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SOLIDIFYING SD-WAN SECURITY

Enterprises are increasingly plugging on SD-WAN to facilitate business-aware connectivity in a growing hybrid environment. Here is how they can make it more secure

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]

Get ready for broadband from the sky

In July last when Bharti Enterprises and the UK Government decided to take over OneWeb, offering to invest USD 1 billion (Rs 7,465 crore) in the firm that went bankrupt, Sunil Bharti Mittal had just upped the rural connectivity and satellite broadband game for India. After emerging from the Chapter 11 bankruptcy protection in November 2020, OnWeb recently announced that it has received additional funding from SoftBank Group and Hughes Network Systems. With this, it has so far raised USD 1.4 billion. This comes as a big boost to its efforts of launching 648 first-generation, low earth orbit (LEO) satellites that will enable OneWeb to offer high-speed, low latency internet access globally by the end of 2022.

In a recent interview with ViaSatellite, Mittal pointed out that despite the efforts by the telcos in India during the last 25 years, there are areas – oceans, mountains, deserts, and forest areas that are almost impossible to connect using fibre or radio terrestrial networks. While the BharatNet project is aiming to provide 2 to 20 Mbps internet connectivity across 2.5 lakh gram panchayats across India, the outcome has been impacted by the ability to connect the difficult and non-viable sectors. Part of the solution was the decision to connect over 5,000 remote villages using satellite broadband under the project. The initiative is being executed by Hughes India using ISRO's communications satellites, GSAT-19 and GSAT-11. The ISRO satellites are using Hughes' Jupiter system, a VSAT platform designed to provide high capacity and efficiency.

Traditional GEO satellites have for ages provided the vital communication network, much before broadband became essential for all. While their cost may be higher, GEO satellites have a longer life and wider footprint since they are positioned much above the earth's surface (2,000 to 35,000 Kms). Unfortunately, the distance causes signal degradation, leading to issues such as latency and interference. The LEO satellites, on the other hand, are closer (500 to 2,000 Kms) and therefore have lower latency. They can also provide higher bandwidth per user than GEO satellites, cable, copper, and even pre-5G fixed wireless.

A lot has changed since the 1990s, when the likes of Globalstar, Iridium, Odyssey, and Teledesic first floated the concept of LEO satellite constellations for providing connectivity. With the advancement in satellite technology, the world is now moving towards constellations like the LEO and medium-earth-orbit (MEO) satellites. The credit for this goes to the Elon Musk-led SpaceX and Greg Wyler's OneWeb that was initially promoted by Richard Branson, Paul Jacobs, Tom Enders, and Mittal.

It seems satellite communication – internet from the sky – is finally coming of age, even though the players still need to deal with pricing and regulatory issues, as well as the debris in the space. However, these are just a matter of time; two years at the most.

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SOLIDIFYING SD-WAN SECURITY

Enterprises are increasingly plugging on SD-WAN to facilitate business-aware connectivity in a growing hybrid environment. Here is how they can make it more secure

BY SOMA TAH

Software-defined wide area network (SD-WAN) has emerged as a preferred option for the enterprises to manage and optimize the wide area networks (WAN) for a distributed and remote work environment in this new digital era. The virtual WAN architecture of SD-WAN allows enterprises to intelligently direct traffic across the WAN, and leverage any combination of transport services including the multiprotocol label switching (MPLS), cellular and broadband internet services to securely connect users to applications hosted across on-premise data centers, and public or private clouds.

SD-WAN expanded the boundaries of enterprise digital infrastructure across branches, the internet, and the cloud, augmented application performance and the user experience. It has enhanced the control, visibility and insights on the application as well. The added flexibility and scalability, however, come at a price. The virtualization, sprawl, and visibility often play out as a slippery, complex and expanded attack surface for them. As the traffic no longer passes through a centralized location for policy enforcement and security filtering, it leaves enterprises extremely vulnerable to cyber threats.

Dealing with complex, expanded attack surface

SD-WAN along with MPLS and virtual private networks (VPN) have already helped enterprises with their varied networking requirements. It is also often considered to be a cheaper alternative in terms of the Capex and Opex associated with adding new sites to the network, but is it any better than MPLS and VPN in terms of security? According to Juniper Networks India Systems Engineering Manager Rohit Sawhney, "Irrespective of whether its cost or performance, the benefits of SD-WAN can be completely overshadowed and burdened with the fast-evolving cyber attack vectors." He also shared a comparative view of the risks associated with each of them.

"Irrespective of whether its cost or performance, the benefits of SD-WAN can be completely overshadowed and burdened with the fast-evolving cyber attack vectors."

Rohit Sawhney, Systems Engineering Manager, Juniper Networks India

"Earlier enterprises didn't have many choices when it came to the WAN. MPLS was pretty much the de facto choice of the last decade. Fundamentally, private MPLS provides secured and managed links between locations through the service provider's internal network. That is the reason many enterprises do not encrypt their MPLS connections or inspect traffic for security threats."

But enterprises have got more choices for connecting their branch and distribution locations nowadays. As the cloud adoption and connectivity requirements grew further, enterprises started relying on VPN over a direct internet connection as it provides a considerable degree of privacy and security with encryption, varying authentication mechanisms and data integrity checks. But VPNs are also prone to cybersecurity threats like spoofing, session and device hijacks and they cannot prevent viruses, malware, or physical threats from stealing information.

"This is where SD-WAN promised to offer more WAN choice and flexibility while providing better visibility and easier management of WAN resources. But connecting through the cloud can limit an organization's opportunity for packet inspection and increase exposure to security threats," points out Sawhney.

DDoS attacks are also a real concern once enterprise locations start leveraging the internet for connectivity. Locations previously protected by private IP on MPLS VPN services are prone to such attacks, especially when concepts like local-breakout kicks in and expose the branch to attackers. SD-WAN management interfaces are exposed to the internet as the solution moves to cloud. This often leads to Web UI threat exposure e.g. HTTP DDoS-attacks, he adds.

No, SD-WAN isn't foolproof

SD-WAN systems form a network perimeter and connect the internet, WAN, extranet, and branches and that makes them an attractive target for attackers as well. The attack surface also grows considerably as organizations switch from a single or limited set of centrally managed secure internet gateways to a distributed set of internet gateways.

The mesh networking topology of SD-WAN brings flexibility in transport services, agility and reliability

"Threat modeling should be conducted early in the development stage of your SD-WAN, so issues can be remediated early to avoid much costlier fixes later."

Raghuveer HR, Senior Director- Sales, NTT India

of application performance, and SD-WAN's virtualized console offers centralized management and visibility into all of these connections. However, the approach still breaks the centralized security posture that most organizations have built into their hub-and-spoke network topologies. Also as SD-WAN appliances are fully-meshed unlike the regular routers, therefore compromising one SD-WAN device can give attackers visibility into the traffic flow from across the organization, leaving the critical enterprise data at stake.

Although a real-time inspection, identification, and policy classification on the user and application traffic is foundational to secure SD-WAN, a basic SD-WAN will not always have security integrated deeply enough into their products leaving enterprises to solve security separately. Now, that is no doubt a daunting task given the rapid changes in the cyber threat landscape in this digital era.

So, if you want to protect your organizational data with comprehensive security and compliance measures you have to add them as an overlay which used to be handled by the security solutions deployed at the core earlier. Also this overlay approach creates another set of problems. First, these point security products generally do not interoperate with each other, which can reduce visibility while leading to acute management and logistical burdens and overhead. And second, point security solutions are too disconnected from SD-WAN functions to do much more than react to connectivity changes creating critical defensive gaps at the network edge.

Last but not the least, the ability of service providers to deliver scalable commercial SD-WAN and security services traditionally requires significant investment in time and resources and may require complex integration and testing resulting in a long time to market and high costs as well.

Chinks in the shining armour

The weaker links in SD-WAN also make it susceptible to various attacks. First, systems and components deployed as part of an SD-WAN solution often become a target of attack. SD-WAN hardware appliances generally use commercially available off-the-shelf (COTS) platforms. Operating systems of SD-WAN nodes are mostly built on general-purpose Linux distributions. Outdated and unsupported open source software makes them even more vulnerable to attacks, indicate experts in the domain.

In an SD-WAN architecture, threats may exploit weaknesses of the data plane, control plane, management, or the orchestration plane. These include fragile and weaker links such as southbound protocols, data center interconnects (DCI), controllers, along with network fuzzing challenges, and DDOS loopholes also.

The Southbound interface is used by controllers to communicate with customer premises equipment (CPE) in SD-WAN. Southbound protocols like OpenFlow, Netconf, REST API, MP-BGP and proprietary protocols are the key in programming SD-WAN end-devices like routers. This communication channel is vulnerable to security threats like non-legitimate access to a process or operating system resources via any exposed interface.

Getting the SD-WAN security right

Digital innovations continue to outstrip the ability of security to protect the expanding attack surface, leaving organizations exposed to new risks every day. Today's distributed enterprises require a solution that ensures uninterrupted connectivity, accelerates the cloud on-ramp, improves application performance and user experience, provides advanced security to protect against evolving cyber threats, and enables unified analytics and reporting for improved visibility and control.

"It is a fundamental requirement to do a risk analysis and assessment that considers your organization's

"A zero-trust-architecture can implement a regime of continuous verification, prioritizing identity authentication, and end-to-end encryption."

Ritesh Doshi, Director-Enterprise Networking, Cisco India and SAARC

risk profile at the outset of designing your SD-WAN and selecting appropriate security controls. Threat modeling is a process that can help you to identify possible threats and vulnerable areas across your architecture. But it should be conducted early in the development stage of your SD-WAN, so issues can be remediated early to avoid much costlier fixes later. It can lead to proactive design decisions, which reduce the threat at the outset, helping your architecture to be secure by design," NTT India Senior Director- Sales Raghuveer HR suggests.

The roadmap to firming up security will depend on how you decide to deploy security as part of your SD-WAN solution. Raghuveer adds: "A centralized model will provide absolute security, but the trade-off lies in application performance. A decentralized model provides security controls at each branch office location for flexibility and autonomy. However, this tends to result in inconsistent security across the organization and is costlier to deploy and manage. A cloud-based secure access service edge (SASE) combines WAN capabilities with cloud-native security functions like secure web gateways, cloud access security brokers, firewalls, and zero-trust network access. However, to be truly effective, it requires close collaboration between networking, security, and DevOps team."

According to Gartner, SASE capabilities are delivered primarily as SaaS and it is based on the identity of the entity, real time context and security/compliance policies. What SASE does differently is decentralize the network. Instead of the hub-and-spoke topology typical of SD-WAN, irrespective of the users' locations, SASE securely connects them to the nearest network point of presence (PoP) where security and networking functions are executed.

SD-WAN needs to be looked at with security at the center of the architecture, and should not be an after-

"The security-driven networking approach weaves SD-WAN and security functionality into a single console and decreases threat remediation time from months to minutes."

Rajesh Maurya, Regional Vice President, Fortinet India & SAARC

thought, reminds Cisco India and SAARC Director-Enterprise Networking Ritesh Doshi. "The solution should provide one-click native integrations with secure internet gateways to provide end-to-end security. This ensures we deliver application experiences and build enterprise scale. This modern-day architectural concept is often called SASE. It reflects the reality that the WAN security and features of today must be distributed, cloud-based, flexible, and agile. We believe that edge-level security is further tightened with an additional level of granularity and visibility that is required in today's distributed enterprise. In addition to this, it is critical to build a robust security foundation by deploying Zero Trust architecture that can implement a regime of continuous verification, prioritizing identity authentication, and end-to-end encryption."

The approach to security is always considered best when it's pervasive, suggests Sawhney, because unlike any point product or component, SD-WAN is a framework incorporating locations, network, users, applications, devices, internet, public cloud and policies, which in turn can potentially open up threat vectors that are spread across the enterprise infrastructure and boundaries. "Although enterprises exploring and deploying a SD-WAN solution are somewhat familiar with common security threats, it remains crucial to have an understanding of the overall framework and components in the architecture. This will surely help security experts to build a more robust security implementation strategy for SD-WAN deployments," he says.

Transitioning to a security-driven networking approach ensures that security is always an integrated function of any network development or expansion project. In such an approach, security becomes an integral part of the new network – adapting and scaling along with the network, even as it expands into new cloud environments, provides more nimble services to branch offices, and moves to the rapidly growing edge.

Explaining this further Fortinet India & SAARC Regional Vice President Rajesh Maurya points out that the integrated management solution that takes a security-driven networking approach, weaves SD-WAN and security functionality into a single console can decrease threat remediation time from months to minutes. "It does this by coordinating policy-based automated responses across the distributed security architecture, unlocking security workflows, and threat intelligence gathering and implementation. As a result, any detected incident alert sent with contextual awareness data from a branch allows a network administrator to quickly determine a course of action to protect the entire enterprise against a potential coordinated attack."

Considering the expanded attack surface and attack vectors, secure SD-WAN is emerging as the most significant WAN service for enterprises due to its ability to facilitate business-aware connectivity in a growing hybrid environment. Secure SD-WAN must have the ability to prevent malicious access and attacks, along with the capabilities such as content filtering, network segmentation to secure specific areas of the network reduce or slow the spread of attacks, data encryption and VPN to ensure confidentiality of data traversing the network.

This has created an opportunity for the service providers to deliver flexible, scalable and secure SD-WAN solutions and many vendors have joined hands with the leading security vendors to sell integrated solutions to their customers. While integration of multiple point solutions certainly helps in solving specific security issues, they also add up an extra layer of complexity, contradicting one of the selling points of SD-WAN in the first place, i.e. reduced WAN complexity and costs. But that's another story for another time.

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The monumental u-turn

The ripples of user-privacy-concerns that have been sparked recently in the WhatsApp universe are going far and wide. Who threw this stone in the water? And who gains – eventually?

BY PRATIMA HARIGUNANI

For anyone who has watched documentaries like The Social Dilemma – this scenario seems suddenly familiar and fearful. January started with an explosion of a different kind. Users of WhatsApp felt a bolt from the blue (or shall we say green) when they were made aware of a new string of privacy-related updates and clarifications. By February 8, the app intends to start sharing its commercial user data with its parent company Facebook and third-party firms associated with it.

The update stirred up a lot of confusion and angst among its users. Encryption of messages and privacy of messages to family and friends – that is, supposedly, still intact but some private information can be accessed and shared with Facebook – or at least, that's what the current set of worries are indicating. The company has been stressing that the update was an attempt to improve transparency about how it collects and uses data.

"Companies have the responsibility to give users adequate awareness on terms and conditions and in a way that they are legible and understandable."

Prof S Sadagopan, Director, IIIT-Bangalore

A lot of technology companies have been, unabashedly, ignoring the significance of user-rights and privacy – so these deaf spots are familiar. But for WhatsApp, this was a unique switch. Encryption of messages and data was, believably, the very sweet spot of this app. How did it become a sour-spot, and how much? This can be understood at three levels: What users feel? What competitors feel? And what regulators feel?

Direct hit

First, let's talk about the almost-allegiant 400 million user base in India that WhatsApp has enjoyed across its fast, and hot, growth curve in the last few years. It is staggering how this app grew its thumb-print exponentially – far into the nooks and corners, and enabling communication, transfer of documents, images and what not for the common man.

But now the privacy update has created anxiety among its users. Of course, the app has issued clarifications on why the update has nothing to do with consumer chats or profile data, and is about outlining how businesses who use WhatsApp for customer service may store logs of its chats on Facebook servers. But most users are having serious second thoughts.

Indirect hit

The damage suffered by Facebook-owned WhatsApp is translating into a collateral-gain for a niche set of players. Signal and Telegram, encryption-strong apps, have exhibited a sudden jump in downloads, and users, since the announcement of the company's privacy notifications. Telegram's active user-base has grown to 500 million at the last count (and 25 million were added in the last few days itself).

As per data from Sensor Tower (a Mobile app analytics firm), the time when WhatsApp struggled with a nosedive of 10.6 million in downloads; Signal has seen 17.8 million app downloads on Apple and Google during the week of 5-12 January, while Telegram witnessed 15.7 million downloads in this period. Incidentally, or not, Signal's founder is also a former co-founder of WhatsApp. Brain Acton left WhatsApp when it was bought by Facebook.

Long-haul hit

Will all this shuffling-and-hopping change something for the basic issue of privacy at all? After all, even WhatsApp was all reliable and privacy-centric before it moved to corporate skyscrapers. Apart from regulators around fair-data use that have sprung up in Europe and elsewhere; India too awaits an important bill in the near future. But even if the law gets more teeth, the basic flaws in the business model of such apps still stay bare.

A lot of technology apps for the consumer are designed around monetization of data. First-party can be a plausible for reasons of improving the app experience and user convenience, but second-, and third-party data are actually the source of commercial value of any such app. Can User-driven data marketplaces replace or complement this side? Also, what about the role of users who are not always that discreet or patient or observant about their right to privacy?

