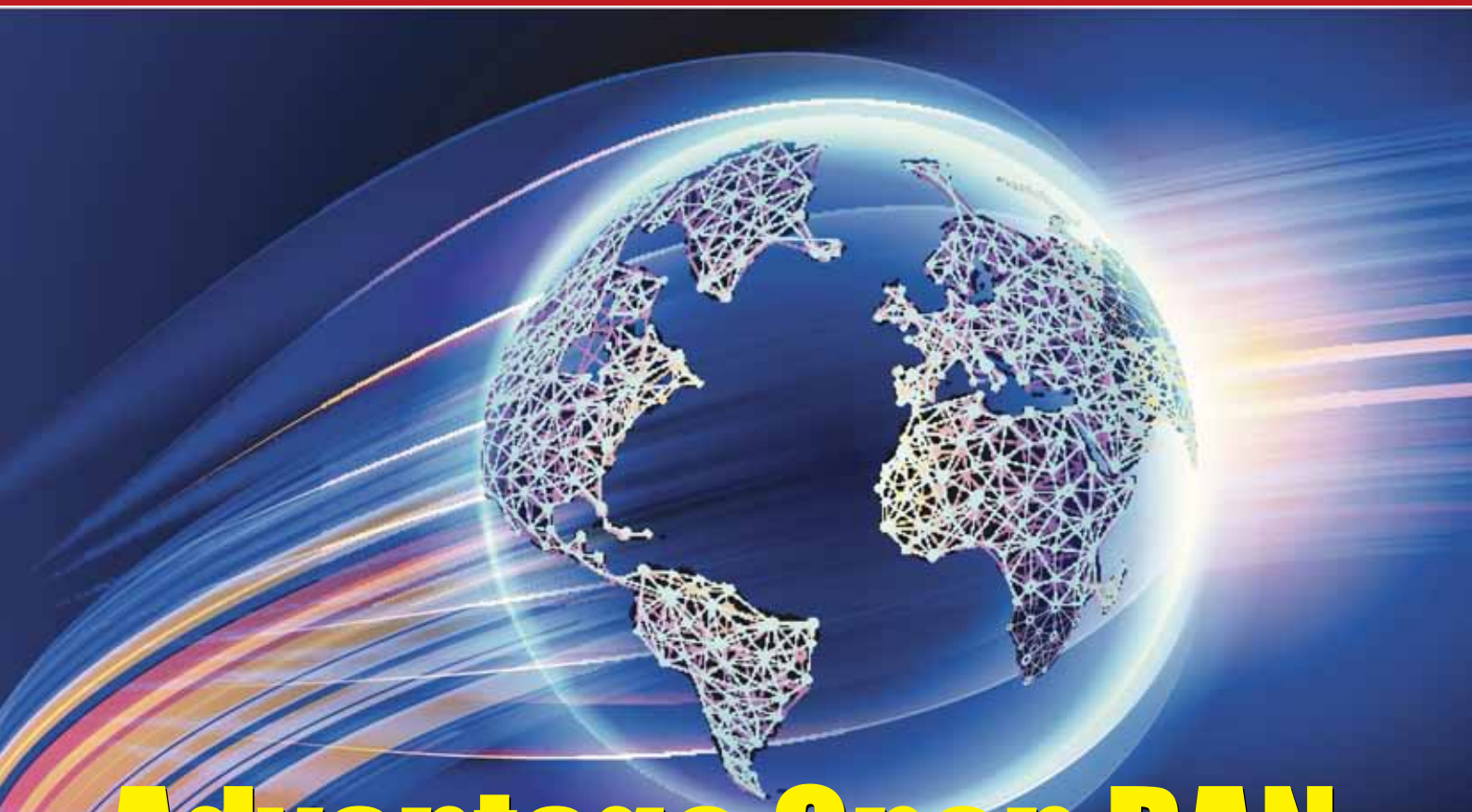
DISRUPTIVE TELECOMS

Enable. Innovate. Transform

WORLD REPORT

December 2021



Advantage Open RAN

Driven by evolution towards 5G, RAN architecture is undergoing its most dramatic change yet

Inside

An Initiative by TelecomDrive.com

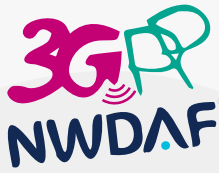
Industry-Leading Open NWDAF for 5G Network Automation

guavus
a Thales company

5G IQ NWDAF®

Enabling MNOs to operate 5G networks at scale

Multi Vendor

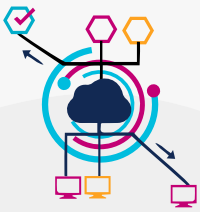


3GPP Compliant

Fully Automated

Cloud Agnostic

Core & Edge Analytics



AI/ML Driven

DEPLOYED IN aws

VISIT US AT WWW.GUAVUS.COM

From the Editor

Zia Askari
Editor, TelecomDrive.com

Trends and Predictions 2022: FWA, WiFi 6 and Sustainable Smartphones

Year 2022 will see increased adoption for Fixed Wireless Access or FWA, WiFi 6 and sustainable smartphones

FWA Gains Ground

The FWA market is growing strongly, with 5G powering enhanced performance. This will hold the key to further closing the digital divide and provide connectivity for unconnected areas.

Many operators have deployed FWA selectively for decades to offer customers internet service, typically in underserved areas where wired internet connections are unavailable. But to date, FWA has not achieved widespread operator adoption outside of a few countries such as Austria or Finland. However, with more governments providing broadband funding and more regulators viewing wireless as an acceptable alternative to wireline connections, more operators are considering FWA, especially the enhanced 5G version, for delivering broadband internet services.

5G should further accelerate FWA's expected growth. Coupled with greater spectrum availability, 5G's deeper network infrastructure and greater spectral efficiency significantly improve the economics and technical feasibility of FWA deployments and can thus support new deployment and revenue opportunities.

FWA's most important impact may be to help narrow the digital divide by improving internet availability in underserved markets. It can be challenging to justify broadband investments in sparsely populated areas with few paying subscribers or inaccessible terrains such as mountains or islands, or even in cities where local ordinances and permitting make it challenging and expensive to connect to customer premises. These factors have opened up markets for broadband services in places where it was previously unavailable, as we have seen in the Philippines, South Africa, Sri Lanka, and Turkey.

Wi-Fi 6: The Future of Enterprise Connectivity

The next generation of Wi-Fi is set to play a pivotal role as organizations innovate with advanced networking technologies.

5G may get the lion's share of all the glamour, but Wi-Fi 6 devices are quietly outselling 5G devices by a large margin and this trend will likely continue to do so for the next few years at least.

This is happening because Wi-Fi 6 and 5G have some similar capabilities but also have come with different, complementary strengths. Both technologies enable higher speeds, lower latency, and increased device density and network capacity and all this is very much needed to enable sufficient connectivity for today's digital-heavy lifestyles.

Additionally, Wi-Fi 6 and 5G are designed to work together smoothly, and the wireless industry appears headed toward a future in which devices can roam securely and seamlessly between all types of wireless networks.

Understanding Wi-Fi 6 and 5G's specific capabilities and associated costs (e.g., for devices, solutions, and customer-premises equipment) can help decision-makers determine which would be better suited to different situations. For some advanced enterprise use cases, such as automated guided vehicles and autonomous robots in industrial IoT scenarios, both Wi-Fi 6 and 5G have proponents and may even be adopted side by side.

Given the role that infrastructure providers and device makers have played in initial Wi-Fi 6 trials, tapping into their expertise could help an enterprise assess its capabilities and establish pilots.

With the benefit of holding 5G-suitable spectrum, many are

From the Editor

seeking to extend their public networks deeper into the private setting. Given their extensive experience running cellular networks, network providers can offer key capabilities such as cybersecurity, privacy, and established relationships with other carriers to support WAN and mobility use cases.

And for some mission-critical services, dedicated, licensed 5G spectrum may have a distinct advantage. And, with better integration of Wi-Fi 6 and 5G anticipated, network operators will have the ability to direct and optimize traffic across both types of networks—for instance, offloading to Wi-Fi 6 to reduce cellular congestion.

And hence, Wi-Fi 6 will certainly be an important part of an operator's network strategy. As 5G's essential partner in advanced wireless solutions, Wi-Fi 6 will be increasingly central to realizing the benefits that organizations are pursuing through next-generation connectivity.

Sustainable Smartphones

Lengthening phone lifetimes would help reduce the environmental impact of smartphones.

After it is manufactured, a smartphone generates an average of 8 kilograms of emissions from usage during its working life, which is most commonly between two and five years. At the end of that time, its end-of-life CO_2e emissions are determined partially by the ease with which its components can be recycled.

Because manufacturing accounts for almost all of a smartphone's carbon footprint, the single biggest factor that could reduce a smartphone's carbon footprint is to extend its expected lifetime. There could still be just as many smartphones in use; what would change is that each smartphone would be used for longer, regardless of the number of individual owners of each smartphone during its lifetime.

Even accounting for the CO_2e emissions resulting from refurbishing and shipping a used phone, prolonged ownership, whether by the original owner or a series of owners, provides a clear-cut benefit. Several trends point to the likelihood that smartphone lifetimes will likely indeed become longer in the medium term.

Smartphones are becoming physically tougher, reducing the need for unplanned replacement. Screen breakages and water damage have historically been common causes for a phone to be written off.

But screens can now cope with multiple short drops, and resilience to being dropped is a point of differentiation. And flagship-model smartphones, whose higher sales price enables the use of higher quality, are becoming more resistant to water damage every year.

Software support for smartphones is being offered for longer. The period over which a vendor maintains software support has a strong impact on the resale value of a device: It is hard to sell a phone that is unlikely to be useful. To enable older phones to work well, smartphone vendors create or source specific versions of each operating system (OS) for each model of phone. Such an OS refresh may well include design changes that make an existing phone "look" new; updated code can also make existing processes flow better and consume less energy.

Vendors also need to provide regular security updates to patch vulnerabilities. As of the start of 2022, the length of this kind of support for a given smartphone's OS is likely to vary between three and five years, depending on vendor, but we expect that by 2025, competitive pressures may have made five years commonplace for most flagship models.

Longer smartphone lifetimes could reshape how the smartphone industry generates revenues and profits.

Moving forward, smartphone vendors could offer higher-priced devices to balance out a fall in the quantity of devices sold, and they may be able to charge a green premium among consumers who favor vendors that have more sustainable approaches.

CONTENT

Advantage Open RAN

To meet ever growing network and capacity demands, driven by evolution towards 5G - RAN architecture is undergoing its most dramatic change yet in the form of Open RAN. It is fast gaining momentum today and Virtualization & cloudification is at the helm of enabling this change

There is a revolutionary change happening with telecom operators, MNOs and CSPs today. This is happening with the help of a wave of new Radio Access Network (RAN) technologies that leverage virtualized and cloud-driven resources that can transform wireless delivery and operations. One of the most important aspects is the shift to embrace open models (Open RAN) of development that let telecoms intermingle software and equipment as per their network requirement and become more adaptable and agile in how they approach markets and engage with their customers.

Open RAN initiatives allow operators to go for independent development of hardware and software in the wireless world. They leverage the virtualization of functions that have historically been bound within physical appliances to create opportunities for innovation.

Growth and competition in existing 4G networks and the transition to 5G has dramatically increased pressure on operators to become more efficient and look for better way to do more with their network infrastructure.

The result is the ability to build capacity with greater flexibility and agility, which can dramatically improve rapid deployment of new services. While some have seen this only as a greenfield opportunity, there are clear advantages to putting this approach to work for operators in all stages of deployment and in multiple

geographies.

Open RAN benefits include more market competition and customer choice, lower equipment costs, and improved network performance. Open RAN architectures are a type of virtual radio access network (vRAN), however, open RAN standards can still be used by non-virtualized architectures.

