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Ten trends that will dial in the future

The industry may stop being just communication monoliths in 2021. Instead, they could be seen dabbling more into new and orthogonal areas. Here's a look into the keyhole

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Source: IDC PC Device Tracker data, 2019Q4, AMD has gained the most share among PC processor vendors for x86 processors for consumer and commercial desktops and notebooks from Q2 2017 through Q4 2019. (RNP-1)

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[OPENING NOTE]

Let's welcome the new Digital Bharat

All's well that ends well, and it will be wise to remember 2020 in the same vein. In March this year, when the deadly novel coronavirus hit the world at an unprecedented scale, India decided to go for a countrywide lockdown that continued till 31 May. This was followed by a phase-wise unlock; the country is in its 7th unlock phase till December end.

No country can afford such a long shutdown. While commercial activities started picking steam after the initial relaxation in May, and then with the Unlock 1.0 in June, India actually never stopped working. The credit for this goes to the telecom sector that stood together to deal with the sudden surge in data usage and to ensure that Indians remained connected and continued to work from home despite the restriction on man-machine movement.

However, none of this could have happened without the active support of the DoT, which facilitated the free movement of telecom field personnel across the country in coordination with its LSA officials and nodal officers of the states. The government's advisory that telecom and broadband services should be treated as essential services also helped in a big way. It enabled 24x7 access to critical tower sites and ensured near uninterrupted connectivity.

The DoT also took a timely decision in March to relax the norms for use of secured VPNs enabling interconnection between home agent position and pre-defined OSP locations. This helped tele-banking, tele-medicine, tele-education, tele-trading, e-commerce, call centre, network operation centre and other IT-enabled services to continue operation. Finally, in November, the government decided to do away with the registration requirement for OSPs; a welcome step that Voice&Data had been pushing since 2004. The new guidelines will provide a strong impetus to the sector.

There were other major initiatives too. The government launched a massive programme to provide broadband access to all villages in India by 2022. This involves laying 30-lakh km OFC, increasing the number of towers from 5.65 lakh to 10 lakh, and achieving 70% fiberization of towers – up from the present 30%. The Union Cabinet has also approved a production-linked incentive (PLI) scheme for 10 sectors, including telecom and networking products, offering an average 5% incentive on the value of products made in India.

And last, but not the least, the government approved the DoT proposal for setting up Wireless Access Network Interface (WANI) by Public Data Office Aggregators (PDOAs) to provide Wi-Fi service through Public Data Offices (PDOs), with intent similar to democratization of telephone services through the erstwhile PCOs. The affordable access to broadband will enhance employment and income opportunities, trigger the growth of small and medium entrepreneurs and boost India's GDP.

While the pandemic may have caused a lot of gloom, the initiatives taken up by DoT during the year will help usher in a new Digital Bharat in 2021.

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Ten trends that will dial in the future

The industry may stop being just communication monoliths in 2021. Instead, they could be seen dabbling more into new and orthogonal areas. Here's a look into the keyhole

BY PRATIMA HARIGUNANI

The good thing about snow is that it is easy to see footprints on the ground. The year 2020 was quite a snowfall. While some enterprises are still busy mowing truckloads out of their paths, some are treading softly into new directions. They are, however, leaving some marks as cues worth following. And some of these marks could turn into cornerstones that will shape the industry in a new way ahead.

If you are still wondering what fairy-feet we are talking about, do not worry. You have seen these prints already. From the physical layers morphing into abstraction in the form of software defined networking (SDN), software defined wide area networks (SD-WAN), etc; to the big drum-roll of edge computing and 5G; we have caught a good glimpse of how technology is redefining the capabilities of this industry. These forces will gain even more traction now.

But what would be more interesting to watch is how the very model of the industry and the revenue-orientation of telco players will assume new contours. On one hand, nudged by cloud rivals and partners, telecom players could be deploying their vast infrastructure strengths as communication service providers (CSPs) and cloud-vendors of a new stripe. On the other side, the rise of over the top (OTT) and the post-Netflix world customer will pull telcos to explore the content service industry with more focus and aggression.

Albeit, the way tables turned for some companies in 2020 with new geo-political headwinds; it is hard to predict the plot of geographical strategies and supply-chains for the next year. It would be worth watching for sure. So would be the influx of artificial intelligence (AI), automation and new technologies and standards. Telcos may turn into platforms. They may go to a changing-room and come out in a cloud outfit. They may shake hands with their arch-rivals and tech-giants. Or they may bring their own pony in the game.

What's not a 'may-be' is the fact that the customer of a typical telco has changed. That's the big spot that every telco would be jockeying for. Whether as a provider of cloud services or as a first-mover in 5G services, be it as a mint-fresh OTT platform or as a edge-partner for low-latency apps, the telecom sector winners of the new world would also be all about picking the right customer and serving them with a lot of confidence.

Nudged by cloud rivals and partners, telecom players could be deploying their vast infrastructure strengths as CSPs and cloud-vendors of a new stripe.

Some under-the-hood changes

- More abstraction
- More intelligence and automation
- 5G, internet of things, cloud

Some driving-seat changes

- New markets – OTT, CSP, edge computing
- Regulators and responsibility
- Geo-political creases

Limping would not do. Jumping too many hoops would not help either. It is all about taking the right foot forward. And listening to the soft snow as it glides down to new spots. Happy stepping ahead!

THE 10 TRENDS TO LOOK OUT FOR

The trends for telcos and the telecom sector can be sliced into two distinct pipes – the 'how' and the 'why' parts. Let's get into the 'how' aspect first and close it with the 'why'.

#1 Software-ization

Does one need to see a big backyard of wires and metal when one is sharpening strategy to face competition in an industry that is still – a lot- about speed? Not really! That explains why everything is turning into 'software'.

Telcos have seen the underground technology behind their networks and fabric change a lot in all the last few years. From one alphabet soup to another, the industry has seen software trickling in and making deep roots in even those parts of hardware-side which were impossible to consider soft all these years. We had SDN, SD-WAN, network function virtualization (NFV), virtual network function (VFN) and network-as-a-service (NaaS) in the network aspects that came in one after another.

The intelligence, programmability and flexibility aspects have grown stronger and stronger with the influx of software avatars of the erstwhile hard-wired physical components of the telco world. Intent-based networking, automation of networking management, software control for routers and switches, and a lot more is happening here. This trend of abstraction and automation will continue and gain new grounds as the industry seeks new markets and service-capabilities. Most of the new opportunities that the telcos are exploring need very high levels of agility, operational simplicity and intelligence-empowered services.

The level of competition is also getting ruthless with new rivals coming into the fray. That's why and where software-ization will accelerate here, equipping players with just the quick-footedness and sure-footedness they need now. The currents of that direction are visible with the new-found buzz around secure access service edge (SASE). The separation of control and management planes of network and better/fast provisioning for network still exist as key enablers for many propositions that telcos want to nail.

Simple network provisioning, dependable industry standards, easy interoperability among various platforms, high-grade inter-carrier quality of service (QoS) and intelligence will be paramount factors as Telco players embrace more and more software ahead. No wonder, as per estimates from IDC, the worldwide data center SDN market was augured to be worth more than USD 12 billion by 2022. And the SD-WAN infrastructure

The rise of OTT and the post-Netflix world customer will pull telcos to explore the content service industry with more focus and aggression.

How is software helping new-ware?

AT&T has shared recently how its investments into NFV and SDN were instrumental in helping the company match the demand of rising Internet traffic in the COVID-19-pandemic period. What worked was building the network on software and open hardware specifications which equips it to be ready for just about anything. Interestingly, its goal is to virtualize 75 per cent of its network functions by 2020.

In another part of the atlas, German enterprises have been spotted to see SDN and NFV technologies as those that improve integration, automation, orchestration and management of network resources and processes (as per a report from research and advisory firm Information Services Group).

What is happening is that SDN technologies help enterprises with quick response to customer inquiries and with rapid provision of new services on the network, the report adds. These tools have also been reported for improved customer satisfaction while increasing sales. They are letting companies experiment with innovative technologies around intent-based networks, artificial intelligence, rapid hot-spot provisioning and data flow allowance.

Telcos are finding them useful for simplifying the management and planning of networks and integrating them with other IT initiatives.

market expected to hit USD 4.5 billion by 2022. The NaaS market, according to GMInsights, is expected to touch USD 50 Billion by 2025.

#2 The 5G

Of course, it sounded like 'all sizzle and no steak' for a lot of industry-watchers; but 5G is going to have a slow, yet deep, influence on the industry. It could be the long end of the rope the players need for creating more industry-relevant applications, providing enriched services and a never-before agility. 5G can help many players with just the horsepower they need for expanding their markets and targeting new segments.

By 2025, 5G can account for 20% of global connections, and operators are expected to invest around USD 1.1 trillion worldwide between 2020 and 2025 in mobile capex. As much as 80% of this chunk will be in 5G networks, as per the GSMA Mobile Economy Report 2020. In fact, mobile 5G is now commercially available from 46 operators in 24 markets worldwide and almost 79 operators across 39 markets have announced plans to

> Most of the new opportunities that the telcos are exploring need very high levels of agility, operational simplicity and intelligence-empowered services.

launch mobile services. We are looking at a big field - 1.8 billion 5G connections by 2025 – with a big slice towards Asia and the US here.

What telcos actually draw from this leap is the emergence of new value-added cases due to low latency and high capacity.

As per a McKinney report in 2019 on 'Cutting through the 5G Hype', it was seen that operators were expecting positive business case, and expected rollout at scale to take until 2022. What jumps out here is how most telcos see 5G as an opportunity to cement, gain, or regain network leadership - around half viewed such competitive positioning as the number-one priority for 5G. The next priority was customer experience and then came the promise of better capacity. As to 5G for fixed wireless access, 22% of operators identified this as their first or second priority.

The players have a lot to contend with in terms of way-forward issues like the densification needed in many of the networks to leverage the higher frequencies, new spectrum acquisition costs, spectrum-related expenses, refarming efforts, etc. Just 11% saw 5G reducing industry capital expense. Many were fraught with worry about site costs (65%) and maintenance costs (50%), increase in IT costs (40%). Of course, there were 22% that saw 5G as an opportunity to reduce these costs. About a third of the operators that were surveyed here had 5G-pilot strategies in place with a lot of work already done on shaping their technology strategies. Looks like, large-scale deployment of 5G is not an entirely farfetched idea as 92% respondents have been planning deployment by 2022.

But to do this properly, telcos will have to confront network evolution investments to meet the demands of the 5G era and to diversify their revenue streams for growth beyond core telecoms services – as per the GSMA report. Do not ignore the crucial parts – Capex will need to be spent more selectively, particularly for small cells. And infrastructure competition turns harder, not easier.

#3 AI and IoT

It is impossible to talk of the future of this industry and not mention some new technology-tipping points. Intelligence would make even bigger inroads into networks and data aspects of the industry – and with more swagger.

Armed with machine learning (ML) advanced and real-time analytics, deep learning algorithms, and robotics many smart players would be able to reduce a lot of latency, delays, cost burdens and overlaps in their services. They would have the precision to personalize

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> 5G is now commercially available in 24 markets worldwide and almost 79 operators across 39 markets have announced plans to launch mobile services.

their services. With the internet of things (IoT), the networks and routers might turn into smart ninjas in their own right – arming telcos with new powers of predictive maintenance, uptime, robotic process automation (RPA), and optimization.

With artificial intelligence (AI), the telcos are building self-optimizing networks (SONs) and ways to fix network and traffic anomalies before they pop as red flags. AI is also helping to bring in really smart, and intuitive, virtual conversational assistants for quick and better customer support. According to a Juniper Research report 'Chatbots: Retail, eCommerce, banking and healthcare 2017-2022', virtual assistants have been estimated to chop away almost USD 8 billion annually in 2022. Reminds you of Vodafone's chatbot TOBi and Nokia's MIKA here?

According to IDC, 63.5% of operators are investing in AI systems for infrastructure improvements. Technavio had predicted that that the global telecom IoT market would be posting a CAGR of more than 42% by 2020. The GSMA Mobile Economy Report, 2020 suggests that enterprise IoT connections are set to overtake consumer in 2024 and it will almost triple between 2019 and 2025, and reach 13.3 billion. This will account for over half of all IoT connections in 2025.

Tapping data from far-off corners through intelligent and connected devices, networks, geo-location points and service nodes makes a Telco player more than a voice-packet. This data can have immense value in terms of insights or third-party services.

#4 Cloud

Even the most formidable Cloud players of today were, once, just sellers of books or makers of search engines or software. But they used their infrastructure backyards and the efficiencies they created here as services worth selling. And look where they are! Telcos and enterprises in the telecom sector have a similar advantage if they can spin their infrastructure muscle with the value of customer-proximity and regional-stronghold to approach this market.

After all, in the past too, telcos have dealt well with technologies that had a cannibalization threat – like voiceover-IP (VoIP), public switched telephone network (PSTN), and standard internet protocol (IP) networks.

Telcos need to push past traditional footholds of data services and network connectivity for their enterprise customers. They already have the winning cards up their sleeve – cloud brokerage capabilities, well-sprawled infrastructure, local data integrity assurance etc. They also have a large distribution in terms of CO and facilities – this is, often, bigger than the sprawl of any hyper-scale cloud provider. As long as they can keep cracking the areas of cloud distribution models, adequate repeatability, production-grade solutions, solid ecosystem play, pricing parts, integration, fragmentation and migration – they can rub shoulders with the top-tier cloud providers quite well.

They can do so with consolidation-moves and partnerships too. Like the ones done in early stages by NTT (Dimension Data), Centurylink (Savvis), Verizon (Terremark), etc. or some recent handshakes done by AT&T, Verizon, Vodafone, Telefonica with Cloud-brigade payers. The shift towards cloud will expand their portfolio and profitability. They have a lot of options here – repurpose existing network stacks into cloud-related services, using infrastructure as data centre hosting stack, move up the cloud stack, offer network optimization and security as value-additions for other cloud solutions, or deliver business services integrated over the network layer or service-enabler parts for third parties.

#5 Edge

Telcos also serve a big segment which is of a different scale and complexity. Yes, the enterprise customer. This is where the fusion of 5G and edge computing can create unprecedented services for enterprises looking for low-latency applications in their factories and remote set-ups. This works great for providing latency-sensitive and throughput-intensive applications that can be run close to end users.

With artificial intelligence, the telcos are building self-optimizing networks and ways to fix network and traffic anomalies before they pop as red flags.

Note that total mobile revenues stood at USD 1.03 trillion in 2019 and revenue is expected to rise at around 1% per year till 2025, predominantly because of growing revenues in enterprise IoT segments and new 5G services.

That's why telcos need to look at Edge from a big business perspective because growth and revenues may slow down in other areas. They can explore this through micro-data centres, customer-adjacent network stacks or cell-sites. IDC defines the telco edge as the one that is located typically near mobile cell sites and/or regional/local data centers. So by distributing the compute and storage resources into the telco edge, the amount of IP traffic flowing back into cloud data centers can be chopped in a big way. A recent IDC-Asia-Pacific Edge report points how CSPs in Asia-Pacific are actively pursuing the telco cloud/telco edge – Telstra, VHA, Bharti Airtel, Reliance Jio, Vodafone Idea, Rakuten, SK Telecom, KT, China Mobile, China Unicom, and China Telecom.

If you have noticed how AWS-Bharti Airtel or Google-Jio moved closer to each other, it is all about respective strengths of each side. Interestingly, even hyper-scalers are considering tying up with telcos for this closer-to-the-data-source advantage which is critical for government licenses and approvals. They are also important for telco-grade backhaul and fiber. Infrastructure and proximity – that's where telcos already, well have an 'edge'.

#6 Sustainability

In the last few years, a lot of debate and activism emerged on the environmental impact side of the telecom industry. Establishing new towers with green and health-consciousness, expanding infrastructure and user-health aspects are some areas where telcos have to, willy-nilly, put in more attention and visible effort. It has been augured that the mobile industry, and the ICT sector, will be charting a pathway to net-zero GHG emissions by 2050.

In fact, telcos have a big role in enabling reduced green house gas (GHG) emissions by enabling digital solutions in transport, travel, smart traffic management, smart lighting, parking, logistics, energy management systems, precision agriculture, connected health and sharing economy solutions.

Incidentally, in 2019 a group of operators – representing more than two thirds of mobile connections globally – committed to disclosing climate impacts, energy use and GHG emissions. More efforts in and alignment with science based targets initiative (SBTi) are good signs. For instance, AT&T has decided to harness the power of mobile technology to enable GHG emissions reductions that are 10 times greater than its own by 2025. Or look at Telefonica, which by 2025, aims that for each ton of CO2 it emits, it will avoid 10 tons of CO2 through its services.

So far, roughly, the mobile sector's annual emissions totals up to 220 MtCO2e, which is about 0.4% of the total global emissions.

#7 OTT

Many players are considering partnering with, or creating their own versions of, over the top (OTT) content platforms. As the main leg of the last-mile part of streaming to a viewer, telcos wield great power and possibility in entering this market. They are the ones who are selling affordable data-packages. They are the ones who are bundling content and entertainment in their offerings. Why not explore more than a foot in this door?

This also makes more sense since telcos have borne the costs of massive network upgrades or the 'top' in over-the-top. OTT players have leveraged the infrastructure that they didn't pay for – in most cases. Telcos have more than a business case here when they want to throw the new hat in the ring.