As Professor S Sadagopan, Director, IIIT-B avers, even the most intelligent people among us behave like a five-year kid when we are downloading a new app. "We are impatient and just waiting to see what happens next. Companies have the responsibility to give users adequate awareness on terms and conditions and in a way that they are legible and understandable. The average user has no time to wade through the endless list of conditions that pop during the sign-up stage. They may also not have the tech-understanding that is required here. So companies need to introduce new steps. At the same time, users should be more careful. An app can allow a user to send two messages easily but at the next message it should

> The damage suffered by WhatsApp is translating into a collateral-gain for a niche set of players – Signal and Telegram have exhibited a sudden jump in downloads and users.

How India reacted

Over 26% respondents said they will drastically reduce WhatsApp usage in favour of other platforms.

Irrespective of the recent controversy, over 18% of Indians feel there is no serious concern and look forward to continue using WhatsApp.

Over 15% Indians indicated that they would rather abandon the platform entirely instead of agreeing to the updated terms.

Of the total, 10% said they will lean towards starting to use SMS and email.

Source: LocalCircles; Sample: 9,000

inform them about the way it uses data or its policy on encryption. And so, level by level, information and clarity should be strengthened – provided the user is patient, and prudent, too."

Interestingly, he has many insights from the concepts being led and guided at IIITB. Like the open-source digital identity platform MOSIP or a COVID-19 tracing app enabled through blockchain. In the industry too, the idea of democratic, consumer-empowering and decentralized marketplaces is catching up. They stress on user-awareness on the power of one's own data.

"Users should learn to be an active participant in how they manage their own data. It is important." Rodrigo Irarrazaval, Marketing Manager of Wibson has also emphasized. Wibson is one example of decentralized data platforms that are claimed to be designed to fix the gap that individuals are not part of the value exchange that is going to occur with their own data. That opens a big space for open, market-driven systems where the buyer can set the price and the individual data sellers have the right and opportunity to choose to accept or decline the offer. Then there are options like BIGtoken that aim to put consumers into the data economy value exchange by giving consumer complete transparency and control of their data, and share in the monetary opportunity for data.

Another possible solution is contextualization of data – by categorizing it into financial, personal, health data etc. Some people may be okay sharing health data for more convenience but for some people it may be a sensitive thing while they are okay sharing data about their location or financial-habits.

Cascading ahead

The evolving situation also reminds one of the scenarios from The Social Network and ignites a lot of questions too. "No technology innovator or start-up guy wants to build a monster – everyone wants to innovate. But the monster is built over a period of time. It is not built in a day, so we need to be very vigilant and watch the monster closely. The chase for valuations and growing too fast – that should be kept aside and, instead, growing slowly -and in the right direction- should be opted for," advises Prof. Sadagopan.

It is a good time for users, companies, app-makers and law-makers alike to ask these questions. It is good time to toss away words like 'network' and 'dilemma'; and to lay the plot of a new story – The Social Utopia.

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The new network normal of 2021

Corona virus has impacted the world in previously unimaginable ways. Here are some fanciful and other serious predictions for the post-pandemic normal

BY TERRY YOUNG

The year 2020 has been a challenging for the entire world. Between the pandemic, shutdowns, wildfires and other natural disasters, most of us are looking forward to a new year in 2021. Here are a few light-hearted predictions plus some more thoughtful reflections on what's to come in 2021 and the impact on service providers.

Santa Claus launches new 5G service for virtual toy delivery

After a brutal 2020 Christmas season navigating varying social distancing rules around the world Santa Claus announced that in 2021 he too will have to go virtual and use 5G. "I can't keep up with the demand and pace of millions of simultaneous deliveries all within a 24-hour period. The traffic volume keeps going up. I need the speed, security, network performance and massive connection rates that only 5G can give. Most kids don't want physical toys anymore – everything is online and virtual. I have created new streaming "toy experiences" and "unboxings" that most kids will love. For those that still want a physical toy, using 5G converged with fixed access, I can reach even remote and rural locations quickly."

Santa is the latest service provider to respond to the pandemic-induced traffic surge for online and virtual services as people work, play and learn at home. Service providers of all types – cable operators, ISPs, mobile operators and others have had to scramble during 2020 to augment capacity to suburban and rural locations and meet the higher demand for streaming and other services.

Facebook will change its name to "About Face"

Amidst growing pressure from privacy advocates, regulatory threats and public relations missteps, critics of Facebook are demanding that the company accept regulatory-enacted privacy rules similar to GDPR in Europe. Massive increase in security threats, weaponized COVID-19 fear plus the burden of overseeing huge misinformation postings will cause Facebook to

> Santa is the latest service provider to respond to the pandemic-induced traffic surge for online and virtual services as people work, play and learn at home.

totally rethink its business model and offer enhanced subscription services, free from advertising.

Governments worldwide issue "stay out of home" orders for citizens

After almost a year of "shelter in place" and vaccines becoming globally available, governments in the US and elsewhere are ordering people to get out of their houses and mingle with the rest of the world. It seems many people have forgotten what it's like to have regular social interaction or to travel beyond the confines of their own neighborhood. "You mean you can eat a meal INSIDE the restaurant," asked one confused person who was interviewed?

Seriously though, we predict the pandemic response in 2020 will have a lasting impact on how and where consumers and businesses will use networks services, how service providers will build out their networks and where they will invest in additional capacity.

Here are a few serious predictions for service providers in 2021.

Digital transformation will accelerate

The pandemic will erase years of resistance by late adopters, social institutions and businesses that previously hadn't bought into the "digital transformation" argument. Forced to go "online or die" individuals and businesses have learned new skills, overcome technology limitations and forged new business models during 2020. These will continue in 2021 and will accelerate many technology transitions that service providers are conducting.

IPv6 will finally overtake IPv4

Hovering right around 33% for most of the year, according to Google, IPv6 will be used in more than 50% of Google searches globally. Boosted by the growth of 5G devices and networks, and increased pressure on CISOs to upgrade enterprise networks for strong network security, many enterprise and websites will accelerate their eventual conversion to IPv6 in 2021. However, many other ISPs, content providers and retailers, hard-hit by pandemic shutdowns, have web sites that are still IPv4 only and will remain unable to fund a conversion of their IT infrastructure. CGNAT can help extend their investment.

The pandemic will have a lasting impact on education

The abrupt conversion of in-classroom learning to remote during the pandemic will encourage elementary, secondary and higher education to offer online options to traditional in-classroom on a regular basis. This will expand education during illness, during period of inclement weather (rainy and snow days) and other situations where a more flexible arrangement would be beneficial.

Service providers move to the edge – faster than expected

The service providers will have to re-architect their access networks to accommodate the traffic shift from dense urban areas to suburban as work, play, and learn at home continues, post-pandemic. According to IDC, edge computing is likely to exceed 50% of new infrastructure deployments by 2023. It has been identified by nearly all mobile operators as extremely important to future networks.

Lifestyles will be permanently altered by the pandemic and many will not want to return to commutes and less flexible working conditions. Remote work will become a new, acceptable alternative in many industries. The recent announcements by Tesla and Oracle to move corporate headquarters from tech talent-rich Silicon Valley in CA to Texas demonstrates a new trend. This will ultimately impact real estate, mass transportation plans and other social institutions that assume large-scale commutes to a few valuable job destinations. This shift will give a boost to distributed edge networks, cloud services and wireless that are less dependent upon centralized traffic aggregation.

That's it for service providers... but here's my final prediction: this year will be so much better than 2020 and we will all be so glad. The COVID-19 vaccine will be hugely effective, and the world will establish an international day of togetherness in 2021.

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AI, privacy, low code, serverless to rule

Thanks to unprecedented rise in digitalization and internet access, improving service delivery will be the key. At least four tools will shape the development arena

BY HYTHER NIZAM

The future of app development, like so many tech disciplines coming out of 2020, will be greatly impacted by COVID-19. Businesses have fast-tracked their digital transformation processes to remain relevant during the pandemic and also to future-proof themselves. Moreover, the increased availability of the internet and smartphones around the world is prompting individuals to adopt a highly digitised life out of convenience. This, in turn, will bring forth a myriad of software requirements – both B2C and B2B, which will drive the tech developers to review and streamline their DevOps strategies to improve service delivery.

In 2021, AI, privacy regulation, low-code adoption for business users, and serverless solution growth will all be key factors for DevOps.

AI will help automate DevOps

AI-driven application development will become ubiquitous in the next year or two. Many aspects of DevOps can be automated and, over time, made more efficient using AI capabilities. These are the key areas where we expect to see significant growth:

- AI-assisted development, which includes entity and workflow suggestions
- Data modelling and auditing
- Data cleansing and maintaining integrity
- Search functionalities across an application ecosystem with NLP
- Automated testing suite with a focus on security and data privacy
- Intelligent data extraction and processing via pre-modelled operations, predictive services and forecasting tools
- Process management and optimisation

> Apple will unroll a new iOS 14 privacy feature that requires developers to ask users for permission to track and collect their data on websites and mobile apps.

Data privacy will play a larger role

With the recent passing of Prop 24 in California, GDPR in Europe, even LGPD in Brazil, privacy regulation is on the rise worldwide. While developers are concerned about users' privacy for the applications by default, they will need to be cognisant of privacy policies for services they integrate with and share information with as well. For example, integrating an SDK into a developer's application can provide value for both the developer and the user, but the integration carries obvious data privacy and sharing concerns. Apple, for their part, will be unrolling a new iOS 14 privacy feature for the iPhone and iPad sometime next year that requires developers to ask users for permission to track and collect their data on websites and mobile apps. Increased regulation will change the types of applications developers look to build in the coming year.

Additionally, remote working increases data privacy and security risks, especially in highly regulated industries. Data access controls, privilege management and authentication forms will play a critical part in mitigating these risks.

Shifting business landscapes will increase low-code adoption

The low-code development market has already been growing steadily over the last several years. In 2021, however, low-code adoption will accelerate precipitously because of changing business conditions. For the past eight months and counting, companies have restructured their businesses and sought out new growth strategies that leverage the digital platform because workforces are more distributed than ever.

Increased demand for process digitisation results in a huge pipeline (backlog) of application development requests, making the ability to respond to market demands sluggish. Now more than ever, organisations need to be nimble, which is not easy in a traditional application development setup.

Good low-code platforms strike a balance between abstraction and control. They empower business developers to build and update applications (adding functionalities or workflows) faster, without compromising the quality, complexity or scale. For this reason, low-code app development and low-code platform adoption will skyrocket in the coming year. It is difficult to predict which industry verticals will see the biggest boost in adoption, but by looking at the user breakdown of Zoho's own low-code platform, Zoho Creator, certain sectors stand out.

Over the past 14 years, we have seen slightly more interest from verticals such as manufacturing, logistics, education, and professional services, where the contribution of custom processes as a differentiator is greater when compared to other verticals. In addition to these, in 2021, we also see organisations from industries with accelerated digitisation due to COVID-19 leveraging low-code applications as a strategic tool to survive and gain an edge against competition. One obvious example of this would be the demand from developers to build custom-fit communication and collaboration applications to support remote workers.

Serverless solutions for efficiency

While container solutions will continue to be a key aspect of development in 2021, serverless computing will also see growth that will outpace the already established containerisation model.

As with anything, it will come down to the core requirement. Containers will work well for complex, large-scale, long-running mission-critical applications, which need constant care and support. They can also be a perfect ally in legacy modernisation. Serverless, on the other hand, gives developers elasticity or dynamic scaling, such that resources can be increased or decreased based on demand. This leads to cost savings, which will be a prime motivator for serverless adoption in the coming year. The key consideration here is the speed of development and cost of maintenance. The development environment in 2021 may include both approaches working hand in hand, complementing each other's strengths and weaknesses.

In 2021, we will see DevOps rapidly adopting new methods due to the unforeseen impacts of 2020. With app development needs skyrocketing, we can expect an explosion of new DevOps olutions and methods to create efficiency and impact.

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Shaping the 5G mobile data in 2021

The pandemic has impacted evolving technologies in unimaginable ways. Here is how it is shaping the telecommunication and mobile sector

BY V&D BUREAU

Blinding encryption protocols, 5x mobile cloud gaming data traffic, a refocused 5G core, and seven-day weekend traffic after people switched to work from home are among the trends impacting mobile data in 2021. The trends are part of the Enea Openwave report, gathered from a cross-section of mobile industry thought leaders including AT&T, Telefonica, RootMetrics, Tutela, Analysys Mason, Strategy Analytics and ABI Research.

Use case benchmarks: The pandemic has impacted how mobile operators are benchmarked by companies such as RootMetrics and Tutela. In their quest to become #1, operators will have to consistently manage new use case-based benchmarking criteria. In 2021 the top use cases for 5G are predicted to be cloud gaming, group video calling, including watch parties, and for enterprises, private 5G networks.

Subscriber expectations have also changed during the lockdowns. Consumers have become more tech-savvy and discerning about connectivity. Their expectations have soared and operators will be blamed for poor user experience – those video calls to the grandkids need to be seamless!

Blinding encryption: Operators could be blinded by new OTT encryption protocols being introduced in 2021, even before standards are agreed. Currently, over 85% of traffic on mobile networks is encrypted and operators have relied on traditional optimization technology to manage this so far. This will change dramatically in 2021. The Internet Engineering Task Force (IETF) will introduce new protocols in the shape of DoH (DNS over HTTPS), DoT (DNS over TLS) and eSNI (encrypted server name indication). Some countries such as China and Russia have banned these protocols, yet DoH could go mainstream around the middle of 2021 as OTTs increasingly look to centralize and control the internet via encryption.

Collaborative mobile cloud gaming: Operators will face 5x increase in mobile cloud gaming traffic by the end of 2021. Gratifying gamers and shocking parents, the WHO recommended gaming as a way to reduce the spread of COVID-19. Gaming was already on an upward trajectory even before WHO's blessings. As connectivity providers, a number of operators, including AT&T, Verizon, and T-Mobile have launched complementary services such as self-configuring adaptive networks, identity verification to stop cheating, and the architecture for gamers to easily 'flip' a game from console to phone to PC for multiplatform gameplay. In 2021, the mobile cloud gaming ecosystem will expand beyond the behemoths of Google, Microsoft, and Amazon and incorporate smaller independent gaming companies.

> Operators could be blinded by new OTT encryption protocols being introduced in 2021, even before standards are agreed.

Refocused 5G priorities: Many European and North American operators have deployed 5G non-standalone (NSA) networks with a view to monetizing a limited number of use cases. As lockdowns proliferated, enterprises rushed to digitalize great swathes of their operations – increase the number of use cases and connected devices. This increase in devices coming online and the subsequent surge of information these connections will generate requires effective data management. In 2021, in anticipation of this, operators will invest in 5G core infrastructure - for both NSA and standalone (SA).

The new normal of 7-day weekend: After being forced to work from home during lockdowns, people continue to work remotely – and a new mobile traffic phenomenon has emerged with the demand for data growing exponentially throughout the week – in suburban areas, while demand has fallen in business districts on weekdays. Many operators expect this trend to continue beyond 2021 and even post-pandemic.

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Users' Choice

PCQUEST

CMR
Insights powered by research

Consumer segment - February 2021

Consumer buying behaviour changed post March 2020. Work from home became mandatory and shift to essential gadgets became priority.

PCQuest along with research partner Cybermedia Research announces Users' Choice survey aimed at the understanding the user's choices, preferences along with product satisfaction.

Product Categories : Nationwide Survey

Laptop

Desktop PC

Gaming laptop

Smart Speaker

Smart Phone

Tablet

Wireless Headset

Smart Watch

Smart Band

Smart TV

Highlights of the Survey

- 30+ Brands will be featured
- Top brands in each Product Category will be announced
- Study the awareness and usage of the brand
- Consumer Satisfaction level of the brand
- Brand Advocacy
- Future trends

Annual Program

- Advertising/Sponsorship
- Brand Advocacy Talk Series
- Coffee Table Book
- Social Promotions
- Awards Gala, Digital campaigns
- Content Marketing
- Video Interviews
- Product Reviews

Partner with PCQuest. Last date for advertisement booking is 30th January 2021.

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Five data-centric trends to watch out for in 2021

The beginning of a new decade promises to be the time to consolidate and build on the gains of widespread digital transformation we witnessed in 2020

BY RAMESH MAMGAIN

From the accelerating shift in digital transformation to a deep realization of the need for a greener future, the COVID-19 has disrupted everything, reorienting the way we work, play and live. As we progress towards the new beginning, it's an opportune time for enterprises to look back and connect dots.

The disruption is here to stay and that calls for transforming this crisis into the new normal. As we welcome the beginning of a new decade, here are the five trends to watch out for in the year 2021.

