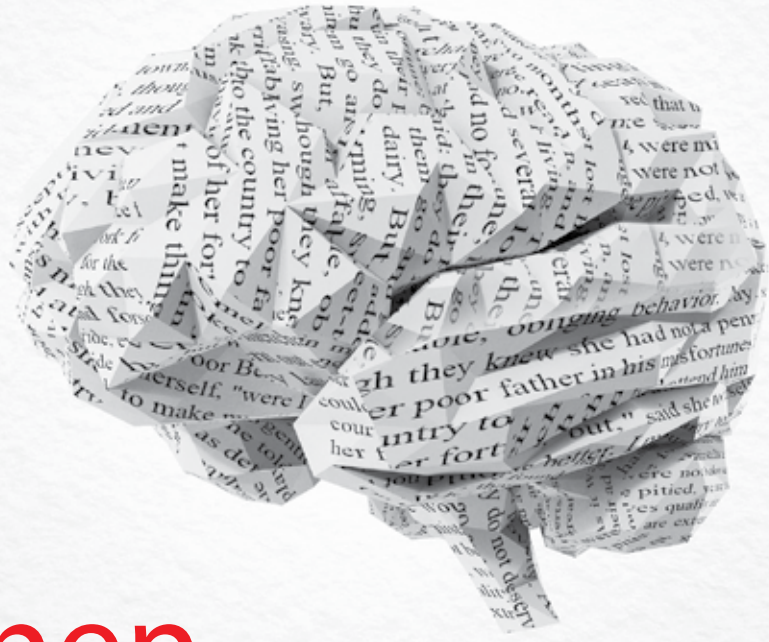
VOICE & DATA

CyberMedia



When print talks, the brain remembers.

That's the power of print. In addition to 70% higher recall, according to neuroscience research it's proven that print content is 21% easier to understand and more memorable than digital media. That is why, print content connects with our brain more efficiently and effectively. So, choose to read newspapers.

INS

THE INDIAN NEWSPAPER SOCIETY

Source: Study by TrueImpact (A Canadian neuromarketing firm)

Qualcomm unveils satellite-based mobile messaging solution

Making major headway in mobile messaging, Qualcomm Technologies has unveiled the world's first satellite-based two-way messaging solution for smartphones. The Snapdragon Satellite will provide global connectivity using mobile messaging from around the world, starting with devices based on the flagship Snapdragon 8 Gen 2 Mobile Platform.

Powered by Snapdragon 5G Modem-RF Systems and supported by the fully operational Iridium satellite constellation, the solution will enable OEMs and other service providers to offer truly global coverage. The solution for smartphones utilises Iridium's weather-resilient L-band spectrum for uplink and downlink.

"Kicking off in premium smartphones later this year, this new addition to our Snapdragon platform strongly positions us to enable satellite communication capabilities and service offerings across multiple device categories," said Durga Malladi, Senior Vice President and General Manager of cellular modems and infrastructure, Qualcomm Technologies.

Commenting on the launch and its applicability, Brad Trenkle, Vice President of Garmin's outdoor segment highlighted that it was an opportunity to expand satellite emergency response services to millions of new

smartphone users globally. "Garmin Response supports thousands of SOS incidents each year and has likely saved many lives in the process, and we are looking forward to collaborating with Qualcomm Technologies and Iridium to help people connect to emergency services," he said.

Beyond smartphones, Snapdragon Satellite can expand to other devices, including laptops, tablets, vehicles and IoT. "As the Snapdragon Satellite ecosystem grows, OEMs and app developers can differentiate and offer unique branded services taking advantage of satellite connectivity. It is also planned to support 5G Non-Terrestrial Networks (NTN), as and when NTN satellite infrastructure and constellations become available," the

Telstra and Ericsson trial Cloud RAN 5G data call

Telecommunications companies Telstra and Ericsson announced the trial of their first Ericsson Cloud RAN 5G data call on Telstra's commercial network in Queensland, Australia. The solution virtualises the RAN baseband as cloud-native network functions for the centralised unit (CU) and distributed unit (DU). The implementation employs an architecture in which both the CU and DU baseband functions are centralised.

By placing both the CU and DU functions at a central site such as a Telstra local exchange or data centre, Telstra will achieve efficient utilisation of compute resources leading to improved cost and capacity outcomes, an Ericsson press release stated.

The centralised Cloud RAN architecture deployed by Telstra is facilitated by the recently announced commercial network deployment of the packet fronthaul technology based on the Ericsson Router 6673. The packet fronthaul technology allows existing site radios to be connected to

the centralised Cloud RAN solution using enhanced CPRI, which places the radio information in an ethernet-based format that connects to cloud infrastructure running the Cloud RAN CU and DU baseband functions. The trial also deploys the Cloud RAN on Ericsson's Cloud Native Infrastructure Solution (CNIS), a bare metal infrastructure specifically optimised for hosting cloud-native 5G applications both at central data centres and at the edge.

Nokia, A1 Austria reach 2 Gbps download link data rates

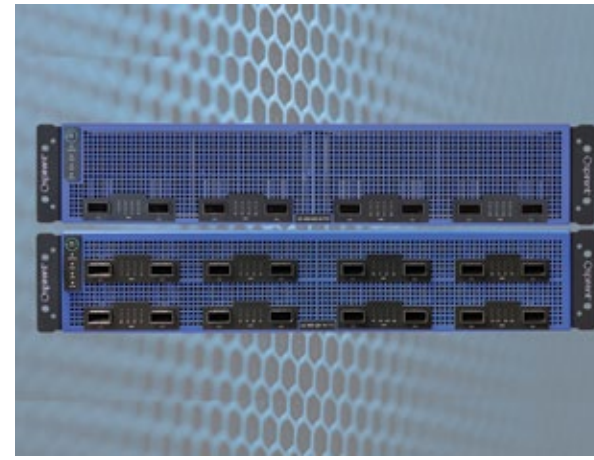
Nokia and A1 Austria have announced that they have successfully verified 3 Component Carrier Aggregation (3CC CA) in a 5G Standalone (SA) trial network in Austria, reaching data rates of 2 Gbps. CA allows mobile operators to reach higher throughputs and better coverage by combining different spectrum frequencies to efficiently utilise their spectrum assets. It will enable A1 to deliver a superior 5G experience to its subscribers.

The trial utilised Nokia's AirScale 5G baseband, a 5G smartphone, and a commercial 5G CPE over A1 Austria's 5G network. It successfully combined two mid-band carriers in the 3.5 GHz TDD band (n78) and one capacity carrier in the 2100 MHz FDD band (n1) for a total bandwidth of 160 MHz by using Carrier Aggregation technology. The peak downlink data rate achieved in the trial was 2 Gbps.

Many operators are relying on sub-6 GHz spectrum for 5G. The lower frequency bands provide the best coverage and the higher frequency bands typically enable higher throughput, whereas the mid-band frequencies provide a good combination of both. With Carrier Aggregation, A1 was able to increase the available bandwidth for mobile users by combining the power of its spectrum assets.

Carrier Aggregation can also be used in other scenarios, for example, to combine the low-band spectrum with the mid-band spectrum for an increased coverage range of the high downlink data rates. It is the key technology that allows mobile operators to make optimal use of their 5G spectrum without compromising on performance and customer experience. It can also help bring down the cost of deploying 5G networks.

Spirent launches platform for scale emulation and testing



Test and assurance solutions provider Spirent Communications has announced the availability of the new A2 400G Appliance to help accelerate the design and development of new-generation high-speed Ethernet devices. Optimised for system and scale testing the streamlined, pre-configured A2 400G Appliance is intended for market segments such as network equipment manufacturers (NEMs), service providers, enterprises, chipset vendors and government that need high-density 400G test capabilities to validate routers and switches.

"The Spirent A2 400G Appliance is a flexible platform with high-density 400G ports for mission-critical scale emulation and functional testing, such as throughput testing with traffic packet blasting, and proof of concept labs to emulate a real-world service provider customer network," the company stated in a press release. The next-generation 2U platform is available in 8-port and 16-port variants for high-density 400G testing and protocol scale emulation, such as high-density hardware interoperability testing and ASICS testing for chipset vendors.

"Spirent offers vendor-neutral Ethernet test solutions with support for various technologies," said the company's VP of cloud and IP product management Aniket Khosla. "This latest optimised solution is designed for customers looking to test key elements of the network under realistic conditions, either traffic or control plane, to accelerate time to market and meet business objectives with confidence," he added.


SHAPING TOMORROW
5G

There are trends adjacent to and beyond 5G that the communication industry is warming up to. Let us see how they will pan out in 2023

BY PRATIMA HARIGUNANI

We could have tried asking ChatGPT to tell us about the top five technology predictions for the telecom industry for 2023 or we could just flip the calendars of 2021 and 2022, and connect the dots ahead. These dots, when juxtaposed with the patterns that analysts and industry experts see, can help paint quite a picture of the year to come.

Of course, 2022 was all about 5G. This technology turning point dominated the airwaves a lot in the last few months. Everything, in a strange way, swings back to how great, serious, disrupting and imminent 5G is. But amidst all this noise, there is some Pink Noise too. Many technologies below the surface are brewing into something substantial. Along with the tectonic shifts made by 5G.

Going ahead players in the telecom sector have started paying attention to these still-nascent or fringe technologies already. They have to consider what else, along with 5G, is changing and emerging in their landscape. However, at times Telecommunication Service Providers (TSPs) and Communication Service Providers (CSPs) need to look beyond the core industry elements. Apart from core industry changes around 5G, network slicing, virtualisation, softwarisation, disaggregation, and decentralisation, many adjacent forces like Artificial Intelligence (AI), Robotics, Edge computing, Quantum technology, Blockchain, and sustainability can redefine the industry's opportunities and challenges.

Some of these trends have started emerging as a strong undercurrent. Many of them are still far into the horizon, while a few may directly disrupt the industry. Some of them may offer incremental change and will have to complement other trends for garnering deep impact. But one thing is for sure: a TSP or CSP that can crack the formula of using new technology with minimum chaos and optimum advantages can gain a lot of first-mover edge; in the current climate of razor-sharp competition and influx of rivals from other industries, that's something that a telecom player is in dire need of.

To get a clear understanding of the trend, the Voice&Data team also sought inputs from industry experts, created a master list of emerging and existing technologies and then filtered it based on the maturity, existing adoption status among CSPs and TSPs, their potential to impact 5G roll out, improve operational efficiency, and revenues. The trend report presents eight technologies that will directly influence the CSPs and TSPs and seven that will indirectly impact them.

Let's see what these predictions look like. When 2023 ends, maybe ChatGPT would tell us how good these predictions were. Or how completely unfamiliar 2024 would look. For now, let's take our best guess.

Eight technology trends that will directly affect TSPs and CSPs

#1

5G LAB-AS-A-SERVICE (LaaS)

When telecom operators adopt 5G potential and multi-vendor networks based on cloud-native technologies, they are juggling various imperatives. They have to support multiple frequency bands like sub-6 GHz, millimetre wave, and various deployment scenarios to realise multiple possibilities of 5G use cases for consumers, enterprises, and industry verticals. That's opening up the market for the 'a-a-S' alphabet soup in this area as well.

Like what we recently saw with NTT, HFCL, and some other players, 5G Lab-as-a-Service has been created to serve as an automated test environment where enterprises can try innovations from concept to reality. It is like a sandbox for rapid prototyping of 5G use cases. It can help to gauge unique plus-es and minus-es of this technology for different verticals like manufacturing, transportation, healthcare, and retail. With pre-integrated and pre-validated 5G solutions, TSPs can easily embrace the integration of complex multi-vendor, multi-technology systems as touted in many 5GLaaS brochures. They can gain more confidence as they co-create 5G solutions, services, and business models to build new 5G use cases and unlock the benefits of this technology.

The 5G LaaS model can strengthen this confidence by enabling testing of deployment and execution across various networks, connectivity types, bandwidth, and latency. This may help players to revisit and change their application architecture and also to reimagine their service solutions and network management. Players like L&T Technology Services, Nokia, Tech Mahindra, Capgemini, and Virtusa have a pony in this ring already. India's Union Minister for Communications, Electronics, and Information Technology Ashwini Vaishnaw recently said that the government was planning to set up 100 5G labs across the country.

#2

CCS AND 5G SA

CSPs are under a lot of pressure to create a monetisation roadmap to recover investments in 5G and charging systems may emerge as a crucial link in the chain. That's, maybe, why they are turning towards converged charging systems (CCS) which are 5G-ready and can monetise a broader range of services. Earlier reports predicted that vendor revenue from the entire telco charging market will grow from $1.21 billion in 2021 to $1.56 billion in 2026. It was explained that this growth will be driven entirely by

"Edge Computing helps service providers offer innovations, enhance customer services, and become a true digital value player in the Industry 4.0 era."

Anand Bhaskar, Managing Director - Service Provider Business, Cisco Systems, India & SAARC

the CCS, which is designed to converge the capabilities of online and offline charging functions.