The Goal of Having Open Standards

The RAN market is dominated by a handful of organizations that do not design their RAN infrastructure to be interoperable. This forces network operators into vendor lock-in where operators must depend on equipment from exclusively one vendor. Without open interoperability standards, there is little space for new vendors at any level of the RAN market to get started.

The RAN vendors that dominate the industry can also benefit from having open standards. A multi-vendor model makes openings for managed service providers. The RAN vendors could partner with the smaller organizations and manage the multi-vendor RANs. Even still, the single-vendor model won't likely go anywhere, because some organizations may prefer to have one place to turn to for tech support or to have a less-complex infrastructure.

Big Benefits of Open RAN

When open standards are widely adopted, equipment vendors will have access to a wider network with more opportunities. Network operators will have the option to select the equipment and software with features that best fit their needs.

And as competition in a market increases, prices for goods and services go down. This will benefit the organizations that need to purchase the equipment, software, and other infrastructure elements in a RAN.

RAN vendors typically only offer proprietary equipment and network functions. Open RAN is changing this scenario and organizations began developing open RAN standards to break out of that mold.

Proprietary products are typically more expensive than generic counterparts. Because there are no third-party RAN elements that can seamlessly integrate into a RAN vendors' infrastructure, and as a result, a network operator is stuck with one RAN vendor's products.

Open interface standards mean that third-party products can communicate with the main RAN vendor's infrastructure. Network operators can then opt for the less-expensive third party product that runs on generic hardware. As network operators look to transition to a vRAN architecture for 5G, using open RAN interfaces can reduce the cost of deploying the new 5G technology.

> ***Open interface standards mean that third-party products can communicate with the main RAN vendor's infrastructure***

And when 5G technology advances and changes, network administrators working with open standard-based vRANs can easily send updates to the network infrastructure to accommodate for the changes.

The O-RAN Alliance is an open RAN standards body that is focusing on including artificial intelligence (AI) and machine learning in its standards. While this is not explicitly part of the interfaces connecting vendor products, standardizing how AI can work within an open RAN architecture can bring automation benefits.

Automated deployments save time and money because setting up the networking software requires less human involvement. AI is a big part of automation and maintaining the network. AI brings automation to operational network functions, further reduces human intervention, responding to traffic problems, and adapting to changing scenarios.

Security is an essential aspect for any technology, and the threat surface area increases as more vendors are brought into a RAN, especially through their interfaces. Vendors should practice security best practices and customers should perform due diligence to ensure the vendors are doing so.

The Radio Access Network (RAN) has been identified as an area that will particularly benefit from independent combinations of hardware and software, allowing for more competition in the ecosystem and the capability for network operators to choose optimum solutions, specifically for their network. This is not without risk, as guaranteeing performance and managing complexity are inherent challenges.

As these new networking developments are intended to align with the objectives of 5G, the need for tight synchronization remains. In practice, this has been seen to result in Network Operators requiring incoming systems to prove they have the underlying capability to meet strict timing requirements, such as to ITU-T G.8273.2 Class-C specifications.

Equally, vendors for Open RAN networks need to be able to validate interoperability in a 'gold standard' environment (including negative testing) to ensure fundamental time transfer requirements in the Synchronization plane (S-plane) are

met in addition to Control, User and Management functions.

Embracing Open RAN

Two open RAN organizations actively promote Open RAN: O-RAN Alliance and the OpenRAN project, which is part of the Telecoms Infra Project. The members of each include MNOs and software and hardware vendors.

O-RAN Alliance (ORAN). Founded in February 2018, ORAN is developing a complete reference architecture for building a virtualized RAN with open hardware. Standardized interfaces would enable an open and interoperable supply chain ecosystem. Various technical work groups cover several topics, including overall architecture, open mid haul and front haul interfaces, RAN intelligent controller and AI interface, and white-box hardware and software architecture.

In February 2019, ORAN published the first open standard specification for the fronthaul interface between the RUs and BBUs. Other open interfaces standardised include the X2 interface, which interconnects BBUs.

OpenRAN: A project group within the Telecoms Infra Project (TIP), OpenRAN has the broad mission of developing open source-based software services across all telecoms and IT infrastructure. Its main objective is to develop fully programmable RAN solutions based on disaggregated software running on General Purpose Processors (GPP) using COTS hardware.

Most likely opportunities for open RAN are in new network builds or in emerging markets where 4G and 5G is still in the planning stages. Several MNOs are also looking to deploy open RAN in rural markets.

Other opportunities include small cell deployments, particularly in-building deployments and 4G/5G private networks. However, other opportunities may open as 5G matures and MNOs start thinking about upgrading and enhancing their networks.

Realizing Open RAN Ecosystem

With open interfaces and open application programming interfaces (APIs), operators can freely choose and adopt best-of-breed solutions among various vendors considering time-to-market and cost in this process by only adding or replacing the required components at the required time without having to swap other equipment that are connected.

Open RAN Benefits

The transformation of radio access networks by open RAN is driven in three main technical areas:

1. Open interface realizing mix-and-match of RAN equipment from different vendors
2. Virtualization allowing disaggregation of RAN equipment hardware and software
3. Intelligence driving optimization and automation of RAN operations.

In terms of commercial realization, open interface having higher maturity of O-RAN specifications and product implementations is a bit ahead. Virtualization and intelligence are also just around the corner with various PoCs ongoing and commercial vRAN products starting to get deployed globally.

Today open RAN is enabling communication service providers to be free from vendor lock-in and to adopt best-of-breed solutions for providing optimized services to end customers with shorter time-to-market. And moving forward,

Open RAN is also expected to foster sustained innovation and create a diversified and vibrant supplier ecosystem. All of this is vital for the RAN industry to meet the diversifying demands and to support the increasing complexities of the mobile system.

The Power of Open Interfaces

With open interfaces, it becomes possible to mix-and-match RAN equipment from various vendors. This allows to introduce and utilize optimal RAN equipment depending on the deployment scenario considering performance, supporting features, schedule and cost involved.

The most prominent is the open fronthaul interface specified by the O-RAN ALLIANCE. For example, with the open fronthaul, best radio units (RUs) for each frequency band and deployment scenarios, e.g. indoor, outdoor micro and outdoor macro, can be chosen regardless of the baseband unit (CU/DU) vendor.

Also, CU/DU can be replaced with those providing better performance, e.g. capacity and power consumption, without having to swap already deployed RUs.

Furthermore, as any vendors' RUs and CU/DUs can be selected, cost competitiveness can be improved. As such, continuous network augmentation utilizing best-of-breed products with reduced costs becomes possible.

The O-RAN ALLIANCE also specifies profiles for 3GPP RAN interfaces to achieve interoperability among different vendors. So far, profiles for open X2, open Xn and open F1 interfaces have been published. Open X2 enables operators providing 5G Non-StandAlone to introduce 5G NR base stations (gNBs) independently of the vendor providing 4G LTE base stations (eNBs).

Similarly, open Xn allows operators providing 5G StandAlone to introduce gNBs from different vendors in the same geographical area. Open F1 provides similar multi-vendor benefits as the open fronthaul but at the higher layer split between CU and DU.

Virtualization

Most web application services are migrating to the cloud. In telecom infrastructures, cloud migration is advancing in core networks, and cloud computing is also gradually happening toward the edge. Similar to the core networks, RAN services currently realized by dedicated software on hardware are considered to be realized by RAN applications running on Commercial Off-The-Shelf (COTS) servers.

In general, virtualization brings benefits such as:

- By separating hardware and software, leading-edge hardware can be easily introduced.
- Latest technology can be introduced only by updating software.
- The latest and many technologies from the IT industry can be introduced.
- Improved development efficiency and shorter time-to-market by leveraging open source and general-purpose communities

Intelligence

Deployment and operation of RAN in the 5G era is becoming complex due to various use cases and applications supported in a network as well as diverse combinations of network parameters and configurations. Furthermore, introduction of split architecture and virtualizations will increase the complexity of RAN.

Under these circumstances, it has become increasingly difficult to manage RAN deployment and operations as well as to achieve RAN optimization with traditional manual operations. In order to solve this issue, introduction of intelligence in RAN is inevitable, enabling automated management and control by using big data analysis, artificial intelligence (AI) and machine learning (ML).

From the operators' perspective, one of the important benefits of introducing intelligence is to reduce OPEX through digital transformation in the RAN operation, which reduces associated operational activities and cost such as drive tests, manual configuration and optimization. Another important benefit is improved RAN performance through automated optimization of radio resource management and control, which will contribute to improvement of customer satisfaction and creation of new businesses.

In order to realize the above-mentioned intelligence in RAN, O-RAN ALLIANCE is leading the mobile industry activities for ecosystems development with regard to innovative, multi-vendor, interoperable and autonomous RAN.

RAN Intelligent Controller (RIC) is a key technology to provide intelligent radio resource management and optimization by using the AI/ML models. RIC includes two layers; non-

real-time (non-RT) RIC with a control frequency over 1 second and near-real-time (near-RT) RIC with a control frequency below 1 second.

TCO (Total Cost of Ownership)

Lower Total Cost of Ownership (TCO) has been expected by introducing open RAN and vRAN. Open RAN brings cost benefits as multi-vendor interoperability allows operators to select products from any vendor, and to make the best choice also from cost perspective. For example, with the open fronthaul, operator can select the most cost competitive RU from multiple vendors without being restricted to the CU/DU vendor.

Also, RAN virtualization is considered to provide cost benefits by aggregation of hardware at centralized locations and use of general purpose servers. On the other hand, vRAN also has factors which can increase the cost. For example, vRAN introduces a new virtualization layer between the hardware and software in which itself is an increased cost, and additional costs for troubleshooting are also anticipated. In determining whether/how to introduce vRAN, brownfield operators also need to consider (a) investments already made for and (b) interoperability with their existing networks.

Hardware Investment

When full-fledged 5G deployment is realized and the numbers of frequency bands and MIMO layers increase, it is easy to imagine that the computational complexity of signal processing will increase exponentially and the power consumption of equipment will increase.

With the conventional vRAN, high-speed control of the physical layer required for virtualized base station equipment (vCU/vDU) cannot be realized, and as a result, dedicated hardware is used to achieve the required performance.

For operators to realize vRAN, it is necessary to improve energy efficiency by making good use of accelerators and to satisfy requirements as RAN while suppressing the cost of computational resources.

Here, it is considered that the performance truly required for vRAN, which could not be realized in the past, can be realized by incorporating accelerators for vCU/vDU. Approaches to utilize hardware accelerators are discussed in later chapters.

Software Investment

One of the challenges of introducing RAN virtualization is that investment in the virtualization layer (virtualization platform) is essential. Various vendors sell virtualization platforms as commercial products, but operators will always be charged the cost of using this platform at the time of construction and on an ongoing basis if they operate vRAN.

O&M (Operation and Maintenance)

Open RAN including vRAN has many potential benefits and are gaining traction. However, for deployment in commercial networks, they require O&M to be in place.

Service Management and Orchestration (SMO) is the critical

management component in the O-RAN architecture. SMO hosts functions such as RAN application management, vRAN infrastructure (O-Cloud) management, and RIC.

The O-RAN ALLIANCE promotes realization of multi-vendor network by specifying O1 and O2 interfaces between SMO and RAN applications and between SMO and O-Cloud, respectively.

To implement vRAN with SMO in commercial network, it requires reasonable SMO decomposition matching operator requirements on management system configurations and appropriate O1/O2 interface specifications to support vRAN application and infrastructure from multiple vendors.

SMO realization

In O-RAN specifications, management-related components are grouped together as SMO. In practice, however, features such as RAN application management, O-Could management and RIC functionality will need to be realized as subcomponents within the SMO.

Automation with vRAN

The existing RAN system consists of dedicated equipment and requires support personnel to go to the site for construction, modification and recovery work.