But do remember some caveats. As the GSMA Mobile Economy Report 2020 warns, the contribution of non-telecoms services is growing slowly. It would be a challenge for non-telecom revenue to grow fast enough to offset declines in core service revenues. For many operators, revenue growth as a percentage is in the low

> Hyper-scalers are considering tying up with telcos for this closer-to-the-data-source advantage which is critical for government licenses and approvals.

single digits, and Pay TV, media, IoT, enterprise solutions and the broader array of digital services still only account for just 10-20% share.

#8 Netflixization

The binge-watch-trigger-happy customer of the modern age has been weaned on the 'right now', 'swipe-swipe-swipe' and 'on tap' levels of any service. What digitization started has been taken to a crescendo with the big buffet of content options that users are now habitual of. Anything less than a big pack of cards is just not enough.

Providers would need to up their ante on many planks now – they would have to ensure that users are getting constant and immediate options that just never stop pouring in. User-centric service, speed and a burst of choices would be staple parts of any communication player now. The old game of ARPUs would, as a consequence, change to new forms of margins and challenges like a wafer-thin level of loyalty. Players would always be on a slippery ice as they scramble to serve this finger-fickle customer.

#9 Regulations and changing norms

Needless to say, the big turning points for any model or shift explained above would be decided by concerns around privacy, data usage and trust. The way regulators decide policies and paths for industry standards, for competition, for consolidation, for data sovereignty, for customer privacy, for fair use of data – all of this and more can be a big force in how telcos move ahead.

Making capital investments, tying up new partnerships or rolling out new business models – not matter what a telco does, it would have to be cognizant of what the regulator says or would say in that space.

#10 Geo-political ripples

The 'why' of any telecom player's model and existence would definitely find ramifications coming from how geo-politics works. What we saw with Huawei and Chinese equipment manufacturers in 2020 would be quite a reference to imagine how important political dynamics are – especially for a top-bracket, high-scale and essential-service industry like this.

So that's it – some of these trends would disappear as soft marks and some would etch themselves strongly as thumb-prints of a unique strategy.

As we step into 2021, we will notice that no matter how unique each trend is, these snowflakes will come together to create a new whiteboard for the telecom industry. Let's turn the calendars now.

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Chugging along the digital pathways

While 2020 reiterated the role of digital technologies, 2021 may see India strengthen its policy framework for a truly connected Bharat

BY DEEPAK MAHESHWARI

Predicting the future is precarious task even in the best of times, more so, amidst so much of uncertainty, but the past and present cues do offer some clues. However, before venturing into the future, it would be useful to take a quick look at the year gone by.

2020: Year view, er, rear-view

In cricket, the 20-20 format is one of the most unpredictable but the calendar year 2020 has been even more so, and not only on account of the COVID-19 that created more disruption than even most of the pessimists had predicted in its early days. With the vaccines making their debut in some countries and the imminent availability of the same in India seems like a harbinger of change and the year 2021 is likely to bring much needed cheer, delight and hope.

While 2020 showed that one does not needs too many things to live and survive, technology certainly was not one of those. Demand for information and communication technology, especially in terms of services got a huge fillip even as some product launches were likely deferred and several supply chains derailed in the face of prolonged and widespread lockdowns across the world.

The reliance on digital technology became a necessity for work-from-home (WFH), study-at-home, online shopping, digital payment, entertainment,

> In terms of policy space, do look out for National Cyber Security Strategy even as it is unlikely to bite the bullet with a definitive stand on encryption.

communication, and yes, even for contact tracing and consultations with the healthcare professionals. A protocol was released detailing how the data would be shared. However, privacy concerns were raised and continue to prevail in several quarters.

Of course, news gathering, dissemination and sharing also went online in a big way, and views – even distorted ones, going viral on social media. Moreover, rumour mongering reached a new peak or rather a new nadir, given the numerous unsubstantiated conspiracy theories, symptoms and treatments floating around, sometimes more virulent and perhaps even more dangerous than even the Corona virus.

However, beyond all this, the digital connectivity helped people stay connected while dealing with isolation. Streaming platforms became the mainstay of entertainment and cashed in with growing popularity and adoption amidst elongated lockdowns and phased unlocking. Several shows and films touch upon use and misuse of technology and 'Jamtara' became title of a show on, what else, cyber fraud, the trait with which this town got associated with.

The year also saw silver jubilee of both the mobile telephony and the internet services in India that had debuted in 1995, barely a fortnight apart. While these had started as two distinct services, there is increasing convergence of the two. Most people take a new mobile phone or a connection not just to talk with someone but also to use the internet even if it is to use certain social media or messaging platforms only.

With the Personal Data Protection Bill still being deliberated by the Joint Parliamentary Committee (JPC) and the National Strategies for Cyber Security and Artificial Intelligence not yet announced, there was no significant legislative or regulatory development through the year to write something home about. Still, it would be wrong to infer that the policy space was inactive.

On the Independence Day, the Prime Minister made the welcome announcement of extending broadband connectivity to all the villages. 5G spectrum auction and long-standing demand for more de-licensed spectrum are likely to be taken up only next year even as digital payments have seen massive growth.

Indian IT companies and their employees rose to the occasion vide quick and smooth changeover to WFH. Some overseas clients realized this only when they saw people joining the video calls with different backgrounds.

WFH became a legitimate mode of work for millions of office-workers. Though initially offered as a temporary reprieve and subsequently extended, the WFH relaxations announced in November did away with a lot of red tape for companies engaged not just in IT / BPO sector but extended to other domains as well. Incidentally, as an industry magazine Voice&Data had championed the cause way back in 2004. In an article published in October 2004 edition of the magazine, the author had also called for the flexibility to enable WFH.

While still in early days, production-linked incentives (PLI) may offer the much-needed booster shot for hardware manufacturing. However, consumers are already facing the brunt of increased prices of mobile handsets thanks to impact of customs duty hike.

Not content with the way content was being or perhaps not being moderated by over-the-top (OTT) players and digital news portals, the government formally brought these under the Ministry of Information and Broadcasting even as some of the industry players were putting up a self-regulatory institutional framework.

Ban on certain mobile apps – so far in three tranches, is more profound in terms of signalling than their actual effect on the ground. Unlike the orders issued to licensed service providers by the Department of Telecommunications (DoT) marked 'Confidential' this time the orders were issued by the Ministry of Electronics & IT (MeitY) but more importantly, the lists were placed in the public domain. The trigger, apparently, was geo-political skirmishes on the physical border that ensued a reaction in the cyberspace.

There was some action at the state level as well. Tamil Nadu launched a troika of policies spanning safe and ethical artificial intelligence (AI), cyber security

bpOrbit

Prevailing Hot Buttons

Being in the time zone that we are in, many BPO outfits would like to share common infrastructure for domestic and international operations. However, just a handful of BPOs would meet the eligibility criteria for this purpose. The least that the government can do is to permit all BPOs to do so, subject to the furnishing of a reasonable bank guarantee.

In the case of domestic call centers, BSNL and MTNL continue to charge an annual levy of Rs 15,000 over and above the rental (usually around Rs 3,000 per annum) for every telephone line. Besides, 1-600 and 1-900 numbers are inaccessible more often than not while dialing from any mobile phone.

The situation is not any different when one tries such numbers from the fixed lines of a private operator. This is in gross violation of the National Numbering Plan 2003 as well as the prevailing orders and regulations of TRAI.

Internet telephony has been permitted since April 2002 except for the specific restriction that there be no termination on the domestic PSTN. However, even for an international call center, which does not need to connect to domestic PSTN, the regulations do not permit it to work using only an Internet only connectivity. This takes away a big opportunity from everybody where the agents can operate out of their homes, using Internet only broadband connections.

While outgoing facility is freely available to international call centers through leased circuits, the domestic call centers do not enjoy the same privilege.

This leads to a situation where, while an international BPO can lease a line from say Delhi to Mumbai for connecting with say a co-location in London, the BPO cannot have a co-location in Mumbai to call up its Mumbai-based customers.

Although a BPO can lease the circuits for enabling Mumbaikars to connect with a call center in Gurgaon, the Gurgaon-based call center agents themselves must make an STD call to Mumbai to speak to the customers in Mumbai, or else the company must have a physical setup in Mumbai from where another set of agents can communicate with the customers there. Either way, the cost of carrying on the operations goes up.

An individual or a firm cannot offer BPO services since it is compulsory for the service provider to be a registered company. This implies that professional firms and SOHOs would not qualify to participate in this opportunity. This restrains, for example, a radiologist to engage into BPO on his own, for a few hours a day—depriving him of an enormous economic opportunity.

Use of encryption with key pair exceeding 40 bits on Internet is not yet freely permitted in the country. This is a major hindrance in attracting high-end BPOs to the country since the IPR holders perceive that the encryption of 40 bits is insufficient.

The Path Ahead

To realize the enormous potential that the BPO opportunity offers, some fundamental changes are required in our policy and regulatory framework. Any entity should be able to offer BPO services, irrespective of its structure—albeit subject to certain basic conditions.

One should be free to interconnect and share the infrastructure of domestic and international call centers and make outbound calls from domestic call centers. In case one wants to set up a BPO using 'Internet only' or connect the agents from their homes through broadband, let it be so. Use of at least 128 bit encryption keys should also be permitted freely.

TRAI must link some basic QoS to the tariffs of leased lines, besides restraining BSNL and MTNL from charging Rs 15,000 levy per line annually. TRAI should also ensure that access to toll-free and premium services is accessible in a non-discriminatory manner across the country, irrespective of the type of phone or the operator.

One cannot overemphasize the urgency or the crucial nature of these measures since it is not one single Indian BPO company competing with another Indian BPO out there, rather it is a case where India as a country is competing with others pitching for this booming business!

Deepak Maheshwari
GM, corporate affairs, Sify

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and blockchain. Thankfully, Kerala undid the amendment to the Police Act that would have given massive powers to police similar to those entailed within the Section 66A of the Information Technology Act that had been held ultra vires of the Constitution by the Supreme Court in March 2015.

The traditional enterprise firewall was never sufficient but it did offer a sense of solace and power to the CISO and his team but the paradigm shift to the WFH dismantled this false sense of confidence. On the other hand, with the confidential documents co-residing with personal albums and games, children's study and story books, they had to deal with CYOD (choose your own disaster) instead of BYOD (bring your own device). Finally, it dawned upon them that the cloud may have a silver lining, notwithstanding occasional breakdowns or non-availability.

All the same, impact of the digital divide also got amplified and these were not just in terms of rural and urban. These manifested even within families as generations and genders struggled and contested for network bandwidth, devices and services. Millions lost livelihoods and many even lives, digital access often determined who survives and thrives.

India ranks at 11 in the 2020 Affordability Report by the Alliance for Affordable Internet (A4AI) notwithstanding one of the lowest mobile data tariff and the maximum mobile data consumption per subscription globally.

2021: Hope is eternal

One can predict with conviction and with reasonable confidence that WFH would lead to prevalence and acceptance of flexible and hybrid work being more accepted norm. It could even emerge as *de facto* mode of working for certain functions or organizations, much after the COVID-19 pandemic is gone. Same goes about migration to the cloud and managed security.

Of course, many enterprises would continue their pursuit for 'digital transformation' even if just by using some

While still in early days, production-linked incentives may offer the much-needed booster shot for hardware manufacturing in India.

catchphrase in their vision, mission, branding or even in the name, reminiscent of the dot com boom. AI is the other flavour of the season, having surpassed blockchain, but more pragmatic applications are likely to emerge thereby mellowing down the short-term hype while laying a foundation for long-term value creation.

In terms of policy space, do look out for National Cyber Security Strategy even as it is unlikely to bite the bullet with a definitive stand on encryption. However, any and all efforts are welcome towards enhanced consistency, capacity building and coordination – across centre and states; across domestic and international; and across public, civic and private sector. It would be wonderful if it could mandate ten percent of all IT budgets in the public sector to be set aside for cyber security. After all, a lot of computerisation in the public sector began only after the Prime Minister's IT Task Force in 1998 had recommended earmarking one to three percent of the budget of every ministry and department for IT.

And yes, digital adoption would continue apace especially in education, healthcare, financial services and government services. However, only supply-side endeavours would not suffice as has already been seen this year when millions of students could not continue effective education due to lack or poor availability of connectivity.

Time is ripe for the National AI Strategy as well. With progress in Natural Language Processing (NLP), investment in 'smart, safe and secure' infrastructure to generate continuous streams of 'open data' should indeed be leveraged, provided it passes the basic doctrinal tests prescribed by the Supreme Court in its 2017 privacy judgment.

On the spectrum auction front, there is a lot of action that the country needs to take. The government should have steel nerves to fight the temptation for revenue maximisation via limiting supply and keeping high reserved prices despite precarious fiscal and economic challenges.

If the JPC recommends expanding the ambit to include non-personal data within the PDP Bill, the legislative timeframe may shift to 2022 and some influence of geo-politic developments is inevitable.

Competition authorities around the world are sharpening their scrutiny of Big Tech, especially in the US and Europe. Likewise, the Competition Commission of India is also likely to enhance its engagement and would likely expand its scrutiny but it is anybody's guess about their impact under the current legislative framework limitations.

One does hope that in addition to numerous supply-side interventions like fiberization and setting up of community Wi-Fi networks, we would see complementary nudge to spur demand towards realising 'meaningful and affordable connectivity' through means like direct benefit transfers (DBT) from USO Fund towards end user devices and services for the needy.

On the other hand, fibre-to-the-home (FTTH) has now become a reality, even if in select urban localities. Ditto about the Wi-Fi on domestic flights to keep one connected on the ground even when one is flying sky high.

Beyond now and here

Considering the ongoing trend towards ubiquitous and pervasive digitalisation, it would be best to have a Unified Digital Policy Framework coming out from the Prime Minister's Office that should act as the guiding star for all other policies. Quantum computing, 6G and ethical use of AI would need broader consultations, deliberations and participation.

Till such time, various policies, legislations and regulations would keep popping up regularly from different ministries, departments, agencies and even states! After all, digital technologies have become a de facto concurrent subject in India.

In the meanwhile, India would continue to chug along its digital journey. After all, 'digital' represents a mindset change rather than just a technological advancement.

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The five musketeers of 2021

Investments in cloud-telephony, SD-WAN, data security, data center infrastructure, and 5G will drive the new normal and recovery in post-pandemic India

BY BALBIR BORA

2020 has seen a lot of turbulence in the Indian telecom sector with the advent of the novel COVID-19 virus. A lot has changed in the telecom industry and in the traditional ways things were done. The eyes are set now on 2021 to level the ground with trends to watch out for in the coming year.

Trend 1: Cloud telephony solutions as work from home

Work from home (WFH) or work from anywhere is the 'New Normal' and many global organizations have announced permanent WFH policies. Companies have enabled work from home for their employees to support business as usual in the trying times of COVID-19 pandemic. There has been a need for omnichannel technologies for delivering a seamless connection. WFH has only been possible because of these modern cloud-based solutions, which makes you more connected and productive no matter where you are, it is a truly unified all-in-one platform. It integrates voice, video, chat, contact centre, and enterprise-class API solutions into one global, secure, reliable communications platform.

Cloud telephony has emerged as the need of the hour and many organizations have turned to the Cloud for ensuring quality of delivery in business communication. These solutions have been present in the market for quite some time, but with the COVID situation, organizations have become more forthcoming with acceptance of the Cloud.

WFH seems like a trend that is here to stay, and 2021 will see a growth in the cloud telephony technologies next year.

Trend 2: SD-WAN

Software defined WAN, as a technology, has been in the global picture for a long time but has not been as popular in India. A close cousin of software as a service (SaaS),

> Cloud telephony has emerged as the need of the hour and many organizations have turned to the Cloud for ensuring quality of delivery in business communication.

SD-WAN is the modern approach to managing the enterprise-wide area network.

SD-WAN takes the manageability factor of an enterprise-wide area network and gives it to a third-party SD-WAN provider. SD-WAN is typically deployed on a public internet connection and includes virtualized customer premises equipment (vCPE), with security, networking functions, and devices being controlled by the SD-WAN service provider as per the customer configurations and preferences. This is stark contrast to the traditional MPLS VPN and leased line deployments which was less scalable and rigid.

It is a more cost-effective, agile, scalable, and easier to integrate with cloud-based solutions. With the boom in the cloud telephony solutions, SD-WAN will also become a preferred technology among enterprises.

Trend 3: Data security

In the world of digitization, almost every information is available online which can be easily accessed by anyone and can be used inappropriately. Data privacy is generally the need of preserving/protecting any personal information pertaining to an individual or an organization from exposing it to a third party.

Over a period, various data privacy laws have been introduced and enacted by different countries. The most recent and the popular ones are GDPR (General Data Privacy Regulation) 2018 and CCPA (California Consumer Privacy Act) 2020.

Along the same lines of Europe and US popular laws, India has been working on the framework of India's Personal Data Protection Bill. In December 2019, the Bill was introduced in Lok Sabha. It is speculated that the 2019 Bill will be given the shape of legislation soon and we will soon have the Personal Data Protection Act, in force. The Bill is modeled on the similar principles as EU's GDPR and is expected to be even more stringent.

The whole country is waiting for the enactment of the Data Protection Bill 2019 which will be India's first law on the protection of personal data of individuals as well as the businesses operating in country.