The 5G future

While India gears up for5G adoption in 2021, the concerns around network and data security are also looming large. From the user point of view it could not be a better time as many of us would be working from home and a faster internet would be a boon. However, 5G is not just about

> As our remote workforces deal with sensitive data on a daily basis, focus towards securing endpoints will be high on the IT priority list.

consumer mobile services as it will reset the order of internet-based services as well.

Being an all-encompassing transformative technology, once 5G will be set in motion with optimum application, it will soon be the oxygen to our hybrid virtual ecosystem across industries. This is so, simply because the technology is dynamic and versatile in nature and can fuel internet of things (IoT) and intelligent use and management of data even more superiorly.

However, once we have the fundamentals in place for 5G and IoT, then we will be able to extrapolate the benefits of this technology from the economic, environmental to societal points of view.

Cloud native applications

The increasing adoption of cloud and digital technologies will push the demand for container applications as well. Given the focus on agility, this acceleration will be driven by cloud native applications across environments.

These will not only help eliminate constraints from IT teams but also abridge the path to business gain, with a one-stop view of their infrastructure enhancing the quality of services from IT teams to the fullest. Cloud native applications are critical to the digital enterprises of today and will set businesses up for success in both IT and DevOps front in the time to come.

Shining a light in the data lake

The New Year would see more enterprises shining the light in their dark data lakes to not only improve their business but to stay ahead in the industry they operate. This can be done by faster adoption of new-age tech tools like AI and analytics to garner insights from the deepest corners of their data lake.

The enterprises would accelerate the usage of the vast amount of data that they have which is sitting idle so far. While the pandemic has moved teams across the globe into the momentum of having data protection as a priority, it is high time to leverage this placid data lake intelligently.

Back up-as-a-Service (BaaS)

As digital adoptions remain a priority for organisations, the next step for them would be to improve efficiencies across the spectrum, including operations, finance and of course the human resource management.

The SaaS dynamics has changed completely with the pandemic as we now know the benefits of subscription-based models. Infact, the Indian SaaS revenues have grown 30% and are at USD 3.5 billion in FY20 alone, according to a recent report by NASSCOM. This momentum is expected to grow even when we look at data management paving way for Backup-as-a-Service (BaaS). As enterprises will strive to empower their agile workforce with a secure, fast and reliable data ecosystem, keeping a federated view and control of their data will ensure that their IT infrastructures remain protected, compliant and cost-effective.

The endpoint protection armour

Remote working became the new normal for all progressive enterprises, shifting the mindsets about working from home and showcasing benefits at large. One thing is for sure, while our world might not stay all-virtual, remote and flexi work is the future. The policy support from the government (by relaxing the norms for the IT sector) also indicates the prominence of agile workspaces all the more.

As our remote workforces deal with sensitive data on a daily basis, focus towards securing endpoints will be high on the IT priority list. Another reason why we will see increase in enterprises adopting end-point protection is because when the workforce works remotely the control over data protection is low, while the regulatory compliances are high.

And let's not forget the looming dark cloud of cyberattacks, especially ransomware. While there is no surefire way to prevent vulnerability to cyberattacks, integration of newer technologies like AI and intelligent data management will not only armour enterprises against these threat vectors, but also enable them to detect any anomaly in the vast cloud infrastructures and nip it in the bud.

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Tasleem Arif
Vice President and Head Oppo India R&D

"Innovation is embedded into the DNA of Oppo"

Oppo India has been at the centre of R&D and innovation supporting the company's global market in 5G and other new technology areas. ***Tasleem Arif****, Vice President and Head Oppo India R&D talks with* ***Prabhu Ram*** *about the impact of 5G in the new normal, the company's R&D initiatives, patents, its innovation-led culture and the support to the ecosystem. Excerpts:*

COVID-19 has impacted the world in many ways, including a massive adoption of digital tecnologies. How do you see 5G impacting consumer lives in the post-pandemic era?

From social engagement norms to the way we work, 2020 has witnessed a lot of changes including that in our lifestyle. More time spent at home during the pandemic has increased the interest in emerging 5G-enhanced digital services like cloud gaming, immersive education like digital AR books for kids, and services that offer remote digital live event experiences.

The catalyst to driving this growth will be the adoption of 5G in India, which will enhance the quality of life for users. 5G's fast network speed, low latency, and massive connectivity should allow consumers with uninterrupted streaming of high-quality video content such as UHD, 4K, 8K that includes all paid OTT video, AI-based video content and premium esports streaming.

5G will enable consumers to futher explore their interests and integrate it ito their daily live for better internet of experience. One-third of those considering taking up 5G will continue to engage with core digital services including video on-demand streaming subscriptions, high-fidelity music and live sport streaming services.

How crucial is R&D in making a remarkable change in pushing tech forward?

Oppo has always focused on innovation in order to make our users future-ready and add value to their lives and experience. With our brand vision 'technology for mankind and kindness for world', our entire approach is towards making life of our users better everyday.

Our technology development strategy '3+N+X', is a clear indication of our vision of tech for people and our brand philosophy of building great products for our users. As part of this strategy, the "3" refers to the three underlying technologies, namely hardware, software and services technologies, which help the company to bring an integrated smart life to users worldwide. "N", represents a number of Oppo's essential capabilities, including AI, security and privacy, multimedia, and interconnectivity. Lastly, "X", refers to the leading-edge and differentiated technologies and strategic resources such as the flash charge technology that foster innovation and greatly improve user experience.

With this strategy R&D plays a crucial role in understanding the requirement of our users and coming up with localised solutions. The R&D team at Hyderabad is working relentlessly on product localization and innovation in fields such as software, imaging, and communication network. Being the largest R&D centre

> Our R&D team at Hyderabad is working relentlessly on product localization and innovation in fields such as software, imaging, and communication network.

outside of China, it is a key enabler for the implementation of our 3+N+X strategy and accelerate the adoption of advanced technologies in the Indian market.

Our research and technology is not only making a breakthrough to impact the Indian Oppo users but marking its imprint on the global map as well. The overseas market is very reliant on our Hyderabad research and development team. Our techies' footprint can be found on the phones in Europe, the Middle East, and Africa.

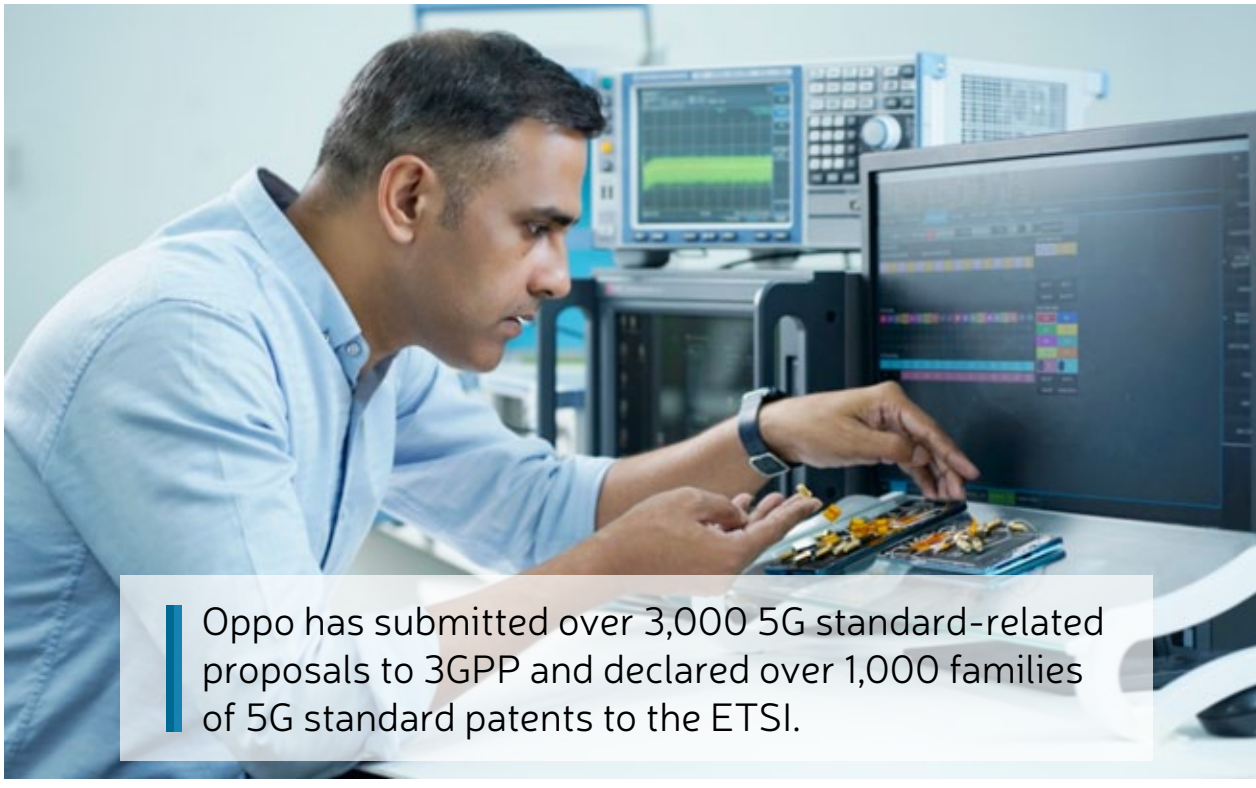
Oppo has a strong patent portfolio. What drives this innovation-led culture?

Innovation is embedded into the DNA of Oppo. By following 'virtuous innovation', we ensure that technology empowers people. The dedication of teams can be witnessed through the different global benchmarks set by us which have led us to stay at the centre of innovation in the industry.

The concept technologies demonstrated at the 2020 edition of Oppo Inno Day including the X 2021 rollable concept handset, the AR Glass 2021, and CybeReal AR application that showcases how we integrate technological innovation with a human touch in order to give users value by offering personalized technology that is appropriate and relevant. Going forward, Oppo will continue to collaborate with partners, illuminating the future of humane technology.

On the emerging telecom standards front, whre do you see India on the 5G path?

Unlike 3G or 4G, 5G is currently the first globally unified communication standard. This means that 5G has lower promotion costs, more flexible applications, and greater



> Oppo has submitted over 3,000 5G standard-related proposals to 3GPP and declared over 1,000 families of 5G standard patents to the ETSI.

> 5G has lower promotion costs, more flexible applications, and greater potential than previous communication standards.

potential than previous communication standards. Even though many global countries have seen the deployment of 5G, the development has not yet reached its full capacity and is at nascent stage. Currently 92 operators in 38 countries and regions have deployed 5G in their real-time networks.

India will be a major market for 5G services and we can expect to see a lot more progress in this sector. 5G will be a key driver for Industrial Revolution 4.0. Enterprise use cases that utilize massive IoT with ultra-reliable, low-latency communications to transform verticals such as manufacturing, utilities, healthcare, retail, agriculture and automotive, will gain significant efficiencies as they adopt 5G at scale. We witnessed how 4G impacted people in past few years, 5G is expected to achieve wider coverage in the next few years, and we expect that there will be more diverse devices and innovative services.

Oppo India is also at the forefront of the country's 5G push. We are among the few OEMs in India to invest in state-of-the-art 5G simulators. While most 5G tests in the country involved non-standalone models, we developed their solutions on stand-alone platforms. This meant that testing devices with an authentic 5G set-up. The team here is now working with various Indian operators on solutions to make 5G technology less complex and more affordable.

The company seems to be working with start-ups, academia and state governments. How is it supporting the ecosystem in India?

We not only encourage in-house innovation but have also tied up with multiple other organizations to encourage a wave of innovation across the country. We have partnered with T-hub and signed MoU with the Kerala Start-up Mission to support the startup ecosystem. Through the collaboration, we aim to scale up opportunities for some of the most innovative startups in the areas of artificial intelligence (AI), network, battery, camera and image processing, gaming, and system performance.

We are also working with IIT Hyderabad to make localized camera solutions, specifically targeting the requirements in India identified after a detailed consumer research. Imaging effects have been specifically designed and tuned for the India skin tone.

What about the 5G-specific R&D initiatives globally and in India? How is the Indian scientific talent enabling innovations and IP in making 5G possible?

We have always attached great importance to the development of patents, with continuing effort on the exploration of cutting-edge technology. As of September 2020, Oppo has submitted over 3,000 5G standard-related proposals to 3GPP, declared over 1,000 families of 5G standard patents to the ETSI. It has deployed its 5G standard patents in over 20 countries.

As an early adopter in the 5G journey, Oppo became the first tech brand to launch 5G mobile products in the European market and organized the first 5G WhatsApp call from India. It was honored in early 2015 to be the only device manufacturer participating in the global push for the unification of a standard and has now become one of the most influential smartphone manufacturers contributing to the development of 5G standards.

The India R&D team is also working closely with leading industry chain partners like Jio, Airtel, Qualcomm, MediaTek, and others to soon realize the dream of a 5G experience for every smartphone user in India. With the set up of our first 5G innovation lab at Hyderabad R&D centre we aim at elevating the global 5G experience and strengthen the overall ecosystem. The new lab will deepen the development of core product technologies for the 5G ecosystem and accelerate its rollout in the country. The technologies developed at the lab will mark a global footprint while promising our vision to make India an innovation hub.With the new 5G lab set-up our India team will also be leading 5G led innovations for other countries including Middle East, Africa, South Asia, Japan, and Europe.

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Alternative cloud makes a better sense

Instead of mega clouds, small and medium businesses can opt for a simpler and more affordable option with alternative cloud to takes care of their needs

BY BLAIR LYON

In recent months, many small and medium-size businesses (SMBs) in India have invested in cloud computing, security tools and process automation in order to maintain business continuity and hasten recovery from the hardships caused by the global coronavirus pandemic. Indeed, the 'silver lining' of the pandemic for these SMBs is that they are much further down the road towards digital transformation than they would have been had the pandemic not forced their hand. Those SMBs at the cusp of digital transformation have a distinct advantage in the marketplace of today and tomorrow because they are far better equipped to serve socially distanced customers who increasingly require a digital-first customer experience.

> Alternative cloud providers focus on core services companies really need, and provide simple, intuitive interfaces that ease access and on-demand provisioning.

> A key differentiator with alternative cloud providers is the level of support and responsiveness they provide in comparison to the mega cloud providers.

Fortunately, the timing for moving to the cloud couldn't be better. For the first time in the 12-year history of cloud computing, SMBs have a wide array of choices for cloud computing services. With the rise of alternative cloud providers, the choices are no longer limited to the mammoth, hyperscale cloud firms. Here are five reasons SMBs should strongly consider alternative cloud providers for their cloud services:

Cost saving

The cost savings from using an alternative cloud provider versus a mega cloud provider can be up to 50% annually, even though the technology and global networks which handle the workflow of data are essentially the same. Furthermore, in contrast to the infamously complex pricing schemes of mega cloud providers, many alternative cloud providers offer transparent pricing that is straightforward with no surprises. For companies shifting from a Capex to an Opex model, having a clear line of sight into costs is the key.

No vendor lock-in

Being locked into large proprietary cloud ecosystems has a very real impact on budget and control. It's easy to get lured into the hundreds of proprietary services that, once engaged, lock you in as well. Companies should avoid lock-in to maintain freedom of choice, optimise costs, and facilitate competitive agility. Linode, for example, gives developers the ability to reuse their code, no matter which cloud provider they choose. Development happens in the open too, with all documentation stored on Github so that it can be improved upon by the community.

Ease of use

While the expectation of the cloud making things simpler is often assumed, it's not the reality in many cases. Mega cloud providers offer far more services than most SMBs will ever need, which introduces immense complexity in managing cloud services, so much so that hiring certified in-house cloud specialists is often required.

In contrast, alternative cloud providers tend to focus on the core services that companies really need to run their businesses, and they provide simple, intuitive interfaces that ease access and on-demand provisioning. This approach is far better suited to SMBs, which typically have a small technical staff who would rather focus on getting work done than navigating the pitfalls and distractions of too many bells and whistles.

Human-centric customer support

A key differentiator with alternative cloud providers is the level of support and responsiveness they provide in comparison to the mega cloud providers. In fact, some alternative cloud providers offer a live human interface 24x7, irrespective of how big a customer you are.

No dependence at all

A select group of privately owned alternative cloud providers offer SMBs a more subtle but valid advantage over doing business with hyperscale cloud providers: a shared business ethos. Alternative cloud providers that are privately owned and 100% independent are free to stick to their business principles, such as loyally, serving their customers rather than catering to the whims of venture capitalists, resolving to never compete with their own customers and partners, and supporting open source technology and open APIs.

Although SMBs today have many alternatives for meeting their cloud objectives, alternative cloud providers are perhaps the best suited to their business. By focusing on core services, alternative cloud providers typically offer SMBs the same or better performance at a much better price than the larger industry players. Alternative cloud providers also provide the scale and quality of infrastructure needed for most enterprise workloads. More importantly, alternative cloud providers offer SMBs highly responsive customer service and a cloud computing experience that is simple, affordable, and accessible – what cloud computing should be.