A recurring theme in many corners of the industry conversations has been 5G Stand Alone or SA. This represents the full 5G infrastructure including the Radio Access Network (RAN) and Core, which is critical to unleashing the full capability of network slices to enable differentiated services catering for multiple user groups and applications sharing the same physical network. Experts point out that without SA, it will be difficult to launch new services, enable new use cases, or introduce more scalable, automated operating models. 5G SA can bring in aspects like higher throughput, greater capacity, the ability to leverage enhanced mobile broadband (eMBB), ultra-reliable low latency communications (URLLC), and massive machine-type communications (mMTC).

But SA depends highly on the ability for achieving disaggregation. It relies on an open standard network operating system whereby different functional components of networking equipment can be deployed individually and then combined in a modular, fit-for-purpose way, to suit the requirements of an operator's network.

#3

GREEN NETWORKS

It's a no-brainer that climate change is on everyone's mind in 2023. Especially for telcos with the kind of energy their networks, infrastructure and end-users consume. According to estimates, networks can consume more than 75% of all the electricity that a typical service provider uses in one year. According to GSMA's study 'A Blueprint for Green Networks', operators that delay their necessary full-scale energy-efficiency transformation or fail to embed energy efficiency as part of their network transformation will endanger their long-term competitiveness.

The study indicates that energy still makes up an average of 20%–40% of telecom Opex, and the transition to renewables and energy efficiency gains is expected to lower these numbers. This is why telecom players have started considering 5G SA core, cloudification, AI and automation capabilities, edge computing, vRAN and O-RAN, fibre to the home and more. A Nokia-Telefónica joint study illustrates that 5G networks are up to 90% more energy efficient than legacy 4G networks. Hence, going ahead telcos will be looking at all possible ways to reduce their carbon emissions.

Examples are already emerging to show that operators are putting real bucks into this responsibility. While Telefónica has tested a new liquid cooling system and Orange is trying to improve energy efficiency in their networks through passive cooling or solar power, Vodafone is reported to use renewable energy sources to power its operations in Europe. In Singapore, Singtel has joined hands with Ericsson to deploy the city-state's most energy-efficient radio cell. Similarly, Globe has deployed sodium nickel batteries for its core network sites and has minimized the need for frequent replacements.

#4

HYPER-SPECIALISATION AND CO-CREATION

As seen in some recent industry numbers from Omdia, there is a big pressure on telco revenues. While total worldwide telecoms revenue from mobile and fixed broadband services is expected to grow 14% between 2022 and 2027 to reach €1.2 trillion, the monthly ARPU combined across both mobile and fixed broadband is predicted to drop by 4.2%, from €7.48 in 2022 to €7.16 in 2027.

Looks like 5G is not going to be enough to offset the decline in ARPU as customers may not be willing to pay more for it. A McKinsey survey in Europe indicates that over two-thirds of customers are unwilling to pay more than five euros per month for ten-times-higher speed. Even markets with high fibre penetration such as France, Spain, and China are seeing a significant drop in ARPU as there is no clear path for monetising it. Just reselling the technology directly to customers is unlikely to work for the telcos. And merely investing in 5G won't take TSPs and CSPs very far. What will separate boys from men here is how well one can squeeze revenues and new markets out of these bucks.

A 2021 McKinsey reckoning underlines several models to monetise 5G in the B2C marketplace. For example, a business class plan that offers premium network conditions at all times. It would hinge a lot on the road that operators take, the technologies they invest in, and the partnerships they forge. This may help operators increase ARPU between 16-20%. Besides, upselling traditional portfolios with 5G speed can also help telcos increase ARPU by 3% to 6%. They can also start creating highly personalised and targeted offers, selling 'experiences' and not just connectivity, and pursuing B2B2C partnerships, with the potential to triple or even quadruple these gains.

#5

NETWORK SLICING AND SPECTRUM SHARING

The chance to chase new revenue models hinges a lot on how smartly can operators use their finite resources, the spectrum or networks. According to an assessment by McKinsey in 2021, there is a disparity between the capital expenditure and investments made by the telcos and the increase in their revenues from their services. The report points out that it could be due to technical limitations that have prevented operators from offering customers highly differentiated plans based on their divergent digital habits and needs.

This is where network slicing can change the game. It can allow telcos to shed the traditional one-size-fits-all model and differentiate among offerings that share physical infrastructure. A network slice is an independent end-to-end network that entails dedicated or shared resources capable of providing service quality. Slicing gives businesses and organisations the ability to customise networks tailored to meet specific requirements as per specific SLAs.

It would also give them the ability to charge customers more for parts, or slices, of a network that features premium performance. Telcos can also offer sophisticated 'speed tiering' instead of the erstwhile wireless industry's standard gigabyte-based 'data bucket'. RAN Research predicts that network slicing will accrue additional revenues of $16.1 billion by 2029, over and above what the infrastructures would have earned otherwise. But the shift will not begin until 2024 when there is a substantial base of 5G Standalone (SA) infrastructure to build on. Time to talk about 5G SA then.

"Blockchain is creating new business ideas, speeding up the process of verifying transactions, preventing fraud and cyber-attacks."

Pramod Sharda, CEO, IceWarp India & Middle East

#6

OPEN-SOURCE TELCOS

Declining revenues, rising price competition, and the relentless pressure to reduce capital spending and operating costs have made telcos consider new paradigms like open source. Cloud allows this chance of re-engineering telco operations to be run with virtualised and open-sourced software. Theoretically, this can be done at a low cost, using general-purpose hardware.

This is a big shift from the traditional technological model where players would be licensing proprietary solutions from mainstream telecom vendors. Now they can progressively outsource the entire technological infrastructure to a vendor. They can also bring in software with programmability and openness features like Application Programming Interfaces (APIs) that inject simplicity into programming telecommunications infrastructure. Such an approach can pour in more flexibility in using the existing infrastructure and also in enabling integration between operations and the network. It is also compelling how this approach can let telcos make greater use of the data that they have traditionally collected for providing communications services.

Such a shift will also be full of dependencies, and hidden costs such as internally-resourced maintenance and support. It would also need higher contributions from telcos to industry open-source initiatives. But when done well, this can translate into flexibility in service delivery, cost reduction, quicker time to market, higher personalisation of services and solutions, and minimal vendor lock-in.

#7

VIRTUAL RADIO ACCESS NETWORK (vRAN)

The Open RAN world is quite polarised by now. While staunch advocates are highlighting how it's a game-changer, critics are pointing out its flaws, illusions, hazy practical path, and inability to stimulate the 5G service market. There is also poor light on who will develop these OpenRAN-based services, who will sell them, the business model, and whether they will address the corporate or consumer market needs.

Open RAN has also been reckoned to have many thorny technological and operational issues like integration challenges and costs, hardware performance

"With a Digital Twin, telcos can automate actions, give contextual meaning to the IoT data being received and reduce latencies."

Amit Gautam, Co-founder and CEO, Innover

and optimisation, immature ecosystem and unclear lines of accountability when things go wrong, unproven at scale. Critics also point out that it lacks economies of scale and has energy efficiency shortcomings. It also requires a change in the operating model and processes. That means there is a lot of room for improvement and for considering alternatives.

According to Dell'Oro Group, vRAN is likely to approach 5%-10% of the overall RAN market by 2026. This is understandable as RAN accounts for around 10%-20% of total operator TCO, including Capex and site Opex. Hence, players are seeking automation-friendly architectures that can enable non-RAN-related cost reductions and help reduce the TCO. The vRAN architecture, experts suggest, provides more flexibility and an improved path toward automation. According to Transparency Research, the vRAN market is estimated to surpass the $6.4 billion mark by the end of 2030. Industry observers also predict that vRAN will emerge as the best way to reduce the Capex and Opex of service providers and also enhance the quality of packet data transfer.

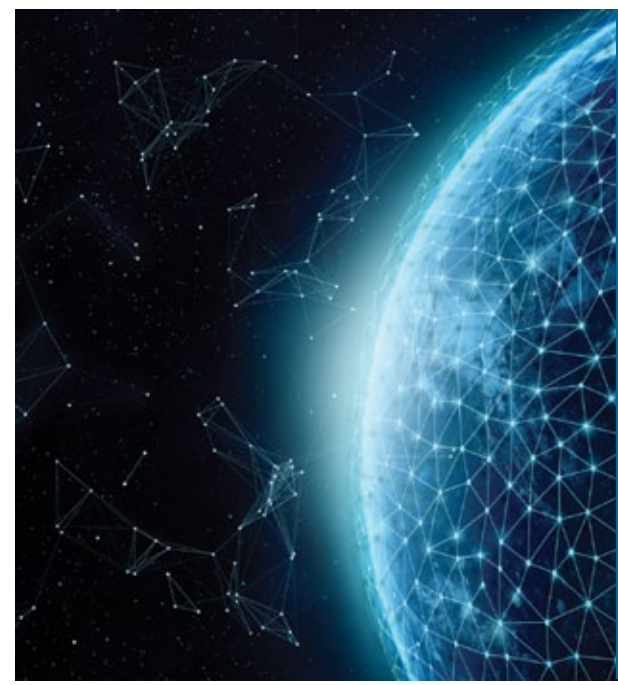
#8

6G AND 7G

Since everyone is going ga-ga over 5G, let's stay in the same vein and look a little ahead. How soon can the successors arrive and would telcos be ready to change gears then?

The Global 6G Market is expected to reach $340 billion by 2040, according to estimates by Market Research Future. This will be driven by advancements in wireless technologies along with increasing connected technology. There is also a sense of high emphasis on low-latency networks for specific applications. More triggers are expected to come from the growth of internet users and edge-computing devices. In fact, with the launch of 5G in 2022, governments and companies have started investing in the research and development of 6G. While slated for a 2030 milestone, those working on 6G have drawn a clear roadmap for its development, says a ResearchandMarkets prognosis.

Reports also indicate that the Department of Telecommunications (DoT) in India is considering various facets of the possibility of opening up spectrum in the 95 GHz – 3 THz frequency range for free allocation to develop future 6G technologies and products. This is still far away, with the spectrum allocation for the next 10-year term. But the potential of 6G will have a bearing on



the investments that telecom players make in 5G. If 6G is going to be very path-breaking and game-changing then it will make the transition from 5G to 6G quite unwieldy and costly for TSPs.

Seven industry trends that will indirectly affect TSPs and CSPs

#1

DIGITAL TWINS

This is a technology that does not have much to do with revenues or any new bells and whistles. But since it can change the cost game a lot, it can be a big lever for many TSPs. Digital twins give companies the exact replica of something in the physical world. For the telcos, it means heavy and complex equipment as well as network pieces. With data-driven schema and blueprints using IoT sensors, tools and remote support, these twins can massively change the task of maintenance and repair of equipment.

While a digital twin will be able to monitor and manage complex telecom networks, it will also be able to help a lot when operators add layers of technology, connected devices and additional spectrum bands. A good example is how Siemens began simulating and testing systems at the level of individual machines. Ericsson has also been experimenting with AR overlays in its Tallinn, Estonia factory.

Digital twins can also be useful in network planning tools to understand the current network situation and

assist TSPs plan for upgrades. It can be applied to optimise site management and field operations. The efforts by IETF and ITU-T to create standard definitions of architectures for digital twins in a network context can pave the way for better frameworks and solutions in this space.

#2

WEB 3.0

It's a big leap away from Web 2.0. It's all about AI, distributed architecture, Blockchain and decentralised apps (dapps). If Uber, Airbnb, and Gig players were designed on the 'platform' economy, there is a new universe opening with the Web 3.0 economy. In June 2022, Nokia talked about the concept of 'network as code'. It refers to creating a persona of the network that can be programmed by ecosystem developers and technology application partners. There is a new lane emerging wherein 5G networks will be able to participate in distributed service chains – the interlinking of multiple service providers to create new value.

TSPs and CSPs will find this world completely new. It would be nothing like they have seen before; intimidating and exciting because it is expected to open the floodgates of new and powerful long-tail product and service lifecycles, designed on the Web 3- experience.

"AI offers CSPs unprecedented ease in collecting, processing, and assessing large quantities of data while making security much tighter."

Sachin Alug, CEO, NLB Services

#3

EDGE AND QUANTUM COMPUTING

If there is anything that has pitted telcos and hyper-scalers strongly against each other, it's the high-hanging fruit called Edge Computing. A report by STL Partners indicates that edge computing services will be a $445 billion market in 2030. The industry is also witnessing the emergence of regional edge in addition to network and on-prem edge. There is a ripe space for local edge data centres that are outside the telecom operators' network and an attraction for vertical opportunities in the on-prem and distributed edge segment.

The telecom industry has long been a prime target of cyber risks, as the provider of a country's communications infrastructure. Quantum cybersecurity can help telcos to enhance the security of data and systems by using the powers of quantum computing to help businesses with encryption, by performing complex calculations much faster than classical computers. This

makes them useful to crack encryption keys or simulate complex systems, which can help identify and defend against cyber threats to protect sensitive data and the Internet's infrastructure.

#4

BLOCKCHAIN

Blockchain is another technology to ensure cybersecurity. It uses cryptography to secure its records and ensure integrity. This allows businesses to implement blockchain technology for areas like identity verification. With technologies such as the Face Recognition System (FRS), Blockchain-based solutions can prevent the loss of private data and identity theft. It can also enable Supply Chain Security since Blockchain can help businesses track and verify the origin, movement, and authenticity of goods as they move through the supply chain, helping to prevent counterfeiting and other forms of fraud.