Trend 4: Data Center infrastructure

The size of the digital economy in India is estimated to grow from USD 200 billion in 2017-18 to a USD 1 trillion by 2025. India is in the process of transitioning from a developing to developed nation.

To enable this digital transformation and to support the security provisions proposed Data Protection Act, the Ministry of Electronics & Information Technology (MeitY) has come out with a discussion on formation of Data Center policy. This policy will create a roadmap for development of in country data center infrastructure, manufacture of local hardware, local testing and certification, etc, among other things. The discussion is underway and Inter-Ministerial Empowered Committee has been set up by MeitY.

Trend 5: 5G

The new telecom technology, 5G is the global standard for a unified, more capable wireless air interface. It is expected to deliver significantly faster and more responsive mobile broadband experiences and extend mobile technology to connect and redefine a multitude of new industries.

The 5th generation of mobile network will give much faster connectivity and it will accelerate the speed of internet with reduced latency. This new technology will be able to make things like self-driving cars and NBIoT a reality with the help of realtime communication and cloud technologies. 5G will certainly leapfrog all existing internet access technologies like DSL, FTTH, wireless etc. This will be able to increase the internet penetration in the country to its maximum and will enable rural and remote regions to have access to internet.

5G is already rolled out on a global level by major first world countries. However, it is under consideration and in trial mode in India. The 5G license spectrum auction is proposed to take place in 2021 and we foresee it as one of the emerging trends in 2021.

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Forging ahead into the connected future

Telecom service providers have the opportunity to transform into digital value players and also enable efficiency for the businesses they digitize

BY SANJAY KAUL

2020 has been a tough year – as individuals, leaders, companies, and even countries, we've had to abandon all things we once held familiar and settle into a new way of living, working, and learning very quickly. But I believe that 2020 has also been the year of connection, whether it was governments coming closer to their citizens and coordinating pandemic efforts virtually, doctors reaching patients in the most remote corners of the country online, loved ones sharing a meal from across a screen, or colleagues innovating over video.

Even though the pandemic turned everyone into an island of their own, today, we are more connected – in more ways than one – than ever before.

Digitization, overall, has leap-frogged and cemented the foundation for a truly digital era, which will enable Industry 4.0 to create a new normal, new innovations, new partnerships, and new economic models. The COVID-19 crisis has effectively rewritten our future, forever altering how we work, learn, consume, create, and connect with one another.

What does this mean for India's telecom service providers? What role do they play in shaping the next normal? The way I see it: three major trends rooted in digital connectivity are taking form that will open up a world of opportunity for India's telecom service providers.

Everything will be virtual in the new normal

According to Ernst & Young (EY), India witnessed an increase of 30% in data usage during the pandemic, essentially catapulting data consumption three years into the future! This surge was driven by the rapid and ubiquitous shift to online learning, remote working, teleconsultations, digital payments, OTT platforms, etc., that the crisis necessitated.

> For small and medium enterprises, 5G can help in establishing a presence online and reaching a more extensive and diverse consumer base across their borders.

Now, this propensity for virtual platforms is becoming permanent. According to a PwC report, India is likely to account for 2.2% of the global digital payments market by 2023. An EY-IPA study has found that by 2025, as much as 20% of the healthcare sector will be virtualized. And according to a Cisco survey, 53% of Indian organizations expect over half of their workforce to continue working remotely post-pandemic.

This means that going forward we can democratize access to essential services like healthcare, education, banking, etc., and generate new jobs in smaller towns and villages, as remote work becomes a norm. However, nearly 50% of Indians still do not have high-speed internet access. Therefore, flattening of the network ensures that we are moving to more efficient and open architectures that will enable internet access to all.

While this is the first step, attention must also be paid to streamlining the hurdles to delivering services online. All of this requires last-mile connectivity and uninterrupted broadband, where service providers have a significant role to play.

The promise of 5G for businesses will drive deployment

In the context of 5G, the pandemic has been a bit of a paradox – on the one hand, it has pushed back roll-out plans given the tremendous pressure that the telecom industry has had to face; on the other hand, it has served as a catalyst for deployment, especially for businesses.

5G goes far beyond just faster speeds and more throughput and can help businesses future-proof themselves. For instance, enterprises today are becoming more distributed and accelerating their move to the cloud, where 5G can support seamless collaboration between dispersed teams, and allow leaders to gain visibility of a highly scattered workforce, etc. Additionally, companies are also looking to automate their supply chains to make them more agile and resilient. Here, 5G will allow more mission-critical IoT devices to be connected reliably through wireless and help enterprises leverage Industry 4.0 technologies like AI/ML, robotics, big data, etc. For small and medium enterprises, 5G can help in establishing a presence online and reaching a more extensive and diverse consumer base across their borders.

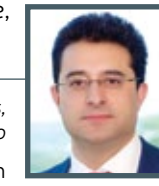
With the demand for industry-specific applications rising and enterprise processes getting digitized, enterprises will become a major contributor for service providers in the coming years. It is truly a win-win. Service providers will emerge as true digital value players, offering digital playbooks that will make all sorts of enterprise verticals efficient and, as a result, create enormous value that can be shared across the value chain.

Demand for everything as a service will rise

While there's no doubt that the pandemic has caused a surge in the proliferation of digital services, what's interesting is that it has created new trends in the way these platforms are consumed. Earlier, digitization looked different for different stakeholders – individuals, companies, governments, etc. would adopt and use technologies in distinct and disparate ways. Today, the lines between individuals and enterprises aren't as clear. Everyone wants technologies and tools that are easy to use, manage, and pay for. As a result, the demand for everything to be delivered as a service and managed through the cloud is gaining momentum.

Here, too, telecom service providers have the opportunity to transform into digital value players, offering bundled solutions for education, entertainment, SOHO (small office, home office), etc., and not only carve new revenue streams for themselves but also enable efficiency for the businesses they digitize.

The crisis has been the biggest disruption in recent history, but it has allowed us to reflect and identify where change is needed the most. As we step into a brand new year, I believe telecom service providers will become the greatest enablers of a new, more connected, and inclusive world, one where the internet will serve as the bridge to immense possibilities for people, businesses, and communities.



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Pandemic drives the change

Economic and societal impact of COVID-19 will drive faster adoption of cloud, intelligent edge, digital reality and telemedicine

V&D BUREAU

Trends in telecommunication and media led by disruptions and newer technologies may affect businesses and consumers worldwide in unprecedented ways, changing the way people live, work and entertain forever. According to Technology, Media and Telecommunications (TMT) Predictions report by Deloitte, many of these trends are being driven by the global pandemic's economic and societal impacts, resulting in intensifying growth in video, virtual, and cloud technologies.

"A range of enterprise and consumer technologies – from 5G to the cloud to virtual reality – will continue to offer opportunities to the worldwide business ecosystem," says Deloitte's Industry leader for Technology, Media and Telecommunications Ariane Bucaille said. According to him, while some technologies followed expected growth patterns, the reality of a global pandemic has resulted in unprecedented technology acceleration that has fundamentally changed people's lifestyle.

Adds Vice Chairman and US Technology, Media and Telecom leader Kevin Westcott: "The pandemic will continue to shape business strategies in 2021 and consumers will expect faster, more reliable and safer user experiences. TMT companies that can address these customer needs, while rebuilding their industries for growth, will likely emerge as leaders next year and beyond."

Cloud to continue on the growth path

By some metrics, the cloud market grew even faster in 2020 than in 2019. According to the report, this was driven by increased demand due to COVID-19, lockdowns, and the work-from-anywhere business environment. Deloitte Global predicts that revenue growth will remain greater than 30% for 2021 through 2025 as companies migrate to the cloud to save money, become more agile, and drive innovation.

With the pandemic driving more enterprises toward cloud, the market will likely emerge from the pandemic

> While some technologies followed expected growth patterns, the reality of a global pandemic has resulted in unprecedented technology acceleration.

stronger than ever. Cloud providers and others in the ecosystem will also have the opportunity to capitalize on increased usage, while cloud users can seek to explore new ways for the cloud to create value. In the near future, cloud technologies may become the dominant solution across all types of businesses.

The intelligent edge for Industry 4.0

The intelligent edge – the combination of advanced wireless connectivity, compact processing power, and AI located near devices that use and generate data – is already animating some of the largest technology and communications companies on the planet. Deloitte Global predicts that in 2021, the global market for the intelligent edge will reach USD 12 billion, continuing a CAGR of around 35%.

According to the report, the increase is being driven primarily by telecommunications companies and their expanding 5G networks, along with hyperscale cloud providers. These highly capitalized leaders' trailblazing may make it easier for companies across multiple industries to attain the intelligent edge.

"Many of our technology predictions emphasize a reliance on virtual innovation driven largely by the pandemic – remote working, digital transformation and cloud migration have all accelerated faster than we expected," says Deloitte's Vice Chairman and US technology sector leader Paul Silverglate.

"But one prediction we'll be keeping a very close eye on, driven primarily by the expansion of 5G networks and the rise of artificial intelligence, is growth of the intelligent edge. By bringing powerful computing capabilities closer to where data originates, the intelligent edge unlocks the potential for faster, less expensive and more secure operations in everything from autonomous vehicles to augmented reality to the internet of things – helping to realize the promise of Industry 4.0."

The 5G health myth gets busted

Concerns about 5G's health risks have no basis in fact. Deloitte Global predicts that in 2021, it is very unlikely that the radiation from 5G mobile networks and 5G phones will affect the health of any single individual. But if education about 5G is to be effective in curbing popular fears, it needs to be compelling, consistent, and pervasive, and it needs to begin now.

Healthcare move to video

One effect of COVID-19 has been jumpstarting a worldwide trend of telemedicine, including video-based doctor visits. The global pandemic not only necessitated the elimination of regulatory barriers to such visits but also helped consumers better understand and leverage video calling apps, especially consumers over the age of 65.

Despite some initial trepidation, the report notes that patients and doctors have been willing to shift to virtual appointments, including video visits. Deloitte Global predicts that the percentage of virtual video visits to doctors will rise to 5% globally in 2021, up from an estimated 1% in 2019. "Even single-digit growth is significant; 8.5 billion doctor's visits, worth a total of approximately USD 500 billion, took place in the 36 OECD countries in 2019 alone."

Education, enterprise opt for virtual reality

The market for digital reality headgear is growing as immersive technologies gain popularity in the enterprise and for education. According to the report, led by purchases by corporations and educational institutions, sales for enterprise and educational use of wearable headsets for virtual, augmented and mixed reality – collectively known as XR or digital reality – will grow by 100% in 2021 over 2019 levels.

Market growth for these headsets has already accelerated in some markets due to the risk of COVID-19 infection driving their use in teaching employees and students virtually rather than in person. With the pandemic accelerating the opportunity to demonstrate their value, digital reality headsets may continue to gain ground after the pandemic ends due to a variety of other benefits, such as lower cost, greater safety, and better learning retention.

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Get ready for more cloud in financial sector

Decision makers are seeking to balance agility and scalability of the cloud with requirements for cyber security, compliance, and operational consistency

BY SANJAI GANGADHARAN

Changing customer needs and preferences are driving the evolution of a new financial services industry. As established incumbents compete head-to-head with digital-native competitors to deliver differentiated digital experiences, the speed, agility, and quality of service delivery has become critical for success. To support rapid innovation and digital transformation, financial services organizations are turning to public cloud, private cloud, and hybrid cloud environments—a move that can bring both powerful benefits and considerable challenges.

A recent survey by A10 Networks and Gatepoint Research explored this trend in depth, asking senior decision-makers at leading financial institutions about their current plans, concerns, and priorities for their hybrid cloud and public cloud environments. Participants offered their views on topics from cloud form factors, to regulatory compliance and governance, to securing web applications against threats including ransomware, data theft, and DDoS attacks. The results show decision makers are seeking to balance the agility and scalability of the cloud with requirements for cyber security, compliance, and operational consistency.

Switch to and from hybrid, multi cloud

Under half of respondents reported hosting applications primarily in the cloud — but the financial services industry

> Financial services organizations are paying close attention to form factors, architectures, and deployment methods to ensure their cloud strategy truly fits the business needs.

has not abandoned its legacy roots just yet. The majority of survey participants still rely primarily on their private on-premises data center for application delivery. However just over a third also described their environment as hybrid cloud, a model in which public cloud services complement private cloud resources — as distinct from a multi-cloud strategy, in which organizations use multiple cloud services within the same enterprise architecture, with or without integration to on-premises resources.

The willingness of financial services IT leaders to pick the right environment for their applications can also be seen in the five percent of respondents who planned to repatriate applications from private cloud environments to their on-premises data center, indicating not every financial application may be suited for certain clouds. While some verticals show a full-speed-ahead attitude toward the cloud, financial services organizations are paying close attention to form factors, architectures, and deployment methods to make sure their cloud strategy truly fits their business needs.

Take care of increasing security concerns

Storing and processing vast amounts of sensitive personal and financial data, financial services firms are a rich target for cybercriminals. Top concerns cited in the survey included ransomware, the theft of personal identifiable information (PII), and phishing or fake sites. The impact of such incidents on a company's reputation can be severe – especially in an industry built on trust. Indeed, more than a third of respondents expressed worries about the kind of incidents that can erode a company's public image, citing hacking, cyber defacement, and brand damage or loss of confidence. DDoS attacks that can degrade service and customer experiences represent a significant risk as well in the highly competitive financial services space.

As public cloud, private cloud, hybrid cloud, and multi-cloud reshape IT architectures—and erode the effectiveness of traditional network cyber security strategies – financial services IT leaders are taking new approaches to protection. More than two-fifths of respondents had already established a timeline to introduce a Zero Trust cyber security model, in which access controls are extended throughout the environment rather than being limited to a hardened network perimeter, and users both inside and outside the organization must be authenticated and authorized prior to connection.

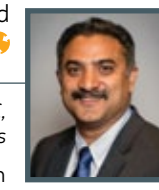
Technical counter measures are proceeding as well. As cybercrime groups continue to target financial firms with DDoS attacks, nearly a third of respondents plan to deploy or replace an existing web application firewall or DDoS protection solution. But progress is not always swift; 29% of organizations are working to upgrade their TLS capabilities to support modern PFS/ECC encryption standards to meet consumer and organizational expectations around privacy and security, while meeting the performance impact of the more advanced standards.

Invest in hybrid cloud, cyber security, management

As financial IT decision makers set their budget priorities, cyber security comes first – by a large margin. Nearly three-quarters of respondents said that security was the most likely driver for new technology investments. Operational improvements and cost savings were each named by nearly two-thirds or participants, while regulatory compliance rated nearly as high.

Perhaps surprisingly, innovations keyed to business considerations received much less emphasis than operational benefits. Roughly one-third of respondents named such factors as revenue generation, customer satisfaction, and business advantage from new technology. Even fewer were motivated by the ability to accelerate development speed.

Just as the changing perimeter has spurred interest in 'Zero Trust' security, the rise of public cloud, private cloud, and hybrid cloud has brought new focus on polynimbus management for unified cross-cloud and on-premises control. Asked about the most important capabilities for financial platforms running in hybrid cloud environments, top responses included regulatory compliance, redundancy and disaster recovery, comprehensive application security, and centralized management and analytics.



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Building a better, secure payments future

Mobile, cashless payments and e-commerce market competencies are the decisive factors driving the move toward a cashless society model

BY GOPAKUMAR SUBRAMONIAN

While digital payments have evolved significantly over the last few years, the financial services industry has witnessed an extraordinarily accelerated transition in 2020. Payment methods that were previously considered emerging or niche alternatives have become consumers' preferred means of transacting during the COVID-19 pandemic, including a whole new suite of contactless and touchless alternatives for commercial transactions.

This effectively means that the way people interact with their financial institutions or favourite shopping brand is transforming with everything available at their fingertips and on their mobile device.

With its broadly available mobile and internet services, and effective mobile payment solutions, along with forward looking regulatory developments, India is taking steps to increase usage of contactless or touchless payment solutions. The ongoing pandemic has further accelerated the need to digitize amongst businesses too. With a surge in the number of consumers and merchants utilizing digital platforms, it is a priority to invest in the creation of a robust digital ecosystem. This will increase loyalty and engagement in the long run as digital becomes the new normal.

Emergence of contactless consumers: Undoubtedly, the most visible trend of the past year is the emergence

> Purchasing via a mobile device continues to gain traction in e-commerce for the sheer convenience it offers to customers. 'Shop and Pay' is the emergent choice.

of the contactless consumer. Increasing apprehensions about physical currency have led to a decline in cash transactions. Customers are demanding at-home service and touchless options. This transformation has impacted payments in two primary ways – the first is the increased use of Wi-Fi-enabled cards or mobile wallets at the POS, and the other is the rise of online or mobile prepayment through wallet applications and e-cards.

As hygiene standards have become more stringent, more people have turned to online interactions as well. People are adopting online ordering and this trend is going to continue post-pandemic.

Purchasing via a mobile device continues to gain traction in e-commerce for the sheer convenience it offers to customers. 'Shop and Pay' is the emergent choice. When consumers opt for purchasing anywhere, anytime, online merchants can respond with simplified, secure and seamless checkout.

Ubiquitous digitization: Growing consumer preference for contactless payments has resulted in increasing number of merchants and small businesses looking to go digital. UPI transactions will continue to rise in years to come. In addition, modern point-of-sale (POS) machines come with comprehensive tracking solutions to enable merchants to understand consumer buying patterns. Use of this data will allow merchants to operate more efficiently, streamlining inventory management and allowing for better understanding of capital requirements.