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TV RAMACHANDRAN

PRIORITISING ICT ACCESSIBILITY FOR PERSONS WITH DISABILITIES

Critical implementation measures are required to enable India march towards inclusive digital prosperity, and to safeguard and empower vulnerable citizens against adversities

Almost 80 million Indians, according to a World Bank report, struggle every day with some level of disability. That number is the entire population of Germany. In an age where internet access is a fundamental right for all, many Indians suffer without accessible information and communications technology (ICT). While India has commendably approved well-defined Acts and policies to promote the welfare of persons with disabilities, on-ground execution has been slow – at a high cost to millions of lives. The unprecedented global pandemic further exacerbated the situation for persons with disabilities and shone a spotlight on the urgent need for better ICT accessibility. While requisite policies and other legal and regulatory guidelines are robust and right in place, implementation has been an enormous challenge.

Think about the panic we may have felt without the ability to access technology or the internet in 2020. Most of us went online to access basic amenities, communicate with loved ones, stay employed, get an education, conduct financial transactions, and even healthcare. But as per an NCPEDP 2020 report, many persons with disabilities and our elderly could not avail of financial assistance, necessities of daily living, resources, and accessible technology.

A report by the Disability Legislation Unit of Eastern India and Centre for Advocacy and Research (CFAR) highlighted that 77% of differently-abled students, teachers, and their parents could lag in learning as they were unable to access distance learning methods, whereas 56.5% admitted to not attending classes

> It is critical to prioritize and implement key strategic measures designed to empower Indian persons with disabilities to avail their basic constitutional rights.

regularly during the pandemic. The Right to Education is another fundamental right granted to all Indians that many persons with disabilities cannot access without appropriate ICT Accessibility.

This is evident from the fact that the DARE Index, which compares and ranks countries based on standard accessibility metrics such as country commitments – laws and regulations, capacity to implement, and overall progress on ICT Accessibility implementation; has also witnessed India's decline by two places from 46 in 2018, to 48 in 2020. ICT accessibility refers to the design and availability of products and services in the information and communications space for all users, including those with varying capacities to operate the devices.

Our implementation rank fell by 14 points from 2018. The DARE index tracks ten technology areas, including mobile, websites, accessible content, assistive technologies, e-governance, and more. Robust policies are only the very first step. Unfortunately, we are lagging severely behind with on-ground implementation.

India DARE Index Score, 2020

Digital Accessibility Rights Evaluation Index

DARE Index Score: 48/100

Global Ranking: 45

Regional Ranking: 1

PeerEconomic Development Group Ranking: 12

Implementation Ranking: 60

India ratified the United Nations Convention on the Rights of Persons with Disabilities (CRPD) in 2008 and enacted the comprehensive Rights of Persons with Disabilities (RPwD) Act, 2016. This landmark act recognizes that it is mandatory to adhere to ICT Accessibility across public and private sectors as part of fundamental human rights. In September 2019, the National Disaster Management Authority (NDMA) released detailed guidelines on 'Disability-inclusive Disaster Risk Reduction' (DiDRR). The National Digital Communications Policy (NDCP 2018) includes the need to promote Broadband for All by 2022 and achieve universal access through robust digital communications infrastructure, under its'Connect India' objective. Section 1.4 reads, "Ensuring inclusion of uncovered areas and digitally deprived segments of society by: (a) channelizing the Universal Service Obligation Fund (USOF) for... (ii) Marginalised communities, women and persons with disabilities..."

Specifically, for COVID-19 relief, the Ministry of Social Justice and Empowerment (MSJE) mandated that all states disseminate COVID-19 information in Braille and audio formats, and that all government websites need to be accessible. But on-ground implementation was abysmal, and many states failed to execute these measures. As a result, persons with disabilities, the elderly, and other vulnerable sections of our society were left struggling.

Now more than ever, it is critical to prioritize and implement key strategic measures designed to empower Indian persons with disabilities to avail their basic constitutional rights. First, we must set up the inter-ministerial steering committee to implement and oversee accessibility measures within the government as recommended by the TRAI in 2018. This can be extremely beneficial to have a focused approach to offering immediate relief to persons with disabilities regarding ICT accessibility. This includes ensuring all

> The DoT's recent instruction to all Unified/Unified Access Services/CMTS Licensees for allowing specialized telecom services to customers with disabilities is a welcome step.

high-priority government websites and apps meet accessibility standards and driving the widespread adoption of Universal Design standards.

It is also unfortunate that nearly four years after the passing of the RPwD Act, not many people are yet aware that accessibility compliance is mandatory and applicable to both public and private sectors. Building awareness, oversight, and monitoring of the RPwD mandates will go a long way towards empowering persons with disabilities in India.

Another top priority is to ensure that children with disabilities do not lose their ability to exercise their constitutional Right to Education. With COVID-19, remote and e-learning was not a nice-to-have luxury, but a necessity, as even government schools went online. India still has a long path to upgrade the infrastructure and adopt assisted technologies to foster an inclusive education system.

The National Education Policy 2020 (NEP) is being hailed as a new era in educational reform and takes cognizance of the concerns of the differently-abled and encourages home-based learning for them. It is excellent that the NEP recognizes the RPwD Act and its provisions for inclusive education, where students with and without disabilities learn together. These recommendations include non-discrimination in schools, accessible infrastructure, reasonable accommodations, individualized supports, use of Braille and Indian Sign language in teaching, and monitoring. The policy also has provisions for recruiting special educators with cross-disability training and incorporates disability awareness within teachers' education. The DoT's recent instruction to all Unified/Unified Access Services/CMTS Licensees for allowing specialised telecom services to customers with disabilities is a welcome step forward.

But persons with print disabilities are unable to access the thousands of accessible books available in international libraries. India only has access to 27,000 titles of the more than 650,000 titles available online (WIPO, 2014). A perceived ambiguity in the Indian Copyright Act of 1957 prevents these policies from being implemented to better education for children with disabilities. For almost 8.8 million blind and millions more with varying levels of visual-impairment, accessible books are essential for learning.

Global partners are still hesitant to share their accessible content even with certified Indian organisations until the Government of India ensures that the Indian Copyright Act is not misinterpreted and implemented against persons with print disabilities. The recent notification issued by the Copyright Office seeking comments from the stakeholders on the need for the copyright amendment may address such vital issues. Mandatory e-learning due to COVID-19 has made this an urgent matter, and if rectified, can offer great relief.

The nation has demonstrated incredible resilience and courage under fire during this global disaster. And it is now gearing up operations to inform, vaccinate, and track a billion people across the country against the COVID-19 virus. As we launch e-health, e-finance, and many more much-needed e-governance initiatives, we cannot lose sight of inclusivity and honouring the commitments set by the PM's 'Sabka Saath, Sabka Vikas, and Sabka Vishwas' campaign. Let us ensure we take all members of our society, including persons with disabilities, along with us on our road to recovery and beyond.

As our Father of the Nation, Mahatma Gandhi, beautifully pointed out, "The greatness of a nation is measured by how it treats its weakest members." This is all the more important for India to emerge even stronger than before from the pandemic situation.

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The views expressed in the column are personal

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Giving a shot in the arm

How real-time data usage, communication and collaboration technologies have become quintessential for India's infrastructure sector

BY VIKAS AGGARWAL

Communication and collaboration technologies have fast evolved, and the current pandemic has acted as a catalyst for faster, deeper and wider adoption. While the effects are visible across various sectors, the emerging business case in the Infrastructure sector calls for a specific mention.

Infrastructure projects in India and around the world are prone to two major risks. Firstly, there is a potential risk of actual completion timelines shooting much beyond the planned dates. Secondly, the delay in the completion of construction projects leads to cascading consequences in the form of cost overrun. The root cause analysis of reasons for setbacks often underscores facts like procedural inefficiencies at various stages of implementation. Evidence from projects has shown the discrepancy between estimates and on-ground data, leading to projects getting derailed or failing to provide the intended benefits.

The adoption of enterprise-wide unified collaboration tools has helped overcome the challenges associated with a fragmented approach. This breakdown of the silo approach and adoption of a unified approach has led teams to co-create the solutions of the future leveraging online collaborative toolkits. COVID-19 has further necessitated this adoption from an add-on feature to a necessity. Enterprises are adopting tools to fine-tune the planning process and shortening the construction time. Collaboration and communication technologies play a vital role across the lifecycle - ideating, designing, prototyping, implementation and operation and maintenance of infrastructure.

In ports, railways, complexes and architectural constructions, the engineers, hardware and trained professionals are the actors. However, in this digital era, communication, collaboration and digital teaming have redefined the efficiency of these actors as it emphasizes on visibility aspect. For instance, asset availability linked communication in terms of visibility of the number of cranes available at a particular site is of immense value to the site engineer.

For ports, a seamless collaboration among the source port, landing station, shipping lines, logistics partner and warehouse are crucial for end-to-end visibility, on-time performance and live tracking of goods. In Railways, drones/UAVs are being leveraged for surveillance in areas like track sections and yards. Drones are efficient at disaster sites and aids the teams involved in restoration work.

Technologies in communication and collaboration space including 5G, sensors, internet of things (IoT), small cells and their business use case is now a necessity to bring advancement like predictive maintenance. The next generation technologies promise to speed up the flow of data to machinery, cars, drones and other wireless devices. For infrastructure sector, the ultra-reliable low latency communication (URLLC), triggered through 5G, will enable autonomous systems and connected machines, resulting in the creation of smart factory. In terms of 5G readiness, several countries including USA, Japan, South Korea and China, are in an advanced stage. Information Communication Technology (ICT) infrastructure including cloud, sets the backbone for supporting 5G, IoT and machine to machine (M2M) which leverages the platform to provide new business models. The complex machines in this ICT based industrial revolution 4.0 consist of cyber-physical systems and many leverage the concept of digital twin. A low latency network through an efficient communication channel paves the path towards a reliable system.

In India, however, to cater to the rising demand of the infrastructure sector, real-time data usage, communication and collaboration technologies have become quintessential paving the path for a data-driven digital era.

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Fuelling power sector growth

How emerging communication technologies can help India's power sector drastically improve its quality of services and profitability

BY SOMESH KUMAR

In the wake of a new digital era, it has become important to understand the primary thrust area to catalyze our country's agenda of power reforms, despite the challenges faced due to the slow absorption of new technologies. With communication technologies evolving rapidly the power sector is poised for an era of ubiquitous connectivity. This internet of energy (IoE), comprising of communication infrastructure and a plethora of energy devices, is touted to become a foundational infrastructure for smart grid deployment.

Popular communication technologies include radio frequency (RF), cellular (3G, 4G, NB-IoT, 5G), and power line carrier (PLC) communications. RF technologies lead to a low total cost of ownership and offer high reliability and hence, are being considered

> Different types of devices can be used over the same RF network to gradually scale up the same communication network for other business applications.

> Since spectrum is a national resource that needs to be used efficiently, there is a need to allocate frequency bands for PLC communication technology in India.

a preferable option for both mission-critical and non-mission-critical applications in power utilities. In addition, different types of devices can be used over the same RF network in the form of RF canopy, thereby providing power utilities the option to gradually scale up the same communication network for other business applications basis the need.

RF, however, requires detailed RF engineering leading to slow deployment speed and faces inherent interoperability challenges. In order to alleviate the issue of interoperability, the Bureau of Indian Standards (BIS) is in process of formulating standards for RF communication interoperability, post which power utilities will gain more confidence while using this technology. This standardization initiative, once complete, along with RF canopy, could lead to a plethora of RF-based devices for diverse applications such as smart metering, SCADA, etc. with a possibility to foray outside the power sector, such as street lights, traffic signals and other smart city applications, thereby enabling this to be a foundation infrastructure for smart cities.

PLC technology, albeit with the inherent requirement of bespoke engineering for O&M, is a contender for areas having good quality power cables. Because spectrum is a national resource that needs to be used efficiently, there is a need to allocate frequency bands for PLC communication technology in India.

Cellular technology, apart from being a mature technology option with no interoperability issues offers quick deployment speed and no Capex investment. Considering that the power sector has more stringent service level agreements (SLAs) than other sectors, telecom service providers would need to align their SLAs more in line while also making their business plans and technology roadmaps more coherent with the needs of this sector.

Although NB-IoT is emerging as a candidate for low data rate, low processing, and non-complex devices such as smart meters, its efficacy on the field at a large scale in the power sector remains to be seen. 5G technology may offer novel characteristics such as multi-gbps peak speeds, ultra-low latency, higher reliability etc., and is expected to usher in an IoT/M2M revolution globally. However, a true value of 5G in the power sector would be realized when employed in applications requiring ultra-low latency and high reliability such as SCADA, Phasor Measurement Units, Demand Response etc. thereby enhancing grid reliability and reducing unplanned power outages. With the recent announcement by the Government of India to launch public Wi-Fi services across the nation, it can surely be leveraged by power utilities for non-mission critical applications.

Going forward, power utilities, especially discoms that are in process of deploying various types of communication networks to fulfill their business requirements can choose to lease them out to other entities. For instance, RF and PLC communication networks that discoms deploy for the digital grid can be leased to third parties for smart city applications. Also, power cables can be fitted with optical fibre to provide additional revenue at a low cost. In fact, this arrangement can also be used to generate non-tariff income for discoms by providing internet and cable TV services to under-serviced communities.

There is an evident gap in the adoption of communication technologies globally and in the Indian power sector. In India, the core operations are still manual and therefore face problems like ad-hoc decision making, poor data quality, long decision-making cycles, and lesser technology investments. Therefore, a synergy between emerging technologies and the Indian power sector can play a defining role in profitability and quality of services.

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The big BFSI enabler

How the cloud will accelerate economic recovery from the pandemic-driven slowdown and drive the growth for India's banking sector

BY CIARAN CHU

2020 has been a whirlwind year. Among the profound changes the pandemic has ushered in, the mass adoption of digital payments and banking platforms is likely to be long lasting in nature. As we adapt to a world shaped by physical distancing, banks and financial institutions are adapting and innovating. For firms looking to recover in the short-term and accelerate their growth trajectory in the longer term, technology-fuelled experiences can help them compete and ramp up services. It will also help organizations improve profitability while reshaping customer experiences.

Additionally, banks must focus on internal IT operations and systems to ensure operational integrity. This is where the power of the cloud will come in. In 2021, cloud will power vital infrastructure for India's banking and payments sector, enabling agility,

> Big cloud providers will continue to canvas and work with regulators to find common ground on the best way to run their infrastructure long term.

> In 2021 we will see banks increase expenditure on process simplification and improvements – something that the cloud can deliver.

improved remote collaboration, and faster application development and deployment.

Outlined below are the three big cloud trends that are likely to have the biggest impact on India's BFSI sector in 2021.

#1 Revaluation of operational control processes

One of the big challenges of cloud adoption pre-COVID-19 was the amount of operational overhead and risk acceptance knowledge required to migrate workloads from on-premises to the cloud. This was coupled with the fact that many banks had in place arduous control processes that were difficult to overcome.

Due to the pandemic, banks have realized that many offshore resources that were maintaining systems could not log in from home, causing a risk issue. Banks were forced to re-evaluate these processes to ensure they were fit for purpose in this new world, where physical distancing quickly became the norm. As a result, in 2021 we will see banks increase expenditure on process simplification and improvements – something that the cloud can deliver.

#2 Changing relationship between data regulation and innovation

With changing geopolitical dynamics, we will see increased focus around data sovereignty and consumer safety, as consumers seek to understand how precisely their data is being used and governed. As a result, we can expect more countries to follow the likes of Poland, setting up national clouds, where banks can enjoy the benefit of cloud computing, shifting from capital expenditure (Capex) to operational expenditure (Opex), even as the data remains in country.

Big cloud providers will continue to canvas and work with regulators to find common ground on the best way to run their infrastructure long term. Regulators in the past have stood in the way of innovation, in part due to a lack of understanding of the competitive landscape. Banks would end up spending more on maintaining the status quo to placate regulators. While it will be a gradual shift over the next five years, I would hope banks can reduce overheads, which restricts their ability to innovate, by working with cloud providers and regulators to automate and simplify activity through increased transparency.

#3 Long live the marketplace platform

One of the greatest drivers of cloud within the BFSI sector will be the need for banks to diversify their revenue models from fee-based transactions (where it is a race to zero) to a new client-based service. Banks will also realize how much easier it is to drive partnerships and gain meaningful data insight in the cloud.

Another critical trend to watch for will be the continuing demand for use of hybrid and multi-cloud environments, where banks avoid being locked into a single vendor by using a mixture of private and public cloud offerings. Following in the footsteps of Spanish multinational BBVA, we will see a lot more banks embracing a hybrid cloud approach to build a platform of services, which customers and partners can easily access as they diversify their business models.