Experts point out that the distribution of data and information and the decentralisation of information make blockchain a technology that will help the telecommunication industry immensely. From data management to fraud detection and prevention, blockchain can make businesses more agile and keep them on their toes. The technology is also driving new business ideas, speeding up the process of verifying transactions, and preventing fraud and cyber-attacks, besides being highly efficient, reliable, and secure.

"The transition to SA is key to many of the intriguing improvements and capabilities, including network slicing, that 5G can make possible."

Rishi Kapal, Director - Innovations & Employability, Vijaybhoomi University

#5

OPEN CACHING

We have seen how Cisco, Qwilt and Digital Alpha (DA) are working together to disrupt the commercial Content Delivery Network (CDN) market with a new as-a-service offering based on Open Caching. They have BT as the flagship customer. Seems like the streaming content is increasingly delivered in 4K and soon 8K, supporting AR and VR applications across multiple devices, over wireline and wireless connections. But all this can push network capacity demands, with consumer internet video traffic expected to comprise 82% of all Internet traffic by 2022, up from 73% in 2017 according to Cisco VNI Forecast 2017-2022.

That means high-performance requirements which mark a shift from traditional content delivery models. This also means there is an opportunity for service providers to use their edge assets to deploy their own distributed CDN capabilities. They can also turn into more active participants in the streaming media delivery value chain. Open Caching, described as an open architecture developed and endorsed by the Streaming Video Alliance, is designed to help service providers deploy an edge CDN footprint, offering them more control over content flows.

Industry Expert Panel

AMIT GAUTAM
Co-founder & CEO, Innover

ANAND BHASKAR
Managing Director - Service Provider Business, Cisco Systems, India & SAARC

DEVANSHU BAJPAI
Country Manager, SAARC Region, ZStack International

KAAVYA PRASAD
Founder, Lumos Labs

KAUSHIK MITRA
Senior Director, Cloud ERP, Oracle India

PRAMOD SHARDA
CEO, IceWarp India & Middle East

RAGHAV ARORA
Co-Founder & CTO, Statiq

RISHI KAPAL
Director - Innovations & Employability, Vijaybhoomi University

SACHIN ALUG
CEO, NLB Services

SOURABH GUPTA
CEO & Co-Founder, Skit.ai

SRIVIDYA
Founder, Avaali Solutions

SUDHIR KUNDER
Country Director, DE-CIX India

"Conversational AI and Voice AI are examples of AI-enabled technologies that can drive customer experience operations for the CSPs."

Sourabh Gupta, CEO & Co-Founder, Skit.ai

#6

ROBOTIC PROCESS AUTOMATION

Use cases of RPA have gained a lot of traction in recent years. These specially designed bots are being leveraged as a critical strategy for telecommunications enterprises to streamline operational processes such as managing data, increasing business agility, controlling costs, improving business efficiency, and developing new models and services. As the number of subscribers increases, so does the burden on routine business processes.

Experts highlight that the future of the industry will hinge on how effectively service providers automate repetitive processes, and devote human intelligence and resources towards work which is more strategic and growth-oriented. This will help mitigate operational overheads, avoid human errors, and enhance productivity. In short, RPA will help telcos achieve the ideal balance of artificial and human intelligence to yield the best possible outcomes.

Automating repetitive and command-based tasks also has its advantages in every industry. In telecommunication, it can take away hours of manually engaging in customer support, generating reports, and many other time-taking tasks. Telcos can also benefit from RPA by automating their people management processes.

#7

ARTIFICIAL INTELLIGENCE

The past year has been quite eventful for almost all economic sectors as the economy in India shows an upward growth trajectory. CSPs have gradually increased their investments in technologies like AI to optimise business operations across the board and deliver new services, as they deal with the requirements for real-time visibility and actions, the increasing volume of data, and the need for integration between network performance and app performance.

For the network operations and planning teams, the key areas of focus for the introduction of AI include the identification of problems and adjustment of the network in real-time, prioritised quality of service for customer segments such as first responders, and laying the groundwork for network slicing solutions that will come into play with 5G.

Voice AI is one technology that will become ubiquitous for CSPs in transforming their customer servicing operations. As these businesses expand, so will customer queries, prompting them to constantly look for ways to improve their customer engagement processes. This is where Conversational AI, specifically Voice AI, can support communication providers in developing much smarter, streamlined, and superior customer engagement processes. Voice AI technology may also prove revolutionary in supporting the triad of customers, contact centres, and service providers.

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Former Chairman, DCC &
Former Secretary, Telecom

Pathbreaker of the Year Award
CoWin Platform
[Received by Dr. R S Sharma, CEO, National Health Authority]

Lifetime Achievement Award
Prof. Ashok Jhunjhunwala
Dept. of Electrical Engineering, IIT Madras

Reach out to the technology decision makers of the telecommunication industry.
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Gearing up for the future needs

Five trends the optical cabling industry must watch out for as they roll out infrastructure that can handle the data demands of tomorrow

BY DR JITENDRA BALAKRISHNAN

From the fourth industrial revolution to the unveiling of the metaverse, new applications and use cases are constantly shaping our communications landscape. Communication service providers and those rolling out infrastructure must anticipate the data demand from these use cases over the next decade and invest capital today for their networks of tomorrow. These include high-speed broadband networks, Fibre to the Premise (FTTX) networks, the convergence of optical and wireless networks, and the rapidly emerging data centre infrastructure; all of these rely heavily on optical fibre cable.

Economic uncertainties today make it challenging to plan new infrastructure and network roll-outs, but it is important to build these networks for the data demands over the long term. It is better to over-build networks today than run out of capacity tomorrow. Let us look ahead to understand what is in store for the optical cabling industry in the year and beyond.

> AltNets will create competition for established players, especially in geographies where the FTTH roll-out has been slow to begin.

> Expect cable suppliers and the ecosystem to innovate to make the deployment of fibre faster, easier, and more manageable for a less-skilled workforce.

THE POST-PANDEMIC SURGE IN ROLLOUTS WILL CONTINUE DESPITE ECONOMIC UNCERTAINTY

The COVID-19 pandemic triggered a huge rise in demand for networking and connectivity. Adults in the US spent an average of 485 minutes – 8 hours and 5 minutes – per day on digital media in 2021. There was an appetite for greater bandwidth from businesses and individuals alike. This led to a bullish outlook for the fibre optic cabling industry, which remains the case as we approach 2023.

The demand for network infrastructure is only getting stronger, with countries investing heavily in infrastructure for telecom networks. This will ensure demand for fibre optic cabling remains strong and the post-pandemic bounce continues, albeit tempered slightly by the financial uncertainty experienced by global markets.

DEMAND WILL OUTPACE SUPPLY, BUT NETWORKS WILL STILL BE DEPLOYED

We're currently living through a phase where there is more demand for network capacity than what is currently available. In 2022, the size of the global fibre optics market was $10.8 billion. Looking ahead, IMARC Group projects that the market will grow at a compound annual growth rate (CAGR) of 16.8% from 2023 to 2028, reaching $26.3 billion.

The optical fibre industry has gone through periodic cycles of over- and under-capacity, and we are at a stage of the cycle where capacity investments have not kicked in yet. As we go through this period of under-capacity, we should expect demand for fibre optic cabling to remain strong. This could add pressure to infrastructure rollouts in the coming years, and customers rolling out networks will be looking to lock in strong supply partners.

DEMAND FOR INFRASTRUCTURE WILL INCREASE THE ROLE OF ALTNETS AND PRIVATE EQUITY IN NETWORK ROLL-OUTS

The demand for FTTH infrastructure in particular has led to the rise of AltNets in countries where the pace of deployment is highest; the US and UK have many examples. This model has created many valuable companies, often backed by PE money. These AltNets will likely create a different dynamic within the fibre optic industry in terms of capacity demand and innovation. They will also create competition for established players, especially in geographies where the FTTH roll-out has been slow to begin. The big caveat is the impact of economic headwinds, but the AltNet model is here to stay.

THE NEED FOR MORE SKILLED WORKERS WILL LEAD TO NEW TRAINING INITIATIVES AND PRODUCT INNOVATION

Laying fibre optic cables is a one-time project. An installed network is expected to last for years to come. Setting aside issues like budgets, supply constraints and permissions to lay networks (right of way), the biggest challenge faced by infrastructure projects is in finding the human resource to make it happen quickly, which makes it important to train the workforce quickly.

In some cases, skilled workers can't be trained fast enough to keep up with deployments. Hence, we are likely to see cable suppliers and other parts of the ecosystem innovate to make the deployment of fibre easier, faster, more affordable, and more manageable for a less skilled workforce.

VENDOR LOCK-IN WILL BECOME LESS APPEALING AS CUSTOMERS PRIORITISE LONG-TERM FLEXIBILITY

Network rollouts are complex, time-sensitive initiatives with several challenges. Customers will need to ensure that their supply risk is low, for example by avoiding vendor lock-in. While patents and proprietary components will continue to spur innovation within the market, especially in closures and termination solutions, we're likely to see customers favour lowered supply risks as well. This will ensure that networks can be deployed on time, and also that future maintenance of the network is not subject to the whims of a single supplier.

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Get ready for greener and more intelligent networks

Organisations need to move away from the 'rip and replace' approach and substitute it with sustainable, secure, and scalable network architecture

BY ANAND BHASKAR

Technology and the Internet are emerging as the country's most powerful enablers of economic and social transformation. According to a KPMG report, 5G can boost the national GDP by $500 billion in 2025. However, the network and connectivity must be reimagined to realise its true potential. Sustainability has to become the core of everything we do and create. We need to move away from the 'rip and replace' approach and substitute it with new and improved network architecture, which is efficient, secure, and scalable to adapt to the evolving business needs. Here are a few connectivity, networking, and collaboration technologies that have the potential to transform businesses in the year ahead.

INTERNET OF THINGS

Today, networks support unpredictable traffic volume, mobile, and IoT devices; approximately 20 billion devices are connected to the Internet. And this is expected to grow to 75 billion by 2026, according to Gartner. These connected devices are expected to generate massive amounts of data that will exceed the ability of human operators to manage alone on time. Therefore, the adoption of IoT will help the telecom industry monitor base stations and data centres remotely, ensuring minimal downtime for the network, enhanced business operations, and more revenue generation.

METAVERSE

The Metaverse has the potential to impact all our lives in many ways and bring about transformational changes to the way we work, transact, and interact. Gartner predicts that by 2026, nearly 25% of people will spend at least an hour a day in the Metaverse. By embracing this virtual environment, organisations can enhance customer experience, monetise investments through adjacent services and increase operational efficiency. Augmented Reality is rising as a valuable asset in creating the Metaverse.

EDGE COMPUTING EVOLUTION

To prepare for 5G profitability and enable IoT and Metaverse technologies, service providers and application developers must rethink how their data sources and applications are distributed. Low-latency applications will require intelligence distributed to the edge where the use cases reside. Other applications may benefit by avoiding the constant backhaul or distribution of traffic from centralised data centres. Therefore, as the demand for real-time processing and low-latency connectivity applications and services increases, edge computing will become indispensable as part of a hybrid cloud computing model.

Moreover, it will enable the service provider industry to offer an edge cloud platform to deliver services for vertical industry participants. It will help the service provider industry offer more innovation, enhance customer service, and ultimately become a true digital value player in the Industry 4.0 era.

Most importantly, sustainability has to take centre stage in everything that organisations do. Today businesses across sectors, even the telecom industry, are committing to Net Zero policies and programs.

Going ahead, the industry will need to continuously work on improving the energy efficiency of products, saving energy, and reducing carbon emissions for themselves as well as their customers. Organisations will also need to explore technologies that can help them transition to a more efficient way of building and operating networks, reducing legacy technology and focusing on sustainable components that will save money and the environment.

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Mobile, AI, cloud-based solutions to rule the roost

Emerging technologies will enable businesses to improve operational efficiency and communication, and deliver first-rate customer service

BY SHIBU PAUL

In today's hyper-competitive space, businesses must stay relevant and offer exceptional services to satisfy their customers. But that's easier said than done, particularly since digital technologies are expected to continue to dominate in 2023. During the year, businesses can expect to experience increased mobile devices and app usage, growing use of AI and automation, and more widespread use of cloud-based solutions.

> The advancement of 6G and AI is expected to amplify application performance, enabling businesses to deliver exceptional services to their customers.

> Organisations must figure out the best way to communicate internally as the hybrid work environment means employees aren't always under a single roof.

CONNECTIVITY TECHNOLOGIES

By 2023, global Internet users are projected to reach 5.3 billion. This is due to the continued growth in both the number of devices connected to the Internet and the amount of data they generate. The same criteria are responsible for increased expectations to stay connected at all times, especially when people are working from remote locations.

The advancement of 6G and AI is expected to amplify application performance, enabling businesses to deliver exceptional services to their customers. Besides, sustainability will also be at the forefront. We're seeing an increase in solar panels and other solutions that lessen our dependence on fossil fuels for energy in everyday life. IT leaders are also interested in taking sustainable measures without compromising performance and keeping costs in check.