Time for open banking system: Due to the pandemic, visits to a local bank branch have been prohibited or restricted. As a result, banks and other financial institutions are investing in tech-enabled solutions to allow customers to bank the way they want.

Adopting an 'open banking' approach democratises access to data and banking services to give customers more control over how they manage their money. Freeing customers from geography-dependent services could translate to increased customer loyalty through customised financial management and other potentially rewarding partnerships.

Security continues to be a concern: One of the most important aspects of digitization is security. People and businesses are more connected than ever, yet as our technology advances, so do criminal exploits. It is imperative to understand consumers and their preferences towards different modes of payment in order to build digital platforms that are both relevant and secure. Businesses are gradually becoming more open to moving services to the cloud, and they want the security to match.

Payment specialists: India's financial landscape is quite varied, with idiosyncrasies visible across states. There is a need to tap into local specialists to cater to the needs of local markets effectively. This has led to the rise of 'payment specialists' who will help with licenses, market expertise and operational bandwidth to complement the technology, domain expertise and scale of global firms.

The pandemic has caused a transformative shift in the financial ecosystem by rewriting the rules. All participants in the ecosystem are rethinking their approach to delivering financial services. In the past, digitisation and the implementation of technology solutions was an afterthought. Today, it is an important business purpose function for successful and seamless functioning of business operations.

In coming years, success will almost depend on how effectively organisations customize product offerings to cater to consumers and meet the requirements of real-time payments solutions. The growing consumer preference for mobile and cashless payments combined with advancements in technological infrastructure and e-commerce market competencies will be decisive factors in the move toward a cashless society model. Overall, an exciting digital journey lies ahead of us and there is a need to reinforce it with a robust payments infrastructure that makes security and trust an integral part of the digital experience.

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Building a Network for the Future: How Service Providers Can Prepare Now

JATINDER KHURANA
Director, Regional Sales, Ciena India

While most sectors are grappling with declines in business currently due to COVID-19, according to a report by GSMA, LTE subscribers in India rose around 26 per cent year-on-year to around 644 million by June 2020. Now, the increased data traffic on mobile networks resulting from COVID-19 combined with increased tariffs translated into growth in ARPU and revenues[1]. Clearly, the Indian telecom sector is slated to grow amidst the economic slowdown.

These figures clearly compel us to look towards the fast-approaching future, which is NOW. With staying home being the new norm, many businesses are considering making this a permanent model globally. In India, all schools and learning systems have gone online, and Indians have shifted to OTT content and social media as their primary sources of entertainment. For service providers, this trend clearly implies heavy traffic management and increase in number of subscribers in the current data bands and this will grow even further.

To maintain continuous Quality of Experience (QoE) for consumers, it is now time to adapt to the future of networking. Moving from high spend on OPEX and

CAPEX, legacy systems which are difficult to scale in a heavy traffic period – factors such as adaptability, scalability, cost, automation, self-management play a key role in defining our future readiness to support new tech such as 5G, SD-WAN and use cases like online gaming competitions, smart homes and connected vehicles.

Moving beyond legacy architecture and ways of network management, it is time to automate and scale telecom networks. Here is how we at Ciena believe service providers can maximize the exciting opportunities of networking:

Highly scalable and programmable infrastructure

Considering the ever growing data demand from current and new users, and the speed of innovation at which next generation technologies are accelerating, service providers need a scalable network without impacting the OPEX, TTM and TTR[2] at access, aggregation and metro networks.

Moreover, rather than waiting for the system to detect errors and the engineer to fix these errors during high traffic and new demands manually, we recommend service providers program their infrastructure (which can be in their own data centers or the cloud) remotely, and in advance. The convenience derived from remote management during unexpected demand and the ability to program multiple devices is the future. The ideal infrastructure will evolve towards an open, flexible, and scalable Adaptive Network™.

Data migration to Edge Cloud

OTT content, online gaming, industrial IoT and automation, automotive apps, AR and VR are just a few of the applications which have made real-time latency and bandwidth speeds impertinent. The storage and compute requirements of such use cases require physical data centers. This implies heavy infrastructure management and scaling these data centers – given the accelerating demand – poses many logistical challenges.

Given the requirements of new age apps, the easiest, most cost effective solution is the migration to Edge Cloud, that is, migrating data from physical centers to the a cloud ecosystem encompassing commodity-off-the-shelf compute and storage components coupled to highly scalable and programmable networking components.

Fully automated systems for self-diagnosis and self-healing

Often, the underlying problem in the network architecture is recognized when there is an overcapacity or when a system alarm indicates an error, which requires manual checks in the current network ecosystem. Automation for problem recognition and awareness is the answer to these challenges. The need of the hour is AI and ML[3] based capabilities which use information provided by applications and telemetry, allowing the network to continually self-diagnose, self-optimize, and self-heal. A future-proofed network infrastructure is required to support the ongoing evolution of networks.

Disaggregated infrastructure

Instead of utilizing the costly, full-featured IP stacks on devices across the network, here we are talking about simplifying management and support by migrating the functionalities of these devices into an orchestration layer on the cloud. By doing this, we are disaggregating the physical and cloud functions while bringing them together seamlessly. The byproduct of this disaggregation will be - less processing power, less storage, reduction of overall network footprint, massive reduction in real estate, power, cooling, operational and maintenance costs.

Virtual management and control operations

New applications will require computing power to be located at the edge of the network, delivering scale and performance dynamically as needed while significantly increasing the number of deployed IP router nodes. This associated complexity makes intelligent automation a critical network requirement.

A multi-vendor, hybrid network environment can make it easy for any network provider to start their journey from a box-centric legacy IP approach to a simple, automated network design, efficiently supporting legacy services most while preparing for the next wave of applications requirements.

Wherever you are in your network journey, Ciena's future network expertise can help you get started or help you create the Adaptive Network™ experience. Read more about Adaptive Network™ here: *https://www.ciena.com/insights/white-papers/Introducing-the-Adaptive-Network-Vision.html*

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TV RAMACHANDRAN

IT'S TIME TO REALIZE OPTIMAL SPECTRUM PRICING

Cost of spectrum is directly related to affordable access to digital communications, which is critical for driving India's recovery post COVID-19. Here is what the government should do

Access to the internet and mobile services is now synonymous with our survival – particularly after the COVID-19 pandemic hit the world. Those who could get necessities and services or work or study online could better navigate the new normal of lockdown and social distancing measures. The millions, who couldn't, suffered more severe hardships.

So, how do we get the great equalizers – internet and mobile services – to every corner of our country and its citizens? How do we boost India's economic recovery post-COVID-19 and beyond? This is the central mission driving PM's Digital India initiative. The most effective answer may lie in greater use of an unsung but critical resource – spectrum, the lifeblood of all telecommunications.

Recent world-wide spectrum auctions

S.No.	Country	Spectrum bands	Auction/ award date	Quantum of spectrum offered	% of spectrum sold
1	Finland	25.1-27.5 GHz	Jun-20	2400 MHz	100%
2	Australia	3575-3700 MHz	Dec-18	125 MHz	100%
3	Austria	3410–3800 MHz	Mar-19	390 MHz	100%
		700 MHz	Dec-18	40 MHz	100%
4	Sweden	3600 MHz	May-20	80 MHz	Local License
5	Spain	3600-3800 MHz	Jul-18	200 MHz	100%
6	UK	2300 MHz	Apr-18	40 MHz	100%
		3400 MHz	Apr-18	150 MHz	100%
7	USA	600 MHz	Apr-17	70 MHz	100%
		28 GHz	Jan-19	1650 MHz	100%
		24 GHz	May-19	700 MHz	100%
		37 GHz, 39 GHz & 47 GHz	Mar-20	3400 MHz	99.90%

Source: Country Regulator and Operator Websites, BIF Analysis

> In India, most auctions since 2010 have not yielded optimum results. In the six e-auctions held since 2010, only 60% of the spectrum could be sold.

But how can we drive more spectrum use for the benefit of our nation?

Spectrum's most significant value comes from its usage, but high reserve prices (RP) have limited its use in India. Spectrum is allocated through auctions – and herein lays the crux of the issue. In India, most auctions since 2010 have not yielded optimum results. In the six e-auctions held since 2010, only 60% of the spectrum could be sold. The rest lay unused and idle. In the 2016 mega-auction, only 41% was procured by telecom operators due to a steep RP that did not reflect real market value.

In stark contrast, many recent auctions worldwide have successfully sold the entire spectrum offered in their auctions. For example, in the UK, the 2013 and 2018 spectrum auctions were 100% successful – all 60 MHz of spectrum offered in 800 MHz band and 185 MHz offered in 2600 MHz band were sold. Similarly, in 2018, all 190 MHz of spectrum – 40 MHz in 2.3 GHz band and 150 MHz in 3.4 GHz band were sold. Setting the optimal RP proved to be the most critical factor in the UK auctions' success.

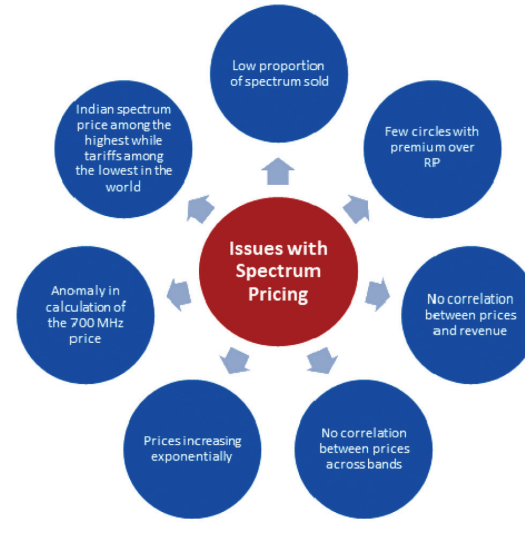
An auction is only as successful as the amount of competitive bidding it generates, and most importantly – the sale of the auctioned goods at a much higher price from the starting price. In India, in 2016, 700 MHz spectrum got no bids, and other auctions have also seen low enthusiasm. High reserve price for these auctions became the final clearing price and not the intended catalyst for fierce bidding. In many cases, the average sales price was hardly 5% above the RP. This is undoubtedly a sign that something needs to change.

In the 5G UK auction, the total amount of spectrum auctioned was sold for more than 19 times the RP of £70 million! In 2013, the 800 MHz and 2600 MHz UK auction concluded with a total of £2.34 billion, a premium of nearly 80% over the RP. How can we infuse Indian spectrum auctions with the same level of triumph? The answer lies in finding and setting the right RP – based on actual market value.

Spectrum can be a potent socio-economic growth engine, as firmly established by many reputed agencies worldwide – the World Bank, London School of Economics, NERA Economic Consulting, and the Indian Council for Research on International Economic Relations (ICRIER). Many other studies have also shown a direct and quantifiable economic gain from the usage of broadband, mobile and rich interactive apps – spectrum is the foundation for all these services. DoT accurately categorized "Spectrum as a key natural resource for public benefit to achieve India's socio-economic goals" in Section 1.2 of the National Digital Communications Policy (NDCP) 2018. But we can only leverage these numerous advantages if spectrum is available for use and not lying idle.

The right spectrum price is directly related to mobile broadband services' affordability, better coverage

Issues with Indian Spectrum Pricing



> Revenue Surplus Approach is most suitable for and analogous to the current conditions. It is the appropriate method for 1800 MHz spectrum valuation.

across the country, and faster data speeds (GSMA 2019 report). Let's look at the Indian railway system. Its success lies in how much and how effectively our trains are used every day. Our railway system runs 12,000 trains and carries more than 23 million passengers, over 7,000 freight trains and three million freight tonnes every day. It connects over 8,000 stations across India. If ticket prices or freight charges were astronomically high, very few people and organizations would be able to use our trains. As a result, very few stations would be in operation, and the railway system would be considered a luxury, not the backbone of India's transportation. Setting too high a price is a critical gating factor preventing the use of a valuable resource for public interest.

Breathing life back into spectrum auctions

The auction process must discover the true market price of spectrum. We recommend a comprehensive fresh spectrum valuation based on a review of the various inputs that go into valuation, including approaches to evaluate spectrum, use of mean, last auction price, and more.

It is ineffective to use the RP from a previous auction to calculate RP for the next one. This is especially true when the final clearing price of spectrum in an earlier auction is equal to or only slightly more than the RP for that auction. Particularly since, most often, the RP or selling price is matched by a single bidder, and not all-round healthy bidding. We cannot rely on the Marginal Cost of Funds based Lending Rate (MCLR) to set prices. It does not capture or mirror the telecom sector dynamics. A better benchmark for telecom services is the consumer price index.

The Revenue Surplus Approach is most suitable for and analogous to the current conditions. It is, therefore, the appropriate method for 1800 MHz spectrum valuation. This method determines spectrum value from the bidders (telecom providers) and their customers' points of view. Through this method, we can figure out how much a service provider can and is willing to invest in spectrum to realize the net revenue potential and revenue surplus over the spectrum's license period.

The new RP should ideally be set at 50% of its valuation. For RP of 2100, 2300 2500 and 3300-3600 MHz bands, weightage factors in-line with TRAI recommendations should be used. For newer bands (3300-3600 MHz) where no past experience is available, it is also worthwhile to take into account the international experience and set RP in line with international norms.

Optimal pricing of spectrum is essential "to be equipped for the broadband era" as per NDCP 2018. Section 1.2(b)(v) also directs "Optimal Pricing of Spectrum to ensure sustainable and affordable access to Digital Communications".

As we move towards introducing 5G in the country, the need for optimal spectrum pricing reforms is even more pronounced. When available, 5G would be the first generation of mobile communications technology that transcends usage beyond the field of communications. Energy, mobility, healthcare, finance and many other sectors eagerly await the proliferation of 5G in India to leverage its numerous benefits for public good. In this context, we need to remember the landmark Supreme Court judgement of March 1995 that held that air waves (spectrum) constitute "public property" and must be utilized for the public good.

Sub-optimal pricing would cause ineffective usage, missed or delayed implementation of 5G and generate losses that are completely irretrievable. Hence, the situation needs urgent remedial actions. It's a 'now or never' defining moment to offer 'Broadband for All'.

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Mark Weaser
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"Speed versus quality is a classic balancing act"

As the world of content bursts with never-before spread of choice and convenience, developers have a lot to catch up. Can they sacrifice speed for reliability, security, scalability and experience? Or should they use low-code as a tool or as a quick-fix that can raise its head later with other issues? Here's why OTT applications need a different mix of automation and flexibility. OutSystems Asia Pacific Vice President ***Mark Weaser*** *in an email interview with* ***Shubhendu Parth*** *shares how the industry is using AI to move apps across development, test and production environments at a single click. He also touches upon why PWAs, native environments and multi-device worlds have a serious connotation for the developers busy binge-coding for OTT.*

The pandemic and the ban on Chinese apps in India led to a surge in demand for OTT and other mobile applications in India. How do you see the low-code platform enabling this ecosystem?

According to a study by techARC-Unomer, based on data collected from over five million smartphone users, four out of five (79%) smartphone users in India have OTT apps installed for entertainment needs, and almost 70% of these users have multiple OTT apps installed. With the lockdown across the globe, people are spending more time at home. This has resulted in a massive demand for OTT entertainment apps, which is now the most-common app category among smartphone users in India.

The significant rise in adoption of OTT and other mobile applications creates added pressure for developers and IT staff alike. New applications have to be built faster to meet the needs of the market. Customers have vastly higher expectations when it comes to the quality of the experience, so developers not only need to develop quickly, but the sophistication and refinement of their experiences means that whatever they are building has to be of the highest quality. Finally, because of the scale of the market demand, these new applications need to be of very high-performance, secure, and extremely reliable.

While there are many paths to building OTT and mobile applications quickly, most of those solutions fall short in the richness of the customer experience as well as being insufficient when it comes to the scalability, reliability and availability aspects of the solution. What OutSystems offers developers is a platform solution that combines the best of low-code-based development tools, with underlying services and architecture that enables developers to build solutions that meet all needs of this complex and exciting market.

How do you compare traditional programming with a low-code development environment? What are the factors influencing companies, OTT platforms and mobile app developers to shift to low-code?

What low-code development offers, through its visual, model-driven approach, is the ability to quickly and efficiently build valuable applications. The challenge with most low-code offerings is that speed comes at the cost of being able to build a wide variety of solutions. Another challenge with low-code is that you might be able to build a departmental app used by 10 or 15 people quickly, but that application will likely never be able to scale to

> While there are many paths to building OTT and mobile applications quickly, most of those solutions fall short in the richness of the customer experience.

supporting millions of users. And even though low-code applications can be built quickly, we have to sacrifice on the ability to update those applications continuously after they've been deployed for the first time.

With traditional coding, on the other hand, developers can build just about anything that can be imagined. This flexibility, however, comes at the cost of time and complexity. While traditional method allows one to build applications that are highly scalable and reliable, it requires rigorous application of good architecture principles and IT governance from the beginning of the process. And while building the first iteration of an application is painfully slow, traditional coding suffers the same challenges of lack of speed when it comes to updating applications.

OutSystems was built from the ground up over the last twenty years to be able to provide the best of both of these worlds by delivering an end-to-end application platform that's optimized for building rich enterprise-class applications. Our development tools benefit from a visual, model-driven approach, but with years of refinement, are able to offer similar expressiveness as traditional coding methods so that developers can not only build applications quickly, they can build just about any type of application and they build with beautiful, rich user experiences.