As the industry moves further into its cloud journey, we will see more bank leaders and CIOs recognize the need to get machine-human collaboration right. We will see more investment in employee reskilling and upskilling, as banks begin to unlock the value that lies at the intersection of employees and technology. There will be a more top to bottom approach to "applied intelligence" – combining intelligent cloud technologies and solutions with human ingenuity – across all areas of banking business, reshaping core banking processes and transforming customer experiences.

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"We are aiming for dynamic personalization based on watching behaviour"

Can Technology be more than an unexpected plot-point in the script of OTT evolution? Looks like it is getting cast in a bigger role as we see the space exploding in India – in terms of the number of hours of original content created here (1,800 hours), the size that is expected to touch USD 2.9 billion by 2024, and spurt in investments (USD 700 million last year and growing 25-30% in 2021). ***Rajneel Kumar,*** *Business Head - Expansion Projects & Head of Products, ZEE5 India chats with* ***Pratima Harigunani*** *and gives a teaser on why, and how, technology is emerging strongly for hyper-personalization, content-related analytics, and monetization. Kumar, whose favourite show is Final Call, also opines why even as technology gets visceral here, we are still many miles away from a Black-Mirror scenario. Excerpts:*

How important is technology for an OTT player like you, especially when you are vying against global majors who have been using technology in a deep way here?

It is a very competitive landscape and we are not only playing against home-grown rivals but also against global players that have been in the market for over ten years, and with a wide resource base. These rivals have tested their strategies market by market and then they have entered India. That creates a specific situation. Users – as in the case of a smartphone – get inured to a certain feel and experience. That becomes a have-to-be factor. They expect seamless navigation, smart recommendations and engagement. The platform has to be designed in a way that users can enjoy longer sessions and keep coming back. Great content is one important determinant of success but so is the quality of user experience on the platform. We are cognizant of competition and have been investing in the user experience in a strong way.

The field is dotted with issues like device fragmentation and commoditization too. How do you stand out and confront such challenges? What is the role of technology, if any, here?

Technology plays a critical role. Just look at the variety of device formats that are in consumption today – from smartphones to big-screen smart TVs and devices – we have such a wide roster today. Interestingly, we started in 2018. And these devices have been in existence for some time but it was in the year 2020 that average monthly time spent on being connected to these formats showed such a spike. Since we entered the space recently, we

> Technology helps in making the DRM function seamlessly and in handling other complexities. We want to offer seamless playback across all formats.

> Unlike traditional models, where sales teams and meetings dominated the space; we have entered an era where advertisers enjoy a self-service and personalized model.

had to ensure backward compatibility with all kinds of devices. Technology also helps in making the DRM function seamlessly and in handling other complexities. We want to offer seamless playback across all formats; and at the same time, we want to provide discovery, which is both seamless and relevant. We also offer a variety of content like live news, hyper-short content, music – everything. Technology helps in understanding the user better, in creating personalized selections for the user and in making search more and more intuitive. The browsing experience is another area where technology helps to make it all enjoyable and easy – with cache, lightweight parts and image-optimization.

Does it play any role in advertising areas or in monetization?

Yes, we create monetization plans which are relevant, contextual and align well with browsing experience. They are geared to deliver CTRs and marketing goals with a better understanding of the user. Unlike traditional models, where sales teams and meetings dominated the space; we have entered an era where advertisers enjoy a self-service and personalized model. They can make audience selection across the length and breadth of the country, can measure effectiveness of the campaigns and make-real-time changes – all in a no-touch environment. Besides that, technology also enables purchase and subscription areas with integration of payment gateways, hassle-free payments etc. We managed to create payment through TV too – through use of QR codes.

Wasn't this space strongly positioned on being ad-free for the user? Can technology create revenue streams that minimize intrusive marketing?

Yes, our hyper-short content offerings are a good example. We can explore digital gifting and tipping. Users, who enjoy specific content, can reward the influencers or get call-backs on special occasions like Birthdays. Plus, we can also shape e-commerce within the entertainment. These shopping environments can be designed in both vertical and horizontal ways. They can

> Technology enables purchase and subscription with integration of payment gateways. We managed to create payment through TV too – through use of QR codes.

facilitate shopping (let's say a user likes a certain T-shirt being worn by a character) without the need for a user to leave the environment. This is a win-win for all – for users and advertisers as well as OTT players. As to being completely ad-free, I feel that this space would be a mix of both kinds of models.

What made you explore hyper-personalization? What is this 'segment of one'? How was this achieved?

Hyper-personalization helps to deepen engagement and understanding of the user. Content can be shaped as per a user's location, past behaviour and reactions on recommendations. AI helps to gauge what actually works for a user and can be as granular as what time of the day and what day of the month it is – because a user's preferences can change for various reasons. The signals keep coming back and all this helps to refine the model and devise a rich engagement matrix. Personalisation also helps in search areas.

We have begun on-boarding of XroadMedia to ramp up our hyper-personalized Video on Demand offerings and social media services. The back-end solution Ncanto will provide multiple content discovery, recommendations and personalization use-cases to the users. It will also be deployed to scale up HiPi, our new short-form-video platform. Incidentally, since HiPi's beta launch in August 2020, we have witnessed a massive 30 million new user installs along with 70 million existing ZEE5 users upgrading to the short-form-video platform. We are aiming for dynamic personalization based on interests and watching behaviour. We would do this by closely following the user's entertainment journey; and with a dynamic mix of statistical, editorial and user-based recommendations

Does it work? And should we worry about technology creating a Black-Mirror scenario?

We believe that gone are the days of broadcast; even the current trend of viewing audiences in clusters and cohorts will soon give way to individual personalization. We have benchmarked the solution for a few months and found adoption and click-through-rates on recommendations were significantly higher. We also saw a substantial increase in average time spent by a user. We are confident about elevating a seamless content viewing experience. Whether it will be a dark scenario – no, I do not think so – we have very limited information of the user and the intent is to make the experience better for the user.

Do you also help in grasping exactly what a user expects in terms of content despite what is generally working in the market? 'Kaagaz' was a refreshing effort in the midst of dark crime pot-boilers. How do you help the content team? Can you guide them?

To an extent, we can. For instance, our teasers are tested on sample groups with neural activity-tracking. There is a lot of science and analytics that can empower scripts and shows. The market may be showing that thrillers are working. That's the Meta data. But technology can slice it in a minute way as to what specific themes within the drama are working – family values, certain characters, conflict, edginess, or something else. We can create such bucket lists, in a well-mapped way, for the content teams. Past data can help tremendously in creation of new stories.

As any great web-show would nudge us to ask - What happens next? Are you looking at competition and aspiring to deepen the use of technology?

We aspire to – yes. But we are not looking at competition. We have to keep getting better and better at engagement and optimization. We want that the user comes to the platform, enjoys it, stays and never leaves. In India, you can never reach the end-point of this journey but it is a continuous effort and we will keep investing in technology for that. We have always believed in the power of great content and powerful technology coming together to offer the best experience to a viewer.

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[COMMENTARY]
5G

Get ready to surpass the cloud

With 5G, there will be no cloud computing, because it's not about the cloud, it's about the best way to work, store and transmit information

BY ANURAG MEHROTRA

With every passing year, human society has made advances in storing more data per unit of space and transmitting more data per unit of time. The rise of cloud computing in the last decade has been a result of this. The sky isn't actually involved in cloud computing; the term basically means that instead of hardware and software being locally owned as a product bought by users, be they individuals or companies, it is instead rented as a service. Cloud providers have the hardware and software, and their clients can connect to them over the internet and use them as they need. This outsourcing of entire IT departments that has steadily occurred would not be possible without faster communications technologies.

But such technologies are still improving. Passing a certain threshold in their capacity allowed for cloud computing. As more thresholds continue to be crossed, cloud computing improves. And past another certain threshold, new forms of computing will be enabled that surpass cloud computing, just as cloud computing surpassed what was prevalent before it. 5G is a technology that has the potential of doing both. The 5G telecom standard, which began to be adopted in 2019, can deliver transmission speeds at least ten times faster than its predecessor, 4G – and that's a conservative estimate. It also offers low to no latency (delay or lag), whereas 4G is far from being so close to perfection. Due to these improvements, it bears the promise of both

> Being able to relocate much of the required computing for a 5G use-case to the edge of a network will enable intelligent automation.

enhancing existing cloud operations and opening up new ones.

Sectors ranging from healthcare to transportation to banking could amplify the efficacy of their own operations with applications that are only possible with 5G speed and latency. Indeed, any endeavour that uses cloud computing to work with big data will find itself with vastly greater potency with 5G. Though we don't see industrial operations in front of our eyes, it's also worth thinking about how they can be augmented. These already apply internet of things (IoT) techniques in their production processes and supply chains to maximize quality and seamlessness. But while industries can add as many sensors as they like through their operations, they aren't useful if all the data cannot be swiftly consolidated and then utilized. 5G will again open up new doors there, allowing different parts of operations to communicate directly and smartly with each other. This will extend to industrial robots, which will be equipped to work in better coordinated fashions, enhancing output and accelerating automation.

Customer-facing applications will also be transformed through cloud computing, as the client-server architecture of cloud computing can be rehauled for much more broad and hefty use-cases than are possible today. Right now a bottleneck in many mobile applications is the ease of storing and transmitting data somewhere outside of a smartphone or wearable device, which has only limited storage. While improvements in cloud computing have consistently been made over the years, with the capacity to transmit vastly more data through 5G technology, all sorts of new mobile applications will also be within reach for businesses. In particular, we may see virtual reality (VR) and augmented reality (AR) technologies come of age with what 5G offers, with monumental applications in healthcare, tourism, gaming and other realms we cannot even imagine today. While 4G enabled us stream Netflix, 5G will power up autonomous vehicles.

But 5G, as may be getting clear, is more powerful compared to its present applications. As technological forces develop, they have throughout history found themselves to be fettered by existing ways of working with them. It is likewise unlikely that 5G will find its full expression in cloud computing. Surpassing the prior, we are already seeing a new revolution in computing, viz. edge computing. While cloud computing is a centralized process – the cloud provider hosts all the necessary and software together – edge computing distributes the process, much in the scheme of the internet of things. With this, edge computing brings a network of computing and storage closer to end users and applications.

5G and edge computing are meant for each other. The low latency targets that the 5G standard has defined are most easily met by having some parts of the computing process closer to the source. Moreover, 5G also offers greater connection density than 4G, meaning that more devices can interact with each other in a given range of space. The lower connection density of 4G was better suited to cloud computing, which didn't entail as much distribution of a task within space. But being able to distribute applications as IoT makes various operations involving computing even more effective. 5G confers a speed of computation on the edge devices that would have been lacking earlier except at the center, the cloud. Now, all devices through the network, with the enhanced spark of 5G, will each be more intelligent. In all, it's quite likely that being able to relocate much of the required computing for a 5G use-case to the edge of a network will enable intelligent automation by swiftly and reliably distributing data through the network, and with that, will take away from the current hegemony of the cloud.

That said, there are some purposes for which cloud computing will remain; most notably, big data requires the capacity of the centralized cloud. In all, the ultimate result of the capacity of 5G may be to help us think about information and computation in more fundamental and thus more flexible ways. With 5G, there will be no standalone and sufficient service such as cloud computing, because fundamentally, it's not about the cloud, it's about the best way to work on, store and transmit information. Enterprises involved in computing – whether providing the service or using it – will see brighter horizons when they look at their tasks. This is how innovation works, but 5G, compared to most technologies, will augment this process even more.

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Securing enterprise communication network

Security engines need to gain visibility of data and control over each and every piece of information leaving an un-bordered enterprise network

BY SONIT JAIN

No sooner did companies move to a digital model by digitizing their processes, the COVID-19 pandemic not only accelerated this process, but also pushed companies to move their business operations into the cloud. The technology was being pushed to deliver solutions overnight. One such impact was on security when companies were forced to adopt work from home. Security managers did not have time to build a resilient security architecture and had to live with the insecurities that came in along with this new culture.

It is predicted that by 2021-22, over 83% of enterprise workload will move to cloud infrastructure and we have seen this shift already since March 2020, with an increase in the utilization of data centres and cloud application facilities. In all this, threats have evolved too. They have become more data-oriented as we saw an increase in data breaches and attacks that are centred on data during this period. Companies were over night exposed and now had to fend from attacks over multiple frontiers. The attack surface increased and what was supposed to be a zero-trust network became open to all networks.

Security walls were crumbling and operations, which were being followed for years started showing cracks. Enterprises soon realized how vulnerable they were by not following a data security approach. With the move towards digitization, companies forgot the traditional approach – you keep your most precious thing in a safe locker. Security solutions were no longer sufficient enough. A complete change in approach was required and it was time to bring the data right at the center of risk and security management.

Understanding the threat vectors to valuable data and build protection against them has become the key to building a secure enterprise. Security engines are now required to gain visibility of data and control over each and every piece of information leaving this un-bordered network.

Let's look at steps that will help enterprises protect their data in this perimeter-less enterprise's digital environment.

Switch to a new, better data security approach

The traditional approach to security is to gain application visibility and prevent them from being used as a threat surface was falling short in securing an enterprise. It lacks visibility on the data context of transactions beyond layer 7, essential for preventing data exploitation.

The answer to this is to switch to a data security approach that takes security beyond just the perimeter and applies security to the data itself. The data security approach provides a detailed, granular and deepest possible data-level visibility. It collects information on each transaction and ensures that every piece of information that is transmitted to, from and within the organizational digital work network along with its source and destination – URLs, email addresses, body content, subject, attachments, the content of attachments, etc. This requires that every inbound and outbound communication is analyzed for security breachs and logged, allowing the organization to deep dive into the granular details of the transaction to generate reports, helping set up data security policies at a granular level to ensure data security and maintain enterprise's data security health.

Managing internal threats

Threats today involve both external as well as internal actors, creating a complex threat surface for enterprise security. While external threats can be managed

> All inbound and outbound communication should be analyzed and logged, allowing organizations to deep dive into the granular detail of the transactions.

using a strong security solution, it is the internal threats that become a challenge for the security team to handle.

Internal threats, in general, include intentional and unintentional data leaks, creating a gateway and acting as one for threats and more on platforms that are essential for business operations. Enterprises must gain complete visibility on their actions, monitor and control their entire threat surface that the users interact with. This will enable enterprises to be informed on their vulnerabilities, but also help protect from them while providing valuable insights to strengthen overall enterprise security measures and ensure maintained enterprise's overall security.

#3 Bringing remote, WFH users under security infrastructure

With the recent COVID-19 pandemic, we saw a rapid adoption and increase in remote work culture, making it a new normal work environment. While this was enforced to maintain business continuity during the lockdown, rushed implementation resulted in creating loopholes for both enterprise's data and network security. These unsecured users have access to the enterprise's data and internal network for business operations, acting as a vulnerable threat entrance.

The solution is to bring these unsecured users under the enterprise security infrastructure using WFH client/solution that enforces their entire internet traffic through the security infrastructure and implement security policies allowing enterprises to gain visibility and control on all communication sent and received by these users. This enables the enterprise with the power to control the use of data on business and non-business application while also limiting and restricting access to these applications with their security policies.

Moreover, not all employees use office assets, but use their personal devices to access the enterprise's network and data. These devices must be authenticated using a zero-trust security model to prevent threats by verifying and validating the access using more stringent and secure authentication to avoid unauthorized access.

#4 Allow but monitor and control mechanism

With the shift to cloud and extensive use of cloud and SaaS applications for ease of access and business operations, the security teams face a challenge with gaining visibility on the use of these applications once allowed to by their users. For these reasons, the security team uses a traditional allow/block security mechanism. This mechanism either allows the use of applications, but blinds the enterprises with its usage or blocks the access to applications, affecting the business operations.

In contrast to the allow/block mechanism, the Allow but Monitor approach as it states, allows the use of these applications, but completely monitors how it is being used and controls the use of sensitive data on these applications. It can also block misuse of the applications and critical data on these applications. This increases productivity while maintaining adherence to enterprise data security initiatives.

Data today stands as the most valued asset and it is evident with the recent trend in data breaches. It contains sensitive information like customers' personal data, business intellectual property, anonymized customer data, business-critical information/strategies, employee's personal data, and more. If it falls in the wrong hand, it can result in both financial and non-financial loss like loss of business, partnership exits, loss in customer trust, compliance fines, etc. with an average data breach cost of USD 3.86 million.

Data security is a primary corporate responsibility for enterprises that handle personal information to ensure its safety and security from being exploited. Enterprises must shift from perimeter security to a data-centric security solution to align with the transforming environment on both the technology and threat front.