And finally, businesses should ensure their networks are ready for the influx of traffic coming their way. They should consider upgrading their networks to support higher speeds and bandwidths, as well as investing in technologies such as artificial intelligence and machine learning which will help them make better use of available bandwidth.

COMMUNICATION TECHNOLOGIES

As we move into the 21st century, communication trends will only become more and more important. To keep up with the ever-changing landscape, it is essential that businesses and individuals alike stay up to date on the latest technologies and methods of communication. Moreover, the need to deliver personalised communication internally and externally makes communication a top trend for 2023. It's no longer necessary to stay connected with the customers but also to deliver messages that appeal to their preferences.

It is also important for organisations to figure out the best possible way to communicate internally as the hybrid work environment means employees aren't always under a single roof. It also means that businesses need to take extra measures to ensure their team's productivity and keep them motivated.

Finally, in 2023 the industry can expect to see a continued increase in the use of Artificial Intelligence (AI) and automation in communication. AI has already begun to play a key role in communication, with platforms like Microsoft's Cortana and Amazon's Alexa used for tasks like scheduling meetings and sending messages. One can also expect AI to play an even bigger role in communication, with more businesses using AI-powered chatbots to interact with customers.

NETWORKING TECHNOLOGIES

Networking technologies are projected to grow in popularity in the upcoming years. This will be due to the increasing demand for mobile app development and the need for businesses to stay connected with their customers.

Also, the increasing popularity of hybrid and multi-cloud deployments is resulting in changes to data centre networks, including the deployment of new security measures, greater automation, and more. Not only this, but security in these hybrid environments is a pressing issue. More than half (56%) of respondents in a Cisco report say security is the top networking challenge when managing distributed and hybrid workloads.

Businesses can expect to see a surge of new technologies in the year ahead, from AI to 6G. These technologies will enable businesses to improve their operational efficiency and provide first-rate customer service. In addition, IT leaders will always prioritise sustainability and cybersecurity to advance enterprises and ensure their success in the ensuing years.

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Transforming businesses in the data-driven world

Businesses need to ride on the digital infrastructure laid by connectivity, networking, and communication technologies to usher in innovation

BY KARUNYA SAMPATH

For the first time since the Industrial Revolution, technology is seeing a greater alignment with applications that are truly making difference in the way businesses, consumers, and society function. From the information at your fingertip to storing and churning petabytes of data on your virtual servers as well as handheld devices, making faster decisions with accuracy and flexibility is possible today due to technologies like Fibre-to-Home, 4G, unified communications, social media apps, cloud, micro-services, Web 3.0, and automation.

Affordable smart mobile phones, the rise of the cloud, and faster links to end users are enabling both sellers and consumers to ride the Web 3.0 wave to have a choice of multiple products and services with quality customer experience to choose from.

If assembly lines have improved productivity and scale by dividing labour among skilled workers, machines have improved manufacturing consistency. Similarly, information technology has bridged the gap between the industrial and corporate sectors. The Internet, cloud, and last-mile connectivity have transformed the business lifecycle of ideation, manufacturing, sales, distribution, and consumption with higher visibility, control, and ease of business for suppliers, governments, consumers and communities.

In the past years, aggregators of applications like ride-hailing, food delivery, travel portals, and eCommerce, etc. have made use of technologies like location-based services, cloud, edge computing, UPI, messaging, chatbots, CDN, APIs, data science, AI, ML, 4G, IoT, AR,

> The Internet of Things will bring manufacturing, agriculture, building management, and retail outlets to the forefront.

VR, and automation to reduce the digital divide. These technologies also bring sellers and consumers together securely and ubiquitously.

THE POST-COVID BUSINESS

The pandemic has taught businesses and consumers that interactions and work must continue irrespective of location and environment. Digital workplace and hybrid work will, therefore, continue to evolve to improve productivity, employee engagement, talent retention, and customer service, provide better security, and reduce operating expenses.

In 2023, cloud computing and cloud-native applications will continue to accelerate the start-up ecosystem as well as legacy businesses for innovations with agility, speed, scale, and flexibility. Edge computing will further aid data processing right where it's needed: for Industry 4.0, autonomous vehicles, remote monitoring of assets in the oil and gas industry, and smart grid by processing huge amounts of data coming from various elements without needing to go to centralised computing resources.

With Infrastructure as Code (IaC), networking and security are no longer separate domains for carrying and processing data. Cybersecurity will become ubiquitous to detect, prevent and protect the data in all layers of communications, mediums, and environments.

The Internet of Things (IoT) will bring manufacturing, agriculture, buildings management, and retail outlets to the forefront from being a closed-door industry. It will enable predictive maintenance, speed up medical care, improve customer service, etc.

Tomorrow's workforce – both blue and white collar, entrepreneurs, doctors, farmers, and scientists will no longer need to travel to prestigious universities, to learn, hone and apply their craft. They will be able to master it sitting at their homes and living in the surrounding familiar and conducive to their overall well-being. With enormous bandwidth, 5G will enable businesses to create and deliver new products and services that will allow them to offer new experiences to customers.

The technology will help emulate real-life environments like performing remote surgery, manufacturing industrial components using 3D printing technology, and processing complex data to make smarter decisions. It will improve safety and traffic management, smart grid control, and smart retail too.

INFRASTRUCTURE FOR A DATA-DRIVEN WORLD

With data as the new oil, datafication is simply transforming everything in our life into devices or software powered by it. Industrial machines, office applications, AI-powered appliances, and everything else will further rely on data. AI and ML will churn disparate and complex data, making humans take faster decisions in areas like healthcare, banking, finance, investments, logistics and transportation.

In healthcare, AI will help Genomics quantify your genes and result in finding diseases or any possible problems that could have been detected by manual methods. The Augmented and Virtual Reality tools that were limited to airline pilots, astronauts, and top scientists, will be used in training, entertainment, and education to provide immersive experiences that help retain information better and practice complex skills.

The blockchain which uses a digitised and decentralised public ledger will enable a new digital and online economy around the Internet securely accelerating money, and confidential data exchanges from banks and the insurance industry to retail and e-commerce to healthcare.

In 2023, businesses will ride on the ubiquitous foundation of digital infrastructure laid by connectivity, networking, and communication technologies and will usher innovations and developments in transformative technologies, including AI, cloud computing, blockchain, IoT, AR and VR, and faster transport like 5G, to improve business productivity, consumer experience, and human lives.

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[INDUSTRY SPEAK]
CLOUD SERVICES

Enhancing enterprise cloud experience

Service providers must invest in tools and frameworks that can help identify optimal consumption models for customers' cloud needs

BY APURVA KADAKIA

The emergence of cloud technology has resulted in a massive shift in the way businesses operate. Companies continued to use the cloud in 2022 to modernise operations and expand IT capabilities. The cloud innovation transformation will continue with its rapid turn of events in 2023 and beyond. An ever-increasing number of organisations and associations will move their services to the cloud to address evolving solutions for their businesses.

A Gartner report indicates that by 2025, cloud computing will be pervasive with over 80% of businesses

> CloudOps elevates cost and operational efficiency while ensuring that companies are extracting the maximum benefits from their cloud platform.

> Businesses will be better placed to deal with the changing technologies and their needs if they are cued into the emerging cloud technology trends.

moving into the cloud space. It will not only drive technological innovations but also serve as the foundation for business innovation.

This surge in cloud computing growth would be fueled primarily by cloud service providers, which collaborate with public cloud platforms to provide value-added cloud support services such as infrastructure as a service (IaaS), software as a service (SaaS), or platform as a service (PaaS). These service providers would need to provide speed and differentiation across the entire cloud adoption spectrum, from cloud migration to cloud-native innovations.

Some organisations view cloud service providers as partners who assist in making the most of their cloud infrastructure. Other businesses, however, would like them to advise on new areas of cloud exploration due to the complexity of multi-cloud architecture. Businesses will be better placed to deal with the changing technologies and their needs if they are cued into the emerging cloud technology trends.

FINOPS AND CLOUD OPTIMISATION

With the cloud platform's pay-as-you-go model, there is a significant benefit in not encouraging large adoption costs and only paying for what is required. Businesses now find it simpler to migrate to the cloud because of the change in investments from Capex to Opex, reducing upfront IT costs and more business agility. However, without proper discipline and lack of cost management, cloud deployments can surprisingly overrun their budgets. This is the case today for 94% of organisations that moved to the cloud during the pandemic.

Cloud service providers must invest in tools and frameworks focused on identifying optimal consumption models for every customer's cloud needs. Cloud optimisation models help identify consumption patterns, storage efficiency and optimal utilisation. CloudOps not only elevates cost and operational efficiency but ensures that companies are extracting the maximum benefits from their cloud platform.

PLATFORM AVAILABILITY AND STABILITY

While most of the cloud platforms maintain high availability, there are times when customer needs and usage would affect cloud workloads and the environment. Thus, as a cloud service provider that assures complete availability and stability, it becomes very relevant to invest in a stability monitoring tool.

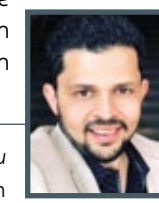
A Machine Learning or ML-based intelligent platform that provides a fully automated proactive monitoring solution can act as a good first line of defence before the public cloud support teams get involved. With more and more businesses expected to be fully operating on the cloud, this is a basic yet important area for CSPs to build their tech and processes.

CLOUD MANAGEMENT PORTAL

With multiple business functions running on the cloud, businesses are now struggling to manage the overall health and usage of their cloud platforms. They not only face cost overruns but also find it difficult to identify the correct cloud architecture that would suit their current and future business needs. This becomes more challenging when one needs accurate data points for further innovation in a multi-cloud environment.

The need of the hour is a single-view cloud management portal that acts as a cloud health dashboard, an advisory tool and a marketplace as well. This can help reflect upon current health in terms of consumption, security and best practices in a hybrid cloud environment. Furthermore, this will allow future cost modelling and help in identifying digital innovation needs.

These three areas consistently require attention and innovation from the service providers. Any cloud service provider that identifies these as key investment areas would have an edge over others in this digitally-driven future.



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Fixing safety latch for the cloud economy

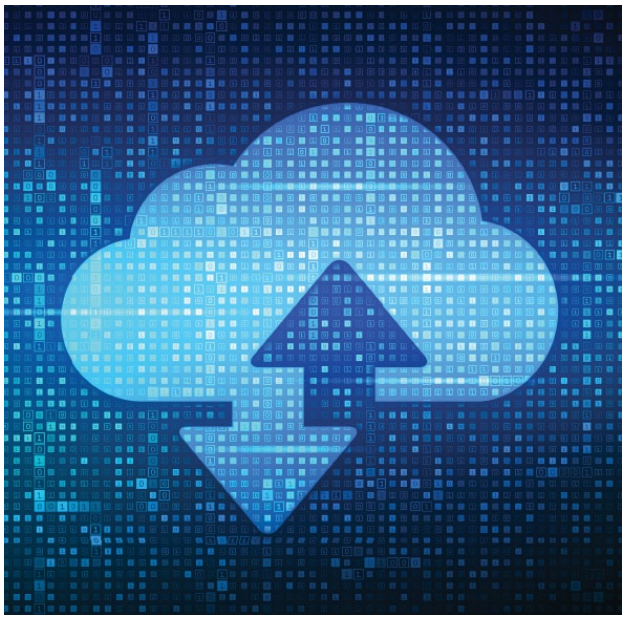
Enterprises must keep an eye on emerging threats and evolving security technologies to keep pace with change and mitigate business risks

BY RAJ SRINIVASARAGHAVAN

Given the global uncertainties that businesses faced in 2022, it is interesting to see that Gartner has predicted an 11.3% increase in global security spending in 2023. Cloud security will contribute to a majority of this spending; Gartner also predicts that 95% of digital payloads across the world will be running in either a public or a private cloud by 2025. Obviously, with a tectonic growth in cloud adoption comes the increased need for cloud security.

Let us look at the cloud security areas trending amongst the business community in the year 2023.

According to Gartner, "Remote work and cloud-based delivery of enterprise applications by remote working professionals are primarily going to drive cloud adoption in 2023." Hence, it would be prudent to trace the security trends from these two perspectives for the year ahead.



CLOUD SECURITY WILL INFLUENCE REMOTE WORK

COVID has made remote work through the cloud a dire need due to its 'anytime, anyone, anywhere' possibilities for companies. Remote work primarily means the company will be looking at the following security concerns: a need for tightened IAM, permissions and privileges to access resources in the cloud, levels of authentication and authorisation needed to access that is beyond user id and passwords, the principle of zero trust, and a secure Virtual Desktop Infrastructure (VDI) to allow these accesses. Certainly, these security topics are going to trend a lot in 2023.

SECURING ENTERPRISE APPLICATIONS ON THE CLOUD

Delivery of enterprise applications primarily means a tightened Develops for Cloud deployments, Continuous Integration (CI) and Continuous Deployment (CD) process that would include security in every aspect of the delivery process. It also means minimising target end-points that are exposed to the outside world and customers to minimise the attack surface for hackers, automatic risk assessments before deployments, and boot-strapped security and compliance processes that accompany the deployment.