Furthermore, with a powerful set of platform services, AI-powered automation and rich management tools, applications built on the platform can scale from being departmental apps to servicing millions of simultaneous users without any additional friction or re-architecture. This is particularly true when it comes to mobile applications. For instance, a mobile application can be converted into a Progressive Web Apps (PWAs) with nothing more than a single click. Similarly, applications are secure from design time to runtime with over 270 different security checks provided by the platform and tools, and there is an additional, built-in layer of security specifically provided for mobile applications that we refer to as AppShield.

With anybody and everybody now able to create an app, will it not lead to dumping of low-quality offerings? What about the security threat?

Speed versus quality is a classic balancing act that applies to the process of building software. For those who prioritize quality, it makes sense that there would be a healthy scepticism of development platforms that promise greater speed.

To address this concern, it's helpful to substitute the word "speed" with "automation." The speed can be increased by using rapid application development platforms for things that developers no longer have to do. Various studies show that as much as 60% to 80% of development time is spent on repetitive activities. For example, the way code is written to extract data from a table and the way it is presented on a screen do not vary much. And it's the same for security, internationalization and accessibility.

Having said this, developers still need to have some basic understanding of coding principles in order to build applications that will ultimately be scalable, reliable and available. That's why OutSystems believes that the best approach to building software is when a multidisciplinary team made up of representatives of the business, development and IT collaborate together to build the applications that really matter. We offer specific tools so that every member of the multidisciplinary team is empowered to add their value to the overall process. For instance, OutSystems includes Workflow Builder so that a business analyst can ensure that the proper business requirements and workflows are easily mapped into the applications development process without the requirement for them to become full-fledged developers and write lines of code.

By creating a platform that optimizes the value from every member of the multidisciplinary team – and also run on top of an enterprise-class application infrastructure – applications can be built quickly, meet the precise requirements of the organization, and yet remain highly secure, scalable and robust.

> The challenge with most low-code offerings is that speed comes at the cost of being able to build a wide variety of solutions.

From a developers' perspective, do low-code platforms allow working on multiple environments like development, test, and production? Can one deploy artefacts from one environment to another?
Low-code solutions generally focus on the development aspect of building applications. That's why we talk about OutSystems as being more than just low-code. We combine the benefits of visual, model-driven development with a whole platform approach to optimizing the entire application lifecycle. Our platform includes a rich collection of AI-powered tools and automation that enables scenarios such as this. Applications can be moved from 'dev', 'test' and 'production' environments with a single click, and at the same time, IT can provide robust controls over who gets to manage those movements from environment to environment, as well as when and how that is accomplished. It also includes rich tools for managing every aspect of each environment's parameters as well as monitoring the health and performance of each deployed application or module.

We believe that this full platform approach is the only viable solution for building applications quickly and making sure the applications run right, they are scalable, and reliable. The approach also ensures that the applications can be updated as quickly as the needs of the organization changes.

You talked about the OutSystems platform earlier. Can you elaborate on the offerings for the mobile apps and OTT platforms?
We offer three ways to develop mobile applications. One, we help build a mobile app. These are the applications that users install on their phones, have access to the sensors of the system, can operate offline, and have a UX designed for a native experience. Two, we help create a flexible web app (PWAs). These are apps that users can use on their phones without installing and directly use web-responsive technology to adapt to different devices and browsers automatically. Three, we also help build the mobile backend. One can create custom native mobile apps keeping OutSystems at backend, and using traditional tools such as XCode, Android Studio, or Visual Studio and native languages.

Mobile apps delivered with OutSystems are ready to be installed and run on iOS and Android devices, and they adapt to different form factors using a single code base. Developers only need to create the UI and front-end code once. There is no need to adapt the code for each device users wanting to support. It achieves this by generating highly performing hybrid applications that use the Cordova framework. OutSystems mobile apps are generated with an optimised responsive JavaScript application at its core, wrapped by a native shell that deals with all interactions with the device and offline data and logic.

We also allow developers to build the UI of the mobile app using a "what you see is what you get" editor that is equipped with the tools they need to make a great UX. This includes a drag-and-drop editor, grid and flex layouts, smart vertical spacing, and accelerators such as UI patterns and screen templates, so building mobile screens is as fast as possible.

Besides, OutSystems UI, a fully-integrated UI framework that provides customizable themes for mobile apps, together with a huge library of samples and patterns allows developers to rapidly develop beautiful mobile apps with a great look and feel. The platform also provides all the tools you need to build applications that run offline or in poor network conditions. The apps built with OutSystems automatically store all application content on the user's device for performance and offline access, and the platform's visual language provides everything you need to control, including which data goes to the device.

When it comes to securing mobile apps, OutSystems dramatically accelerates the development of secure mobile applications and their deployment in a secure runtime environment. The built-in application lifecycle management capabilities promote a clear assignment of responsibilities in the DevOps processes laying the foundation for a secure Software Development Lifecycle

> Even though low-code applications can be built quickly, we have to sacrifice on the ability to update those applications continuously.

(SDLC). One notable example is SES, the world's leading provider of secure satellite-enabled communications. Headquartered in Luxembourg, SES serves a wide range of customers from government agencies and multinational corporations. In order to best serve this diverse customer base, SES re-designed its IT strategy to deliver innovative solutions uniquely suited for each vertical market.

The new SES IT strategy was designed to accelerate delivery of new digital applications that included mobile, social, analytics, and cloud capabilities. To achieve the speed and agility, it considered a number of low-code, rapid application development options and selected OutSystems because of the technical maturity of our platform and being the only solution that did not pursue a strategy of vendor lock-in. The first applications SES delivered with OutSystems were modern, mobile front-ends integrated with the existing ERP and CRM systems. From the moment these solutions were deployed, they were well received by the business units. Building on those early successes, IT started developing innovative applications to support other business critical processes. These include a satellite optimising app, a dashboard for real-time monitoring of satellite systems, and a self-service portal for customers.

The results from the initial solutions were impressive. With OutSystems, IT is much more responsive to the business demand. SES can now support new verticals within eight to ten weeks, which is a lot faster than traditional development methods.

On the development front, how easy or difficult is it to manage different versions of software and applications using low-code platforms?

There are two ways to answer this. First, is to address the situation where lots of different people or teams are building lots of different applications across a large organization. While most low-code offerings focus on building applications quickly, few take a complete platform approach that enables the entire application lifecycle to be managed end-to-end. OutSystems has taken precisely that approach so that we not only enable applications to be built quickly, we also enable those applications to be deployed and managed easily and we provide a rich set of tools that enable IT to provide governance across broad portfolios of applications and components. We also provide a rich set of AI-powered tools for architects to analyze portfolios for technical debt and to find opportunities to refactor applications and modules to eliminate duplication of effort.

The second way to answer this question is in terms of enabling large, multi-disciplinary teams to work together seamlessly to build large-scale applications with lots of moving parts and capabilities. In our experience, the most successful, high-value projects are delivered through a close partnership between IT and business users.

Eschewing siloes, a more holistic and collaborative approach, like that enabled by OutSystems, ensures that each participant in a multidisciplinary team benefits from a visual, model-driven, AI-powered application platform that is optimised for their particular contribution to the process. For instance, there is a visually-driven tool for UI/UX experts to design and build rich customer experiences whether those are PWAs, mobile applications or traditional desktop apps.

Another example is an AI-supported dashboard optimised for architects to ensure that applications adhere to proper coding standards, minimize duplicated code, and avoid technical debt. In supporting better collaboration between business analysts and the rest of the development team, a truly collaborative platform, like OutSystems, includes specialised tools for defining workflows that are integrated with all the other development and design tools.

Visually-driven development is definitely the future of coding. But it is critical for IT and the business to work together seamlessly to ensure that applications meet business needs and adhere to all of the governance requirements that assure high-security, scalability and reliability. While certain low-code and visual development solutions do enable non-developers to solve siloed problems, it's only with modern, AI-powered application

> A full platform approach is the only solution for building applications quickly and making sure that the applications run right, they are scalable, and reliable.

platforms, like OutSystems, that organisations can truly realize the benefits of faster application development and total agility.

A notable example is Schneider Electric, a European multinational company providing energy and automation digital solutions for efficiency and sustainability. To continue innovating for customers, Schneider needed to boost agility and efficiency in its business processes, capabilities, and operations, this included developing, deploying, and managing new applications. By deploying OutSystems, Schneider Electric transformed its IT landscape by setting up a "Low-Code Digital Factory", which doubled its development speed, producing more than 60 new apps in about 40 percent of the time than previously would have been needed with a "traditional" development process.

In summary, just about anyone can build an application using a low-code platform, but for that application to be of any real use to the business and for it continue to be useful as business needs change, business experts have to work hand-in-hand with developers and IT professionals in an integrated team, and platforms that take advantage of low-code but also offer a more feature-rich, capable platform, like OutSystems, are the only way to enable that kind of strategic value

With programming and software development becoming highly automated, where are we headed after low code and no code? Will we see AI taking over the programmers' role soon?

Our latest research report 'The speed of change: How fast are you?' highlights the importance of ingenuity and adaptability in the current dynamic environment. Yet, bulk of survey respondents also indicated that their average application delivery time is about 3-6 months, which is considered an eternity these days. Given the speed of the COVID-19 spread, it is more crucial than ever for organisations to act fast.

It is clear that in this new normal, digital-first and cloud-first transformation has become even more urgent. While COVID-19 has caused many disruptions, it also presents opportunities for digital innovation and differentiation initiatives. As a result, demand for applications is increasing. The modern, visually-driven, AI-powered platforms excel in addressing these challenges and enable developers to successfully shift their priorities. The use of technology helps speed up innovation and boosts agility, while providing benefits for both IT and business users alike. This new technology will not replace developers. Instead, it will help them be more productive and work closer with the business to meet its changing needs and challenges.

The AI-powered feature of the OutSystems development tools radically increases the speed of delivery by automating, guiding and validating development throughout the application lifecycle. AI Assist is designed to aid all skill levels, from professional developers to business analysts. This works across every step of the process of building, deploying, and changing robust, high-quality, and secure applications, like CRUD operations and validating their work patterns based on analysis of tens of millions of application graphs.

In making sure that applications run right, OutSystems leverages groundbreaking AI technology in Architecture Dashboard to help IT leaders visualize and govern complex cross-portfolio architectures built with OutSystems and identify issues early in the development lifecycle. Architecture dashboard ensures that applications are secure and resilient, that they perform as expected, and that teams are able to avoid costly design errors or duplication of effort. Besides, the platform includes TrueChange that checks for bugs and architecture errors, analyzes the impact of changes on component and application dependencies, provides team and architectural governance, and even monitors performance in real-time. As a result, developers can build, manage, and change enterprise-critical applications or services with zero friction, zero errors, zero lead time, and zero technical debt.

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Prepare for a flexible future

Flexible work model as the new norm is driving employee engagement, productivity and economic impact. Here are the trends that is fueling it

BY TIM MINAHAN

A year ago, not much about the way we worked had really changed in decades. Most companies still organized work around major hubs in large cities and their workforce was comprised of local talent that commuted to the office every day, regardless of the type of work they needed to complete. Then the global pandemic hit, and everything changed. Flexible work models replaced traditional ones as people were forced to work from home, and work became an activity, not a place. And the change has just begun.

Going ahead in 2021, flexible work models will become the new norm, driving levels of employee engagement, productivity and economic impact the likes of which the world hasn't seen since the first industrial revolution. Here are the four key trends that will fuel them.

#1 Haters will no longer hate

The universal work from home experiment set forth by the pandemic has changed long-held misconceptions about remote work. Once dubious that 'real work' could get done outside the office, executives and managers are now realizing the positive impact it can have on employee productivity, work-life balance, mental health, costs, and the environment.

According to a study conducted by Citrix and OnePoll, 70% of 10,000 employees feel they are as or more

> Savvy companies will embrace technology-enabled remote work models to tap into talent pools that are beyond commuting distance to traditional work hubs.

productive working remotely, while 83% feel they have a better work-life balance when working outside the office.

Savvy companies are taking note of this and in the year ahead will embrace technology-enabled remote work models that allow them to tap into new skills and talent pools that are beyond commuting distance to traditional work hubs (offices, call centers, etc.) and reap the benefits the benefits they provide.

#3 Employees will shun the office

Historically, the office was the place where collaboration and innovation happened. Outside meeting spaces, colleagues held casual conversations in hallways, cafeterias and gyms. But protocols designed to slow the spread of the coronavirus have changed this. Employees must be screened before they enter an office and wear personal protective equipment and socially distance once inside.

Safety guidelines will limit office capacity for the foreseeable future, causing even knowledge workers to transition to shift work. Many employees simply don't want to deal with the hassle and anxiety associated with all of this. In fact, 64% of 2,000 respondents to a separate Citrix-OnePoll survey said they would not feel comfortable returning to the office for one month or more. And three percent said they don't ever want to go back full time.

Recognizing this, companies will reimagine the role of the office and shift from designing places to purpose-built spaces where regardless of where they work, employees can efficiently and effectively collaborate with colleagues, partners and customers to drive innovation and value.

#4 Urbanites will take flight

It used to be that if you wanted a big-league job, you had to move to a major city to find and keep it. But as work has gone virtual, location has become less critical to career success and opportunities than ever before. One in four respondents to another Citrix poll of 2,000 knowledge workers indicated they have abandoned their city dwellings, or plan to do so because their job is now 100% remote and will be permanently (37%), as also because they now only need to go into the office once a week (25%). Over 22% respondents also indicated that the pandemic has proven that they can do their job from anywhere.

#5 Companies will go where the talent lives

The battle for talent hasn't ceased in light of the pandemic. In many ways, it has only intensified as companies evolve their businesses to accommodate changing market dynamics and customer needs. While it may be scarce, there is talent out there. According to the results of a study conducted by the Centre of Economics and Business Research (CEBR), if given the chance, 95% of 2,500 knowledge workers polled who are currently employed say they would work from home 2.4 days per week, on average. And between 60%-70% said they'd do so from local coffee shops, shared workspaces and other remote locations at least one day per week.

Leveraging flexible work models and digital workspace technology, companies will reach out and engage a forgotten part of the workforce that has in-demand skills but has opted out because traditional models centered around work hubs didn't fit their lifestyle or obligations and create the space they need to work and succeed, wherever they happen to be. And in doing so, CEBR estimates they could drive upwards of USD 2 trillion in economic gains across the US economy and an increase in GDP of 10.2%.

While it's never clear what the future holds, it is certain that companies will continue to face challenges that disrupt work in the year ahead. Those that embrace flexible models and digital technologies can create a better way to work that empowers employees to be and do their best and power their business forward.

Minahan is Executive Vice President of Strategy, Citrix

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Strengthen your network security chain

A poorly-protected WFH device can be the weakest link exposing your organization's network to cybercriminals. Here are eight simple steps to handle it

BY PAUL DUCKLIN

Every time you hook up a poorly-protected device to your network, you run the risk that crooks will find it, probe it, attack it, exploit it and – if things end badly – use it as a toehold to dig into your digital life. Criminals who figure out how to commandeer a vulnerable device inside your network can use that device to map out, scan and attack your laptop – the one you're using right now to work from home – as if they were right there beside you.

If you've ever played around with internet of thing (IoT) devices, for example, you'll probably know that many of them are based on the Linux kernel and the open source system software that typically forms the core of any Linux distribution. Indeed, even the tiniest and most stripped-down devices often include not only special-purpose software tailored to that device, but also a host of standard Unix command line utilities that are the same as, or similar to, the tools you will find in any penetration tester's toolbox.

For example, a device such as a webcam or smart speaker usually doesn't just contain audio and video processing code. You'll probably also find one or more command shells. Shells such as bash, lash, ash or dash make it easy to run command scripts to automate system management tasks.

Then, there could be LAN and wireless configuration programs. Tools such as ifconfig, ip, iwlist and iwconfig make it straightforward to map out and configure network settings. You may also find downloader tools and programs such as curl and wget can be used not only for downloading files over the internet, but also for uploading stolen data to outside websites, typically just with a single command.

These devices also contain other scripting software, scheduling tools, remote access and encryption tools, as well as network and account passwords. For example, you will often find programming tools such as awk, mawk or gawk, a minimalist scripting language that can be used to write internet clients and servers, as well as sifting and searching files, all in just a few lines of code.

Scheduling tools or program such as cron or an equivalent make it easy to schedule programs to run at regular times even when no one is logged in, for example to watch out for computers being connected to the network and sending back a notification message.

Besides, many IoT devices include both SSH client and server software such as ssh, sshd or dropbear. These give crooks a way to create secret, encrypted network "tunnels" into and out of your network using software that's already there.

On the network and account passwords front, your Wi-Fi password may very well be stored in a plaintext file on the device, such as /etc/wpa_supplicant.conf. Password

> Many IoT devices include both SSH client and server software such as ssh, sshd or dropbear. These give crooks a way to create secret, encrypted network "tunnels".

or authentication tokens for any accounts that the device is hooked up to may also be lying around for the taking.

Generally speaking, the closer the crooks get to your computer on the internet, the more aggressively they can attack it – and the next best thing to being on your computer already is to be right next door on the same network with their favourite hacking tools preinstalled.

What to do?