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India is a premier destination for IT services: Tejas Networks

2020 has taught us many lessons, but also made us Aatmanirbhar. The Aatmanirbhar Bharat ecosystem has the potential to unlock value, and we can take advantage of the unprecedented opportunities. Tejas Networks is building world-class telecom products to build a strong, self-reliant, Aatmanirbhar Bharat.

We talked to Sanjay Nayak, CEO and MD, Tejas Networks, about many interesting things with respect to Aatmanirbhar Bharat. Excerpts from the interview:

SANJAY NAYAK
CEO and MD, Tejas Networks

Tell us about Tejas, its products, and Aatmanirbhar Bharat.

We are delighted to talk about Aatmanirbhar Bharat. About 20 years ago, India had made a name in the world, in the IT space. There were large companies, such as TCS, Infosys, HCL, Wipro, etc.

Unfortunately, there were no telecom companies. We started Tejas to show that we can build world-class telecom products from India, not just for India, but also for the world. This journey has been extremely exciting, and clearly, not easy.

It is very satisfying to see that today, as a country; we have realized the importance of building indigenous products. Last week, PM Modi was speaking about how our solutions should go, not just for India, but for the world. What we do at Tejas, we make at a broad level. We started off making optical transmission equipment.

We also made next-gen SDH, SONET equipment. Over the years, we have developed a lot of new products. In the optical transmission side, I can proudly say everything that India needs to build an end-to-end 100% domestic network, can now be built. Today, our DWDM solution can carry 600GB of wavelength. Also, packet transport, MPLS products, etc., have also been developed.

On the optical access side, FTTH has become the mainstream application, especially; post Covid-19, when people want to do WFH, LFH, etc. You need products such as G-PON. We are proud to say that we have the full range of products. 70% of the BharatNet network was built using our G-PON equipment. We are now supplying to major operators. We have expanded on the optical access.

The last part, we have also focused on the wireless segment. We are focusing on LTE. We have built our own base stations, radios, etc. We are addressing the fixed wireless network, as well as mobile networks. Every single bit of technology has been developed grounds up in Bangalore, India. 100% is manufactured in India. There is no reason to feel that these cannot be done out of India.

More than 50% of the world was engaged in developing products. If you take ex-China, the companies are actually located in India. We should have confidence in our own talent and capability. Tejas is one of the first companies to have put it all together.

Tejas is widely regarded as the biggest make in India telecom manufacturing company. How is it positioned against the global companies?

While Tejas is an Indian company, to sell our first product to any operator, we have to be globally competitive. Think of Reliance, Tata, BSNL, etc. They may have to buy their domestic equipment from India.

The private operators would not buy any equipment from us if we did not have the absolute best technology to offer that would benchmark us against the best in the world. We did not have the quality required for carrier-class equipment. Thirdly, we would not get a rupee more that would be paid to a global competitor. In technology, quality and price, we have no choice, but to be the best in the world. That's how we win business in India, and around the world.

We started with software-defined networking (SDN). Today, everybody in the world says the network will be software-defined. SDN allows us to use competencies in software, and to convert the hardware problem to a software problem. All the semiconductor chips used are in the form of IPs. We print the logic real time on the chips. The hardware has become software.

By taking a software-defined hardware approach, we got two benefits. Our cost of development became much lower. In India, you could do something at $25 million, which would otherwise take $100-125 million in the USA. Second, there

was a lot of design re-use. We took IPR of 1GB and took it to 10GB, 100GB, etc. Software-defined hardware was something that we did very well in terms of competitiveness.

FTTx, as an example, 9 months back, would you have thought it to be a killer app? We added one card into the PCB. We also created the NG-PON. It gives you an example of the software-defined hardware architecture. Our time-to-market is the shortest. Customers can also upgrade their product. These are our competitive products, not just in India, but everywhere else.

Tejas has been focused on growing international sales over the last few years. What lessons can domestic companies learn?

International business takes a long time, especially in the telecom equipment segment. Telecom is an infrastructure business. If you are going to build an infrastructure, unless you have local presence, unless you have shown a commitment to be in the market for the next 10 years, why would anybody want to risk their critical infrastructure? It takes time. Time is required to build trust step-by-step. You have to be good on technology, quality and cost. You have to engage with customers. You must have some quality that would not be available from the big players. You get to do a small part, do a good job, and that takes time.

You also have to pick and choose the battles that you want to fight. At Tejas, we looked at where India is located in an interesting part of the world. There is the ASEAN region, and the Africas. We are in the center of Southeast Asia and Africa. These are emerging markets with India-like roots. Success in India gives us the credibility to be successful in these markets. Once we succeeded in these markets, we went to Americas, Mexico and Europe.

The third thing is, India is known as a premier destination for IT services. The brand of India is unique. India needs to brand itself as a proper destination. You also have to build partnership with the overseas. You do stuff that is important, and teach the local guys to do the other stuff. We have made a lot of progress. About 40% of our revenues are now coming from international destinations. Tejas equipment is deployed across 75 countries now. Our journey at the international level is still at the infancy. We should be making more progress as the time goes by.

How has Covid-19 impacted the telecom industry?

There are three trends. Clearly, broadband infrastructure has become a national priority, say, as a road. India worked as a country. We had rural broadband. Broadband has now catapulted as the top-most priority of all the countries today. Covid-19 has also accelerated the digitization of economies and societies. Everybody has seen what has happened over the nine months. People in Bangalore have seen, and, the same has happened in Chennai and Delhi. The quality of service has not suffered. The number of patients has been a lot more. Everything is happening on time. These are just some examples of how digitization of societies and economies have happened.

FTTx has now become a regular, and has suddenly accelerated. India has less than 5 million home broadband users. TRAI estimates that in the next three years, India will have over 100 million subscribers. It is massive growth. The operators are comfortably getting their ARPUs. It is a situation where people are willing to pay, operators can build good-quality networks, and everybody is happy. The same thing is happening across the rest of the world. London has less than 10% broadband connections. In Europe, people don't have fiber. So, FTTx is happening around the world. We are now competing with everyone.

There is also huge geopolitical turbulence that has happened. Countries have become conscious regarding whom do they do business with. There are all kinds of trade barriers, embargos, etc. Especially, the depth at which telecom networks are becoming, governments around the world have become conscious of a secure, trusted network. They also want to know what is happening with their networks. The trust factor has gained. Security concerns have changed. What used to be an almost automatic decision, has now changed. People do not want to put all the eggs in one basket. Tejas has taken this opportunity. We bring the best of both worlds. Price competitiveness of the Chinese ecosystem has also changed. The innovation culture of the western ecosystem. This is a magical combination. The Indian government is looking at how Indian businesses can be globally successful.

The size of the global opportunity is huge. The Indian IT industry is somewhere around worth $130-140 billion per year. BharatNet spent about $4-5 billion. In UK, the national broadband is a $12 billion project. The Australian broadband project is worth $40 billion. There are hundreds of countries developing their broadband infrastructure. We are talking about a $100 billion dollar opportunity. Per subscriber cost for BharatNet is $20. Australian broadband is worth $1100. USA broadband is worth $500. This is a great opportunity for us to export. Aatmanirbhar Bharat gives us the impetus to design and make in India. We are also looking at an equivalent export opportunity. We may lose this, due to Covid-19.

How are you planning to use 5G and fiber broadband across the sectors?

5G impacts our business in many ways. One, the core business is optical transmission. In India, we are not really getting good 4G experience. The backhaul from the base station is the choking point. 25-30% of cell towers in India are on fiber for 4G. There is a huge opportunity to fiberize the towers. In 5G, when you roll out the network, there are two implications. One, the number of towers for 5G will be 10 times more than for 4G. You cannot have a 5G network if you don't have a robust backhaul. There is a large opportunity to build fiber backhaul from the tower.

We have upgraded our products to 5G standard. We are aware of the LMLC standard proposed by the TSDSI. Our CTO was part of the initiative. India has been contributing to the front haul standard for the optical fiber already. Some variants of G-PON can also be used for that. Our optical transmission products are being upgraded to 5G backhaul.

Tejas has also been part of LTE development. We are now upgrading our radios to software to make them 5G-compliant. We have won awards for the ultra-converged product. 5G will probably happen in India from 2022. It will take 3-4 years for large-scale deployment. India should develop its own ecosystem for 5G. Reliance is developing its own ecosystem. We also have the possibility of 5G radio ecosystem in the future.

The pandemic blues

COVID-19 that continues to impact enterprise networking market in India is driving revenues south; a 16.4% drop on yearly basis in JAS 2020

V&D BUREAU

India's networking market that includes ethernet switch, routers, and WLAN witnessed a 16.4% year-over-year (YoY) decline during the July-September 2020 (3Q20) period. The decline during 3Q20 was majorly characterized by drop in the revenue of router. According to IDC report, while the routing business in India declined by 40.2% YoY in 3Q20, the WLAN market in India grew marginally by 3.1% YoY.

The report also indicates that demand for consumer-grade gateway routers saw a rapid increase driven by remote working and online schooling. However, the enterprise class WLAN (access points and controllers) segment declined significantly due to lesser demand for campus infrastructure. Besides, the market for Wi-Fi 6 witnessed significant traction. While the revenue contribution of Wi-Fi 6 differed by vendors, there was a significant jump in the sales of Wi-Fi 6 access points across all the major vendors in the segment.

Switching had a YoY decline of 8.8% in 3Q20. Much like the routing segment, the decline in the ethernet switch segment was attributed to the decline in investments from service providers. While the switch market declined YoY by 8.8%, from a sequential standpoint, the switch market expanded by 12.6%, which shows that the market is recovering from the COVID-19 impact. Key segments like professional services and banking continued to spend. However, investments from other verticals continued to be slow.

Ethernet switch market in India

The IDC's Worldwide Quarterly Ethernet Switch Tracker indicates that in 3Q20 the market in India stood at USD

> While the routing business in India declined by 40.2% YoY in 3Q20, the WLAN market in India grew marginally by 3.1% YoY.

136 million (by vendor revenue) registering a YoY decline of 8.8%. Both DC and non-DC segments posted a YoY decline. Professional services and banking were some of the key business verticals. Banking played a very important role in providing continuous investments during the COVID-19 period.

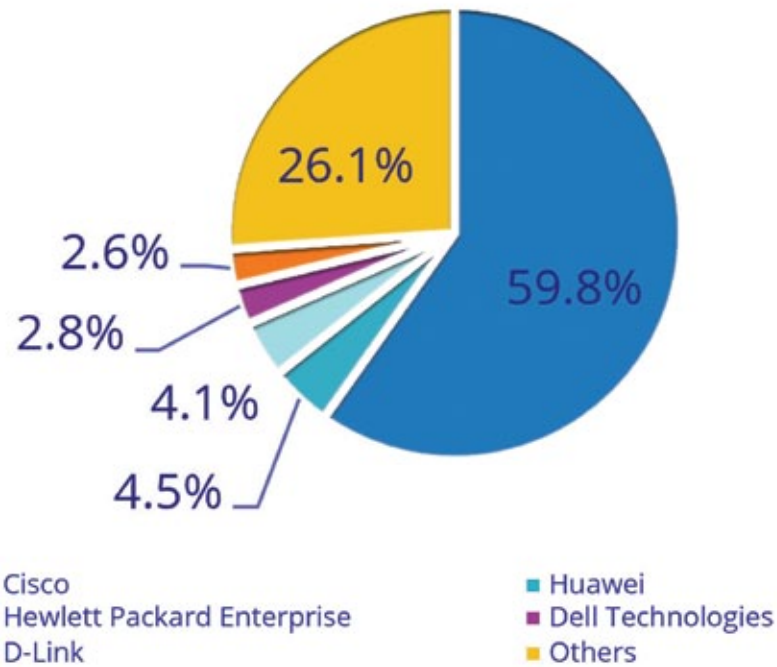
The consolidation exercise within the banking sector had greatly boosted the revenues of ethernet switching segments. Investments from manufacturing also showed some signs of recovery in terms of specific segments such as hi-tech, automotive, and pharma manufacturing. Government buying continued to be slow specifically in the state government segment. IDC expects the market to fully recover by 1H 2021 subject to the pandemic's prognosis in the country.

India WLAN market 3Q20

IDC's Worldwide Quarterly Wireless LAN Tracker reveals that the Indian WLAN market had a YoY growth of 3.1% during 3Q20. The market stood at USD 60.9 million (by vendor revenue) majorly contributed by consumer gateway routers. While enterprise class WLAN took a significant decline of 25.7% YoY, the consumer gateway router demand picked rapidly by 36.7% YoY to support the growing demand of employees and students working out of their homes.

Lower demand for campus infrastructure caused a steep decline in the enterprise WLAN segment (access points and controllers). Despite the lower demand in the enterprise WLAN segment, Wi-Fi 6 is picking up traction in India with a significant jump in revenues over the last few quarters.

India Top 5 Ethernet Switch Companies, Q3 2020 Vendor Revenue Market Share



Source: IDC's Worldwide Quarterly Ethernet Switch Tracker, Q3 2020

> Enterprise class WLAN – access points and controllers – segment declined significantly due to lesser demand for campus infrastructure.

Public hotspot initiative projects, such as PM WANI is expected to boost the growth of wireless infrastructure business in the country thereby enabling an effective last mile to fuel growth in the tier-2 and tier-3 cities of India.

With a market share of 29.8%, TP-Link was the market leader position in the WLAN segment during 3Q20, followed by D-Link due to the rapid increase in demand for consumer gateway routers. The enterprise class WLAN segment was led by Cisco followed by Hewlett Packard Enterprise.

According to IDC India Senior Market Analyst for Enterprise Networking Sudharsan Raghunathan, COVID-19 has accelerated the enterprise movement towards cloud which has become the origin of transformation in the networking ecosystem. "Many of the networking investments have been around technologies that enable seamless working from anywhere, enhancing the security framework, extending the corporate network efficiently, easier manageability and troubleshooting, and bringing back employees into the office premises safely."

Raghunathan further indicates that the focus for software-driven has been more than ever and the market is at the point where networking and security cannot be perceived as silos anymore. "In short, COVID-19 has accelerated the pace of network transformation which will transform to self-healing and self-driving networks of tomorrow," he concludes.

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DIGITAL INDEX: RANKING OF INDIA'S TOP ENGINEERING COLLEGES LAUNCHED: DECEMBER 2020

Top 100 Tech-enabled T-Schools

INSTITUTE NAME	CITY	RANK
Birla Institute of Technology	Pilani	1
International Institute of Information Technology, Hyderabad	Hyderabad	2
College of Engineering Pune	Pune	3
Dr B R Ambedkar National Institute of Technology	Jalandhar	4
Maulana Abul Kalam Azad University of Technology	Haringhata	5
Indraprastha Institute of Information Technology	New Delhi	6*
International Institute of Information Technology, Naya Raipur	Raipur	6*
National Institute of Technology Silchar	Silchar	
Chitkara University Institute of Engineering & Technology	Rajpura	
R.M.K. Engineering College	Chennai	
Reva University	Bangalore	
DIT University	Dehradun	
Koneru Lakshmaiah Educatio		
Galgotias University		

Top 10 Zone Wise Institutes

East

NAME OF INSTITUTE	CITY	RANK
Maulana Abul Kalam Azad University of Technology	Haringhata	1
International Institute of Information Technology, Naya Raipur	Raipur	2
National Institute of Technology, Silchar		
Gandhi Institute for Technological Advancement, (G		
Amity School of Engineering & Technology, Amity U		
Kalinga Institute of Industrial Technology		
Talent Academy of Technology		
ool of Engineer		

Top 10 Government Institutes

Government

NAME OF INSTITUTE	CITY	RANK
International Institute of Information Technology, Hyderabad	Hyderabad	1
College of Engineering Pune	Pune	2
Dr B R Ambedkar National Institute of Technology	Jalandhar	3
Maulana Abul Kalam Azad University of Technology	Haringhata	4
Indraprastha Institute of Information Technology	New Delhi	
International Institute of Information Technology, Naya Raipur		
National Institute of Technology Silchar		
National Institute of Technology Hamirpur		
Thiagarajar Colleg		

Top 10 Private Institutes

Private

NAME OF INSTITUTE	CITY	RANK
Birla Institute of Technology	Pilani	1
Chitkara University Institute of Engineering & Technology	Rajpura	2
R.M.K. Engineering College	Chennai	3
Reva University	Bangalore	4
DIT University	Dehradun	5
Koneru Lakshmaiah Education Foundation	Vaddeswaram	
Galgotias University		
Maharaja Agrasen Institu		

AT A GLANCE

- Ranking of Top 100 tech enabled engineering colleges
- Top 10 Zone wise engineering colleges, • Top 10 Government colleges
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- 20+ Views & opinions of leading Industry Leaders, • Circulated to leading corporates
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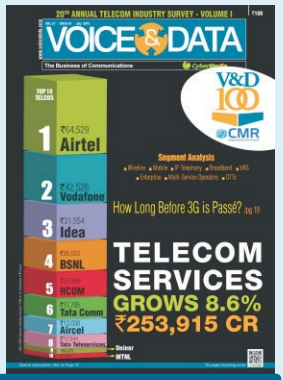