While deploying cloud-native tools driven by secure containers with the security postures of the services they are going to expose to the outside world, organisations and CIOs will also think about proxies that are going to protect these services, white-listing of services, access control lists, application, and cloud security firewalls.

API AND SERVICE ARCHITECTURE SECURITY

When considering enterprise application delivery, third-party APIs, especially the customer applications talking to SaaS applications would be a prime target for hackers. This may become a bigger concern if proper API security controls, authorisation and authentication protocols are

> Zero-knowledge proofs and Blockchain-based security implementations will start getting noticed in 2023 amongst cloud startups as a security mechanism.

not established between service endpoints. This could lead to security disasters, wherein within a few clicks hackers can control very private information of customers and corporates. Going ahead, API or Service Security will be much debated with standard solutions offered in the year 2023.

SECURING MULTI-CLOUD DEPLOYMENTS

Since companies do not want to get locked to a single cloud provider to deploy their applications, most of them adopt the multi-cloud option, where they establish deployments across multiple clouds. This makes it much more challenging to monitor since customers are forced to employ third-party tools to monitor their deployments across clouds. Multi-cloud environment, if not properly managed could lead to security nightmares. Definitely security problems faced during multi-cloud deployments will be the highlights of many technology and business forum discussions in 2023.

DATA, DEVICE AND USER ACCESS SECURITY OF CLOUD APPLICATIONS

This is going to directly lead us to end-point security, Edge-location security, and device security through which lots of users are going to access the enterprise applications. Hence, the security of an application will be as good as the device and Edge location from which the application end-point is going to be accessed. This would also touch upon an important aspect of privacy and data security, especially when users are handling applications through their devices.

Such devices and user security garner a lot of attention over the next few years as this is where the world of cloud applications is moving to and any slip-up could lead to a heyday for hackers. One can expect new products and trends like dynamic passphrase-based device security during the year.

SECURING CLOUD DEPLOYMENTS FROM KNOWN VULNERABILITIES

One of the other important security concerns in 2023 is the need to control known vulnerabilities. Around 75% of the attacks happen through the exploitation of known vulnerabilities. If these can be minimised, the company migrating to the cloud or one who is deploying cloud applications will be able to cover most of their bases. So, security tools that are going to help in assessing and eradicating known vulnerabilities would be a trend.

Another area of focus would be to identify network zones that will be greatly affected by the known vulnerabilities. By not keeping the greatest assets near the zones where hackers can easily access them after they immediately exploit the known vulnerabilities, the attack radius and intensity can be minimised.

SHARED SECURITY FOR COMPLEX MULTI AND HYBRID CLOUDS

With more companies adopting the cloud, a shared security model between the cloud customer and the cloud provider is going to be discussed a lot. This will be more so in the context of defining the responsibilities of each of the parties in establishing a balanced security posture between private and public cloud applications, and on-premise data in conjunction with the multi-cloud model. Since this is the most complex implementation from a security and governance perspective, that one can think of, it is going to trend a lot in the next few years or decade.

NEW AREAS OF HOPE FOR CLOUD SECURITY

Finally, zero-knowledge proofs and Blockchain-based security implementations will start getting noticed in 2023 amongst cloud startups as a security mechanism. Zero-knowledge proofs will eliminate the need for password-based access in the future. Coupled with Blockchain-based cloud deployments, Zero Knowledge Proof Applications would offer some fascinating possibilities for enterprise and user cloud security. Though this is still a subject of research, experts point out that the time will come when the industry will make user access secure and easy without much burden on the users.

Summing up, 2023 is going to be a landmark year for cloud security enthusiasts where secure cloud-native tools, secure application deployments, vulnerability assessment tools, and new-age security will be discussed immensely.

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Enabling digital shift in communication

With digital everything taking the centre stage, enterprise communication needs to keep pace with evolving technologies and trends in 2023

BY DR ANANTHAKRISHNAN GOPAL

In the APAC region, Unified Communications as a Service (UCaaS) technology has contributed a great deal towards the digital shift in the communication space. The total cloud spending in the APAC region during the year 2022 was $8.7 billion in the second quarter of 2022, which is a 35% jump and adds up to 14% of the worldwide spending on cloud services.

Considering the rise in communication platforms, below are the technology trends that will impact the UCaaS business in 2023.

AI at the centre stage: Artificial Intelligence, the magnum opus in technology today, has been paving the way for various innovations in the sector. Virtual avatars are a hot issue right now when discussing the importance of AI in a variety of fields, including banking, retail, and the auto industry.

Extended reality charms: Since we all yearn to go beyond the supposed actual boundaries of the globe, it is a significant technical trend right now. Gamers, medical specialists, retail and modelling experts all

> Evolving 5G and satellite technologies will allow customers to access cloud communication services from anywhere on any device.

> Unified Communications service providers will evolve to become Contact-Centre-as-a-Service (CCaaS) and also offer communication platforms as a service (CPaaS).

adore this technology since it produces a reality free of any physical existence.

Shift to the cloud: According to Gartner, more than half of enterprise IT spending will shift to the cloud by 2025. Organisations are passing up on-premises hardware and outdated VoIP systems that don't have the dependability and contemporary security measures needed to fulfil consumer expectations and compliance standards as they continue to embrace the advantages of cloud environments.

Organisations also understand that UCaaS may provide greater flexibility, security, and cost-saving opportunities while relieving the pressure on overburdened IT departments. These advantages are frequently sufficient for businesses to pursue a full cloud migration and permanently give up on-premises old equipment.

Cybersecurity is paramount: Shoring up cybersecurity is imperative to success and a critical first step in the digital transformation journey. BYOD or Bring Your Own Device is increasingly becoming a common and expected practice as part of the trend toward hybrid work settings. Employees are downloading work applications onto their devices, which presents new challenges for the IT staff managing the vulnerabilities these devices and applications introduce into networks.

Additionally, in recent years, cyberattacks have escalated against telecom operators, deteriorating dependability and data loss protection. To combat hackers and meet increasingly complex client security needs, investment in cybersecurity is going to be on the rise.

Smarter mobiles define the future: These smarter items will be around well into the future, potentially even beyond 2023, as data scientists create AI household robots, appliances, work devices, wearables, and much more. Be on the lookout for increased tool integrations that add efficiency to the mobile workforce.

The 5G era: During the pandemic, Wi-Fi powered the work-from-home model. Today, WFH is evolving into work-from-anywhere (WFA). The primary technologies driving this progress are anticipated to be 5G and satellite, which allow customers to access cloud communication services practically from anywhere on any device. Watch for the deployment of satellite and 5G to increase business communication in 2023.

Time for consolidation: The whole spectrum of UCaaS companies should see increased mergers and acquisitions in 2023, mostly due to the desire to close service-providing gaps or pool resources to boost profitability.

There is more potential for UCaaS providers to evolve into becoming Contact Centre as a service (CCaaS) and add communications platform as a service (CPaaS) space. By 2025, over 95% of multinational corporations, according to Gartner, will adopt CPaaS capability. Interestingly, even though CCaaS has long been popular among SMBs, we now see an increased adoption among major organisations, which encourages suppliers to add to or broaden their CCaaS products.

Beginning of intense datafication: Simply described, datafication is the process of turning all of the physical items in our life into electronic devices that are powered by data. In conclusion, datafication is the process of transforming manual, labour-intensive processes into technology that is data-driven.

Now that AI is a huge part of everybody's life, the importance of data will rise along with it and will be a huge aspect of all the daily utilities, from a smartphone and industrial equipment to office software.

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Moving ahead on the wireless turf

Wireless and sensor-based technologies will drive the way technology is consumed and used at home and by small and medium businesses

BY MARTHESH NAGENDRA

Predicting future trends can be a tenuous business. However, if we look at the past few years, technology has come a long way. Communication from the old and slower mediums like the telephone and fax has now turned into a superhighway for information using satellites and fibre optics. Data moves with the speed of light and with the invention of faster communication standards, the business of volumes, and falling prices due to competition, Internet connections at home have become faster and cheaper than we could ever imagine.

There has also been a significant increase in the number of connected devices and the rate of data consumption has made wireless connectivity significantly common. This has propelled the development of Wi-Fi speakers with Artificial Intelligence integration and voice assistants, such as Amazon Echo Dot and Google Nest Audio.

> The future belongs to the IoT and it will be prevalent in practically all aspects of our daily lives, making us more comfortable and secure.

> Skill development for SASE and wireless technologies will be a growing challenge for infrastructure and operations teams as these trends evolve.

As technology becomes more advanced, newer devices are needed to support the latest networks which can give wireless networking speed that is as good as connecting a physical LAN wire. Yes, we are speaking of speeds that are needed for laptops, TVs and smartphones. At the same one cannot forget the other IoT devices like smart speakers, smart fans, smart switches, and smart everything that needs to connect even though they sit in the background serving you silently. Many of the trends are likely to become mainstream in 2023.

TRUE OR STANDALONE 5G

5G has been around for several years now, but most of the services offered by consumer CSPs do not use a 'pure' form of this technology. Instead, they piggyback on existing 4G (LTE) infrastructure to provide their services. This means it's not likely that users are using it to its full potential. The next step in the rollout of 5G will be the move to what is being called the Standalone 5G, also known as 5G SA. The market is rapidly developing to provide affordable 5G cellular network connections.

With Standalone 5G, all infrastructure including base stations, core networks and backhaul links are dedicated exclusively to 5G. It no longer relies on 4G in any way and delivers the full speed and latency benefits of 5G. Therefore, it brings in faster access, lower latency rates, edge computing and end-to-end network slicing. 5G SA also ensures the future readiness of a network, opening it to more opportunities and exploration.

IOT AT THE HOME

The future will belong to the Internet of Things (IoT) and it will be prevalent in practically all aspects of our daily lives, especially in our homes – making us more comfortable and secure. There are predictions that by 2025, there will be almost 30.9 billion active IoT connections for homes. And these forecasts are in the right direction. Our preferences for music, temperature, lights and as well as our times to go to bed are known to the smart IoT sensors.

Similarly, smart plugs, lights, and security systems function to make our lives easier. It gives us the freedom to not worry about home security because when we are not at home, security is regulated using a smartphone app. The sensors utilise the app to notify us of invaders, whether animal or human. No wonder then, IoT is going to occupy our homes because of its ease and the ability to take away the hassle and stress. For example, when house members leave the home at night during a storm, the IoT-enabled smart controllers in the network will ensure that all doors and windows and duly locked.

IoT-powered smart homes are the future. Low-powered, long-range, and cost-effective IoT-powered devices will enable these homes to be more connected, complementary and conscious.

RISE OF THE SMB PRODUCT RANGE

With the advent of remote and hybrid work, products designed for small and medium businesses (SMBs) will gain momentum and will lead firms to innovate in this direction as well. Wireless value innovation creates a scalable return on wireless investment and makes networks a strategic innovation platform. However, there is significant complexity at play and several new skills are required to achieve this innovation, such as wireless integration capabilities and wireless tracking implementation experience. Skill development for SASE and wireless technologies will be a growing challenge for infrastructure and operations teams as these t rends evolve.

Gateways, switches, access points and cloud-based management systems will be more visible in India as more and more firms opt to eliminate the cyber threat. Products developed for SMBs will not only retain but build their charm owing to their cost-effective nature and accessibility. They also enable scalability, fast deployment, simplified operations, and better security to ensure that only those authorised can access the network and data.

From small office deployment solutions to remote work solutions to devices for data and recovery, 2023 will be a year when SMB products will leverage the market and flourish in the real sense.

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More data steam for MarTech, AdTech world

The future of marketing and advertisement technology will be driven by advancements in AI, automation, and data science

BY RITESH UJJWAL

Metaverse isn't the only one that shook the innovation space in 2022. The industry can expect the year ahead to pave the way for significant changes in the AdTech and MarTech platforms. The bigger question is whether brands and companies are market-ready to earn people's time, attention, and money.

With the pandemic pulling a gear shift in every sector, the marketing rulebook has had its share of expirations and additions in the past two years. With the year 2022 behind, one can look at a complete transformation to normalcy coming back after all the Covid-induced constraints. Following the noise in the AdTech and MarTech space during the previous year, here are some of the technologies that will define the marketing sphere in 2023.

ZERO-PARTY DATA GATHERING

Zero-party data is what a customer proactively shares with a brand. But what data are we talking about? It can be preference centre data, purchase intentions, personal context, and their identity for the brand. Here, consent is what drives the data for marketing usage. This data is used to improve customer experiences and target advertising.

In 2023, gathering zero-party data will become the norm for marketing spaces in businesses and organisations across all domains. A prominent trend in digital marketing will lead organisations to become more proactive in their data collection activities.

THE EMERGENCE OF AI IN MARTECH

In the past, companies relied on various technologies and solutions to analyse data and track performance measurements. But they have still struggled to keep up with the market's rapid changes. Thanks to big data analytics, companies are now more likely to continue embracing AI solutions to deliver better results.