By now, it might sound as though you need an enormous range of skills just to figure out where to start, let alone where to finish, in securing your own network to be robust enough for WFH. (ICYMI, that's short for working from home.) The good news is that you don't need the combined practical experience of an IT manager, a tech support guru, a penetration tester and a network engineer. Instead, there are eight questions you can ask yourself about devices on your home network, and about the setup of your network, that will help you run a tighter WFH ship.

#1: Do I actually need this device online? If not, consider removing it from your network. Or if you don't need it listening in or activated all the time, consider powering it down when you aren't using it. (Unplugging it from the wall socket is often all you need to do.)

#2: Do I know how to update it? If not, find out how. If the vendor can't reassure you about security updates, consider switching products to a vendor that does (and see step 1).

#3: Do I know how to configure it? Make sure you know what security settings are available, what they are for, and how to set them up (and see step 2).

#4: Have I changed any risky default settings? Many IoT devices come with remote troubleshooting features turned on, which crooks may be able to abuse. They also often arrive with default passwords set, which the crooks will definitely know. Some routers ship with Universal Plug and Play enabled, which can expose the inside of your network by mistake. Check and change defaults before you make the device live (and see steps 2 and 3).

#5: How much am I sharing? If the device is hooked up to an online service, familiarize yourself with how much data the device is sharing, and how often. You may be happy to share some data, but never feel squeezed into turning all the options "to the max" (and see steps 3 and 4).

#6: Can I "divide and conquer" my network? Some home routers let you split your Wi-Fi into two networks that can be managed separately. This is useful if you are working from home because it means you can put your home IoT devices on a "guest" network and your work computers such as laptops on another (and see steps 1, 2, 3, 4 and 5).

#7: Can I turn on "client isolation"? Some home routers have an option known as client isolation that shields devices on the network from each other. This reduces the risk of a security hole in one device being used to attack other computers "from inside" (and see steps 1, 2, 3, 4, 5, and 6).

#8: Do I know whom to contact if there's a problem? If your work has an IT department or offers access to tech support, make sure you know where to report anything suspicious. Ask them what information they are likely to need and provide it at the outset, in order to speed up the process.

By the way, if you're an IT department looking after remote workers, make it easy for your less-technical colleagues to reach out for cybersecurity advice, or to report suspicious activity, and take the attitude that there's no such thing as a stupid question, only a stupid answer.

Experience shows that most employees are ready and willing to do the right thing when it comes to cybersecurity – after all, if they get hacked while WFH then their own digital life is at risk along with the company's. So, set up an internal email or telephone reporting line where users can easily and efficiently report possible attacks and get the whole company to be the eyes and ears of the security team.

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Seamless and secure

Network security infrastructure should have features that can enable enhanced data security along with unhindered access to data. Here is how to achieve it

BY SONIT JAIN

COVID-19 has pushed a huge number of organizations towards work-from-home (WFH), resulting in a sudden increase in the number of such users. The remote workforce provides various benefits to both employers and employees, but they also lead to some critical security issues since they access enterprise data through their personal networks, devices, and from remote locations. This increases the potholes in network security through which cybercriminals can pilfer critical business data. To address these security concerns, companies need to have network security with advanced features that can prevent data leak and enhance data security for these roaming and remote working users.

A remote workforce requires seamless access to enterprise applications and data for optimal performance. Hence, a security infrastructure should have features that can enable enhanced data security along with seamless access to data for employees.

Data-first security approach

Organizations usually deploy firewalls to secure the network. This becomes ineffective to protect data due to its approach towards security. While the data-first security approach enables businesses to deploy data-centric security. It allows companies to monitor every bit of data leaving the organization.

The present-day network or device-centric cybersecurity alone won't be a foolproof solution against data exploitations, as data itself needs to be secured. By following a data-first approach, businesses can ensure that they stay well ahead of cyberattackers in the fight with them. And to do that, they need cybersecurity devices that can help them seamlessly integrate a data-centric strategy with their existing enterprise networks.

Companies also need Firewall Solution that can provide data leak prevention by monitoring data as it leaves the network using the web as well as SaaS/Cloud applications.

Appropriate data leak prevention systems deeply inspect data level information, application data, control the inflow and outflow of data, and provide context-sensitive leak prevention, thereby eliminating cyber risks. As a result, by taking the data-first approach, businesses can future-proof their data and cybersecurity efforts.

Context-based data leak prevention

Context-based data leak prevention feature enables organizations to define data leak policies where they can include what type of data should not be sent outside the enterprise network. It identifies, monitors, and protects data in motion on the network by enforcing security policies. For instance, they can restrict sending of emails with keywords such as "tenders" or "quotations." This provides organizations with complete control over the inflow and outflow of data.

The context-based data leak prevention can scan for data leak based on file type, size when trying to upload or send as an attachment. It further uses the power of Contextual Intelligence Engine, inspects context of applications like mail body, subject, and message on IM to identify possibilities of data leak and report it while blocking the communication.

Enhanced cloud solution

To protect your enterprise data from being misused or

> The present-day network or device-centric cybersecurity alone is not a foolproof solution against data exploitations, as data itself needs to be secured.

leaked by remote/roaming users, you probably have a clear and strict set of data security policies laid out for all employees. However, implementing such policies in growing enterprises can be hard, due to the rapid influx of new devices. This results in the introduction of non-compliant devices into the network. Also, there may be users who are not aware of enterprise data security policies. This leads to instances of non-compliance and can potentially lead to data breaches. This can also leave your critical data and applications stored on the cloud open to being accessed by hackers who can use the same to launch cyberattacks on a larger scale.

Thus, it becomes necessary to use an enterprise cloud solution that offers enhanced security features for enterprises' roaming users. These solutions can identify critical pieces of data and monitor them for misuse and leaks over Email, Web and SaaS. You can define critical business data and set strict access and usage policies for such data using an advanced data security solution. The enterprise cloud security feature enforces all communication passes through the firewall solution at the Head Office which automatically applies Data Security Policies to such remote/roaming users. As a result, regardless of the level of awareness among users and devices used by them, the most vital pieces of your enterprise data remain safe.

Monitoring and controlling

Monitoring and controlling user's activities are important to identify and keep bad actors away from the network. The remote users use multiple web, cloud and SaaS applications for business operations. These applications pose a major threat to data security if enterprises cannot control and monitor activities on such platforms.

Contextual intelligence controlling use of such platforms restricts personal use of such applications by allowing corporate login only. It also enables businesses to block or allow specific data types, file extensions, file content, and much more. Thus, it allows businesses and cybersecurity teams to get in-depth visibility over the data that is downloaded or uploaded by employees. And this in-depth visibility becomes more beneficial with a remote workforce to monitor what data employees are sharing. Hence allowing enterprises to monitor user activities while controlling how the application is being used.

Improved SaaS security

SaaS is used by almost all the enterprise and it has found its own place in keeping enterprise operations running. It does provide various benefits, but security concerns are revolving around SaaS applications. Since several third parties access SaaS applications, organizations must ensure enhanced SaaS security. Features to improve SaaS security will monitor each and every bit of data received from and sent to the applications. This will help businesses prevent data exploitation and to detect the entry of any malware through SaaS applications.

Improved SaaS security will also enforce data transmissions to abide by all the policies defined by a company. To enhance SaaS security, organizations can encrypt sensitive data before transferring it over the network. The encrypted data can then be decrypted once received by the authorized receiver. All these practices will allow businesses to have complete visibility on how their data is being transmitted and for what reasons.

Firewall with data security approach

A data security approach goes beyond the third generation of firewalls and includes all the features as mentioned earlier. Unlike the traditional layer-7 security, the data security approach will not just monitor applications but also the data that is accessed and transmitted by them. It protects data leaks on browsing, SaaS applications, and network, ensuring that data is not exploited.

One of the biggest advantages of having a data security firewall is that it starts monitoring and prevents data exploitation right at the gateway. And for remote organizations, the most suitable firewall is the one that can be deployed both on-premise and on the clouds. Plus, it should also provide security to remote workers without impacting their device performance with its enterprise cloud solution. This will help maintains data security and also ensure that the productivity of remote workers is not affected due to the enhanced security terms and policies.

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Vinish Bawa
Head, Emerging Business & Enterprise,
Nokia India

"SD-WAN is now on the investment priority list"

Nokia claims that its Data Center Fabric solution enhances design and operations for all cloud builders. Made for webscale companies, service providers and enterprises, it offers cloud builder networking teams an open network operating system (NOS) and a declarative, intent-based automation and operations toolkit. In an interview with ***Pradeep Chakraborty****, the company's Emerging Business and Enterprise Head for India* ***Vinish Bawa*** *talks about the post-COVID-19 data center trends, the growing demand for SD-WAN and how it is evolving, the Data center Interconnect (DCI) Network, and the new offering. Excerpts:*

What are the trends that are likely to shape the Indian data center industry?

India is amongst the largest data-consuming nations – over 7000 peta-bytes of data consumption per month – and this is poised to explode. However, when it comes to data center storage, India lags behind the developed world as well as Asia-Pacific. With roughly 40 million less Internet users, Europe has more than 12 times its capacity to store data — 8,600 MW, compared to India's 700 MW.

Migration to cloud-based business ops, varied government incentives, push for 5G/big data/ IoT and call for data localization will ensue a significant CAGR growth of up to 35% for the next few years. We will see an increased investment in the date center space. Businesses will be run on the pillars of green measures, including decreasing power bills through new technologies (hydro fuel cells), in tandem with ensuring the minimal environmental impact, operational efficiency through virtualization and automation, continued capex, but, with a mandate to streamline costs in an effective manner.

During the current COVID-19 crisis, we are now witnessing a trend towards remote management for unstaffed or understaffed data centers, especially to mitigate risks of infrastructure (server) failures. The other talked about trend of cloud computing moving towards edge computing, is still a work in progress. We are confident that as the economics permit, it just won't be service providers capitalizing on the edge, but, edge cloud shall also cater to consumers, enterprise and telcos, thereby reinforcing the need of a robust data center supply.

What has been the impact of COVID-19 on the data center industry?

The data center landscape and professionals constantly evolved and dealt with a variety of issues ranging from scalability, architecture decisions, dealing with a diverse array of complex workloads to maintaining security from incessant cyber threats and hacks. But, COVID-19 has had an unprecedented impact on the cloud businesses.

Demand for data centers have gone up as companies look to keep their business functional by facilitating technologies to work remotely thereby augmenting the need for cloud services and expediting the call for digitization through rapid overhaul of digital infrastructure and assets to allow employees to deliver

> Hyper-scale data centers are witnessing high growth in India and globally. Its increasing adoption has created the need for connecting them.

seamlessly as well as empower customers to adapt and embed preferences to the new ways of working of digital and online transactions.

The advancement in technology has enabled a bulk of data center operations to be performed remotely. However, critical technical requirements and system upkeep still require minimum staff onsite 24x7 and ensuring their safety, which adds to the operational expenditure. Operations are further impacted due to travel restrictions and delay in shipment and delivery of key infrastructure components including upkeep infrastructure and hardware fault resolution.

Some key observations are that surge in demand has resulted in data center businesses to grow by almost 100% over the last quarter. On the spend side we are witnessing expedited investments in remote network operations through advanced automations to reduce the manual management, investments on analytics to increase the visibility on applications, users and devices, and finally, investments on collaboration side for disaster recovery.

How are CIOs conceptualizing data centers in during this pandemic time?

Today's digital world requires the organizations to have a digital backbone – cloud, network, IT infrastructure – which underpins its ability to navigate change and adopt cloud native and or public cloud strategy. Instead of investing heavily on legacy, the CIOs are also seeking to conserve capital and shift to cloud through hybrid multi-cloud environment.

COVID-19 has accelerated the dependency on all things remote and created the pressing need for the CIO to address the concerns about scaling systems and services to deal with changing demand. The focus is entirely on the CIOs to ascertain if their organizations can manage the enormous workload while working remotely. This makes them cognizant of the importance of digital transformation.

There is awareness amongst CIOs that if the business is not restructured into a digital environment, their businesses shall be replaced by competitors who are agile enough to adopt a digital model. As such, the CIO and leadership team are relying on cloud and colocation data centers to play a massive role to bring the new reality into existence.

How is the interest now for SDN-based networks?

Investments into the software-defined networking (SDN) and the network function virtualization (NFV) have proven instrumental and helped organizations to keep pace with the rising internet traffic, stemming from the noval coronavirus. Building your IT network on software and open hardware specifications has helped mitigate the risks posed by COVID-19.

SD-WAN is shifting under the pressure of today's business challenges. COVID-19 is driving the demand for cloud-based applications and changing the way customers consume them. Data center operators need to scale their networks to deliver distributed cloud applications, but current solutions limit the way they can build and operate them.

With more employees working from home, IT priorities have been shuffled again, which is changing the way many leaders approach digital transformation. Trends indicate that SD-WAN is picking pace and is now on the investment priority list as network, security, and cloud application performance are now in the corporate spotlight.

Nokia is now launching a game changing data center fabric solution to help data center operators scale their data centers and operate them more easily at a time when the need to address their pain points is most urgent.

Would you be going for high-bandwidth switches?

The Nokia data center fabric solution is aimed at cloud builders, such as webscale companies, service providers and enterprises that need to design, deploy,

> Edge cloud will be a strategic asset for service providers to support new services and applications, opening new vertical market opportunities.

adapt and automate data center networks at massive scale to keep up with increasing demand for distributed cloud-scale applications. We offer an open, extensible and resilient network operating system (NOS) based portfolio of data center switches that deliver massive scalability, aggregation and interconnection and cloud environments. The portfolio includes the 7250 IXR-10/ IXR-6, 7220 IXR-D series, and 7220 IXR-H series of data center switches with a declarative, intent-based automation and operations toolkit that delivers agile and scalable network operations for data center and cloud environments.

Data center Interconnect (DCI) Network is the new emerging requirement. What are you doing?

Hyper-scale data centers are witnessing high growth in India and globally. Its increasing adoption has created the need for connecting them. This connectivity between different data centers is called DCI. This growth of DCI solutions in India is driven by over-the-top (OTT) and webscale companies as their data traffic is growing by leaps and bounds. These companies use hyperscale data centers to support the growing data traffic, leading to increased demand for DCI solutions.

Another driver for DCI solutions is the government's Digital India vision and its aim to localize data within the country. Nokia's focus is on this crucial segment. Of the combined webscale and data center traffic in India, around 30 TB is flowing on Nokia solutions. Since the solutions that we have developed are newer, they are more focused on enterprise-specific problems. Further, they are state-of-the-art, more open and flexible. For example, our Photonic solution allows 400G to 800G of data on single wavelength. We have a smaller version called WaveLite series, which is designed for small enterprises and allows up to 200 GB data. We also offer customized solutions. We recently launched the DC switching fabric solution. While DCI solutions are required for inter- and intra-Data Center connections, switching fabric is required within a data center.

We did a lot of research on this product and signed a strategic partnership with Apple to develop it. The key benefit of this solution is that it offers a totally open and flexible portfolio for switching fabric, which is unheard of.

Edge computing is likely to be the future. What are your plans?

Edge computing is transforming the telecoms landscape, offering the flexibility that is needed to enable modern, agile business opportunities with secured and high availability services; build scalable and distributed data centers that combine the best of IT, open source and cloud.

Edge cloud will be a strategic asset for service providers to support new services and applications, opening new vertical market opportunities. The industry needs to start preparing and implementing edge infrastructure now to address these business opportunities and be ready for the next evolutionary steps of their networks, including 5G.

Our data center routers deliver massive scale, openness, aggregation and interconnectivity needed for the modern data center networks and cloud environments. Powered by next-generation silicon chipsets, these platforms deliver port speeds up to 400GE and support comprehensive IP and Ethernet feature sets.

We offer a broad portfolio of modular and fixed-configuration Interconnect Routers (IXRs). These routers implement our open, extensible and resilient Service Router Linux (SR Linux) network operating system (NOS). We complement them with our Fabric Services Platform, a toolkit that empowers your NetOps teams to efficiently automate and operate the entire data center fabric infrastructure.