Operational costs and work time can be reduced by decreasing the frequency of on-site work and increasing automation by software. Virtualization helps to achieve this by disaggregation of hardware and software with more features being implemented by software, and by intensive use of automation realized by MANO.

MANO controls each software component to automate the construction, modification, and recovery of the vRAN system consisting of multiple vendors. Such control is expected to be performed via the O1 and O2 interfaces. The automation by MANO can be expected to significantly shorten the construction period.

Security

Open RAN brings several enhancements leading to increased modularity combined with increased functional split, utilization of open source and commonly used protocols, interface to third parties and use of cloud. In the following we discuss potential security challenges, security opportunities, solution directions and recommendations for open RAN.

> ***In the future, the open RAN ecosystem may converge towards an ecosystem of telecoms and IT infrastructures***

Open RAN security challenges

Looking at the security challenges it is obvious that most of them are neither new nor specific to open RAN. Potential security solutions associated to the challenges are first and foremost to bring holistic security in place that encompasses security by design and zero trust.

A key item of holistic security is consideration for complete lifecycle where baseline security (such as hardening, password management) and asset as well as identity & access management (IAM) together with privileged access management (PAM) play a key role. Lifecycle security also includes appropriate consideration for continuous security in context of CI/CD, DevOps and agile method of working.

Continuous security in the form of vulnerability management should be applied to production network as well. Interfaces can be secured with security credentials provisioned to the functions that are the end-points of the interfaces and by utilizing existing security protocols.

Network operators should enable clear separation of roles defined among vendors, infrastructure providers and service providers where each party takes care of their share of security. In addition open RAN calls for shift in mindset related to security architecture since cloud and edge are heavily used.

Last but not least, proper considerations for security operation becomes essential with considerations for automated monitoring, response and operations (AMOR). In terms of processes and resources, IT security process can form the foundation and resource issues can be resolved by automation as well as utilization of IT security resources since the technology is very similar.

Open RAN – The Road Ahead

As the open RAN ecosystem grows, telecom industry is set to benefit from other various kinds of industries deployments. For example, key players and growing startups in the IT industry are entering the area of virtualization and intelligence with their strengths and technologies.

In the future, the open RAN ecosystem may evolve and converge towards an overall ecosystem of telecommunications and IT infrastructures by sharing servers and virtualization infrastructures with transport networks, core networks and IT systems.

Nokia: Unleashing the Benefits of Private 5G Networks

As digitalization continues to drive business transformation for industries – as a technology enabler, 5G is increasingly playing a critical role and this is where Private 5G Networks are gaining ground. Keeping this trend in mind, Nokia is powering a lot of innovation with the help of solutions designed around augmented reality, video and data analytics, AI/ML, edge cloud, IoT, network slicing, automation, robotics, NaaS etc.

Vinish Bawa, Head of Emerging Business and Webscale, Nokia Networks, India *speaks with* Zia Askari from TelecomDrive.com *about the company's current focus towards enterprise segment and its future plans.*

What is the big focus for Nokia when it comes to targeting the enterprise segment?

When it comes to enterprises, Nokia is involved in a wide range of sectors around the globe and our industrial-grade private wireless is providing superior connectivity for customers in multiple industries worldwide. We are focused on enabling enterprises to capitalise on the benefits of private 5G networks while also identifying exciting new use cases to fuel innovation, revolutionise business models, and speed up digitalization.

5G technology is also designed for enterprise and businesses unlike the previous generation of technologies that focused primarily on the consumers. The enterprises will benefit from 5G's fast speeds, low latency, and high capacity, that will help to improve their efficiency, safety, and. Some of the key segments to benefit will include manufacturing, energy, transportation, logistics, education, healthcare, etc.

Nokia's private wireless solution is trusted by over 340+ enterprise clients worldwide in a range of vertical industries to truly unleash the digital transformation. Over the years, we have established ourselves as a reliable partner for businesses all around the world. The enterprise business for the India market is evolving and with the roll out of the 5G network and allocation of spectrum next year, the segment is expected to take a positive turn just like the global players.

How do you look at the upcoming technologies that will gain importance as far as enterprise connectivity is concerned?

The next generation of connectivity, especially in enterprises will prove to be of great importance for the businesses. The continuous growth of connected devices and automated systems will necessitate adoption of 5G if organizations are to support their transformation plans.As the enterprises pursue their transformation plans, their need for secure, dependable, scalable connectivity is bringing 5G to the forefront of digital strategy. Many of the enterprises have already deployed 4.9G networks that allow them to connect billions of IoT-enabled devices and assets, and which will in turn provide a smooth evolution to 5G. According to a Nokia 5G report, the energy and manufacturing firms show the highest awareness of 5G, and are exploring its potential for advanced use cases including infrastructure maintenance, remote machine control, and cloud robotics as the need for remote operations have become a norm for every industry with the pandemic kicking in last year.

With digitalization transforming industries, the new generation communication networks will bring human augmentation technology and physical/digital fusion which create a whole new set of expectations for future networks. This is where these new age technologies such as augmented reality, video and data analytics, AI/ML, edge cloud, IoT, private networks, network slicing, automation, robotics, NaaS etc. would need a better form of

connectivity such as the 5G network to leverage the best use cases for the enterprises.

Private 5G connectivity holds great potential for enterprise communities. How does Nokia look at this segment? And what innovations can we expect from Nokia here?

Private 5G connectivity for enterprises holds tremendous potential for industries to grow more dynamically and efficiently. With the coming of Industry 4.0, which will leverage the best use of private 5G network in the factories and enterprises, a next era of manufacturing has already started to emerge. The private 5G connectivity will enable industries to undergo the much-needed digital transformation as the asset-intensive industries move quickly to take advantage of the new age technologies.

Industry 4.0 and private wireless together will enable industries to fuse physical with digital processes by connecting all sensors, machines and workers in the most flexible, affordable and reliable way available.

Nokia's Conscious factory in Chennai, India has already implemented a Private LTE network, which has delivered excellent results in terms of functionality, time consumption, production, remote working, safety, and zero human error. We were able to achieve 31% labour time reduction through robotic automation, save 31,000 man-hours through software robotic process automation andachieve 16% OEE improvement since the transformation.

We are at the global forefront of enabling the segment with private wireless network which is anticipated to be a key game changer for several industries. We are the market leader in private wireless globally. Customers all over the world are using our private wireless networks, which have been field-tested in some of the hardest environments on the planet.

What are some of the big innovations and disruptions that we can expect from Nokia in the year 2022?

Nokia is constantly evolving with the advent of new age technologies and introducing new innovative solutions for the customers. With the ongoing 5G Network trials in India, Nokia has partnered with all threeservice providers for a range of use-cases in the enterprise space which are ought to revolutionize the industries to the next level. Applications such as Intelligent Video Surveillance powered by 5G and AI will enhance the surveillance and security at various locations by real time detection of images of humans/objects thereby enabling quicker response in the factories. On the education front, immersive andexperimental learning at schools, colleges and other institutions is one use case where students will be able to access the educational content across multitude of devices. With these 5G use-cases, we plan to enable the enterprise segment in India to align with the growing demand and functioning at an efficient rate.

Talking about innovations and new solutions, Nokia has launched the industry's first cloud-native, mission-critical industrial edge solution in October this year to allow enterprises to accelerate their operational technology (OT) digitalization initiatives and advance their journey to Industry 4.0. The new industry-first MFA (MulteFire Alliance) certified 4.9G/LTE private wireless networking system, which was launched in June, is another example of our innovation which is intended to make private wireless available to a wide range of customers, applications, and markets around the world, and it can also be utilized by customers who do not currently have access to licensed spectrum.

In today's scenario where digital transformation holds great importance, how can Nokia help enterprise in this space?

The dynamic transition of the global enterprises to digitalizationexplains why a robust digital infrastructure is critical for sectors to continue to flourish and keep up with the rest of the world.Physical industries have been slower than digital industries in adopting digitalization systems and platforms that drive efficiency and innovation. This is largely due to the need to deploy new and emerging infrastructure and technologies required to meet the stringent performance needs placed on many of their operations. With several years of strong ICT spend – during which digital industries outspent physical industries 70:30 in spite of having only 25% of the workforce and only 30% of GDP contribution. In the next decade, we expect physical industries to invest more in ICT and leverage end-to-end 5G technologies extensively, transforming themselves into augmented physical industries.

We envision a range of industries transforming to Industry 4.0 and this is where Nokia can help enterprises in India and globally with extremely reliable and secure wireless connectivity to undergo this digital transformation. Our private wireless solution unifies all business-critical IoT applications onto a single network and enables high-bandwidth, low-latency, ultra-reliable, and secure wireless connectivity for industrial machines, IoT devices, autonomous vehicles, and connected workers.

This tremendous shift across enterprises will not only result in a significant value inversion in areas such as safety, productivity, efficiency, and resiliency, but it will also result in more job opportunities, higher wages, and increased government revenues. We estimate that the formulation of this economic equation, which will be catalysed by 5G+ enabled digitalization, will boost global GDP by $8 trillion by 2030.

MediaTek: At the Forefront of Driving Innovations in 5G, Gaming

As 5G is fast emerging as the mainstream technology for all telecom networks across different global markets and also in India, MediaTek is at the forefront of enabling innovations and power up 5G capable devices across a wide range of market segments. MediaTek is also helping its customers with great gaming experience on their devices. MediaTek HyperEngine gaming technology is at the forefront of the innovation in gaming, powering several gaming smartphones which are popular in the market today.

Anku Jain, Managing Director, MediaTek India ***interacts with*** **Zia Askari from TelecomDrive.com** ***on the success of MediaTek, its increased focus on 5G, gaming and how the company is realising the full potential of technologies such as NB-IoT and LoRaWAN with the help of its products.***

MediaTek has done wonderfully well as a company, over the past few years. What is the secret of your exponential success and how do you look at the near future?

MediaTek is a leader in chipset innovation, powering nearly 2 billion devices a year. MediaTek continues its legacy as the no.1 chipset provider for smart TVs, voice assistants and smartspeakers, and has also retained the no.1 position in the smartphone chipset

segment in 2021. While the current market demand for 4G and 5G chipsets has contributed to this accelerated growth, our capabilities to deliver on demand along-with market readiness has largely helped us sustain and accelerate this momentum.

In today's highly dynamic market scenario, there is a need to step up research and innovation, to be able to deliver quality products and solutions on time. MediaTek designs chipsets with a futuristic mind, incorporating the latest technology trends that every user looks at in his/her device. We continue to focus and invest in R&D for the industry with a breakthrough innovation that expands the capabilities across advances such as camera technologies, power saving enhancements, latest networking technologies and standards, gaming, AI as well as other technology trends that make the devices smarter and more productive.

MediaTek is committed to technology democratization and we believe the benefits of the technology should reach every segment of society. Over the past couple of years, we have also increased our focus on 5G chipsets targeting a wide range of devices, from entry-level to medium and to premium flagship segments. The path breaking Dimensity 5G series with several enhancements like integrated 5G in-chip and advanced 4nm process is making inroads to 5G smartphones in India.

Thanks to MediaTek's commitment to innovation, MediaTek now leads the smartphone SoC market with a 40% share and every 2 in 5 smartphones are now powered by MediaTek chipsets. In India, we have emerged as the preferred chipset vendor for smartphone OEMs.

The company is already touching to power about 2 billion devices globally – where is the next level of growth going to come from?

With 5G emerging as the mainstream network technology across all markets, and also in India, our focus will be to deliver 5G capable devices across a wide range of audiences. Currently, the market for 5G smartphones is limited to a niche audience; however, this is likely to change in the next couple of years when 5G gains mass adoption. Thus, there is a need to focus on devices that appeal to the mass market but are capable of delivering superior performance and advanced feature sets. MediaTek already has built an exhaustive portfolio of 5G chipsets including Dimensity 720, Dimensity 800, Dimensity 1000, Dimensity 1200 and more. Of late, recent launches like Dimensity 900 and Dimensity 9000 have set new benchmarks for the 5G smartphone market in India.