AI provides marketers with real-time insights that help them make better decisions. It automates repetitive tasks, freeing time for more strategic work. In 2023, AI will get deeply incorporated into MarTech. It is set to cover every aspect of marketing, from customer segmentation and targeting to content creation and distribution.

THE EMERGENCE OF AI IN ADTECH

As AI gets better at understanding human behaviour, it will also become increasingly proficient at creating

> By 2023, video traffic is estimated to make up 80% of all Internet traffic, making it easier for MarTech companies to analyse reach, engagement, and RoI.

personalised customer experiences that will in turn drive engagement and conversions in the brand's favour.

AdTech companies with the help of AI will now be able to target ads more accurately, personalise the user experience, and track engagement all under one platform. AI will also help improve the efficiency of campaigns by reducing the cost of advertising for brands and businesses. Contextual advertising is an apt example of leveraging the power of AI to deliver ads that fit better with the consumer's behavioural patterns and drive better engagement.

With AI becoming more sophisticated, the future of the AdTech industry looks promising and one can expect to see more AI-powered products and services in the years to come.

PURPOSE-DRIVEN MARKETING

Marketing can drive sustainable growth by driving compelling experiences and keeping purpose and innovation at the forefront. Having a strong purpose at its core contributes value to a brand, both in terms of earning consumer trust and also as a strategic decision. Effective marketing depends on helping companies create a more meaningful world for their customers by identifying a social purpose. No wonder, then, purpose driven-marketing will be the way forward.

GenZ being the loudest influencers in the industry, brands will continue to target and connect with the influencer's audience by plugging across each touch point encompassing communication, experience and transaction. For instance, sustainability will be set as a goal for brands to achieve as it can be the key differentiator between the brand that one likes and the brand one chooses to buy from for sustainable reasons. This further strengthens the point that purpose will continue to trump everything in brand marketing.

VIDEO MARKETING FOR THE WIN

Brands today have made bite-sized video marketing a huge part of all their campaigns on social channels, such as Instagram reels and YouTube shorts. These help them increase engagement among millennials and catch the audience's attention more quickly. An average user spends about 88% more time on a website with video content and is 64% more likely to purchase a product after watching a video that talks about it. This is reason enough for companies to adapt ephemeral content into their marketing strategies.

By 2023, video traffic is estimated to make up 80% of all Internet traffic. This makes it easier for MarTech companies to analyse reach, engagement, and return on investment around brand campaigns that leverage video content.

MADTECH: CONVERGENCE OF ADTECH AND MARTECH

MadTech is the intersection of marketing, advertising and technology. This is where the successful deployment of the right tools and strategies in marketing and advertising takes place. Working with data acquisition technology, brands now have data warehouses filled with information. This includes demographic and geographic information, order history, buying preferences, product research, and purchase intent. When this data is combined, brand marketers can build a much clearer picture of the audiences to target, what offers would be relevant to them, and the best marketing tactics required for success.

Technology is constantly evolving and new trends are constantly emerging. To stay ahead of the game, businesses must ensure that they are on track with the latest trends on the right platforms. The future of marketing technology will be driven by advancements in AI, automation, and data science. AI is the game changer helping marketers make intelligent decisions by providing them with insights that would otherwise take too long to generate manually or with traditional methods.

The AdTech and MarTech industries are set to experience significant growth in 2023. Brands and companies that want to take advantage of this growth should consider adopting key strategies, such as developing innovative products, growing their customer base, and investing in the latest technologies.

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Get technology booster dose for CX

CPaaS players must add new capabilities, tools, and channels that can help businesses offer exceptional consumer experiences

BY NITIN SINGHAL

In today's digital-first economy, businesses are continuously evolving ways to engage with consumers. At the same time, consumers have changed the way they interact with brands, looking for faster and more satisfying digital experiences. They are expecting an end-to-end engagement from brands, at their convenience with knowledgeable support, interactivity, and friendly service.

Communications Platform as a Service (CPaaS) providers also have to deal with the same expectations from the businesses that they serve. In their endeavour to shine in this new landscape and embrace the opportunity, CPaaS players must be ready with new capabilities, tools, and channels to support and enable businesses to offer exceptional experiences for their consumers.

Let us explore how the industry can take on these challenges that are likely to shape the CPaaS business in the days to come.

WIDER ADOPTION OF A DIGITAL-FIRST STRATEGY

The focus in the year ahead for CPaaS companies will be on the efficient and measurable delivery of services. Leveraging technologies, enterprises across industries will be able to enable digital outreach to consumers and address their needs in real time.

SPREAD OF THE 5G TREND

The industry will witness an increase in the use cases supported by 5G while interactions will become more intertwined with the daily lives of people. The exchange of information across all the platforms will become faster with 5G. Of the 800 million smartphone users in the country currently, about 10% are already 5G-enabled. It is expected that by the end of 2023 about 80% of smartphones will be 5G enabled. For CPaaS providers this means a larger consumer base and a better opportunity to connect people with businesses.

> CPaaS providers will be able to create better visual experiences by plugging their video capabilities into the Metaverse framework.

> Pairing live videos with emotion recognition technology will drive excellent benefits for various industries, especially those that are customer-facing.

SECURITY AND AUTHENTICATION

These are times when the power of decision-making lies in the hands of consumers. This means digital engagement will assume a new meaning. However, with increased digital engagement there will be a need for better security, authorisation, and authentication since any breach could mean the loss of reputation for businesses and consumers moving to competitors.

AI AND ML TO THE RESCUE

Artificial Intelligence will enable a better customer experience. While the technology has already penetrated the industry, the use cases are likely to increase in the year ahead. For instance, the pairing of live videos with emotion recognition technology will have excellent benefits for various industries, especially those that are customer-facing. Based on the emotional state of customers, contact centre agents will be able to respond to them in a better manner. The next few years will see growth in AI- and Machine Learning-enabled intelligent conversational messaging and commerce through popular messaging apps.

METAVERSE TO TAKE OFF

As an alternate reality primarily driven by its visual component Metaverse will emerge a bigger opportunity for businesses to leverage virtual engagement. With CPaaS providers plugging their video capabilities into the Metaverse framework, they will be able to create better visual experiences. Imagine employees participating in meetings and other collaborations in their digital avatars; in a virtual space that is as realistic as possible. There are CPaaS providers already working on these technologies that can seamlessly be embedded with programmable Video APIs.

LOW-CODE, NO-CODE ADD VALUE

The addition of new CPaaS features can only add value for developers when communications solutions are developed and deployed quickly. This is where low-code solutions are gaining popularity now. With these, developers will be able to build and deploy communication solutions rapidly and also reduce the time to test and time to market.

HYBRID COMMUNICATION FOR CX

Hybrid communication has a huge role in the year ahead given how users can reach out to businesses through multiple channels. This kind of communication can provide personalised support through a cohesive and unified communication experience. In the year ahead, there will be more complex forms of hybrid communication solutions deployed using CPaaS, enabling engaging and realistic consumer experience (CX).

HYPER-PERSONALISATION RISES

Personalisation being the buzzword of the day, customers increasingly expect a seamless, and engaging brand experience at every touchpoint. This is where data analytics has a major role to play in the next year. For instance, AI-powered contact centre agents will not just be able to handle simpler queries but even complex ones. Combining live video with emotional AI will make it possible for contact centre agents to intervene in case there is an issue and understand what solution to offer based on customer sentiments. And it will directly translate to better CX.

OMNICHANNEL APPROACH THROUGH COMMUNICATION CLOUD

This is the era of multiple communication channels. Brands today reach out to customers via SMS, WhatsApp, RCS, e-mail and social media channels. By creating a communications cloud, CPaaS providers can offer companies the benefit of integrating all these channels into one cloud, for seamless access and service delivery. This technology is likely to see an uptick in the times ahead.

E-MAIL AS THE PREFERRED CHANNEL

There will always be a need for people to connect with others and businesses through digital communication channels. This is where the year ahead will see e-mail making a comeback as a strong channel for transactions, authorisation, authentication, and acquisition, supported by deliverability services.

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Logistics management gets wings of cloud

The future of logistics will depend on the adoption of digital technologies and systems that will be more interconnected than ever before

BY AMIT MAHESHWARI

Logistics technology continued to evolve in 2022 with upgrades in robotics, Software as a Service (SaaS) technologies, GPS fleet tracking, and supported by policy changes. These factors have transformed the movement of freight by shippers and carriers. Real-time data insights are making supply chains smarter, and more businesses are emphasising sustainability as a crucial element of the logistics ecosystem.

Spurred by recent policy changes and infra upgrades, the logistics industry is expected to grow at a CAGR of 10%-12% in the near term, improving India's competitiveness. With a pick-up in demand, the logistics market, pegged at ~$250 billion at present, is expected to touch $380 billion by FY25.

The year 2023 will see business and supply chain executives face a vital and compelling challenge: where and how to invest in logistics technology, and how to secure data flow. Businesses can no longer afford to lag behind technological developments. Consumers today are tech-savvy and demand higher expectations from businesses. They want fast delivery, real-time visibility, flexibility and excellent customer service.

It is here that the National Logistics Policy (NLP) can play an important role. Launched by Prime Minister Narendra Modi to encourage innovation and draw in more investment while making the industry more competitive, the goal of the policy is to bring logistics costs down from the current 13%–14% levels to that in line with developed nations. This would boost the competitiveness of Indian products in both the domestic and foreign markets. Furthermore, policy shifts and major decisions are being made to expedite last-mile delivery, eliminate transportation-related issues, save manufacturers' time and money, and prevent agricultural product waste.

The future of logistics will depend on the adoption of technologies that will make organisations more efficient and effective. Systems will be more interconnected than ever before and adaptation to uncertainty will become critical to the new normal. Organisations will have to constantly analyse the market, assess the risks,

> Cloud-based logistics technology integrates resources from all phases of the logistics process in real time for more precise coordination of the operations.

and devise strategies to improve customer satisfaction while reducing costs. The following are some logistics technology trends to look out for in 2023 that will help fill the technological gaps and enable efficiency.

CLOUD-BASED SOLUTIONS

The increased use of cloud-based logistics technology is ushering in a new age for logistics stakeholders. Cloud-based logistics technology integrates resources from all phases of the logistics process in real time for more precise coordination of the operations.

With the use of cloud-based solutions, shippers can track their cargo as it is transported to the destination. When a logistical problem arises or route optimisation is required, they can react in almost real-time to prevent delays and enable on-time delivery.

Carriers may use cloud-based technology to instantaneously bid on freight, increase the productivity of their fleets, and enhance how quickly they can react to traffic jams and other problems on the road. Cloud-based technologies enhance communication by enabling mobile app technology for drivers to stay in touch with shippers while on the road.

BLOCKCHAIN

The decentralised, encrypted system for storing and recording ownership and transaction data, Blockchain was originally designed for streamlining financial transactions. The technology has subsequently grown into a significant trend that numerous supply chain players have adopted.

Shippers can simply trace and monitor a product using blockchain, which saves them time and labour. In addition to providing real-time, tamper-proof transaction records, it also allows shippers and carriers to track the ownership and movement of freight as it travels from the warehouse to the final destination.

By using blockchain, carriers can put more of their attention on moving and delivering the freight at a higher rate while worrying less about lost, damaged, or damaged items, as well as other logistical concerns.

SUPPLY CHAIN VISIBILITY

In 2023, there will be a sustained emphasis on enhancing Supply Chain Visibility (SCV). Traffic patterns, weather conditions, and inventory information are examples of real-time data utilised to enhance SCV. With the use of this real-time data, shippers and carriers can avoid inventory shortages or logistical problems.

Cloud-based tracking technologies can be utilised by shippers to improve customer service and inventory management by increasing supply chain visibility. They can make real-time decisions about whether to buy more items from suppliers or reschedule purchases due to supply chain issues such as overstock.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

With the arrival of AI and ML and led by 5G, data-driven decision-making is now possible and will play a vital role in the years to come especially in the supply chain management sector. It will help the entire industry to become more efficient and save costs in multiple ways. Right from evaluating tonnes of data to predicting air-transit delays or prioritising tasks, AI and ML can make all this possible with just a click.

INTERNET OF THINGS

IoT is already revolutionising various businesses across sectors. Supply chain and logistics are not any different. It has increased efficiency, reduced the risks, and helped in improving inventory management and collating granular data, among other benefits. IoT will play a significant role in the coming years and boost the growth of the sector even further.

With new developments affecting practically every aspect of legacy systems and technology, including the continuous development of freight logistics platforms, AI-driven transportation management systems, and smart contracts that track parcel and freight movement, the future of logistics appears bright. With stakeholders keeping up with the latest advances in logistics technology to stay competitive, clients can be assured of the highest quality experience.

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Driving on the digital lane

Communication, connectivity, and networking technologies will continue to transform businesses in 2023

BY JOYJEET BOSE

Digital is fast becoming the bedrock of evolving customer behaviour, resulting in improved business efficiency and utmost consumer satisfaction. Businesses are constantly recalibrating operating models and working environments that are engaging in diverse activities across functions via multiple devices. Connectivity with the ecosystem is assumed to be 'on' 24/7 x 365 where there is an emerging need for enterprise-grade solutions that are flexible, secured, and backed by trusted managed services and support.