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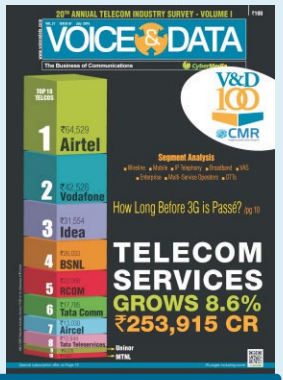

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KYC- and OTP-related scams up, unwanted calls down

Despite a 34% decrease in the volume of spam calls during lockdown, India continues to find place in the top 10 list of most spammed countries

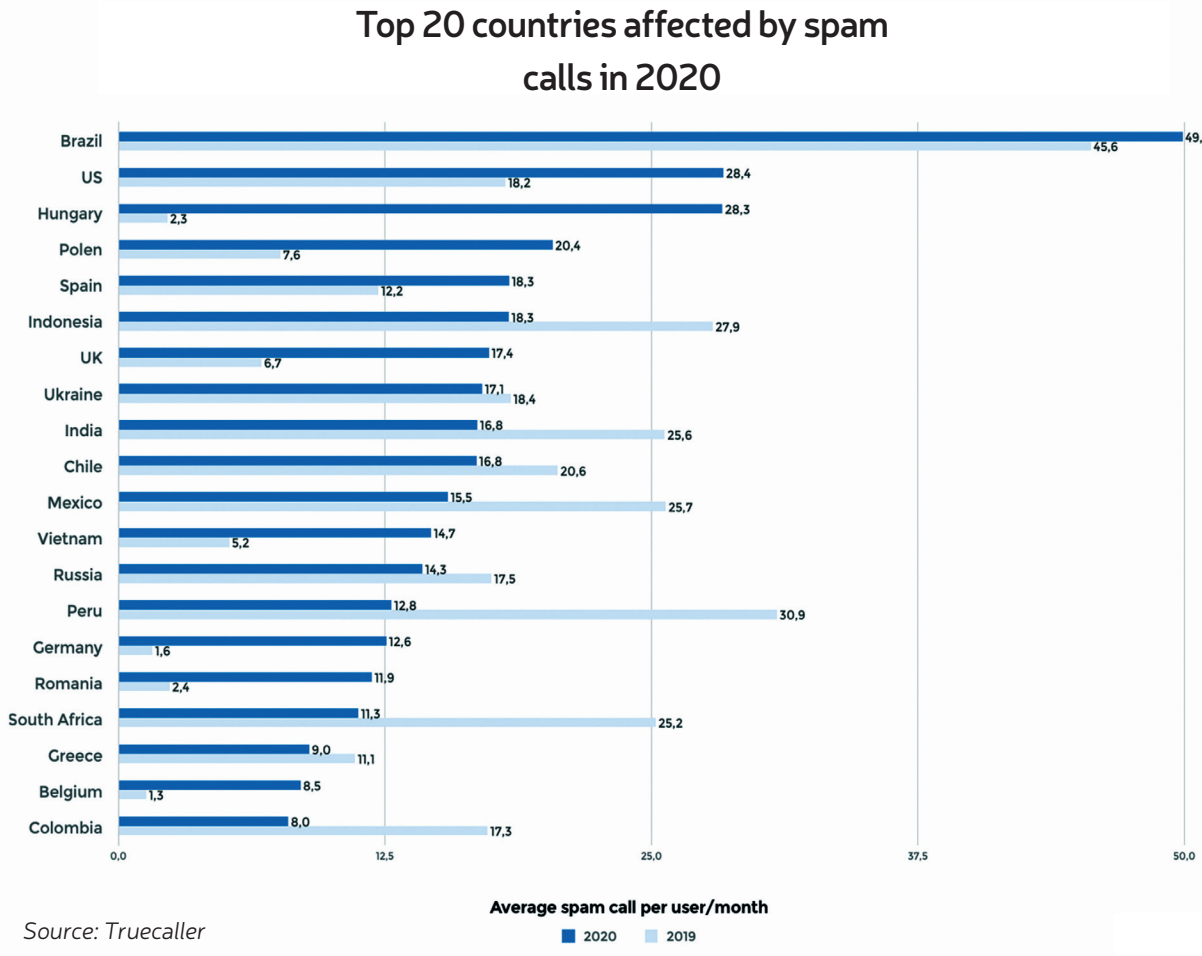
BY SOMA TAH

2020 has been a trying year for most of us. It has also been a big lesson for many. With the countries going into lockdowns after the corona virus outbreak, we have seen businesses and people look for new ways to solve complex problems, to reach and connect with teams, no matter who they are and where they work.

These factors not only had an impact on people's communication behaviour, but also the patterns of spam and scams around the world as well, reveals a recent report by Truecaller. According to the company, it helped users identify 145 billion incoming and outgoing calls and 13.8 billion spam SMSs globally between January and October 2020.

The spam reached its lowest point in April 2020 when strict curfews and lockdowns were implemented worldwide. The overall volume of calls also dipped during this period. The strict lockdown measures implemented in the country earlier this year made it impossible for telemarketers to go to work, or utilize the equipment they need to carry out large scale spam campaigns. However, from this point, reports of scammers taking advantage of the uncertainty around the pandemic emerged. In May, spam calls started to pick up again and have been

In May, spam calls started to pick up again and have been increasing on average by 9.7% per month. October this year was the record high in terms of spam calls.



Source: Truecaller

increasing on average by 9.7% per month. October this year was the record high in terms of spam calls. It was 22.4% higher compared to pre-lockdown.

India among top 10 most spammed countries

The annual Truecaller Insights Report, which lists the Top 20 countries affected by spam calls in 2020, reveals that though spam calls received by users in India have decreased by 34%, it still makes it into the top 10 most spammed countries. In terms of number of spam calls received by users globally, India has shown a lot of improvement as it ranked 9th in 2020, down from the 5th position last year. India was ranked as the most spammed country in the world three years back.

With a 56% increase of spam calls compared to last year, the US is now the second most spammed country in the world, a significant rise from the 8th position last year, while Brazil continues to stay on top. Last year, the top 10 countries were dominated by the South American region (see: Top 20 countries affected by spam calls in 2020).

While some of them saw a decrease in the spam volume, a lot of European countries have surfaced on the list this year. These include Hungary, Poland, Spain, UK, Ukraine, Germany, Romania, Greece and Belgium. The biggest increase of spam calls comes from Europe and the US. While Hungary posted the highest 1132% jump, it

Operators continue to be the top spammers in India with 52% user calls received for the upselling of various offers and reminders.

Types of spam calls

Nuisance: Due to this being a broad spectrum of calls, this is defined generally as calls that are unwanted, a disturbance for users, harassment or pranks.

Scam: Fraud attempts, money swindling, unknown links, etc.

Telemarketing: Promotional calls from companies, surveys, political calls, new client outreach for services, subscriptions, etc.

Robocalls: Automated calls with a pre-recorded message. Some of these calls can sound like real people talking, and use voice recognition technology to answer and ask follow-up questions.

Operator: Telecom companies upselling data plans, promotions, etc.

Financial service: Banks, credit unions, credit card companies etc.

Insurance: Calls from companies selling different types of insurance policies.

Debt collection: Organizations calling for payments of debts owed by individuals, businesses, and bounty hunters.

Political: Campaign calls to secure votes for parties, including political robocalls.

Health: Hospitals, private practices, health care services.

was followed by Germany (685%), Belgium (557%) and Romania (395%).

Scam calls on the rise in India

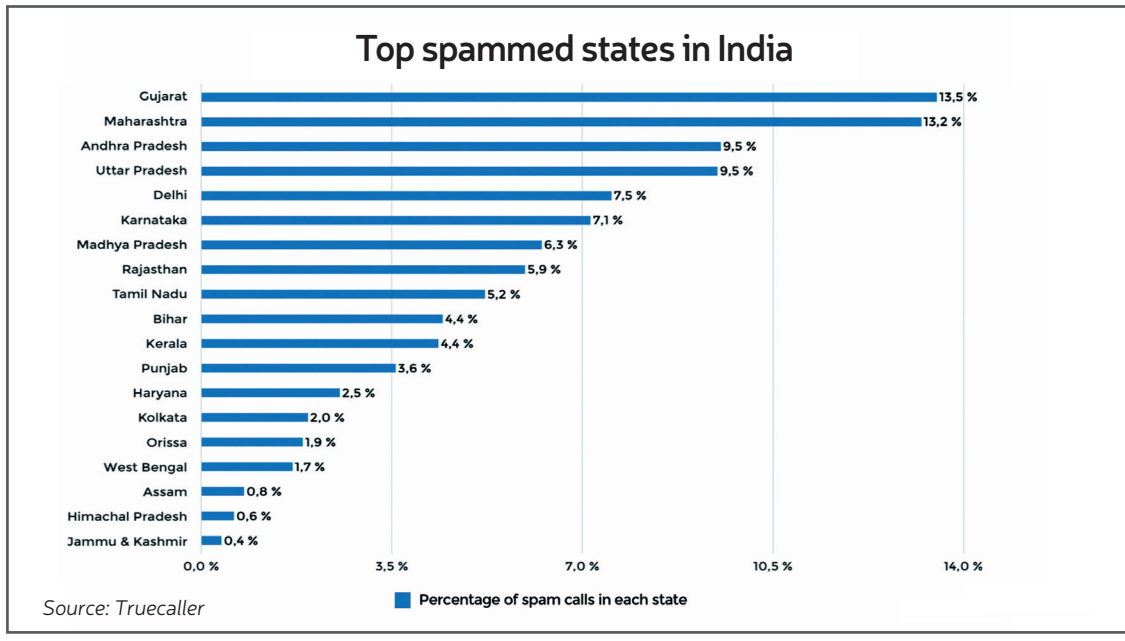
"Hello, your ATM card is about to expire, sir..."

Hello sir, I am calling on behalf of SDI bank. Does your account number starts with XXXXX..."

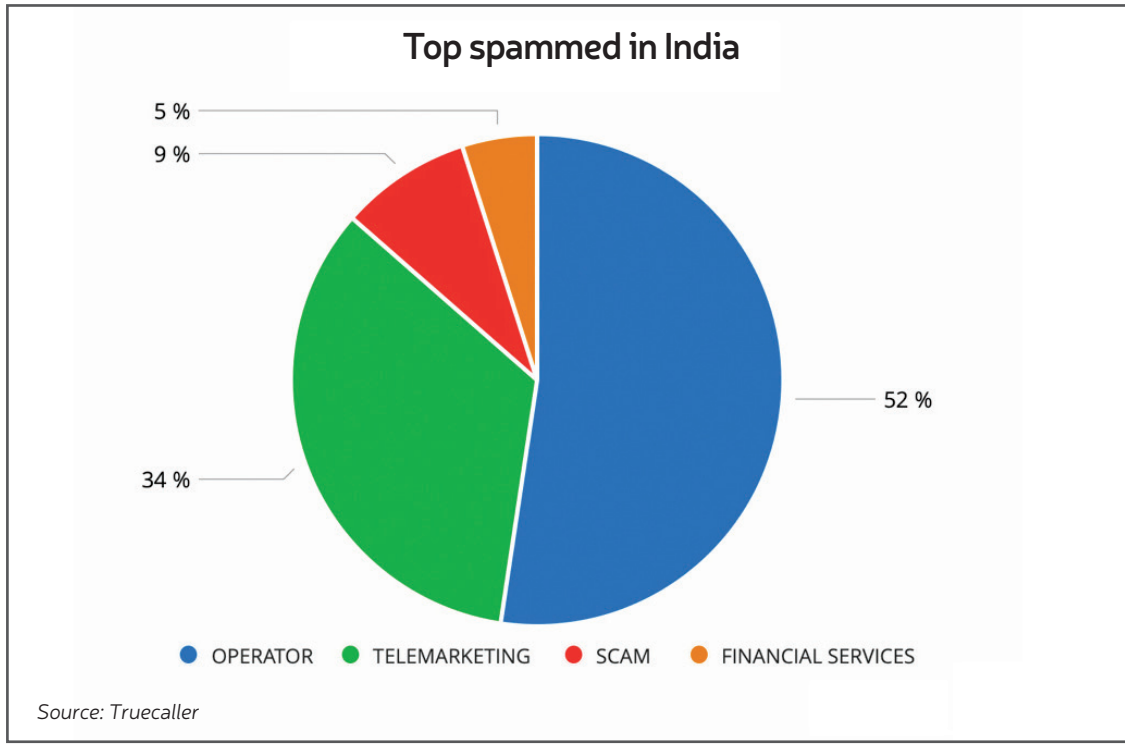
Remember those signature opening conversations from the true crime web series, 'Jamtara, Sabka Number Aayega', used by the boys' as a bait to lure unsuspecting and gullible people to share their confidential financial details. And, things haven't really changed much since the Jamtara incidents.

The Truecaller report indicates a very India-specific scam in India that has been gaining traction each year – the KYC- and OTP-related scams. The scammers try to hook unsuspecting people using either phone calls or SMS in order to obtain sensitive information about their financials or force them reveal a secret OTP with the ultimate aim of extracting money from their bank accounts or digital wallets. Overall, the spam trends look very similar to last year except for the scam calls, which increased from 6% to 9% (see: Top spammers in India).

With regard to spam call categorization, operators continue to be the top spammers in India with 52% user calls received for the upselling of various offers



Source: Truecaller



Source: Truecaller

and reminders. However, the study also witnessed telemarketing services emerging as big spammers, recording a total of 34%.

Gujarat emerges as hot target for spammers

One of the most interesting revelations that came from this year's report was that 98.5% of all spam calls in India originate from domestic numbers. Gujarat emerged as the state that received the most spam calls in 2020, followed closely by Maharashtra. The report also noted that the largest cities contributed a majority share of spam for the respective state they are in. This level of granular data for India is new to the 2020 report, says Truecaller (see: Top spammed states in India).

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Smartwatches, hearables surge ahead

Besides new products from the likes of Apple, Samsung, and others, the pandemic and seasonal buying helped push the number of boxes up

V&D BUREAU

The global wearables market grew 35.1% year-on-year during the third quarter of 2020 (3Q20) with total shipments reaching 125 million units. According to the International Data Corporation (IDC) Worldwide Quarterly Wearable Device Tracker, the surge was driven by seasonality, new product launches, and the global pandemic.

New products from the likes of Apple, Samsung, and others helped renew interest in popular categories such as smartwatches and hearables. Meanwhile, consumer spend on electronics also increased during recent months as spending on travel, dining out, and other leisure activities decreased. This shift in spending was another catalyst for the wearables market.

"Many countries began easing restrictions and opening up their economies during the third quarter, which helped bolster outdoor activity as well as demand for wearables," IDC Mobile Device Trackers Research Manager Jitesh Ubrani said, adding that a broader range of price points from numerous vendors meant that there was something for everyone.

According to Mobile Devices and AR/VR Research Director Ramon T Llamas, the double-digit growth not only indicates strong demand, but also suggests that many people got a wearable device for the first time in both emerging and developed markets. "Consider what this means: a larger installed base of wearable device users going forward and a larger opportunity for device replacements in the years to come. And, as some wearers own multiple devices – like earwear and wristwear – the wearables market will enjoy sustained demand."

How they fared?

Apple led the market with 33.1% share during the quarter. AirPods along with Apple Watches were hugely popular due to pandemic driven demand. Apple's expanding Watch lineup also ensured that devices were available at multiple price points including new mid-level products such as the Watch SE.

Xiaomi followed in second place with 17 million units shipped, 12.8 million of which were basic wristbands. The low price point along with international expansion combined to move the company forward with 26.4% year-over-year growth.

Huawei ranked third with unit shipments totaling 13.7 million. Despite facing US sanctions, the company was able to drive growth across multiple markets although its shipments were concentrated in China. Nonetheless, by not relying on Google for its watches and with many components coming from non-US vendors, the negative impact to Huawei's wearables business has been less than in other tech categories.

Samsung's strategy to attack the earwear market with multiple brands continues to pay off as the company ranked fourth in the wearables market. Hearable shipments reached 8.4 million during quarter along with 2.6 million smartwatches.

It is important to note that for an earworn device to be considered a hearable by IDC's definition, it must offer functionality beyond audio, like a smart assistant, health and fitness tracking, or audio experience enhancement.

Bundling of wearables with smartphones continues for the South Korean electronics maker and, at least in smartwatches, the company continues to invest in the commercial segment, a strategy employed by very few smartwatch brands.

Fitbit and BoAt tied for fifth place, each holding 2.6% of the wearables market. Fitbit's new devices launched near the end of the quarter were relatively well received and a price drop on older models has helped the company stay within the Top 5. Meanwhile, BoAt focuses solely on the

Top 5 wearable device companies by shipment volume, market share, and year-on-year growth, Q3 2020 (shipments in millions)						
Rank	Company	3Q20 Shipments	3Q20 Market Share	3Q19 Shipments	3Q19 Market Share	Year-On-Year Growth
1	Apple	41.4	33.10%	29.8	32.20%	38.60%
2	Xiaomi	17	13.60%	13.4	14.50%	26.40%
3	Huawei	13.7	11.00%	7.3	7.90%	87.20%
4	Samsung	11.2	9.00%	8.5	9.20%	32.20%
5	Fitbit	3.3	2.60%	3.5	3.80%	-6.20%
5	BoAt	3.3	2.60%	0.8	0.80%	316.90%
	Others	35.3	28.20%	29.2	31.50%	20.80%
	Total	125	100.00%	92.5	100.00%	35.10%

Source: IDC Worldwide Quarterly Wearable Device Tracker, December 2020

Top 5 wrist worn wearable device companies by shipment volume, market share, and year-over-year growth, Q3 2020 (shipments in millions)						
Rank	Company	3Q20 Shipments	3Q20 Market Share	3Q19 Shipments	3Q19 Market Share	Year-Over-Year Growth
1	Xiaomi	13.5	24.50%	10.5	23.80%	27.80%
2	Apple	11.8	21.60%	6.8	15.30%	75.00%
3	Huawei	10.7	19.50%	5.7	12.90%	88.10%
4	Fitbit	3.3	5.90%	3.5	7.90%	-6.40%
5	Samsung	2.8	5.10%	2.8	6.20%	1.80%
	Others	12.8	23.30%	15	33.90%	-14.70%
	Total	**54.8**	**100.00%**	**44.2**	**100.00%**	**24.00%**

Source: IDC Worldwide Quarterly Wearable Device Tracker, December 2020

Note: *Wrist-worn wearables include Smartwatches (e.g. Apple Watch, Wear OS watches), Basic Watches (e.g. Huawei Watch GT, Fossil's Hybrid watches), and Wristbands (e.g. Xiaomi Mi Band).*

Indian market (a rapidly growing market for wearables) and primarily sells hearables.