In the backdrop of the government's Atmanirbhar initiative, we have also increased the focus on indigenous manufacturing and have been supplying chipsets for leading smartphone makers like Micromax and Lava. We have also collaborated with companies like VVDN Technologies and Tessolve to accelerate the adoption of smart devices across segments like smarthomes, enterprise, logistics and others. In view of the current developments around AI, IoT, Cloud and 5G, we believe, for MediaTek in India, the next level of growth will come from not only smartphones but also smart devices like smart speakers, WiFi routers, voice assistants, smart TVs, and a wide range of AIoT and Edge applications.

There is a lot of buzz around 5G and gaming seems to be a big use case when it comes to elevating user experience. What has MediaTek got in store to enable seamless 5G driven gaming experience?

Mobile gaming is evolving at a speed never imagined before thanks to the advancements in the data network and chipset technologies. Market reports reveal that mobile games now contribute around 66% of the App Store revenue share.

MediaTek HyperEngine gaming technology is at the forefront of the innovation in gaming, powering several gaming smartphones which are popular in the market today. MediaTek HyperEngine packs upgrades for the 5G-era, adding a wealth of new features to speed up game load times, create reliable and low-latency connections by managing multiple networks, manage resources intelligently to provide consistently high FPS while also maximizing battery life, and offer new tools for development artists that can improve in-game image quality.

The latest, MediaTek HyperEngine 3.0 now comes with the third generation of call and data concurrency allowing the user to keep a 5G data connection open and uninterrupted for their game, while simultaneously making or accepting a VoLTE call on the second SIM. With the High Speed Rail (HSR) mode the smartphone will search and connect to the lowest latency available cell tower to minimize online ping. This is particularly advantageous when travelling fast, as the relative distance – and thus latency – to each tower changes rapidly.

MediaTek's second generation Rapid Response provides a direct, chip-level connection to the touchscreen at a minimum of 240Hz ensuring lowest latency and fastest response of touch-input. Reliable Multi-Peripheral Coexistence ensures that the wireless environment is carefully managed to avoid interference and keep them reliably and seamlessly connected with low latency. MediaTek has optimized Bluetooth audio to minimize latency between game audio encoding and BT signal sending, creating an ultra-low latency pipeline that's up to 60%

faster than proprietary competitor alternatives.

We have a dedicated portfolio for gaming chipsets. The Helio G series of chipsets are designed to deliver an incredible gaming experience through an array of technologies that boost the mobile gaming experience, ranging from vivid visuals and rapid sensing touchscreens to enhancing the connection between your smartphone and the internet. Additionally, all the latest chipsets from MediaTek incorporate the advanced HyperEngine technology so that users get the best of all the worlds, in terms of connectivity, collaboration, gaming and more.

MediaTek has been investing a lot of its efforts in its India operations. What can we expect from the company in the year 2022?

MediaTek, through its innovation centres in Noida and Bengaluru, has been investing hugely in technology and human resources in the recent past. We realize innovation is crucial to stay competitive in the rapidly evolving technology landscape. The initiatives in India are in congruence with MediaTek's innovation strategies globally. The company had invested about 77 billion New Taiwan Dollars back in 2020 on R&D, and now it is set to cross the 100 billion in 2021.

In India, MediaTek has set an aggressive hiring plan, with a focus on artificial intelligence technologies, smart home and enterprise segments, 5G and wireless communications, among others. We are also pursuing the Make in India opportunities in collaboration with leading manufacturers in not only smartphones but also devices like digital TVs, voice assistant devices, Wi-Fi routers and other smart home products.

In the smartphone segment, we look to widen the portfolio with a range of mainstream, premium and flagship products. With the recently announced Dimensity 9000 chip, we have achieved a new milestone in flagship 5G smartphones in India. Built on the most power efficient 4nm package, the chipset ensures superior 5G speeds and next-gen gaming technology, professional-grade imaging, videography, advanced AI and computing architecture. Building on this momentum, we hope to sustain the leadership across all smart devices segments in India and thus realize the vision of technology democratization.

MediaTek is already addressing a huge smart device ecosystem with 4G, 5G and Wi-Fi technologies. How do you look at emerging technologies such as LoRaWAN which involves connecting networks of sensors? How can MediaTek play a role here?

The proliferation of IoT network and devices has led to the demand for low-power technologies like NB-IoT and LoRaWAN. They are especially useful in crowded areas, remote places and challenging terrains. In India, these technologies can find a wide range of applications especially in farming, industrial asset management, utilities, traffic management, logistics management and more. According to LoRa Alliance, LoRaWAN network coverage is expanding quickly, with 163 network operators in 177 countries currently installed and growing. Statista estimates say LoRaWAN and NB-IoT are expected to account for around 85.5% of all LPWAN connections by 2023.

As a leading chipset player, MediaTek has already invested in these technologies, especially in NB-IoT. MediaTek MT2625, an NB-IoT R14 enabled SoC, announced as early as 2017, enables ultra-low power and cost effective IoT devices for a wealth of applications ranging through home, civic, industrial or mobile use. Its highly integrated design incorporates an NB-IoT modem DSP, antenna RF and base-band analogue front-end, in addition to the high-performance computing elements. The modem is highly customizable, enabling CSPs to configure them based on the local or international frequency requirements.

As 5G gains popularity in India, we foresee a greater opportunity for NB-IoT and LoRaWAN to power several applications. In addition to user-end devices and sensors, we will be focusing on enabling low-power access capabilities across connectivity applications like modems, cloud networking equipment, and more.

What kind of disruptive innovations can we expect from MediaTek in the coming year?

MediaTek has been constantly engaged in innovations across all segments. However, given the current trends around 5G, AIoT and WiFi 6, we await several innovations that can integrate the best of all these technologies onto a single chip. Since there is a constant need for innovation around power efficiency, performance, multimedia and other usability aspects, we will work towards enabling the OEMs to build devices of their choice.

The launch of MediaTek Dimensity 5G Open Resource Architecture for select chipsets is the first major step in that line. The open architecture enables OEMs to tweak the SoCs to integrate their own algorithms and optimisations at a deep level, thereby creating unique variants in response to the needs of the specific market segment. Going forward, we will expand this further to allow more room for innovation at the OEM level and pave way for the launch of a vast array of products.

Powering Digital Transformation with SD-WAN

As organizations look for enabling digital transformation (DX) SD-WAN is gaining ground and promises to deliver WAN connectivity that is ideal for today's enterprise. Deployment of SD-WAN is enabling huge cost savings and at the same time driving networking simplicity.

Companies around the world are at various stages of supplementing traditional MPLS WAN service with next-generation ready SD-WAN solutions that promise cost savings, improved security, simplified connectivity and a host of other benefits.

SD-WAN Drives Business Agility

Most organizations are in the midst of some form of digital transformation (DX), transforming how they bring products and services to the market— and ultimately deliver value to their customers. But DX initiatives also bring complexity for the network operations team. With business-critical services distributed across multiple clouds, this leads to potential performance issues, especially at branch locations.

Given these realities, it is no wonder that software-defined wide-area network (SD-WAN) technology is rapidly going mainstream. Unfortunately, SD-WAN is an example of the paradox of DX: transformative technology can potentially move the business to the next level, but the expanded attack surface it creates can expose the organization to significant risk as well. That is why an SD-WAN deployment, like every other DX effort, should be accompanied by a security transformation (SX) that rethinks outdated principles, broadens protection beyond the data center, and integrates the

security architecture for centralized visibility and control.

DX all the way

DX is arguably the most important business trend involving IT in organizations. It empowers businesses to operate with more agility and scale more quickly—which is absolutely essential in many industries today.

Moving beyond the digital enabled enterprise, DX creates fully digital enterprises that "are hyper-connected, adaptive, intelligent, and agile with technology highly integrated into new operational processes, policies, and organizations that unlock its transformative capabilities.

DX looks a little different at each organization, but it is almost always marked by increasing reliance on hybrid cloud architecture. For the network operations team, this means bringing existing on-premises resources together with multiple external cloud networks and ensuring their availability and performance, no matter where a user is located.

Addressing DX Networking Needs

As more services move to the cloud, it becomes increasingly clear that conventional network architectures are not able to handle the workloads of a cloud-first organization. This has resulted in the rapid growth of another key DX technology— SD-WAN.

SD-WAN provides high-performance access to cloud applications for users located away from headquarters, enabling a more agile network and facilitating automation at branch locations to a degree previously not possible.

Specific benefits include:

1. Direct cloud access. SD-WAN eliminates the need for backhauling—routing all cloud and branch office traffic through the data center. This enables direct access to critical cloud services for all users, regardless of location.

2. Better application performance. SD-WAN can be configured to prioritize business-critical traffic and real-time services like Voice over Internet Protocol (VoIP) and steer it over the most efficient route. Having several options for moving traffic helps reduce packet loss from overloaded circuits and latency due to heavy traffic, improving performance and user experience.

3. Increased business agility. Network planners no longer need to plan weeks or months in advance to deploy additional multiprotocol label switching (MPLS) bandwidth for a traditional WAN. In addition, the need to ensure network performance at multiple branch locations no longer inhibits other DX initiatives from moving forward quickly.

4. Cost savings. SD-WAN allows traffic to be routed efficiently over multiple channels—including not only existing MPLS circuits but also the public Internet via LTE and broadband. This reduces the cost of new MPLS bandwidth.

Disrupting Network Security

It is hard to argue with the benefits of an SD-WAN network architecture in a world of DX. But SD-WAN also has a glaring disadvantage. Each SD-WAN-enabled site with local Internet access is a further expansion of an organization's attack surface—and another weak link in the network security chain. This further expands an existing problem, since branch locations often have lower levels of security than headquarters even before the introduction of SD-WAN.

Of course, most other DX-inspired technology deployments also expand an organization's attack surface, and security is often seen as the biggest roadblock to DX initiatives. To be successful, every DX initiative—including SD-WAN deployment—must be accompanied by a corresponding security transformation (SX).

Securing SD-WAN

SX involves rethinking of long-standing principles of enterprise security—including the perimeter-based model, which declines in effectiveness every time another cloud service is rolled out and is completely unworkable with SD-WAN.

SX also requires that security should be an integral part of DX planning, rather than an afterthought. For every DX initiative, planning and deployment teams should follow the principle of security by design, security by default.

When it comes to SD-WAN deployment, the network security and network operations functions should share in the decision-making process for a solution, and a security strategy should be in place when the final selection is made.

Traditionally, these teams operate in silos—and sometimes function in mild competition with each other. But when these teams work together, they can strategically address the legitimate security concerns surrounding SD-WAN: Securing an expanded attack surface created by DX initiatives and the SD-WAN infrastructure itself

Ensuring that malware that does enter the network does not travel horizontally

Compensating for the lack of trained IT security staff at some remote locations

Providing network-wide visibility and centralized security controls for the entire enterprise

As organizations deploy SD-WAN in support of DX, they need to ensure that SX is a part of the equation. With network traffic bypassing the data center, the network security architecture needs to broaden—but not by adding silos to the security architecture.

With a truly secure SD-WAN solution, security is integrated with

the network and expanded across a multisite, distributed enterprise environment. This enables centralized visibility and control, true automation of security processes, dynamic sharing of threat intelligence, and a more resilient network.

Making SD-WAN Successful with SX

SD-WAN offers organizations a great opportunity to deliver tangible value to their branch networks. Some of the things IT and security leaders need to remember include:

SD-WAN is a critical DX linchpin for many organizations.

The business value of SD-WAN is tangible, facilitating cloud delivery to branch offices, providing increased application performance, enhancing business agility, and reducing cost.

SD-WAN expands the attack surface and can be the weakest security link for many organizations.

SX is required to make SD-WAN secure.

Integration is pivotal when it comes to secure SD-WAN.