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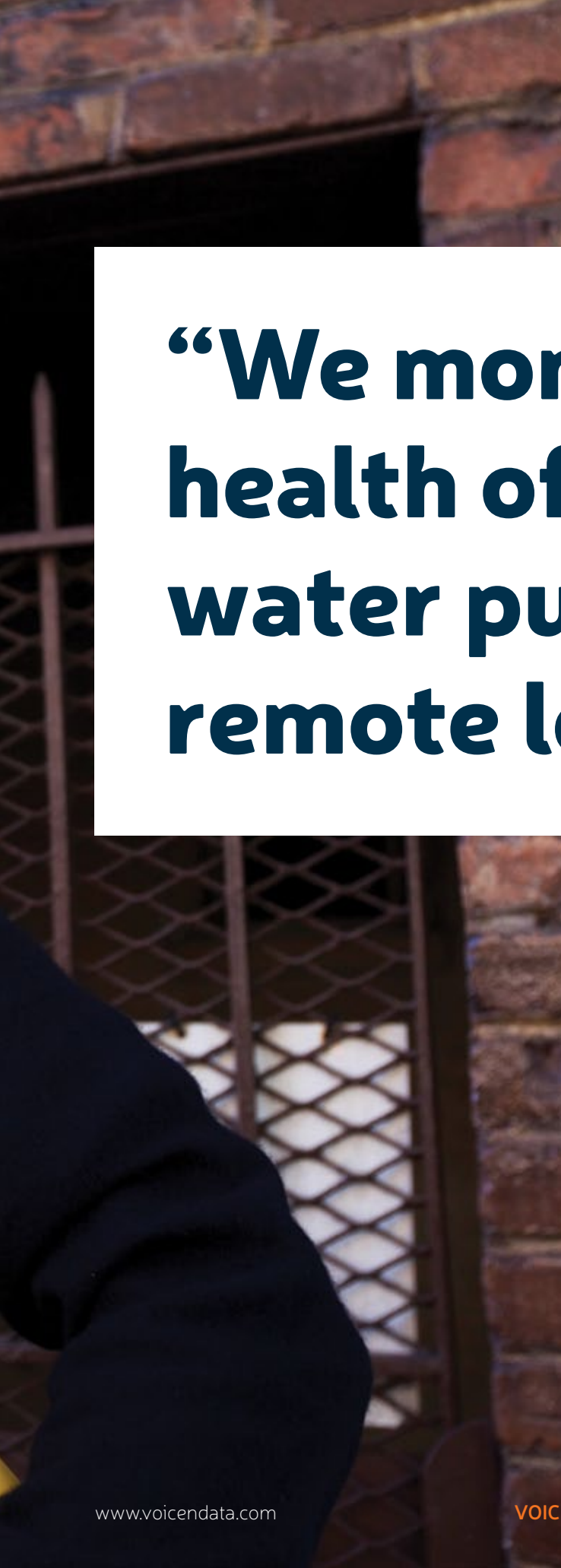
Christoph Gorder
Chief Global Water Officer, Charity: Water



"We monitor the health of 7,300 water pumps in remote locations"

The efforts and money that go into any charity can leak as easily as water out of a broken tap. It is an issue with many ripples for an organization that is working towards reaching the last mile. In India alone, the non-profit charity: water has built five million water pumps for rural communities since 2008. But that's not enough; making sure that the pumps have water when someone comes to them with a pitcher is also an uphill task. ***Christoph Gorder,*** *Chief Global Water Officer of charity: water in an interaction with* ***Pratima Harigunani*** *how IoT solved it. He also talks about how cloud made it all affordable, the approach to predictive maintenance and mechanic-incentivization, and how blockchain can be a big lever for this pipe of trust.*

Why is monitoring such a significant part of what you do? What made you lean towards IoT as a solution for monitoring water? Is there any precedent that inspired you?

We are a non-profit and we fight a cause that is really serious. Around the world, 785 million people do not have access to clean water. Dirty water kills more people every year than all forms of violence, including war. In fact, a vast majority lives in remote rural communities that are hard to get to. So far, the only way for governments and NGOs to monitor rural water systems

> We developed an IoT sensor device concept that can transmit data over a GSM network, and we used AWS cloud for data intake, analysis and distribution.

was to visit them. But let's be practical; reaching these locations takes time, human resources, and money. That means that site visits occur only once or twice a year and as a consequence broken water systems can stay broken for months.

We take care of water projects in rural areas and this encompasses a lot of regions in India, Africa etc. We started around 2006. One of the important things that we have proven with every project is showing results to our donors. Tracking and monitoring are, hence, key parts of our processes. With several projects in many countries, we take pride in delivering proper breakdowns and providing technology-related knowledge wherever there is a need for something like that. So far, we did not use IoT anywhere but as a young organization, we are early adopters of technology. We are always looking for application of cutting-edge technology in solving the problems in this area.

Problems like?

When we started in 2006, we were the first few ones to track donor contribution on Google maps. It may not be a big deal in 2020 but back then, it was fresh. It helped us to march on confidently on the key aspect of 'trust'. We have many followers on Twitter and have made a VR film. So we keep looking at ways of applying technology for this space.

What exactly worked here by using IoT?

Any breakdown on a pump at a village-level is unacceptable in terms of failure-rate. Monitoring these projects is important. But it is also complicated. We get a lot of data. Getting the exact data about a pump in real-time and at a cost which we can afford for that scale – that was our challenge. Solving this hurdle is important because we are talking about its effects on a population that is huge – almost three billion people in rural areas in the developing world. And clean water has many ripples – sanitation, female safety, girl education, health etc. Not having access to clean water holds back development at many levels. So we took inspiration from smart cities like New York and thought – why not apply that cutting-edge technology here? We developed an IoT sensor device concept that can transmit data over a GSM network, and we used AWS cloud for data intake, analysis and distribution. This helped us immediately find breakdowns and create alerts for mechanics.

Working with AWS partner Twisthink, we developed an IoT device that runs on AWS cloud and turns water pumps into smart pumps. Now we are able to more efficiently, and cost-effectively, monitor the health of 7,300 water pumps in remote locations and dispatch service when the water source stops working. The sensors allow charity: water to equip local leaders with real-time data on water system performance. This is a tremendous help to our vision of bringing the remote sensor technology worldwide so that any remote location with water pumps can use the sensor technology to scale its water system more cost-efficiently and ensure water is available to people all-year round.

Was it easy? We are talking about a last-mile application here and that too in a developing world where bandwidth and connectivity can be quite inadequate?

Our engineering teams used to joke that hardware is called hardware because it is hard to make. But despite the expensive part of R&D at the initial stages, we did not face too many issues. The only challenge was in parts where GSM network was a factor. But we are finding now that GSM is quite a universal fabric and is increasing in coverage every year. We have invested in internal technology and highly-specialized antennae for low-bandwidth areas. The price of data transmission has come down significantly.

> The solution part of this water-pump problem can really take a leap if we combine IoT with blockchain to incentivize mechanics, instead of just alerting them.

And you are thinking of taking this a level ahead with edge and predictive analytics?

Yes. When we started with IoT sensors, it was a simple idea. A well breaks down and you get to know about it. You send a mechanic immediately. But a well's health breaks down over a period of time. We have thought of analyzing that too. We can study the number of cranks on a pump's handle and marry that with flow measurement-metrics through the sensor. That will help to catch corrosion or loose rods or other issues much ahead before the actual breakdown. We are working on that and are very close to identifying a breakdown before it happens.

Are you considering using blockchain anywhere? Since you mentioned 'trust' with such passion and significance? And also as lots of charities are warming up to the use of Crypto?

The solution part of this water-pump problem can really take a leap if we combine IoT with blockchain. So instead of just alerting a mechanic about a repair-spot, what if we incentivize him through a blockchain-based payment system? That would be transformative for the entire sector. It can also help to correct a lot of issues in rural areas which are suffering with fragmentation. In India, we are not sure about Crypto but in other countries, it can be certainly used as a good tool.

What precise change did the use of cloud bring in here?

It is a big power for a small organization like ours. AWS cloud helped us to handle large volumes of data at a scale that we could not have afforded. Imagine about 7,000 centres and two million hourly-readings a month! Handling that level of data on our own servers was out of question. AWS gave us databases, reporting tools and analytical support with the affordability that we needed. The building blocks are easy and cheap. Plus, the ecosystem is a big help.

What is your advice to other non-profit organizations on use of technology, especially on the importance of monitoring?

Technology has unlocked so much value. It gives scale and the ability to reach out to more people. We use these tools in our daily lives for almost everything. Why not use them to help make the lives of those people better who need it so much! And technology does not have to be complex. It can work easily.

Are you working on other areas of the water spectrum as well – like quality, wastage or something else?

Water quality is important. Clean water is a major factor for many areas that we work in. Our ambition is to provide comprehensive water solutions in the districts we focus on. Water resource management and systems-level solutions are very critical parts – for charities and local authorities as well. We are passionate about sustainable access. There is a lot of work to be done and a lot of scope out there for technology.

Anything else you want to leave as a drop-for-thought?

All I can say is that as many NGOs, we also did not know what cloud is before we began this project. There are so many developers and experts out there who know so many tools and have so many skills that NGOs may not be aware about. We are all busy in our daily-treadmills but if we can take out some time and share skills for social causes – that can make a lot of difference. As NGOs, we do not know all answers but we understand the problems very well. If someone can help with tools, that can accelerate the path to solutions in a compelling way. Donate skills. Not just money!

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Used smartphones market to touch USD 65 bn in 2024

Worldwide shipment of used smartphones is expected to touch 351.6 million units in 2024, up from 225.4 million units in 2020, with a market value of USD 65 billion. This includes both officially refurbished and used smartphones. While the shipment of used smartphones registered a 9.2% increase over 206.5 million units shipped in 2019, International Data Corporation (IDC) expect that it will grow at a CAGR of 11.2% during 2019-24 period.

Much of the 9.2% growth continues to be driven by mature markets in which trade-in emulates a form of subsidy to push consumers to upgrade. "Over the past year, we have seen rapid growth in trade-in programs and average selling prices (ASPs) across numerous channels. Premium flagship offerings continue to rely heavily on trade-in programs to make the upfront cost more affordable to consumers," IDC said in a press release.

According to the report, vendors such as Apple, Samsung, and Huawei have already implemented their own programs with very aggressive trade-in offers compared with other channels. Telcos on the other hand are using trade-in combined with bundling (family plans and services) to get consumers to turn over their old device and upgrade. "Although 2020 volume was not as large as expected, the used market still performed well compared with the new market, where IDC is expecting a 6.4% decline for smartphones for the year. As with our previous forecast, we still expect to see double-digit growth during the forecast period, at an average of 11.8%."

Talking about the trend, IDC's Worldwide Quarterly Mobile Phone Tracker Research Manager Anthony Scarsella said that in contrast to the recent declines in the new smartphone market, as well as the forecast for minimal growth in new shipments over the next few years, the used market for smartphones is showing no signs of slowing down across all parts of the globe.

"Refurbished and used devices continue to provide cost-effective alternatives to both consumers and businesses that are looking to save money when purchasing a smartphone. Moreover, the ability for vendors to push more affordable refurbished devices in markets where they normally would not have a presence is helping these players grow their brand as well as their ecosystem of apps, services, and accessories," he said.

IDC defines a refurbished smartphone as a device that has been used and disposed of at a collection point by its owner. Once the device has been examined and classified as suitable for refurbishment, it is sent off to a facility for reconditioning and is eventually sold via a secondary market channel. A refurbished smartphone is not a 'hand me down' or gained as the result of a person-to-person sale or trade.

Adds IDC Mobile Phones Program Director Will Stofega: "Although the COVID-19 pandemic has posed challenges for secondary market participants around able-bodied workers and logistics, most of the industry has been able to satisfy demand for refurbished smartphones. Once the pandemic begins to fade, those that were able to invest in technology will be well-poised to prosper during the recovery."

Cisco inks new deal to acquire Acacia for USD 4.5 bn

Networking giant Cisco has announced that it has agreed to acquire Acacia for USD 115 per share in cash, a total cost of USD 4.5 billion. Acacia is a component supplier and maker of high-speed optical interconnect technology for networking systems. Cisco initially offered to acquire Acacia for USD 2.6 billion in July 2019.

Cisco and Acacia expect to complete the acquisition by the end of the first calendar quarter of 2021. The deal after the last week announcement by Acacia to terminate the merger agreement accusing Cisco of failing to meet a set of closing conditions including obtaining necessary regulatory approvals within the timeframe contemplated by the merger agreement. Upon completion of the acquisition, CEO Raj Shanmugaraj and Acacia employees will join Cisco's optics business.

Speaking on the final agreement, Cisco Chairman and CEO Chuck Robbins said that he was delighted that the two companies have decided to come together in this mutual deal. "We look forward to welcoming Raj and the Acacia team to Cisco to offer our customers world-class coherent optical solutions to power the internet for the future," Robbins said in a statement.

"We maintain our strong conviction in the strategic benefits of joining the Cisco family and believe it will enable us to better support our existing customers, while reaching an expanded footprint of new customers globally," said Raj Shanmugaraj, president and CEO of Acacia.

Issuing a press statement, Cisco said that it is committed to supporting Acacia's existing and new customers around the world that require industry-leading coherent optics, digital signal processing/photonic integrated circuit modules and transceivers for use in networking products and data centres. Cisco also said the acquisition will benefit its existing enterprise network portfolio.

Movements

HARMEEN MEHTA JOINS BT

BT has announced that it has hired former Bharti Airtel Global Chief Information Officer Harmeen Mehta as Chief Digital and Innovation Officer to lead the innovation agenda of its new technology unit, Digital. The new unit will focus on the development and rapid delivery of innovative products, platforms and services in key areas such as healthcare and data. The new Digital unit includes accountability for IT, digital innovation, BT-wide business transformation and data and product strategy. Mehta who is likely to take over the new assignment on 1 March 2021, will be reporting directly to Chief Executive Philip Jansen.

SANDEEP GIROTRA TO LEAD STL'S GLOBAL SALES

Digital networks integrator STL has announced the appointment of Sandeep Girotra as its Global Sales Head. In his new role, Girotra will be a part of the company's Executive Committee and responsible for driving the company's order book and revenues across portfolios, customer segments and geographies.

Prior to joining STL, Girotra was associated with Nokia for 24 years. For the last 10 years, he held multiple executive roles such as head of India, head of Asia Pacific and Japan, and head of Global Sales Transformation. A well-recognized expert in the technology sector, he has played an instrumental role in delivering formidable financial performance for Nokia India. He is also credited with driving customer intimacy across markets and building agile market-facing organizations.

Nokia to supports T-Mobile's 5G evolution journey

Nokia has announced that it is strengthening its long-term partnership with T-Mobile by signing a five-year deal that will help the German telecommunications company utilize Nokia's AirScale Radio platform. The platform will enable T-Mobile deploy an Ultra Capacity 5G layer with 2.5GHz Massive MIMO technology, shifting the Un-carrier customer experience into overdrive.

Under the new agreement, Nokia will continue to expand T-Mobile's extended range (low-band) 5G coverage. Both the extended range and Ultra Capacity enhancements will augment user experience and network capacity by leveraging T-Mobile's multi-layer spectrum strategy.

To support the Un-carrier's supercharged 5G network, Nokia will supply AirScale radio access solutions – including macro and small cells across low, mid-band and mmWave spectrum. Massive MIMO, a key 5G technology, will allow T-Mobile's 2.5GHz mid-band spectrum to be utilized to its full potential.

It will also help the company boost network performance for customers in the form of higher speeds and lower latency, further assisting T-Mobile's home internet strategy. All of these enhanced user experiences are built upon T-Mobile's nationwide 5G standalone network. As part of the deal, the company will also help T-Mobile upgrade its mid-band LTE network to 5G and continue to expand their extended range (low-band) 5G network.

LTV gets Ciena power for its high-capacity network

Lightstorm Telecom Ventures (LTV), an independent and carrier-neutral infrastructure provider in India, has deployed Ciena's coherent optics, network management and advanced automation software to serve the country's OTT, data center and cloud providers.

This deployment will transform LTV's metro and long-distance network to support the delivery of low latency and high-capacity digital services. LTV's network covers more than 10,000 kilometers and 60 data centers in five cities, including Mumbai, Bengaluru, Chennai, Delhi and Hyderabad, as well as strategic subsea cable landing stations providing high-capacity connectivity to Mumbai and Chennai.