Cloud, mainly in the form of software as a service (SaaS), will see more proliferation in 2023 as enterprises require smart solutions for their business growth. Pay-as-use models as well as faster turn-up of applications will provide further impetus. Cloud growth is feeding data centre growth. Telcos are busy connecting fat pipes in the hundreds of Gigs to these ballooning data centres on the one side and software-defined wide area networking (SDWAN) is emerging as the de-facto WAN solution.

With the evolution of home-to-cloud for hybrid working, cloud-to-cloud through internet and leased connectivity, and central-office-to-cloud over secure VPN, etc., opportunities for enterprises are in providing secure Internet services through wired and wireless broadband, along with fat pipes into the data centres.

As most of the sensitive data is getting accessed through the public Internet, data security is expected to play a critical role, and enterprises need to move away from providing plain pipes to security-enabled connectivity while leveraging software-defined networking technologies. Such interventions will significantly enable the concept of democratising technologies and driving digital transformation in enterprises, especially among the small and medium businesses in India.

Cloud-based communication is the advanced form of collaboration that is taking place at each level of digital connectivity. Additionally, digital workspaces have enabled digital resources for enterprises into a single virtual location. This is further simplifying things for management through a dedicated cloud-based console while offering a secure and collaborative remote access experience to users on both company-owned and BYOD devices.

Cloud, mainly in the form of SaaS, will see more proliferation in 2023 as enterprises require smart solutions for their business growth.

The world has been transitioning with reimagining customer experience towards the virtual presence of customers. This approach has assumed greater significance in the wake of the minimised physical interaction environment. As businesses are modernising their operations, they want to provide customers with seamless support and experiences across all digital touchpoints.

To stay ahead of the curve, organisations across industries and sectors are embracing new technological interventions like Artificial Intelligence (AI), Machine Learning (ML) and data analytics that have revolutionised the current omnichannel experience. Adopting an omnichannel approach will become a critical business imperative in 2023. These bind all customer-facing interfaces together, integrated at the backend, and help in creating a better experience for customers across platforms including web applications, mobile apps, intelligent chatbots, wearables etc.

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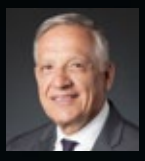

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[COMMENTARY]
CUSTOMER EXPERIENCE

Scripting the next phase of revenue generation

With B2B digital experience becoming critical for higher ARPU, communication service providers must devise innovative strategies to refine CX

BY AMIT SANYAL

Customer experience is directly linked to revenues for the Business-to-Consumer (B2C) segment and Business-to-Business (B2B) as well. However, B2B customer experience is often overlooked in most cases because there is an assumption that enterprises have the competency to manage the product or service, and so the threats associated with post-sales experience are less. Traditionally, enterprise customers have been more loyal, with many of them continuing business with the same vendor for several years. That's why most businesses focus on marketing and sales and neglect customer experience activities when it comes to the enterprise segment.

In today's evolving digital enterprise landscape, B2B customer experience is becoming relevant by the day. A recent study by consumer experience company Lumoa points out that 80% of B2B customers expect a buying experience similar to that delivered to B2C customers. Today, the B2B customer experience is gaining more significance in sectors like communication. The segment is critical because it has emerged as a primary source of

> Investing in customer experience requires a strategic rethinking of the underlying business support system (BSS) infrastructure.

> CSPs must explore strategies to leverage AI, Edge Computing, and Augmented Reality for delivering optimal solutions to B2B customers.

revenue growth for Communication Service Providers (CSPs), particularly in India where the B2C ARPU is at its lowest.

With B2B digital experience continuing to play an increasingly crucial role, CSPs must devise innovative strategies to refine their customer experience. Thus, investing in customer experience requires a strategic rethinking of the underlying business support system (BSS) infrastructure.

B2B CUSTOMER EXPERIENCE TO PROTECT INVESTMENTS

In the wake of the developments around 5G, CSP businesses in India are likely to face greater challenges in dealing with enterprise customers. The new technologies, platforms, and solutions will necessitate huge investments for both the CSPs and their enterprise clients, so they will demand more attention. Also, there is increasing competition among providers, so CSPs also need to focus on innovation to stay aggressive and agile. Despite these challenges, the prospects are far higher. Globally, the market for 5G applications for enterprise and industrial segments is estimated to exceed $50 billion by 2027.

The 5G era will be marked by several innovations powered by the latest advancements like Artificial Intelligence (AI), Edge Computing, and Augmented Reality (AR). To address the market requirements, CSPs will have to explore strategies that will help them leverage these technologies and deliver optimal solutions to their customers. With AI, for example, CSPs can offer advanced analytics across parameters like historical data, customer engagement, fraud detection, and shopping behaviour.

With Edge Computing, the CSPs can provide the infrastructure closer to enterprises enabling them to perform mission-critical and bandwidth-intensive tasks with minimal latency. AR, on the other hand, can help companies create realistic shopping experiences or virtual tours, which will enhance their customer experience journey. These enterprise-focused 5G-enabled services are estimated to yield a higher return on investment compared to similar B2C investments. Investing in innovative customer experience strategies will help achieve maximum revenues from these services, for both CSPs and their customers.

ACHIEVING GREAT B2B CUSTOMER EXPERIENCE

One of the major differences between the B2C and B2B segments is the selling cycle. For a B2C sale, the company needs to convince only one customer who will buy the product or service at a time. Fulfilling a B2B customer deal, however, is often more complex as the process requires a series of reviews and approvals by multiple people. But once it's accomplished, the result is impressive, and the chances of retaining that customer are higher. Thus, for providers, customer retention is far more rewarding than customer acquisition. Providing a smoother customer experience that addresses their demands and issues on priority will make the journey easier.

Maintaining good relations with customers will also enhance the chances of future business opportunities from referrals. Industry surveys also reveal that offering personal services of high quality can yield more returns and improve customer satisfaction. If the quality of service is higher, almost 50% of consumers will make an impulse purchase, and it is almost entirely related to the personalised services they received, says a survey by PwC.

To sum up, CSPs can explore several ways to innovate their B2B customer strategies to improve customer experience and service delivery and earn more revenues. Research conducted by The Tempkin Group reveals that 86% of those who receive a great customer experience are likely to return for another purchase. The study also found that engaged and satisfied customers are likely to buy 50% more frequently and spend 200% more annually. On the other hand, the study revealed that only 13% of people who had a subpar customer experience would possibly return. Identifying the right strategies in the digital B2B customer experience domain is integral for CSPs to stay competitive in the market.

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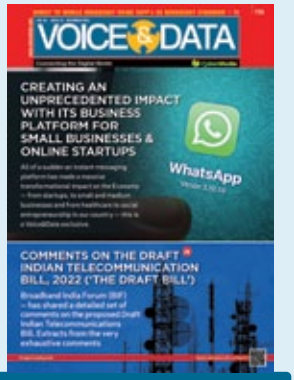

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Building networks for an immersive experience

The success of immersive experiences like the metaverse depends on the foundation of reliable, agile, and adaptable telecom networks

BY JURGEN HATHEIER

Immersive work platforms like the metaverse are no longer just the latest fad. A recent Deloitte report says that the potential impact of virtual reality-based technology in India is likely to be between $79 billion and $148 billion annually by 2035. The report further says that the metaverse may contribute as much as 1.3% to 2.4% of the country's total Gross Domestic Product (GDP).

Likewise, a recent study commissioned by Ciena to understand business professionals' sentiments about new collaboration applications like the metaverse in the workplace indicates that 92% of the respondents from India were eager to engage in more immersive experiences for meetings. The global study, which surveyed 15,000 business professionals, also revealed that 51% of respondents from India felt that virtual meetings were more convenient, while 44% believed virtual meetings are more efficient and offer fewer opportunities for chatter and other distractions. All this bodes well for the future of immersive experiences in the country.

Several global telcos have already started making headway in the metaverse space. For instance, South Korean service provider SK Telecom recently announced that its metaverse platform ifland, launched in 2021, is now available in 49 countries and claims to have 12.8 million users. In 2022, AT&T announced a collaboration with Quintar, a sports entertainment Augmented Reality company, to develop an AR experience for sports fans.

> Applications being developed for an immersive world offer the business world a refreshing improvement compared to existing solutions.

Anticipating the needs of an immersive future, Indian telcos are working on improving network reliability and making them agile, programmable and scalable.

This enthusiasm for immersive experiences might have been driven by the pandemic, which played a crucial role in the widespread adoption of remote working and hybrid modes of working. Realising the vast productivity and efficiency gains possible by using teleconferencing and unified communications technologies, people once averse to remote meetings are now more open to these immersive tools.

WORKING VIRTUALLY IN 3D

Applications being developed for an immersive world offer the business world a refreshing improvement compared to existing solutions. It comes down to immersion and the ability to move beyond 2D interactions into an interactive environment. This is something like the merging of in-person interaction and teleconferencing to become something in between and something simply more interesting.

When it comes to selecting their avatar for the virtual world, 26% of Indian respondents said that they would take on a different image depending on the purpose or the setting of the meeting. Further, 28% of Indian respondents said that they would like to adopt an avatar image similar to their real-world image. The metaverse offers vast possibilities on how people can interact with others and how they present themselves.

PREPARING THE NETWORK

The success of immersive experiences like the metaverse depends on the foundation of reliable, agile, and adaptable networks. It is crucial to ensure that bandwidth is consistent and networks can handle a massive amount of traffic while ensuring extremely low latency.

This is also reflected in the study; nearly 50% of Indian survey respondents say that the lack of reliable networks could be preventing workplaces from moving towards virtual reality-based collaboration. Indian respondents also believe it will be at least two years before they move away from the traditional collaboration environment to a more immersive experience.

The concern is well founded, particularly when you consider that with work-from-home (WFH) flexibility now part and parcel of any workplace, residential networks and 5G are expected to handle a lot of the heavy bandwidth lifting. If they cannot, these immersive experiences could become a glitchy hassle that businesses discard as a cute toy that wasn't robust enough for mission-critical use.

More than ever, businesses will need to adopt multi-access edge computing (MEC) to facilitate the implementation of the metaverse. MEC is the practice of moving data processing to the edge of a network. This means putting the resources closer to where they are needed, such as employees working away from the office and in non-metropolitan suburbs, and moving computing and storage functions closer to metaverse participants, leading to better performance and lower latency.

TELCOS ENABLE THE DEMANDS OF THE FUTURE

Immersive experiences like the metaverse are a massive opportunity for network providers and many are already investing to ensure they can provide the capacity to run immersive applications at scale. Network providers are upgrading their legacy networks and building end-to-end network capabilities to ensure improvements in speed, latency and bandwidth.

Network providers are using automation and Artificial Intelligence, analytics, and programmable software capabilities to make their networks more adaptable. An adaptable virtual programmable network is not only able to identify a fault but also self-heal without requiring physical repair. It can utilise available resources, compute, storage and bandwidth from other parts of the network and then automatically revert when needed.

With the growing popularity and adoption of remote working, it is no surprise that users want a seamless, well-connected experience regardless of where they log in from. Anticipating the needs of an immersive future, Indian telcos have started working on improving network reliability and making them agile, programmable and scalable. All this means that we will soon be able to interact and conduct meetings in our Avatar form! 😍

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5G success hinges on Shared RAN

The architecture allows components from different vendors to inter-operate across various MNOs, thereby drastically reducing the Capex and Opex

BY KUNAL BAJAJ

The average Internet consumption in India per user per month is up to 20 Gigabytes from Mobile Networks. This is the highest dependency and consumption via mobile in the world for data access. With the rollout of 5G rollout already underway, it is expected that the volume of mobile data may further jump manifold. This raises the question of whether the traditional Radio Access Network (RAN) deployment model can meet the end user's needs.

Radio Access Network distributes the network from the core network data centre to the end customer. The access network goes down every road and every city. It is distributed through fibre cables and towers. Typically, the RAN deployment may account for 60% to 65% of the Capex of Mobile Network Operators (MNOs).

The traditional model of RAN deployment may have worked well for 4G, but when it comes to supporting 5G, it is financially not feasible. This is primarily because a 5G wave can't travel the same distance as a 4G wave, owing to its higher frequency and shorter wavelength. To augment the reach of 5G waves, the access network infrastructure must be brought close to customers to provide the user with a seamless experience. The number of 5G micro cells needed to deliver high-quality services to end customers will be more than 2x the number needed for 4G.

Traditional RAN architecture in place uses proprietary equipment as part of a monolithic stack, which cannot be interoperable with the equipment of another MNO. This creates duplication of infrastructure and an unnecessary increase in Capex and Opex costs for MNOs, thereby limiting the business case for where such investment is justified. For example, higher rentals in denser areas or high-value venues restrict the deployment of access network components as expansion is not financially viable. Likewise, investment in rural areas, owing to lower demand and revenues, further presents business case challenges.

To tackle these shortfalls of traditional RAN, active infrastructure sharing through Shared RAN serves as the best solution. Shared RAN uses an architecture that allows various vendor components to inter-operate across various MNOs. As a result, MNOs can drastically cut down on the Capex and Opex costs that they currently incur to deploy their own RAN.