Post-lockdown in India, the company has benefitted from to a strong marketing campaign and tie-ins with local cricket teams. While ambitions remain strong for the company, it lacks the global presence and supply chain of its many competitors.

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Its broadband for all and satcom everywhere

Get ready for the 'right of way' with a new plot. Turns out that satellites can enable 'Broadband for All' and pan-India progress; with government-industry joint efforts

BY PRATIMA HARIGUNANI

All the top economies of the world viz, Australia, Brazil, Canada, Japan, and the USA use broadband from communication satellites. One of the most wired broadband countries with almost 80% fiber connectivity – the USA, has the highest deployment of satellite based broadband with over four million terminals deployed and continues to grow at the rate of almost 90,000 subscribers per month.

India, with its huge and diverse geographic spread, inaccessible terrains, vast area of unconnected rural and remote villages and huge challenges of right of way (RoW), can benefit from satellite broadband many times more than these countries. However, we still have a long way to go, as Broadband India Forum (BIF) President, TV Ramachandran pointed out at India SatCom 2020. Let's see what else transpired and what we learnt about the technology's potential – especially in an Indian context.

"People living in unserved and under-served places should get access to satellite technologies in order to ensure inclusive growth," said Department of Space Secretary and ISRO Chairman Dr K Sivan. And he should know as ISRO is a place that galvanizes the best minds and voices of the industry. The 6th edition of BIF's annual flagship event saw the direction for satellite communication get a new fillip.

Its inaugural session hosted a diverse and leading think-tank of the country – from Dr Sivan, as Chief Guest, to Department of Telecommunications (DoT) Member (T) K Ramchand, New Space India Ltd. (NSIL) CMD G Narayanan and Gita Krishnankutty, Regional Head - Inward Investment, South India, Department for International Trade - The British High Commission. They were also joined by some industry stalwarts and senior government dignitaries from NITI Aayog, TRAI, DoT, DoS, ISRO, NSIL, TEC, as well as other leading government stakeholders.

Untapped corners, unharnessed satellites

What came out strongly in this top-level huddle was the potential that India has in this space. Multiple studies have shown how the Government of India's 'Digital India' and 'Broadband for All' initiatives can benefit from satellite broadband. India, with its many remote, unconnected and difficult-to-access terrains, coupled with an extremely low penetration of fixed line and fibre infrastructure, needs satellite broadband for inclusive and widespread digital connectivity.

It was also discussed and underlined how remote, unconnected areas that struggle with basic needs such as electricity, are prime candidates for satellite intervention, apart from mountainous and other inhospitable terrains where satellite broadband scores over its terrestrial counterparts in terms of techno-economic feasibility.

In a critical session on 'Rural Broadband – Satcom's Role', the need for satellite broadband to provide connectivity across the length and breadth of the country was in the spotlight. While terrestrial connectivity is feasible and economically viable to deploy in urban areas, when it comes to rural and remote areas, the cost of providing terrestrial connectivity shoots up by almost 10-20x, thereby making it economically unviable for terrestrial technologies to reach the last 20% of the population.

"People living in unserved and under-served places should get access to satellite technologies in order to ensure inclusive growth."

Dr K Sivan, Secretary, Department of Space & Chairman, ISRO

"The government's progressive announcement of liberalization of the space sector promises opportunities to bring in new technology and solutions."

TV Ramachandran, President, BIF

Industry leaders came together on the power of satellite technology here. They discussed how broadband – through satellite – would serve as a prudent solution in such areas as it does not have to overcome the challenges associated with RoW and the huge costs associated with roll out of terrestrial technologies.

Pan-India, pan-ecosystem – a sea-change

The conference also shared the significance and progress of BIF's foremost objective – which, it states is to help facilitate proliferation of broadband connectivity to all, in a technology agnostic manner. Satellite communications has immense potential for true broadband applications and as a medium for providing broadband services, especially in difficult to reach areas. India SatCom, over the years, has provided a platform to bring together all stakeholders of the satcom ecosystem to discuss the latest technology enhancements that may be leveraged to tap the true potential of satellite communications. BIF believes India must gainfully exploit the spare satellite capacities over the visible Indian arc, besides further capacity building and innovations via private sector participation.

BIF indicated strongly that satellite broadband is critical for inclusive pan-India digital connectivity and commercial IFMC applications. In two dedicated sessions on the vital topics of In-Flight and Maritime Communications (IFMC) and the critical rural broadband proliferation, these areas were discussed – boldly and thoroughly.

The session on 'Making IFMC Services a major success in India' covered the constructs of how extant policy and regulatory framework could make In-flight connectivity and Maritime services a reality over India. While globally IFC and maritime markets are maturing in terms of standards and quality of services, India is just beginning to open its market for these services. To do so effectively, India needs to quickly adopt the global standards for these services.

As to the challenges that are faced by the licensees based on the existing licensing and regulatory framework, it was noted that they need to be addressed so that such services are facilitated in Indian waters and airspace at par with the best global practices. Today, we need to create the necessary framework to make the Indian market a part of any maritime and aeronautical service which has global attributes – one of the conclusions pointed out.

Apart from providing consumer broadband solutions in unserved and underserved areas, Satcom can also complement the fiber roll-out programme of Bharat Net, facilitating robust rural digital outreach. Besides, satcom can also be instrumental in providing backhaul support for cellular (4G) and Wi-Fi nodes, while also serving the requirements of Enterprises (over 500,000 units) and 5G networks – as was discussed and highlighted in this conclave.

Zooming into the future

What was beyond argument was the power that recent path-breaking advancements in satellite technology have in delivering a large amount of bandwidth to a smaller geographical area (via high throughput satellites), or in delivering wider coverage with low latencies (via LEO/MEO constellations). These new technologies and innovations will help make broadband more affordable, available pan-India and accessible to public agencies, industries and citizens at large. It was surmised that satcom can also help augment new technologies and applications for a variety of services, including disaster and emergency relief and control, besides playing a complementing role in providing the backhaul infrastructure for next generation networks.

As BIF President, TV Ramachandran, reckoned here, "The government's progressive announcement of liberalization of the space sector promises opportunities to bring in new technology and solutions, along with investments and employment opportunities. This would facilitate a number of benefits, including provisioning of broadband to the unserved and underserved in a faster and efficient manner. This becomes all the more relevant in today's scenario, when the Covid19 pandemic has necessitated Work-from-Anywhere to be the new norm, and requires ubiquitous broadband connectivity across the country's diverse landscape to facilitate the same."

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BSNL introduces world's first, satellite-based narrowband-IoT network

The public-sector telecom service provider BSNL has made a breakthrough in satellite-based narrow band-internet of things (NB-IoT) to connect its satellite ground infrastructure and provide pan-India coverage, including sea. "With this solution, India will now have access to a ubiquitous fabric of connectivity for millions of unconnected machines, sensors and industrial IoT devices," a Ministry of Communication press release stated.

The initiative is in pursuance of the Prime Minister's vision of a truly Digital India starting with fishermen, farmers, construction, mining and logistics enterprises. Indigenously developed by Skylo, the solution will provide vast coverage within the boundary of India – from Kashmir and Ladakh to Kanyakumari, and from Gujarat to the North East," it said.

"The solution is in line with BSNLs vision to leverage technology to provide affordable and innovative telecom services and products across customers segments. Skylo would also help provide critical data for the logistics sector to enable effective distribution of COVID-19 vaccine in 2021and will be a big contributor in service to the nation," BSNL CMD PK Purwar said.

Commenting on the new solution, Skylo CEO and Co-founder Parthsarathi Trivedi said, "For centuries, industries, including agriculture, railways and fisheries, have been operating offline, and have not had the opportunity to take full advantage of the latest advancements in artificial intelligence and IoT until today. This is the world's first satellite-based NB-IoT network and I am proud to launch this capability in India first to transform lives and our domestic industries."

"Successful POCs have already been conducted by BSNL and Skylo in India and we will soon approach various user groups before the beginning of 2021," BSNL Board Director (CFA), Vivek Banzal said.

This new technology supports the Department of Telecom and NITI Aayog's plan of bringing indigenous IoT connectivity to India's core sectors and it has already been tested successfully by Indian Railways, fishing vessels, and for enabling connected vehicles across India.

A small, smart, rugged box, the Skylo 'User Terminal' interfaces with sensors and transmits data to the Skylo Network. The accompanying data platform provides an immersive, visual, experience for industry-specific applications on mobile or desktop. "It gives users the ability to take immediate and appropriate action, no matter where they are. This new digital machine connectivity layer will serve as a complement to smartphone-centric mobile and Wi-Fi network, and covers India's full geography to bring online new applications for the first time," BSNL stated.

Now use "Voice Commerce" for anytime, anywhere shopping

Proximity communication company ToneTag has introduced "Voice Commerce" for businesses that can seamlessly implement customer interactions and create purchase opportunities into natural environments and surroundings. With Voice Commerce people can buy anything, anytime, anywhere, just with their Voice.

The voice-based solution brings the ease, convenience, and customization of online shopping into the offline retail space. "The unique functionalities of this solution will enable seamless and convenient offline shopping experiences for the customers as well as for the merchants," a company press release said, adding that the solution can help customers order and pay ahead in café and QSR just by speaking to their mobile device and get their order once they reach the outlet without waiting in the queue.

"The introduction of voice-based commerce will facilitate cashier-less shopping by enabling customers to order to any voice-activated devices like Echo Buds or Air Pods, thus experiencing a queue less shopping experience, omitting the trauma of lengthy check-out process at the outlets."

ToneTag's voice-based payments solution utilizes sound waves to generate Audio QR as a medium for the merchant or seller and payment information to complete the transactions. Customers can do tap and pay transactions or do queue less/cashier-less payments from anywhere in the store.

Avnet launches cellular module for IoT app development

Technology solutions provider Avnet has launched AVT9152 module to expand its product line for rapid IoT development. The module is designed for a range of embedded applications requiring cellular connectivity yet demanding low power consumption and minimal component size. This new module uses leading Nordic Semiconductor technology to provide engineers and developers with NB-IoT, LTE-M, GPS and Bluetooth low energy (Bluetooth LE) wireless connectivity in one of the smallest packages in the market.

The AVT9152 module has been developed to support a variety of applications, including beacons for COVID-19 contact tracing, logistics and asset tracking, vending machines, kiosk terminals, medical devices and smart building automation, the company said in a press release.

"These applications demand wireless connectivity and power efficiency without sacrificing a device's scale. Avnet delivers this complete package by leveraging Nordic Semiconductor's nRF9160 low power system-in-package (SiP) and nRF52840 Bluetooth 5.2/Bluetooth LE advanced multiprotocol system-on-chip (SoC)," the release stated.

The module offers a high degree of flexibility and scalability for IoT product development while shortening time-to-market. Completing an IoT design can be as straightforward as connecting a power source, sensors, and an antenna to the module.

"To tap the true potential of IoT, engineers must be able to minimize the size and power usage of their devices without compromising on functionality," Avnet Asia Design and Solutions Services Senior Vice President Andy Wong said. "Our new module takes advantage of some of the industry's best SiP and SoC technology from Nordic Semiconductor to strike that balance for engineers. The AVT9152 is ideal for IoT applications when low power and small size are at a premium and is the latest addition to Avnet's robust technology ecosystem."

Nokia, Vi to provide digital transformation services

Nokia has announced that it has partnered with Vi Business, the enterprise arm of Vodafone Idea Ltd. (VIL) to offer future ready services that will help enterprises to digitally transform and improve their efficiency, reduce operational costs and enhance security.

Last year, Nokia and Vi Business partnered to launch SD-WAN to help businesses with transformation. As the adoption of future-ready network solution increases, this partnership will help jointly offer differentiated propositions in cutting edge technologies like fixed wireless access (FWA), private wireless and gigabit passive optical networks (GPON).

With more than 220 large enterprise customers across industries worldwide, and an extensive ecosystem of key vertical partners, Nokia is the leader in private wireless*. Under the partnership, Vi Business will enable enterprises to use best-in-class technologies to increase operational efficiency, enhance business agility and increase the security of their infrastructure. Besides, the partnership will also enable Vodafone Idea to use virtualization and cloudification to enhance enterprise efficiency in a secure manner.

Meghbela launches bundled four-play services

Meghbela Cable & Broadband Services has announced that it has become the first ISP in Eastern India to deliver voice, video, data and wireless services through fibre-to-the-home (FTTH) technology. The company has launched a voice-enabled Android Box for consumers looking to convert their regular TV sets into a smart TV. Powered by Google Assistant, the Android Box provides access to premium OTT platforms and more than 150 Live TV Channels.

Meghbela, which boasts of 10,000 Km over-head fiber network and 2,000 Km underground optic-fiber-cable, has also rolled out Fixed Line Voice Services which will provide subscribers unlimited free local and STD voice calls to any network. As part of the service, the subscribers can also use the Meghbela App to make or receive calls whilst connected to the closed WiFi network. This service is being launched in Kolkata initially and will be rolled out in a phased wise manner in other markets.

"The customers can dive into the world of superfast broadband with up to 250 MBPS speed and experience ad-free entertainment and music with Amazon Prime, Zee5, Hungama, Hubhopper, ShemarooMe, Gaana along with Bengali OTT Players like Hoichoi, Addatimes and Bongo TV," a company press release stated. The company has a broadband customer base of over 1.5 lakh in West Bengal. While the Meghbela Android Box will be launched in Odisha, Bihar and Jharkhand shortly, the company is also planning to launch an IPTV platform nationally.

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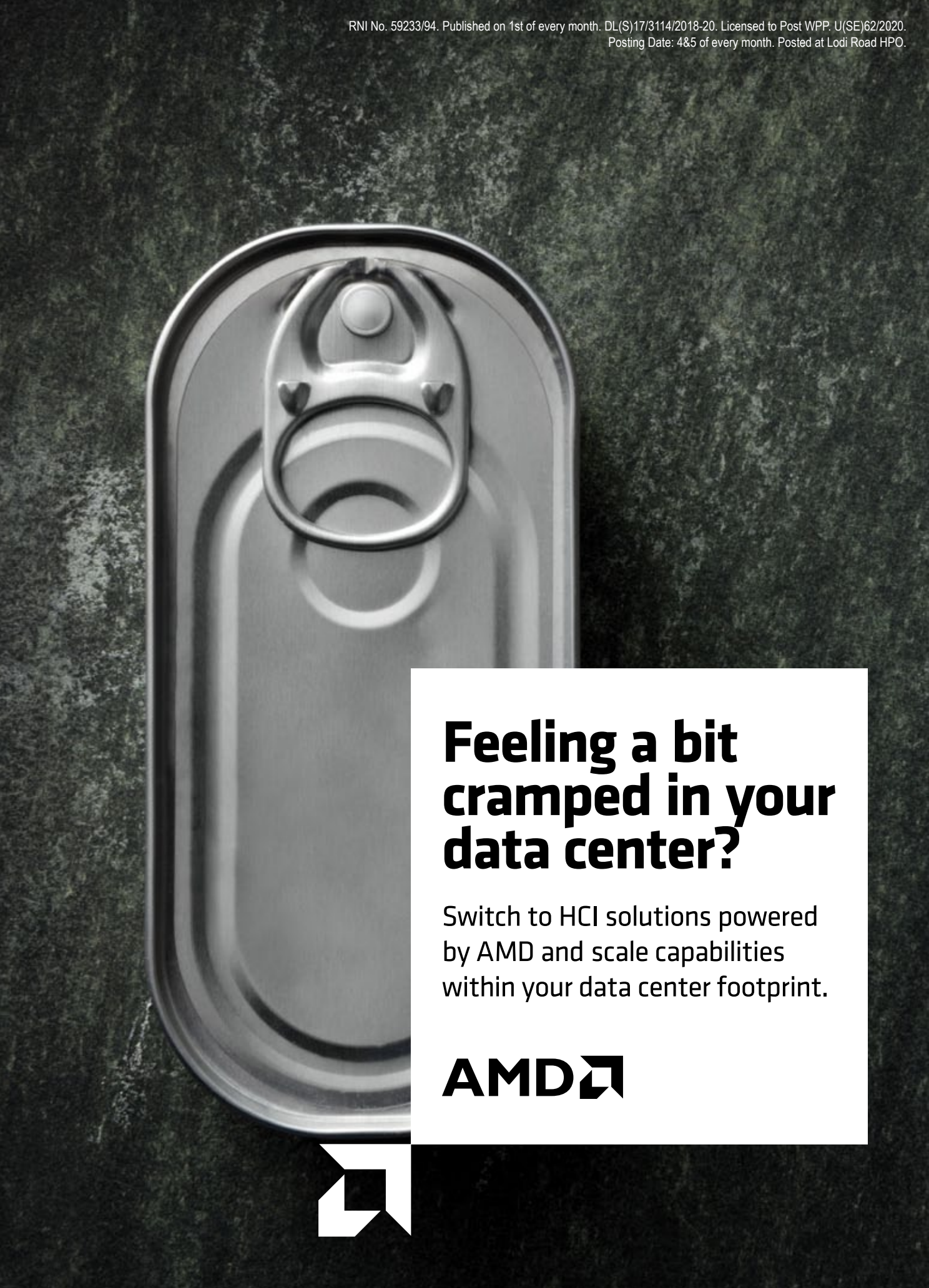

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