SD-WAN and SASE

SD-WAN and SASE go hand in hand - a 2019 report states that 69% of enterprise organizations are migrating data for enterprise resource planning (ERP) applications to the cloud1. With this move, organizations need to address security concerns that pertain to the use of public clouds. Enter software-defined wide area networking (SD-WAN).

SD-WAN is a software-based approach to building and managing networks that connect geographically dispersed offices. Many companies use SD-WAN to securely connect branch offices to their corporate networks instead of relying on traditional and expensive multiprotocol label switching (MPLS) connections, firewalls or proprietary hardware to do it. The challenge is that SD-WAN uses a networking overlay – an "SD-WAN fabric" – that doesn't include any of the security and access controls companies need to protect and defend their network in a cloud environment.

Companies often turn to multiple point products to secure web gateways, support application firewalls, secure virtual private network remote access, and more. Since these products all come with their own policy management protocols, interfaces and sets of logs, this can create unwieldy administrative issues, increase costs and complexity, and lead to gaps in a company's security posture.

To address this, Gartner, a leading research and advisory firm, proposed a new cybersecurity model for networking in the cloud called secure access service edge (SASE). A SASE solution combines the capabilities of a WAN with comprehensive security functions, such as secure web gateway (SWG), cloud access security broker (CASB), firewall as a service (FWaaS), and Zero Trust network access (ZTNA) to facilitate secure network access in cloud and mobile environments.

Gartner expects that by 2024, at least 40% of enterprises will have explicit strategies to adopt SASE, up from less than 1% at year-end 2018.

How a SASE Solution Works

A SASE solution provides mobile users, branch offices and retail locations with secure connectivity and consistent security wherever they are in the world. It does this by offering companies a single, centralized view of their entire network.

This allows companies to quickly identify users, devices and endpoints, apply their networking access and security policies, and securely connect users to their applications and data in a cloud or mobile environment, all while ensuring multi-branch and multi-cloud network security.

It also enables companies to greatly reduce capital costs and cut the overhead typically associated with deploying security and networking at scale. More importantly, it speeds up deployment time and reduces the time to deliver protection by eliminating the need to set up traditional IT infrastructure.

The Benefits of SASE

Among its advantages, SASE:

Provides a holistic view of an organization's network so the organization can better protect it.

Reduces costs by allowing companies to use a single platform instead of multiple point products.

Allows users to immediately gain secure access to a company's network, wherever they are and whatever device they use.

Simplifies network complexity and management by combining SD-WAN and other networking infrastructure into a single cloud-based platform.

Enables companies to consistently apply security to stop cyberattacks.

"Our Top Priority is to Setup Multiple Skill Centres": TSSC

Telecom Sector Skill Council or TSSC is making a big positive impact on the telecom sector skills development in India, it has already helped more than 1 million candidates on its journey so far. Its top priority for the next year is to setup multiple skill centres and collaborate with industry leaders to identify and focus on new technologies and teaching modalities.

Arvind Bali, CEO, Telecom Sector Skill Council (TSSC) *speaks with* **Zia Askari from TelecomDrive.com** *about TSSC's journey so far in India and its plans for year 2022.*

What is the big focus for TSSC when it comes to enabling skill-based education in India's telecoms space?

TSSC has a multi-level approach for the future of the ICT skill development sector in India. Our primary focus is to develop modules and courses for futuristic technologies like 5G, ML/AI, Drone technology, and many more. We have already begun the development of courses in 5G and advanced cyber-surveillance with our partners. Secondly, we are actively creating Centres of Excellence (CoE) which will be the infrastructure necessary to impart these courses in the best possible manner. Third, we are developing our LMS platform with an aim to impart quality skilling digitally. We have partnered with leading organizations to leverage their expertise in this domain and create a holistic platform that can cater to the ICT domain and beyond. Finally, we have created a job portal TELCOJOBS.IN which will provide the industry and candidates a common platform to interact. By, removing the obstacles for hiring in blue collar domain, we are helping achieve efficient and timely hiring to maintain business continuity.

How do you look at the upcoming technologies that will hold importance for skilling and reskilling telecom sector in the year 2022?

5G is the biggest technological shift in the coming year. With the spectrum auctions slated to happen and influx of 5G ready handsets and services in the market, it will be the biggest disruptor in ICT. Ancillary technologies like AI and cloud will help accelerate the usage of 5G and thus are also part of our pipeline. The shift to digital is quite evident now with rural penetration increasing manyfold.

India has also invited investments in electronic and semiconductor manufacturing. This avenue will put India as the top skill exporter in roles such as line assemblers and will create new jobs for semiconductor fabrication in the coming years.

Over the past few years, technology led education has given a whole new meaning to delivering skillsets. How is TSSC utilising technology to enable skills development?

The industry is responding positively to our initiative. We are also developing a learning management system (LMS) to impart skills digitally. The system houses both instructor-led and self-paced courses. We are also exploring new avenues like AR/VR/XR for training such that remote candidates can also have a shop floor like experience despite lack of access to the tools and equipment physically.TSSC has launched its job portal TELCOJOBS.IN which caters to providing employment for youth in ICT job roles.

What are some of the big innovations and disruptions that we can expect from TSSC in skilling telecoms workforce in India for year 2022?

I think TSSC has completely evolved because of this pandemic. As we understood the turn this pandemic was taking last year, we started thinking like our students and figured out the best solutions to their problems. As our biggest stakeholders, the upliftment and betterment of these students takes precedence in our mission. We will focus on exposing the students to new stimuli and give them a taste of what the ICT industry is shaping up to be. We want to sensitize and enable them to become job-ready or spark an entrepreneurial fire in them to start their own shop.

Please share details on how much TSSC has impacted the telecoms space in India so far (number of people trained / skilled so far)? And what are your plans for year 2022?

TSSC has proudly helped more than 1 million candidates on our journey. We have over 40 industry partners and operate PAN India. Our top priority for the next year is to setup multiple skill centres and collaborate with industry leaders to identify and implement and incorporate new technologies and teaching modalities. We will also increase our international presence and CSR projects. I have high hopes that the next year will be the revival from the COVID setback the nation has faced.

Open RAN is the Only Way to Build 5G Going Forward

By Eugina Jordan, Vice President of Marketing, Parallel Wireless

Open RAN - the movement in wireless telecommunications to disaggregate hardware and software, to open interfaces and reduce costs is taking off and is the only way to build 5G networks of today and tomorrow.

According to Dell'Oro Group, cumulative Open RAN revenue from 2020 to 2025 could be as high as $15 billion, with Open RAN revenues accounting for more than 10% of the overall RAN market by 2025.

With Open RAN and the "virtualization" it brings, operators are enabled to run software-based network functions on standard commercial-off-the-shelf (COTS) servers. With non-proprietary, open interfaces Mobile Network Operators (MNOs) can use one supplier's radios with another's servers -- something previously not possible. The Open RAN movement enables a broader, vibrant, innovative,cost-effective, open ecosystem of complete solutions.

Open RAN is utilized in All G networks from 2G, 3G, 4G and 5G. In telecommunications, 5G is the fifth-generation technology standard for broadband cellular networks, which MNOs began deploying worldwide in 2019, and is the planned successor to the 4G networks which provide connectivity to most current cellphones today. 5G will account for as many as 1.2 billion connections by 2025according to the Global System for Mobile Communications Association (GSMA). 5G offers a completely different spectrum of the network ensuring that it can connect to everyone and bring forth all devicesand machines together.

5G technology is designed to deliver multi-Gbps data speed along with ultra-low latency, reliability, and massive network capabilities, which are a few of the key advantages. The higher bandwidth of 5G networks ensures that all users are able to connect more devices at the same time. With 5G there will no longer be slow speeds just because more users are utilizing the same internet connection. 5G will transform industries from healthcare, transportation, manufacturing, automotive, and energy, to name a few.

5G Use Cases

5G will enable many new use cases. Examples includeEnhanced Mobile Broadband (eMBB) which is a natural evolution to existing 4G networks that will provide faster data rates and therefore a better user experience than current mobile broadband services. eMBB will enable 8k video streaming, immersive (virtual and augmented reality) gaming, video analytics, and telemedicine.

Ultra-Reliability and Low Latency Communications (uRLLC) is a new service category in 5G to accommodate emerging services and applications having very stringent latency and reliability requirements such as smart grids, intelligent transportation systems, and remote surgery.

And Massive Machine Type Communications (mMTC) caters to scalable connectivity for a large number of devices and latency agnostic applications such as energy meters and connected home appliances. The possibilities and use cases for 5G are enormous.

Open RAN and 5G Standalone (SA)

Today, most 5G deployments are supported by existing 4G infrastructure where 5G radios are integrated into the existing LTE core network. This is known as Non-Standalone (NSA). 5G Standalone (SA) is the best option for Open RAN networks, as it is not dependent on 4G equipment. With 5G SA, the network is simplified with 5G radios complemented by a next-generation open core network. 5G SA Open RAN networks are ideal for new applications as they provide ultra-reliable, lower-latency communications, allowing more people and devices to use mobile data at the same time, thus enabling true 5G connectivity. According to the Global Mobile Suppliers Association (GSA) Research 97 operators are identified as investing in 5G standalone (including those evaluating/testing, piloting, planning, deploying as well as those that have launched 5G SA networks). And GSA has catalogued 20 operators as having deployed/launched 5G standalone in public networks.

To support 5G applications and services with massive amounts of data, Open RAN networks are the best option for MNOs to integrate a broad ecosystem of software vendors, capture new revenue opportunities and scale for the future.

Open RAN networks can provide additional flexibility to meet rigorous 5G application requirements across different industries with varying network demands for performance, capacity, and latency.

Utilizing Open RAN in 5G networks provides interoperability, improved network performance, network intelligence to shape transactions and lowers Total Cost of Ownership (TCO), both Operating Expenses (OpEx) and Capital Expenses (CapEx) through the implementation of cloud-native automation. Cloud-native automation tools such as Continuous Integration/Continuous Delivery (CI/CD), Zero-Touch Provisioning (ZTP), Artificial Intelligence (AI) and Machine Learning (ML) enable the creation of agile, flexible, elastic, and efficient applications in modern, dynamic Open RAN environments. When automation becomes a key feature of 5G Open RAN solutions, MNOs reap the benefits of not only flexibility of choice and cost savings, but also the agility, scalability, ease of management and upgradeability that comes with the promise of a cloud-native Open RAN solution.

Automated Orchestration and Management is anotherkey benefit from a cloud-native Open RAN solution. Automation with modern tools and technologies can provide several advantages and help at different stages of network deployment, from preparation to rollout of a new network or service, then operating and monitoring the network after roll-out. Automation is also important when it comes to termination or scaling down the network.

The diagram below illustrates the four different stages of network or service deployment and the benefits of automation.

Bringing Up a Site

Once the infrastructure has been set up, the next step is to provision the service or bring a radio site up and running. Zero Touch Provisioning (ZTP) is the automated way of provisioning a service with no manual intervention needed at all.

Testing and Upgrade

Once the network/service has been provisioned, any new features, bug fixes or software upgrades and downgrades are done through automation utilizing Continuous Integration/Continuous Delivery (CI/CD).

Without automation, it can become a tedious task to send people to the site for software upgrades and testing. This can be time consuming, costly, and prone to errors.

With CI/CD software automation, upgrades and downgrades can be done in seconds or minutes with no manual intervention. This can lead to significant reduction in costs and time.

Optimization

Once the network or service has been provisioned, it is also necessary to monitor and optimize the network to enhance and fine tune to meet the required user experience. Artificial Intelligence (AI) and Machine Learning (ML) are key tools to providing intelligent management and operations of the network.