The traditional model of RAN deployment may have worked well for 4G, but when it comes to supporting 5G, it is financially not feasible.

Shared RAN also occupies less space, making it easy to deploy in denser areas with expensive real estate, and in aggregate uses less electricity, thereby making it greener. It can even be used to provide coverage in low-demand areas. Through this approach, Shared RAN increases the quality of end customer experience while improving economics for MNOs. The case in point is the recent deployment of Shared RAN at Mumbai Central railway station, one of the densest locations in the country. The project led to an increase in speed by five times, from 3 Mbps in peak hours to 15 to 20 Mbps. In another one of their tests, the speed even shot up to 115 Mbps.

Shared RAN offers enormous benefits to MNOs in terms of cost efficiency, technology, and scalability. Network virtualisation through Shared RAN is set to bring a paradigm shift in the way data is distributed. In times to come, because of its ability to deliver a solution in high-cost or high-density areas, Shared RAN will have the maximum share among the network deployment models adopted for delivering data capacity deep into the edge of the network. Active infrastructure sharing through Shared RAN is not going to be an alternative anymore, it is going to be the only viable solution for MNOs in such locations.

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Paving the way for rural India broadband network

The next-generation FWA brings new life to service providers, allowing them to provide broadband in dense and difficult terrains

BY RABIN PATRA

As the digital divide persists worldwide, billions of dollars are being allocated to narrow connectivity gaps across the globe. Since scant progress in the effort to connect rural India was made in the last two years, India's Telecom Minister Ashwini Vaishnaw recently announced an investment of $30 billion to ensure last-mile connectivity in every Indian village. Under this initiative, the government plans to connect approximately 80,000 new homes every month.

Rural India has very little fibre optic infrastructure to date, and the recent lack of progress to reach villages in

> Unlike its predecessors, ngFWA has a strong immunity to interference in crowded radio frequencies and the ability to connect in non-line-of-sight scenarios.

> Operators in several countries are deploying ngFWA to complete government-funded broadband projects in a more cost-efficient manner.

those regions is certainly due, at least in part, to the high costs and lengthy timelines to deploy fibre. On average, it costs between $60,000 and $80,000 to bury a mile of fibre optic cable, and the time to complete a full fibre network is typically measured in years.

Historically, these factors have limited the ability of Internet Service Providers (ISPs) to offer high-speed connectivity to only larger cities and a few villages equipped with fibre. In the outskirts of these areas, let alone in deeply rural locations, they are forced to settle for unreliable, low-performance wireless broadband equipment to serve their customers. This infrastructure shortage and the absence of a quality wireless option are the primary reasons that India's connected population relies predominantly on mobile devices and is only marginally covered by residential broadband. However, with recent developments in the fixed broadband space, there is potential to significantly increase the number of households passed and served throughout the country.

THE POWER OF ngFWA

Next-generation fixed wireless access (ngFWA) is a new, unique technology created — from its purpose-built custom silicon to its unique antenna designs and everything in between — specifically to deliver fast, affordable residential broadband at a large scale. With the industry's first instance of true interference cancellation and the ability to connect in non-line-of-sight scenarios, ngFWA has solved the two major challenges that significantly limited the performance of legacy fixed wireless access (FWA) solutions.

Unlike its predecessors, ngFWA has a strong immunity to interference in crowded radio frequencies and the effects of obstructions like trees or buildings in the signal path, and can still deliver reliable high-speed Internet. This breakthrough capability is making it possible for ISPs to connect previously unreachable areas and homes with quality wireless broadband and excellent network economics.

> ngFWA is the first truly fibre-class wireless broadband solution, which has been the missing piece in India's broadband landscape.

Now with minister Vaishnaw's announcement and other resources designated to narrowing the digital divide in India, the region's ISPs have a large opportunity to accelerate progress on that effort with ngFWA. Eliminating the need to build large fibre networks throughout entire villages, next-gen fixed wireless can enable them to cover entire communities with far less infrastructure, significantly lower budgets, and in a matter of months rather than years.

In the United States and several other countries, many operators are realising these benefits and deploying ngFWA to complete their government-funded broadband projects in a more cost-efficient manner. ngFWA can deliver high-performance connectivity where it was formerly impossible in rural India and also stretch the money allocated to closing those connectivity gaps much further, ultimately allowing operators to serve more homes.

The wireless technology can bring new life to ISPs in India, allowing them to expand into new territories and grow their businesses, even permitting them to compete with incumbent providers in many areas. ngFWA is the first truly fibre-class wireless broadband solution, which has been the missing piece in India's residential broadband landscape for decades.

As it continues to prove to be the optimal choice for service providers and grows in popularity all over the world, ngFWA will be especially transformative for Indian ISPs and the communities they serve in 2023.

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Harnessing the power of the cloud

Cloud-based networks can help CSPs upgrade faster, allowing them to add more capacity and provide hyperlocal and transnational services

BY DR CHRISTOPHER RICHARD

Telecommunications is now one of the largest economic growth drivers in the world. As of August 2022, the telecom industry of India had 1.17 billion users, including wireless and wireline subscribers, making it the second largest in the world. Telcos have dominated businesses for centuries, from telegraphs at the dawn of the industrial revolution to today's mobile apps, video, and data services.

It is exciting to see what is happening with the end of the biggest Communication Service Providers (CSPs) in the world and how top cloud providers are helping them in their cloud transformation journey. This significant change is not just about hardware or software changes but about delivering distinctive customer-focused experiences. These solution providers are also making a difference by incorporating essential components of cloud computing. For example, AT&T has announced that it is handing over the responsibility of managing all its 5G network traffic to Microsoft.

For a CSP, it is essential to focus on its three most valuable assets, including client relationships, wireless spectrum, and dependability. All these assets lead the

> Trends like Cloud Native Network Functions, hybrid cloud hosting, and telecom cloud collaboration are transforming the TSP and CSP business.

telecom industry to rely heavily on cloud computing services to offer better on-demand platforms and infrastructure. Besides, the rollout of the super-fast 5G networks has created an opportunity for the service providers to increase the capacity load and data transfer speed. Hence, vendors are enabling CSPs with cloud-based networks to make upgrades faster and allow a carrier to add more capacity and provide services in both hyperlocal and transnational ways.

According to a recent report, the market size of telecom cloud is expected to reach $105.7 billion by 2030 at a CAGR of 14.45%. This data depicts that significant investment in telecom cloud services can bring new opportunities for the world of B2B and B2C communications. As a result, the cloud has become the most effective tool for enabling innovations for telecom and communication businesses.

The telecom cloud market is competing for scalability and resilience. Therefore, various cloud computing trends like Cloud Native Network Functions (CNNF), hybrid cloud hosting, and telecom cloud collaboration have been emerging in recent times. The trend is transforming the telecom and communication businesses.

CLOUD NATIVE NETWORK FUNCTIONS

With all the advancements, software-defined networking (SDN) is now being replaced by Network Functions Virtualisation (NFV). CNFs and NFVs are combined with new 5G features in a cloud-native architecture. This allows telecom companies to look for expansion of their services and the broadest possible market coverage.

HYBRID CLOUD HOSTING

Telecom businesses understand that data and software are portable and interoperable in a hybrid cloud. Therefore, telcos have continued to combine public and private clouds. As a result, the automation provided by hybrid cloud solutions for telecom companies ensures the validity of current applications in the future as well.

TELECOM CLOUD COLLABORATION

Partnerships between the telecom businesses and growth enablers have led to transforming the business landscape through a significant cloud computing trend. The collaboration between telecom enterprises and cloud service providers is expanded to include 5G and edge computing, something that was previously challenging with 4G technology.

It is predicted that by 2025 there will be two billion 5G connections. According to the GSMA, two out of five people will have access to a 5G network. Therefore, telcos are also looking forward to shifting to cloud services to compete with the industry leaders. Leveraging cloud computing and 5G technologies will offer countless benefits to telcos.

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3i Infotech bags RailTel WiFi monetisation project

Information Technology company 3i Infotech has announced that it has bagged the multi-year WiFi Monetisation contract from RailTel Corporation of India in a consortium with Forensics Intelligence Surveillance and Security Technologies and Yellow Inc. The project aims to monetise one of the biggest captive free Public WiFi networks in the world, covering over 6,108 railway stations across India with more than 1.1 million unique users per day.

As part of the project, the 3i Infotech-led consortium will provide edge computing and edge analytics to enable greater flexibility and opportunity to fine-tune the contents and advertisements. It will also create a super app, which will serve as an ideal platform for organisations to mass-market local and hyper-local content and advertisements. The Super App will provide ease to access Indian Railways, services and information and value-added services like infotainment, e-commerce, education, and premium content services and free high-speed internet access to its users.

"The revenue will be generated by monetising WiFi footfalls through targeted advertising solutions, content, and infotainment services for railway passengers," the company stated in a press release, adding that the RailTel app will be one of the largest in terms of users, usage, and

time spent in India. "It will also bring rural India across the length and breadth of the country to its fold, with the mission of connecting Bharat in its entirety and bringing about a major transformation in the Indian Railways," the company said.

As per the contract, the consortium will pay Rs 14 crore per year or 40% of the revenue earned, whichever is higher, to RailTel. With the maximum revenue potential from the WiFi Monetisation Project estimated to be more than Rs 1,000 crore over five years, the company expects a consolidated revenue of over Rs 250 crore from the project.

Jio to provide pan India managed network services to Indian Oil

Indian Oil Corporation Ltd (IOCL) selects Reliance Jio Managed Network Services for its retail outlets

JioBusiness, the enterprise arm of Reliance Jio Infocomm, has bagged a five-year project for deploying and managing Software Defined Wide Area Network (SD-WAN) connecting 7,200 retail outlets of public-sector major Indian Oil Corporation (IOCL) across 28 states and eight union territories.

As part of this agreement, Jio will provide SD-WAN services to enable zero-touch provisioning, 24x7 real-time monitoring and other networked services like remote desktop protocol software and price updates. Jio's services will also include payment processing and Quality of Service (QoS) solutions.

Prateek Pashine, head of enterprise business at Reliance Jio said: "Our extensive experience in large-scale deployments equips us with the technical expertise to support IOCL in achieving higher performance

benchmarks across their network and leverage Jio's connectivity at each of the 7,200 sites." The project will be one of the largest deployments of SD-WAN solutions in India across any industry as well as in the oil and gas industry across Asia, he added. Currently, the solution deployment is in an advanced stage with 2,000+ Retail outlets already onboarded on Jio's SD-WAN setup.

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Tech M, Microsoft to modernise cloud-powered 5G core network

Tech Mahindra and Microsoft have announced a strategic collaboration to enable cloud-powered 5G core network modernisation for telecom operators globally. The 5G core network transformation will help telecom operators develop 5G core use cases for Augmented Reality (AR), Virtual Reality (VR), the Internet of Things (IoT), and Edge Computing initiatives. "It will also enable them to modernise, optimise, and secure business operations and develop green networks with reduced costs and a faster time to market," Microsoft stated in a press release.

As a part of the collaboration, Tech Mahindra will provide its talent expertise, comprehensive solutions, and managed services offerings including Network Cloudification-as-a-Service and AIOps to telecom operators for their 5G Core networks. The modernisation of network core systems and operations powered by AIOps enables operators to deploy and manage their 5G Core networks and leverage the power of the cloud to deliver new and innovative services to their customers quickly and easily. AIOps also helps operators combine big data and machine learning to automate network operations processes, including event correlation and anomaly detection, predicting fault and performance issues, thereby enabling self-serving network operations.

Tech Mahindra will also leverage Microsoft cloud for its sustainability solution iSustain to measure and monitor KPIs across all three aspects of E, S and G. The solution helps operators address the challenge of measuring and reducing carbon emissions from the networks while meeting demands of the countless energy intense digital technologies like AR, VR, and IoT.

HPE expands GreenLake private cloud enterprise offerings

Hewlett Packard Enterprise has announced new application, analytics, and developer services for its GreenLake for Private Cloud Enterprise. Launched in June last year, it is an automated private cloud offering for enterprises looking to deploy both traditional workloads and cloud-native applications inside their data centres. The service includes virtual machines, bare metal workloads, and containers, all running on GreenLake's on-premises consumption model.

Among the new services HPE announced is the option to deploy Kubernetes container services through Amazon Elastic Kubernetes Service (EKS) Anywhere. Customers can now run the same container runtimes on-premises that they use in the public cloud, with a consistent experience across both public and private clouds.

The company announced that HPE GreenLake for Private Cloud Enterprise now includes six workload-optimised instances for general purpose, compute, memory, and storage to optimise performance across a variety of mission-critical workloads, all using the pay-as-you-go consumption model. It expanded the GreenLake Marketplace, a service similar to Apple App Store, to include HPE GreenLake for Red Hat OpenShift Container Platform and the recently announced HPE GreenLake for VMware.

HPE GreenLake for Red Hat OpenShift Container Platform adds support for Red Hat OpenShift to HPE GreenLake and provides customers with DevOps-based application development and a hybrid cloud platform. The service provides management of containers across the Edge, data centre and hybrid cloud environments.

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