LTV is using Ciena's 6500 packet-optical platform with Layer 0 control plane, WaveLogic 5 Extreme, Waveserver Ai, Manage, Control and Plan (MCP), and Services as well as Blue Planet Multi-Domain Service Orchestration (MDSO). "Investing in networking solutions and software from Ciena equips our customers with unmatched speeds and programmable network capabilities," LTV Chief Executive Officer Amajit Gupta said. "Together with Ciena, we're helping to further establish India as a hub for international connectivity."

With Ciena's portfolio of hardware, software and services, LTV will provide an intelligent and reliable network that can adapt and respond quickly to rapidly changing user requirements. Deploying 600-800 Gbps per wavelength delivers increased capacity to support high-bandwidth content, and a software-driven flexible photonic architecture accelerates service velocity and maximizes the potential of new services.

"Bringing new digital services to India requires an intelligently automated network that can dynamically adapt and scale," said Ryan Perera, vice president and country head, Ciena India. "With an upgraded network, LTV makes Digital India a reality and fuels the next wave of telecom growth."

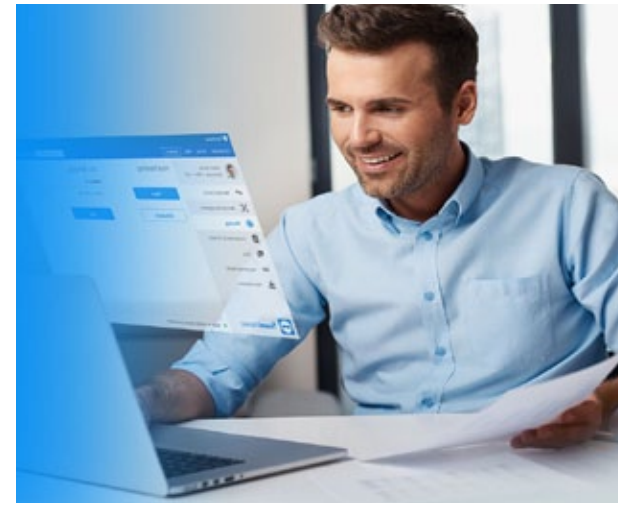
Netgear introduces Wi-Fi 6E with tri-band Wi-Fi router

Networking products company Netgear introduced world's first all-purpose Wi-Fi 6E router during the virtually-hosted CES 2021. According to the company the Nighthawk RAXE500 Tri-band Wi-Fi router can elevate the Wi-Fi experience by providing speeds up to 10.8Gbps and fast connectivity on the new 6Ghz band, free of interference and congestion.

According to the company, the new Wi-Fi 6E router is designed to provide the fastest Wi-Fi speed possible with higher-capacity, lower latency, and the latest WPA3 security. "With cutting-edge technology, the router expands Wi-Fi for more capability, capacity, and experiences for a new world of uninterrupted connectivity while simultaneously conducting distance learning, video conferencing, and 4K/8K video streaming. With the new 6GHz band, this Nighthawk performance router delivers faster speeds, smoother streaming, less interference, and improved latency for devices and Wi-Fi-hungry applications for an overall enhanced experience," the company stated.

The company also introduced Nighthawk 4G LTE Wi-Fi 6 Router (LAX20), which it claims is the industry's first Wi-Fi 6 mobile wireless router, and 4G LTE Modem (LM1200). The LAX20 supports advanced Wi-Fi 6 networking technology delivering 1.8Gbps of high-performance Wi-Fi and improved network capacity to handle a greater number of connected devices on the home network. Combined with a 4G LTE modem for instances where traditional wired internet options are not available or reliable, the router can provide an alternate mobile internet connectivity option. The new router also serves as an ideal solution for those who need internet access for limited time frames for instances such as a vacation home or short-term rentals, the company said.

TeamViewer adds secured meeting, VC on mobile and desktop



Remote connectivity solutions provider TeamViewer has announced the integration of an enhanced TeamViewer Meeting into the client to start one-click meetings right from the existing application. The TeamViewer Meeting, recently rebranded from blizz and now visibly belonging to the company's product family, is being added for free to all TeamViewer clients, the company stated in a press release.

"Due to the global need of reliable, secure digital communication and online meeting capabilities, we have committed to provide every user with an easy-to-use meeting functionality right in their TeamViewer client," the company's Director of Product Management Christoph Schneider said. "There is an increasing demand for end-to-end encrypted video conferencing and screen sharing solutions following the strict data protection and privacy regulation like it is mandatory in Europe, where TeamViewer is headquartered."

The integrated meeting in the client is fully compatible with the stand-alone TeamViewer Meeting product enabling end-to-end encrypted VoIP meetings when joining through mobile devices, which is now possible for all TeamViewer users. Additional features include, instant meetings right from the contact list, HD-quality video, 4k multi-monitor-screen sharing, integration with Outlook, recordings of meetings and the possibility to lock meetings as well as protect them with passwords to further increase privacy. For subscribers, TeamViewer Meeting also offers phone dial-in numbers which can be enabled or disabled by the host.

Amazon unveils mobile-only video plan for India

Amazon has announced that it has tied up with Airtel to roll-out a mobile-only plan for India. The Prime Video Mobile Edition is a single-user plan created especially for India, the company said in a release. Powered by affordable data, the ubiquitous smartphone has become the country's preferred screen for entertainment. Prime Video Mobile Edition is a single-user mobile-only plan, providing SD quality streaming to customers which is created especially for a mobile-first country like India.

As part of the Prime Video Mobile Edition launch in India, all Airtel customers on bundled pre-paid packs can avail a 30-day free trial by simply signing up to Amazon from the Airtel Thanks app using their mobile number. After the free trial period, customers can continue to access the package through pre-paid, 28-day package that comes with 6GB data or choose a higher value pack that includes unlimited calls and data access of 1.5 GB per day.

Talking about the launch, Amazon Prime Video Worldwide Vice President Jay Marine said: "India is one of our fastest growing territories in the world with very high engagement rates. Buoyed by this response, we want to double-down by offering our much-loved entertainment content to an even larger base of Indian customers. Given high mobile broadband penetration in the country, the mobile phone has become one of the most widely used streaming devices. With the launch of Prime Video Mobile Edition we look forward to entertaining every Indian with our Exclusive and Original content."

Zooppy launches new initiatives for movie-lovers

The Indian online fantasy platform for movies, Zooppy has announced the launch of two new initiatives for movies-lovers. The company has launched gaming leagues in regional languages and new video leagues with increase in the prize money. "Apart from English, the gaming leagues will be available in regional languages. The inclusion of regional language is a step towards increasing the user base," the company said in a release.

In the video league the participants have to choose videos from a list of YouTube videos provided in the league. The videos should be chosen in such a way that the views attained by the video will be the highest. Each video has a credit and the user is given 1,000 credits to make a list. Participants who have chosen the list of videos which gained the maximum number of views in YouTube are rewarded cash prizes.

Adds Zooppy Founder Yuva Pushpakar: "We have added regional languages as there is a huge penetration of internet boom in local language content and video. We aim to use vernacular to gain from the huge market available in semi-urban India. Moreover, movies being a passion in India, we aim to capture market share in the gaming segment."

Google Cloud, Nokia partner to work on cloud-native infra

Google Cloud has announced that it has signed a global, strategic partnership with Nokia to bring new solutions for communications service providers (CSPs) that will help modernize their network infrastructures, build on a cloud-native 5G Core, and develop the network edge as a business services platform for enterprises.

Under this partnership, Google Cloud and Nokia will work closely to validate, optimize and evolve cloud-native network functions, and the two companies will also co-innovate new solutions that will help CSPs deliver 5G connectivity and services at scale, the company said in a press release.

As part of this collaboration, Nokia will supply its voice core, cloud packet core, network exposure function, data management, signaling, and 5G core. This includes Nokia's IMPACT IoT Connected Device Platform, which enables automated, zero-touch activation and allows for remote management of IoT devices, as well as Nokia's Converged Charging solution provides real-time rating and charging capabilities that enable CSPs to capture new revenue opportunities from the 5G economy.

The company also informed that Google Cloud's Anthos for Telecom will serve as the platform for deploying applications, enabling CSPs to build an ecosystem of services that are deployable anywhere, from the edge of the network, to public clouds, private clouds and carrier networks. By delivering cloud-native applications at the edge, businesses can benefit from lower latency and reduce the need for costly, on-site infrastructure, enabling them to transform their businesses in industries such as smart retail, connected manufacturing and digital consumer experiences.

Commenting on the partnership, Google Cloud Telco, Media and Entertainment Industry Solutions VP George Nazi said that communications service providers have a tremendous opportunity ahead of them to support businesses' digital transformations at the network edge through both 5G connectivity and cloud-native applications and capabilities. "Doing so requires modernized infrastructure, built for a cloud-native 5G core, and we're proud to partner with Nokia to help the telecommunications industry expand and support these customers."

Movements

VIKAS PODDAR JOINS INDUS TOWER AS CFO

Mobile tower installation company, Indus Towers, has appointed Vikas Poddar as CFO with effect from 12 January 2021. He takes over from, who was acting CFO of the company since April 2020 after the preceding finance chief Hemant Ruia joined another global supply chain solution firm DP World as Finance Director.

Poddar has spent more than 10 years in the company and started off as the Chief of Internal Audit and Assurance. Currently, he is the Global Head of Finance at Vodafone Intelligent Solutions (VOIS), London. Joining Vodafone India Limited in 2008, he has undertaken several finance leadership roles such as Assistant Vice President and Senior Vice President of FP&A and commercial finance.

AIRTEL APPOINTS PRADIPT KAPOOR AS CIO

Bharti Airtel has named Pradipt Kapoor as Chief Information Officer (CIO), to replace Harmeen Mehta. Kapoor will drive Airtel's overall engineering strategy and be a key player in realizing the company's digital vision, the telecom operator said in a press statement. Kapoor will be a member of the Airtel Management Board and report to Bharti Airtel Managing Director And Chief Executive Gopal Vittal. He will also oversee delivery of cybersecurity and cloud businesses which were headed by Mehta.

Kapoor's most recent assignment was with AP Moller-Maersk where he was global head of products and solutions engineering for a 3,000-strong organization. Prior to that, he had spent over a decade at SITA Inc (UK) running products engineering. He has also had formative experience as an entrepreneur.

OneWeb gets additional funding from Softbank, Hughes

London-based OneWeb has announced that it has received additional funding from SoftBank Group Corp. and Hughes Network Systems LLC, bringing its total funding to USD 1.4 billion. The fresh infusion of cash is expected to help the company move one step closer to its aim of launching a first-generation satellite fleet, totaling 648 satellites, by the end of 2022. As per the agreement, SoftBank will now be a member of the OneWeb Board of Directors.

The company last November emerged from Chapter 11 bankruptcy protection after a consortium backed by the UK government and India's Bharti Enterprises invested USD 1 billion to take over it. "We are delighted to welcome the investment from SoftBank and Hughes. Both are deeply familiar with our business, share our vision for the future and their commitment allows us to capitalize on the significant growth opportunity ahead for OneWeb. We gain from their experience and capabilities, as we deliver a unique LEO network for the world," OneWeb Executive Chairman Sunil Bharti Mittal said.

OneWeb's LEO satellite system includes a network of global gateway stations and a range of user terminals for different customer markets capable of delivering affordable, fast, high-bandwidth, and low-latency communications services. In December 2020, the company had launched 36 new satellites, built at its Airbus Joint Venture assembly plant in Florida, bringing its total satellite fleet strength to 110.

"We are excited to support OneWeb as it increases capacity and accelerates towards commercialization. We are thrilled to continue our partnership with Bharti, the UK government, and Hughes to help OneWeb deliver on its mission to transform internet access around the world," SoftBank Chairman and CEO Masayoshi Son said.

Tata Communications acquires majority stake in Oasis

Global digital ecosystem enabler, Tata Communications, has acquired 58.1% stakes in Oasis Smart SIM Europe SAS (Oasis), a France-headquartered embedded-SIM (eSIM) technology company. With this investment, eSIM technology will be fully integrated into Tata Communications MOVE, enabling an end-to-end embedded connectivity solution and strengthening it as a single source platform for global enterprise mobility needs, the company said in a press release.

"Enterprises are increasingly relying on mobile devices to operate and access data in the cloud. This coupled with the rise in the number of M2M connections globally show that there is immense opportunity in the eSIM market," Tata Communications Chief Strategy Officer Tri Pham said.

Tata Communications will drive and accelerate product roadmap R&D with Oasis, leveraging and amplifying the growth in the mobility and IoT markets. The MOVE platform enables enterprises and device manufacturers to capture, move and manage information worldwide through borderless, secure and scalable connectivity, with a network independent, platform approach. "With this investment, the company will deliver an enhanced full-service enterprise mobility solution to customers through complete access and management of the eSIM and software layer," the release stated.

Commenting on the agreement Oasis CEO Olivier Leroux said: "We are looking forward to leveraging our joint capabilities to develop and co-create products and solutions to enable end-to-end embedded connectivity and to transform businesses through the latest mobile technologies."

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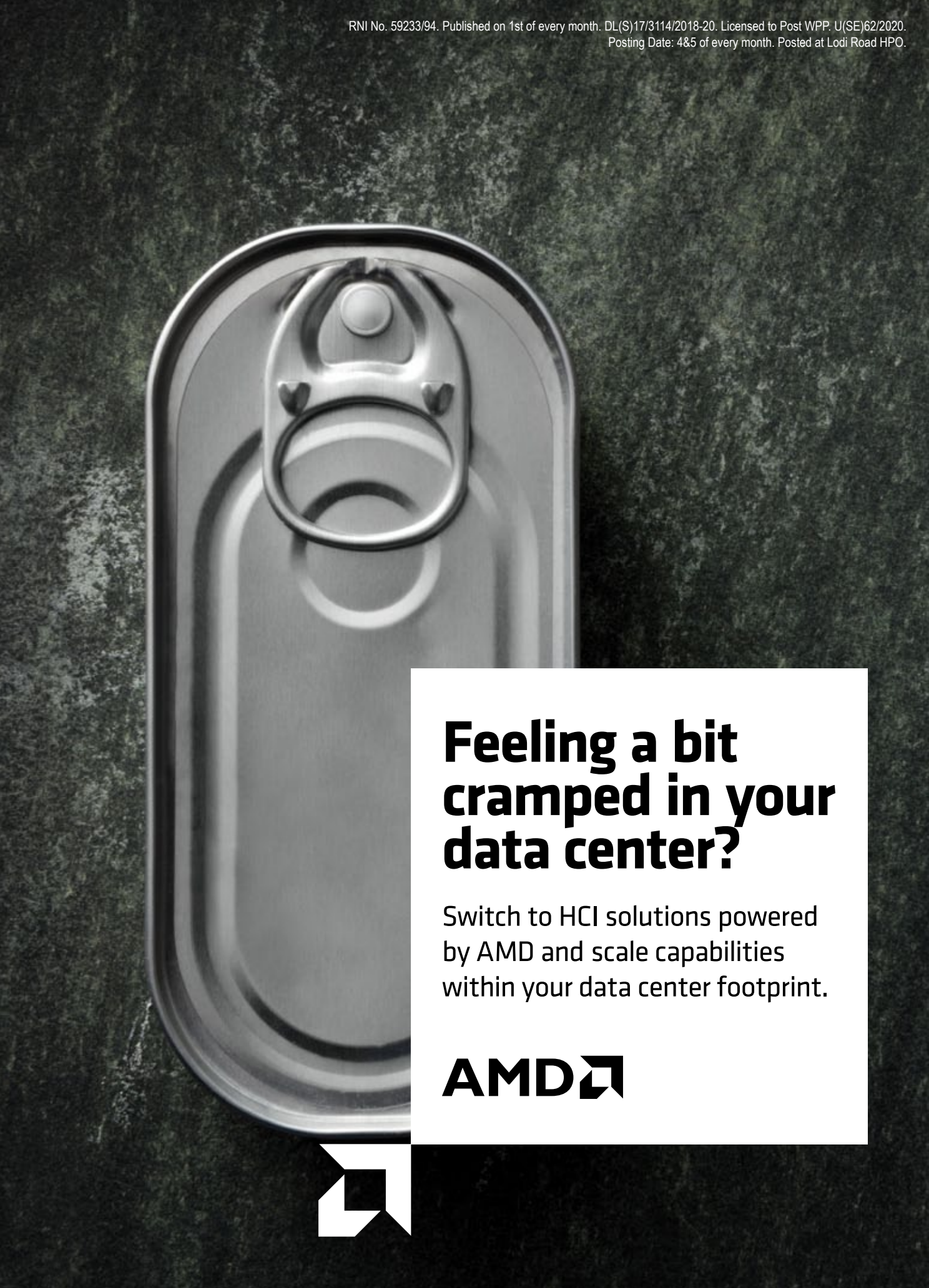

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