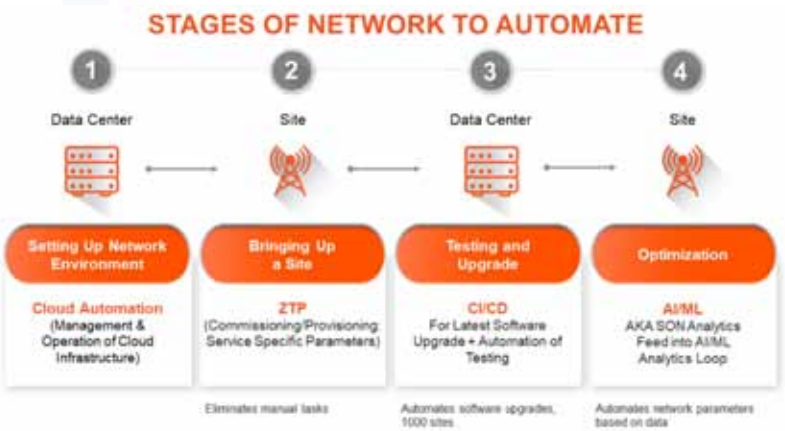
Eugina Jordan, Vice President of Marketing, Parallel Wireless

Networks are increasingly complex, and the only way to manage such networks is by having a self-learning and self-decision-making tool which automates the management and operations of the network.

With cloud-native O-RAN compliant Open RAN networks that utilize automation tools and techniques, MNOs get an agile, flexible, efficient, elastic Open RAN solution that enables them to increase their profitability and reduce their Total Cost of Ownership (TCO).

To help manage modern wireless cellular networks, the proprietary, closed networks of the past cannot keep up with the scale and scope of what is needed for 5G networks of today and tomorrow, with multiple spectrum bands, highly sliced and multiservice. Intelligence is becoming tightly interwoven with 5G networks and beyond and is an important part of the Open RAN solution.

Eugina Jordan is Vice President of Marketing, Parallel Wireless. She is a self-made immigrant woman, she started her telecom career as a secretary and now is the VP of Marketing of the industry disruptor Parallel Wireless. She is an author, inventor, and a speaker. Her passion is to help other women to realize their full potential.



ISpA: Powering Innovations for India's Space Frontier

With a focus on driving growth and capacity for India's space domain - Indian Space Association (ISpA) is putting a lot of efforts towards bringing private and public sector organizations together to drive innovations in the SatCom segment.

Lt. Gen. AK Bhatt (Retd), Director General, Indian Space Association (ISpA) *speaks with* Zia Askari from TelecomDrive.com *about the organizations key responsibilities, its future plans and how opening up of India's SatCom space can enable connectivity for unconnected rural parts of the nation.*

What are the key responsibilities of ISpA and how does the association help in the growth of space sector in the Indian economy?

ISpA aims to be an advocate and enabler for private and public sector engagement, growth, and capacity building in India's space domain. We will work with the Indian government, regulatory entities, and national and international organisations to achieve this goal along with other stakeholders and also participate in formulating effective, efficient and appropriate policies and,

regulatory frameworks for ease of doing business and policy stability. The association also aspires to foster awareness and promotion of design, manufacture, launch, operation and R&D of space related equipments like satellites, launch vehicles, round & space control systems. etc.

ISpA will support Indian startups and established companies in the space domain and act as a unified voice and bridge in the Indian space industry for ensuring and enabling policy frameworks. The association will also focus on interface with defence and strategic domain organisations to understand their needs and sensitize them about emerging technologies. We will facilitate the creation of a healthy collaborative business climate and provide a strong platform for all space industry stakeholders to cooperate, identify areas of mutual growth and sustainability and if need be, look for joint ventures.

Who are the current members and what is the structure of ISpA? What has been the response? and are more companies joining ISpA?

The overall response of the industry players has been overwhelming with several prominent names coming forward to express their willingness to join since the launch of ISpA. We are continuously adding both startups as well as established companies to the organization and we also plan to integrate with other industry associations.

ISpA member entities consist of prominent names from the Indian Space Industry. The founding members include Bharti Airtel, Larsen & Toubro, Nelco, One-Web, MapMyIndia, Walchandnagar Industries and Alpha Design Technologies.

The Core Members include Ananth Technology, Centum Electronics, Godrej & Boyce Mfg., Maxar India, Hughes Communications India, MIL Industries, Bharat Forge and Astra Microwave Products.

The startup members would include, Agnikul Cosmos, Astrome Technologies, Bellatrix Aerospace, Dhruva Space, Digantara Research & Technologies, Kawa Space, Pixxel, Pixxel Space India, Skyroot Aerospace, Galaxyeye Space Solutions and Dron Vayu.

How does the Satcom policy being discussed in the government, help and motivate indigenous manufacturers in the segment?

The opening of the space communication segment to private companies has generated a lot of excitement in the industry and will go a long way toward increasing the much-needed capacity to meet demand in both existing and new areas. This would include a large portion of the country where people live in tough-to-reach inaccessible places where establishing terrestrial networks has proven impossible.

The magnitude of the impact factor for corporations, strategic communitiesand citizens should also inspire the government to work towards creating an enabling environment to ensure that the satellite communications spectrum is protected for space users.

This would also be a critical step in keeping markets active and encouraging new players to enter the market and contribute to the country's vision of indigenous manufacturing and growth.

What are your views on the current position of the sector and how will the connectivity through satellite networks prove to be a game changer for the enterprises and customers in the coming years?

Today, the global space sector contributes more than $371 billion, with India accounting for only around 2.6% of it. In regards to Satcom, India accounts for less than $0.3 billion, but satellite services such as vehicle launch amounts up to roughly $2 billion in our country. The LEO satellite networks will bring in the possibility of uninterrupted and high-speed connectivity for the enterprises covering significant regions of India within their ambit, which so far remain disconnected from the internet.

The launch of satellite networks will be able to reach deep into rural and isolated locations, according to the new satcom policy under consideration. Satcom is crucial in the military, coastal security, border surveillance, disaster management, mission critical operations, and other strategic applications, in addition to commercial uses such as broadband, broadcast, and Sat IoT.

Getting from Operator-centric 4G/LTE to Zero-Touch 5G Networks

By Andrew Colby, Head of 5G Strategy & Product at Guavus, a Thales company

I was thinking recently about Elon Musk and his vision for the SpaceX Starship, which will return astronauts to the moon and ultimately carry explorers to Mars and back. SpaceX has tested the Starship's ability to lift off, perform maneuvers and touch down safely, sticking the landing back on Earth. This was an unmanned mission with no astronauts on board to pilot the spacecraft — an impressive demonstration of zero-touch operations.

Even with astronauts onboard, the Starship will fly itself, relying on sophisticated, telemetry-driven avionics to control in-flight operations from liftoff to touchdown. Of course, astronauts can instruct the spacecraft to do X, Y or Z, but once directed by the pilot, it performs the necessary maneuvers autonomously.

In fact, controlling the flight of such an advanced spacecraft in real time is so complicated that relying on human pilots could cause the Starship to veer out of control and crash. Zero-touch is a must-have capability and not merely nice-to-have.

Contrast this with Boeing's 777 jetliner, which also incorporates state-of-the-art avionics. While it's said these jets are able to "fly themselves," a pilot is capable of piloting the aircraft in a wide range of conditions, and humans are so essential to in-flight operations that there are always two pilots on board. Avionics are employed to augment the ability of pilots but are not intended to serve as a substitute for the humans in the cockpit.

5G Zero-Touch Network Operations

Operating today's 4G/LTE networks is analogous to flying a Boeing 777. Human operators are integral to network operations workflows. Network monitoring provides valuable

telemetry data that informs decision making, but the people in your Network Operations Center (NOC) are in charge.

In zero-touch 5G networks, your NOC team will become more like the SpaceX Starship astronauts, directing the network to do X, Y or Z, which will then proceed autonomously, without the need for humans to perform the necessary functions. As in the Starship, real-time telemetry data will be continuously collected and analyzed to inform 5G "in-flight" operations for carrying out service orchestration and network automation functions. In its own way, the vision for zero-touch 5G is as bold and ambitious as that of the Starship.

How can you realize this objective in your own networks? The answer lies in the design principles and key technologies that underpin this vision, which the 3GPP has created as part of the 5G System.

New Standards

Standards enable suppliers to build applications that are interoperable with other products adhering to those same standards, fostering the growth of a supplier ecosystem that helps fuel innovation. Suppliers benefit by investing in product development with confidence that there will be a market, while customers benefit from the competitive environment that spurs further innovation with the freedom to choose best-of-breed products that strike the right cost-benefit balance for the customer.

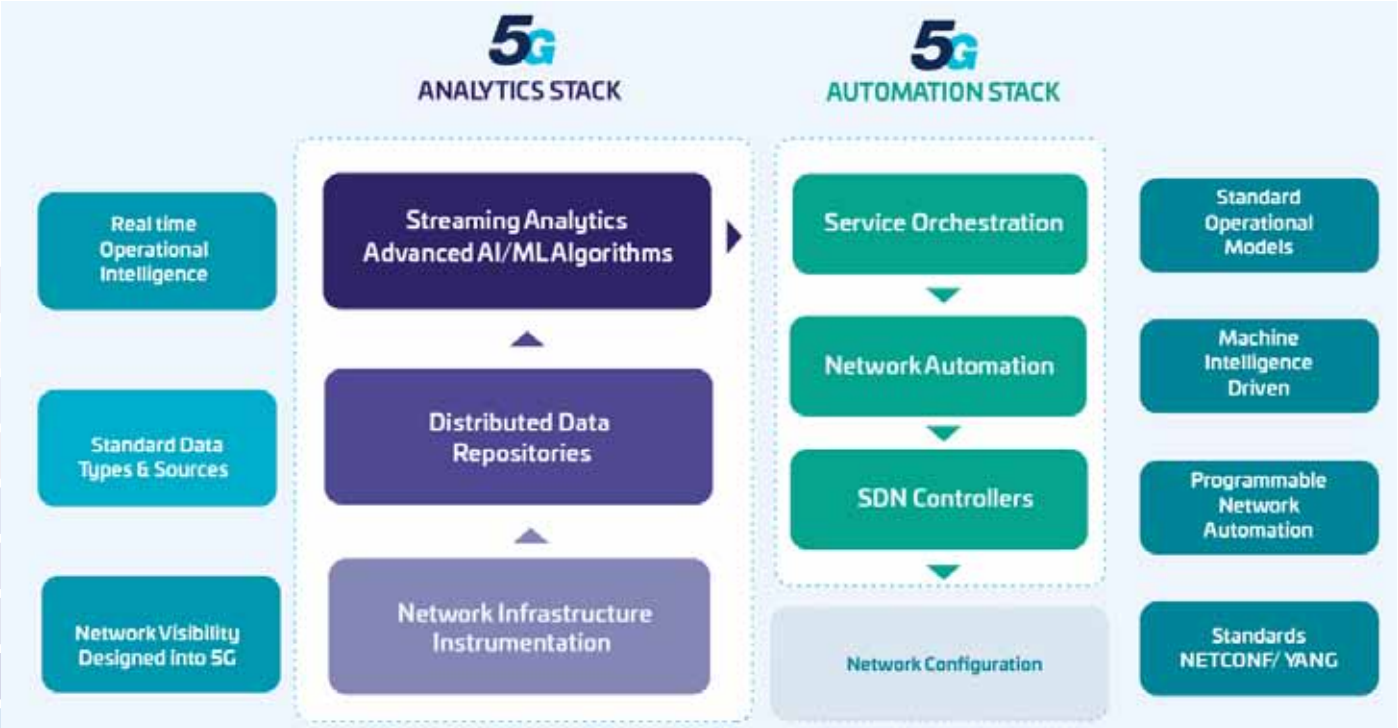
OSS/BSS solutions for telco networks have been plagued by a lack of standards, particularly when dealing with the different types of data that are critical to network operations, service management and billing. This has resulted in a proliferation of middleware and mediation products that have been utilized to integrate components from many suppliers into the highly customized OSS/BSS systems that operators depend on.

This is changing with the 3GPP's investment to standardize network and management data analytics in 5G network operations, which I described in a blog post (https://tinyurl.com/2p8mvkt4). The transition to 5G will force mobile operators and suppliers to engage in the process of OSS/BSS transformation, which will include the adoption of new standards in the management plane. This transformed network operational environment is the foundation on which zero-touch 5G network operations will be delivered.

Built-In Telemetry

Network automation relies on telemetry to continuously monitor the state of the network, and telemetry data is generated by instrumentation. 4G/LTE mobile operators have deployed extensive overlays of additional hardware and software components that are used to instrument the network for telemetry data. The scope and complexity of these overlays have grown concurrent with the increasing scale of 4G/LTE networks and explosive growth in the volume of voice, messaging and data traffic.

In 5G, the goal is to design the instrumentation into the network itself, minimizing the need for separate telemetry overlays, except perhaps for the occasional forensic analysis requiring in-depth monitoring using specialized equipment. The 5G RAN and Core will be built using virtualized network functions in which software instrumentation can be easily embedded, either designed into the underlying code or installed with each software component as normal operating procedure.



Best practice for cloud-native environments is to instrument software components so that each generates the metrics, logs or traces related to current operational state. Hyperscale cloud providers have successfully adopted this model for managing the applications, services and networks deployed in massive data centers. 5G operators will take this same approach, while also adopting standards for telemetry data.

Streaming Analytics and AI/ML

4G/LTE operators have deployed big data analytics solutions that collect telemetry from the monitoring overlay, store the data in a central data lake and then perform analytics. However, this approach often results in a significant lag in detecting network state changes, which not only hinders any attempt to utilize network automation but can also leave network operators flying blind.

5G networks require a new approach. Operational intelligence for network automation requires high performance streaming analytics that can detect network state changes in real time. Ideally deployed at the 5G edge, streaming analytics processes high-velocity data, performing local data aggregation and scoring to extract signal information, which is passed further upstream to consuming network functions and other analytic consumers.

AI and machine learning will be heavily utilized in 5G networks for analyzing data to detect patterns and identify trends predicting the future state of the network. Predictive analytics will be critical for enabling operators to act proactively, with machine intelligence also driving the network automation required.

Getting to Zero-Touch 5G Networks

The major difference between 4G/LTE and 5G networks is the primary consumer of network data analytics. In 4G/LTE, monitoring and analytics feeds dashboards in the NOC, and operators utilize this information to make decisions. In 5G, your network analytics data will feed directly into service orchestration and network automation functions. Human operators in your NOC will still have dashboards that provide visibility into network state, but for the purposes of maintaining situational awareness and backstopping network automation in the event of a problem beyond the ability of 5G machine intelligence.

Zero-touch networks are the vision for 5G, and you're likely going to reach this goal incrementally. When automation is initially employed, you can ensure there are hooks to insert human decision-making into workflows until you gain full trust in your analytics-driven machine intelligence. Once your system is proven capable of performing faster and more reliably than the people working in your NOC, these manual interventions can be disabled, allowing you to benefit from the power of autonomous, self-driving 5G networks.

Andrew Colby, Head of 5G Strategy & Product at Guavus, a Thales company

To read more on 5G Analytics & NWDAF: 5G NWDAF Use Cases (https://tinyurl.com/v5sjj6ez) and Guavus 5G-IQ NWDAF (https://tinyurl.com/my52jkfj).

Andrew Colby is Head of 5G Strategy and Product Management at Guavus, a pioneer in AI-based analytics for communications service providers. As a member of the Guavus Office of the CTO, Andrew leads initiatives with customers to identify ways to apply analytics to improve and transform their operations and customer experience. He has worked in the areas of telecom and IP networking, operational support systems, and data analytics for more than 30 years.

Trends & Predictions 2022 | Combating SMS-Based Phishing Attacks

By Ian Matthews, President & CEO, WMC Global

Entering 2022, WMC Global expects to see threat actors and malicious parties continue to change their tactics, techniques, and procedures (TTPs) as the security marketplace shifts and old TTPs cease to be effective. Security teams must be diligent in their monitoring, intrusion detection, and incident reporting operations to keep up with a rapidly changing threat landscape and to avoid being reduced to playing whack-a-mole with threat actors. One of the biggest ongoing threats to consumers is SMS-based phishing attacks. The bulk of the scams we are tracking take place over SMS messages sent from both shortcodes and ten-digit long codes (10DLC).

New Phishing Methods

Continued attack surges indicate that two-factor authentication (2FA) is no longer enough to secure accounts against traditional or SMS phishing attacks. Threat actors will need to develop new kits and TTPs to keep up with private sector security adaptations. We may also see changes to credential phishing operations that correlate with social engineering objective changes.

The Escalation of Puppeteer Kits

Microsoft recently announced that they now offer users the ability to login directly using Microsoft Authenticator or other multi-factor authentication methods. Eliminating passwords allows Microsoft to drastically reduce the attack surface that's exposed against traditional and SMS phishing attacks. However, this decision, and any other changes additional companies make that follow suit, will likely drive threats actors to employ puppeteer kits more heavily.

Puppeteer kits are dynamic phishing kits that enable threat actors to adapt their phishing pages and insert themselves into the user login process, automatically triggering 2FAand prompting the user to enter their security code into the attack website rather than the legitimate institution. As WMC Global previously reported, threat actor Kr3pto has already implemented puppeteer kits using SMS lures in an attempt to bypass multi-factor authentication security on UK banks. The kits currently use a manual process, requiring an individual to be involved each login process which is costly and low-volume, but exceedingly effective.

Phishing Kit Sophistication

As new authentication methods gain traction, kit sophistication will increase out of necessity. Threat actors do not need to become more sophisticated—they only need to purchase increasingly sophisticated kits. Spammers and low-level scammers will continue to implement these kits, making the kit developers the linchpin of these operations.

Pandemic-Themed Scams

One of the most troubling trends

that we have seen at WMC Global is the exponential growth of pandemic-related scams. Threat actors are posing as international government bodies, such as US state governments and the UK National Health Service (NHS) use SMS phishing to lure victims into providing personal information in exchange for pandemic relief grants, unemployment payments, and digital Covid-19 vaccine passports. These types of scams are extremely lucrative for threat actors, with total US scam losses estimated at between$87 to $400 billion and will continue to grow as a challenge as the pandemic persists.

Law Enforcement Challenges

Despite a robust toolset for cybercrime analysis and management, many law enforcement agencies are struggling to keep pace with SMS-based cybercrime, primarily because of a lack of understanding of the SMS ecosystem and how threat actors are able to operate on the channel. These agencies are often preoccupied with combating many forms of crime at once, so they have little bandwidth to build defenses specifically designed for mobile-oriented and SMS phishing scams. The most important future actions of law enforcement agencies are continued education of their personnel, building alliances with key cybersecurity organizations that can share their knowledge of the mobile space, and encouraging intra-organizational information sharing.

Growth in Business Email Compromise (BEC) / Ransomware

BEC has grown substantially over the last year and looks poised to continue on this path. Malicious actors spoof company email addresses and act as though they are a user's boss, HR representative, or other trusted member of their organization providing a surprise bonus or needing assistance transferring funds. The threat actor's email will always aim to encourage a user to input their login information for the company network or divulge their personal bank details in order to move forward in the scam.

Why Are These Methods Effective?

1. SMS phishing works particularly well because SMS messages have a 98% open rate (compared to only 20% of emails) and 60% of end-users answer texts within one to five minutes of receiving them.
2. Since the onset of COVID-19, attackers have optimized the rapid digitalization of workplaces and lack of in-person interaction to drive vulnerable end users to make quick, underinformed decisions about suspicious scenarios they are experiencing online and on their mobile devices.
3. Mobile phones are a massive security grey area and end users generally expect

"someone else" to be responsible for their digital security, including the phone manufacturer, their workplace IT department, their financial institution, or any other common service for which customers provide financial information. But who is really in charge of securing mobile devices and the actions taken on them? Manufacturers have put some model protections in place, but they do not cover "user error," and employers can pay for employee cell phone plans, but the device is most often personal. End-users must understand that they are responsible for securing their own devices, even if an employer requires them to use them for work.

What Now?

Threat actors will always create new ways of reaching potential victims no matter how much protection consumers are offered and it is essential to combat mobile threats from all sides. As the pandemic shows little signs of slowing in 2022 and the world becomes more technologically advanced to combat the new challenges presented, businesses must shore up their defenses against SMS phishing attacks impersonating their brand and affecting their customers. Law enforcement agencies must also expand their knowledge of the mobile messaging space. Additionally, consumers will benefit from becoming more observant and taking primary responsibility for their digital safety on their mobile devices.

Ian Matthews, President & CEO, WMC Global

Ian Matthews is co-founder, President and CEO of WMC Global. He is a co-inventor of mobile in-market monitoring and leads the ideation of spam and threat mitigation efforts. Over the last 5 years, Ian has diversified the company customer base from telco-centric to include financial services, cybersecurity, and government agencies. He has, in turn, expanded the product suite to include a full range of compliance, risk assessment, and cybersecurity solutions. In the last two years alone, Ian has doubled the number of customers who rely in WMC Global's services.

Mytat: Enabling Innovations in Skill Based Hiring

Putting its focus on skill based hiring and pre-employment testing solutions, Mytat is driving a lot of innovations in India in terms of driving and enabling assessment and recruitment programs to hire freshers & professionals for corporates across multiple verticals in India.

Om Narayan Rai, Head-Enterprise Business Solutions and Academia Relations at Mytat *speaks with* Zia Askari from TelecomDrive.com *about the current scenario in pre-employment testing solutions space and what can we expect in the coming year.*

Please share some details about Mytat?

Mytat is a leading name in the sphere of skill based hiring and pre-employment testing solutions. It has a database of tests that spans a vast spectrum of conventional and emerging domains of learning and work. Mytat is empanelled with AICTE & helps to connect key stakeholders in the educational sector such as colleges, corporates, and industry experts with students in colleges and vocational educational institutes to provide access to 100s of jobs.

Mytat is an Artificial Intelligence (AI) and Machine Learning (ML) based platform that covers the entire life cycle of a student/ candidate. Mytat provides a unified platform to assists students attain real-time industry knowledge and trends in skills requirements & also helps to provide the students with Internships/apprenticeships and other employment opportunities. 500+ organizations such as Amazon, Sapient Nitro, Amdocs, Bank of America, etc have partnered with Mytat for their services & have utilized their assessment and recruitment programs to hire freshers & professionals for multiple job profiles. Apart from the recruitment aspect, Mytat also provides a validated assessment platform that can be used to conduct online exams be it for Schools, Colleges, or even for public sector jobs.

Digital transformation across industries is driving the need for specialised skill sets, your comment?

With two great wars the world has seen, the focus of doing business was on Sales, Operation, Manufacturing and Branding. We can see their dominance in each industrial era. Late but not very late, the world has witnessed Skill as a business from 1980 onwards. However, it has presented a very complicated outlook on the world due to too many non-standardised practices and with no tangible outcome. However, the time wheel has changed its course due to technological advancements, rising needs of the businesses are forcing employers to consider skilling as a continuous process. Now the thrust is not only on skill but also on maximising the individual's potential.

Digital Transformation is an overdue

need and thanks to Corona to force all the stakeholders to adopt, implement it at a fast pace and large scale too. Given this context world in general and industries in specific contexts have realised that we are bound to live in volatility and uncertainty. The only thing that can keep us all going is skilling-reskilling and going even beyond it – enabling humans to achieve their potential.

For example, Today, we see the manufacturing, health care segments – which are very niche in their own way are using it not only onboarding and training but also for critical surgery deliveries, operations using digital interfaces. Nevertheless, the Skill segment is now forced to standardise practices, adapt to futuristic interventions to stay relevant in the digital era.

What are the major challenges faced by employers due to a huge skill gap in India?

While the world's workable population, especially India here is at its peak, it is surprising to note the shortage of talent, that too when India is the biggest supplier of talent, about 16% of highly qualified migrant workers are from India. This story reflects as is in the Indian context too.Employers are struggling more than ever to fill open positions. As per Manpower Group's study Forty-five per centof employers say they can't find the skills they need, and for large organizations (250+ employees) it's even higher, with 67% reporting talent shortages in 2018. Similar views can be gathered from the Skill India Report.

Skill Gaps force organizations to begin the onboarding with training, however, with high attrition rates prevailing in the country, the ROI is way below the expectation. These pieces of training range from a week to a year and a half long as well in their duration. These timelines take away the advantage of an employer on aggressive delivery commitments.

Employees also find it difficult to visualise the career path for themselves and it is a mammoth exercise for leaders as well to manage expectations in absence of a clear road map.

Who needs to re-skill and upskill, which is the age group that stands to benefit from these reskilling opportunities?

Experienced professionals, especially from 5 years of experience onwards need to be part of reskilling, upskilling initiatives. We can roughly say that 30 years onwards age group should be part of these initiatives and there is no upper age limit to it. I look at these interventions as a continuous process, hence all age groups will be able to get the maximum benefit out of them.

What are some of the challenges faced by companies/recruiters towards hiring the right talent for the organisation?

From the making of the first wheel as mark innovation, technology advancement was looked for easing out human life, enhance the quality of results, bring a better experience to all around it. However, not using technology in the VUCA world reflects upon the perception of how recruitment decisions are made. Today not only hiring decisions but also, how an employee is being managed throughout employment tenure in the organization from an employability enhancement perspective through upskilling or reskilling and growth is looked at very critically.

If we look at the available talent pool in India and categories them as Freshers, Early Experience, Mid and Senior Professionals, these all-talent pools bring a different set of challenges to a TA professional or a company.

Freshers have incomplete profiles, no transition preparation for the professional world and almost nil real-time work experience

Early Experience lot keeps switching jobs to find better pay or trying out a new role in search of finding an aspirational match. There happened to be the biggest problem of stability, skill match and willingness to learn. Rather they would leave what is at hand which they are yet learning and move to try something new

Mid and senior segments have a stereotype against assessments and that results in high time wastage in finding fitment through mere interviews

What are some of the technologies and skilling trends that you see being popular in 2022?

With more than ever growing technological advancement, changing socio-economical, environmental situations and other dimensions of our world, the following skills and technical skills will be most shout after:

1. Analytics
2. Big Data
3. Human Experience (ahead of User Experience)
4. Cyber Security
5. DBMS
6. SaaS, Cloud Infra
7. Web Development
8. Mobile and Digital Management
9. Programming
10. Technical Infrastructure Support

However, the skills that also need focus are:

1. Solutioning: Questioning, reasoning, ideation, problem-solving etc
2. Managing Self: Psychological Well Being, Stress Management and agility
3. Interpersonal Skills: Executive Presence, Leadership
4. Technology Adoption: Technology Use, Design and Programming

Critical Communications in 5G Era

With global telecom networks adopting 5G communications standard, operators are always looking for better 5G use cases and critical communications can open up a number of innovative use cases and further drive 5G adoption to the next level.

And in order to achieve this, mobile networks must meet new demands as human communications changes from click and wait/background traffic, to interactive, real-time, haptic communication, and introduction of critical machine-to-machine type communications.

The networks must provide significantly reduced end-to-end latency and higher reliability than is achievable today. Ultra-reliability is vital to enable critical communications. And hence, low latency is crucial to ensure applications are usable and interactive whether human-to-human, human-to-machine or machine-to-machine communication.

And as we move ahead with 5G deployments, there is an increased need for ultra-reliability and virtual zero latency in order to help drive adoption of critical communications for telecoms.

Ultra-Reliability and Low Latency

Minimizing latency and increasing reliability opens up potentially lucrative new business opportunities for a number of industry segments, arising from new applications that simply will not work properly if network delays are too high.

Latency determines the perception of speed. Real-time functionality demands the lowest possible delay in the network. Reliability creates

confidence in users that they can depend on communications even in life-threatening situations.

Here are some use cases that can open up with the help of critical communications in 5G era:

Autonomous Vehicles

Autonomous vehicles is a hot topic for many industry players from car manufacturers, consumers, and insurance companies to governments. The US Secretary of Transportation has said that driverless cars will be in use all over the world by 2025. The IEEE predicts up to 75 percent of vehicles will be autonomous in 20403. While the autonomous vehicles developed today rely mostly on onboard sensors and systems, their performance and safety could be vastly improved through 5G communications.

Autonomous vehicles can reduce accidents and improve road utilization as vehicles can be driven closer to each other and more safely than human drivers can achieve. Transportation companies can take advantage of autonomous car fleets.

The fleets can be utilized more effectively with fewer accident caused by human error. In addition, real-time, ultra-reliable communications between vehicles, infrastructure and smartphones could enable traffic to flow more smoothly, eliminating traffic jams. Commuting time can be used for other activities with the help of autonomous vehicles. This might save an hour per day for people living and commuting in cities.

The communication system needs to be extremely reliable as it involves human safety. The end-to-end latency requirement needs to be as low as 5-10 ms1.

Augmented Reality / Virtual Reality

Augmented Reality (AR) enhances a real-world view with graphics. Real-time information is displayed based on the user's location and/or vision.

Virtual Reality (VR) creates a totally new user experience with the user being in a fully immersive environment. The AR/VR device needs to track user movements accurately, process the movement and receiving image, then display the response immediately. An end-to-end latency of more than 5 ms would lead to cyber sickness, an uncomfortable and nauseating customer experience.

AR will enhance existing service experiences. For example, shoppers can experience how a dress would look on them without trying it on. AR can also be used in emergency situations, for example, firefighters could use AR to see ambient temperature, a building's layout, exits and potentially dangerous areas4. Police officers could use AR with facial recognition to identify a suspect in real-time from the police database before an arrest is made.

Students could learn inside a VR environment conducted by a remote teacher. Students can gain experiences as large as the inception of the universe or as small as how to split an atom. In product development, VR can be used to design and prototype products before they are built, shortening development time and cost.

Remote Robotics / Surgeries

Remotely controlling robots, rovers, devices or avatars in real time can help us to work safely outside dangerous places. Hospitals can arrange remote robotic surgeries via a customized 5G network as if the surgeon was physically present.

For public safety, robots could be sent to work in dangerous situations, such bomb disposal or firefighting. The system needs to be extremely reliable with end-to-end latency

of less than 1 ms to support the necessary haptic feedback.

The combination of haptic interaction and 360º cameras feeding live video over a 5G network to a VR head mounted device will produce a powerful experience as though the user is actually in the remote location and in control.

Reinventing Radio Access

Radio access is close to the user and has a significant impact on reliability and latency. While LTE supports today's broadband traffic, more advanced technology will be needed to provide the ultra-reliability and low latency required by new use cases and applications.

Programmable 5G multi-service architecture

To address ultra-reliability and low latency we will need to build a resilient system dynamically managed that offers high-availability and brings content close to users, on demand and instantly. The key network architecture evolution comes from the following concepts.

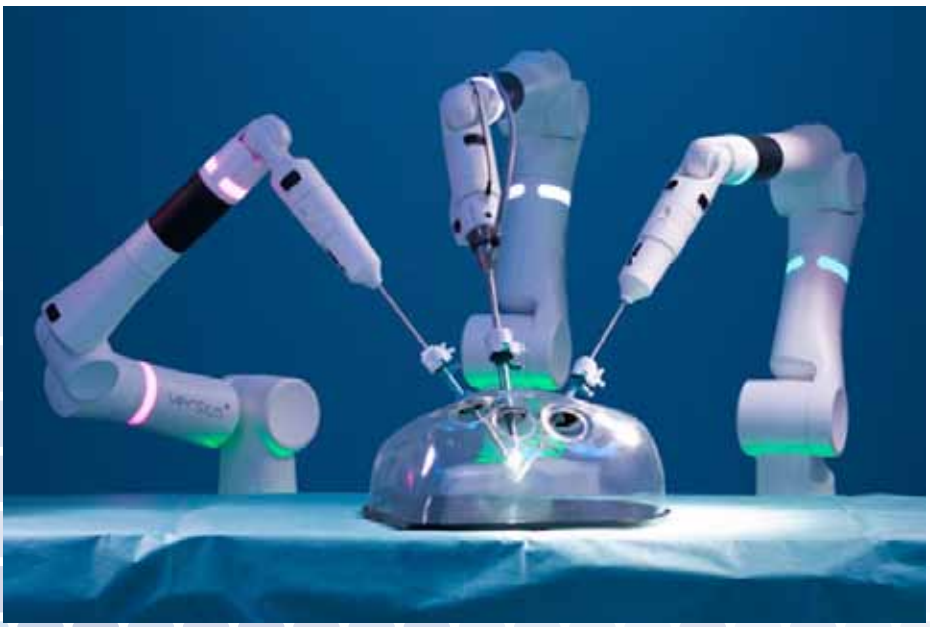
Network Slicing

Network architecture has been traditionally built around a specific use-case. For example, GSM was built primarily for voice and LTE for mobile data. In the future, this "one use case per one physical network" approach will be obsolete. The 5G network will be designed to be flexible enough for an operator to create an instance of an entire network virtually, that is, a customized network for each diverse use case.

Different customized virtual networks will exist simultaneously and without interfering with each other. For example, a customized virtual network for ultra-low latency autonomous vehicle control can co-exist with a customized virtual network for 3D video /4K screen viewing, which requires extremely high throughput.

Programmable Networks

A flexible network will be needed to adapt to various performance requirements. Software-defined functions create a programmable infrastructure, which means that the path of packets through the network is not restricted by a fixed architecture and can be programmed and optimized for latency. Software Defined Networks (SDN) in the mobile backhaul (MBH), aggregation and backbone network enable the use of traffic optimization, bandwidth allocation and Mobile-Edge Computing (MEC) to reduce latency.



Network Resiliency

Network elements must deliver high availability. This can be achieved by pooling a number of core elements and using load balancing to ensure no interruption in service should one or more core elements fail.

The failed core element can be left to recover while the other core elements continue to function. Even should the backhaul become unavailable, service will continue almost unaffected by using a stand-alone mode of operation.

Mobile-Edge Computing (MEC)

Moving the gateway and application server closer to the radio can significantly reduce latency even further. Services are no longer tied to a single point-to-point IP connection, enabling the connectivity path to be freely chosen according to actual service demand.

This any-to-any connectivity model, in which devices communicate directly through local switching at the RAN level avoids unnecessary data forwarding to centralized mobility anchors (gateways). This offers the shortest and best path for routing traffic that needs low latency while at the same time ensuring continuity and seamless mobility.

Moving Forward

There is a need for a phased approach to embrace Critical Communication in 5G era and it can happen with the help of deployment of radio access and programmable 5G multi-service architecture. Programmable 5G multi-service architecture will introduce Network slicing, Programmable Networks, Network Resiliency and Mobile-Edge Computing (MEC) and then it will be easier for telecoms to deploy reliable critical communication networks and open up great number of use case opportunities.

Unlock a world of opportunities powered by software with **Parallel Wireless** Open RAN solutions. We empower operators to unleash the full potential of their networks as they migrate to 5G through our O-RAN compliant, ALL-G solution that drives down cost and enables mobile operators to innovate, modernize and expand their networks.

Contact us to see how we can put Open RAN to work for you.

parallelwireless.com

Telecom Drive

The pandemic era is pushing the boundaries of digital transformation in every sphere and 'DIGITAL FIRST' is only way forward.

Go 'DIGITAL FIRST' with Most Trusted Global Resource for Telecoms.

TelecomDrive.com