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WORLD REPORT

July 2021

5G in the Cloud

Operators Can Reimagine 5G Dynamics With a Cloud Native Strategy



5G



"Nokia is innovating on-premise and cloud-managed SD-WAN solutions"

Sandeep Sehgal
Nokia India



How the pandemic has accelerated digital enablement at global telcos

Pankaj Garg
Alepo Technologies



Guavus: AI-driven Analytics in the 5G Era

Chris Neisinger
Guavus



IDEMIA Driving Innovations in 5G, M2M and eSIM Space

Matthew Foxton
IDEMIA



"RAD is offering backhaul providers the shortest evolution to 5G xHaul"

Udy Kashkash
RAD

Industry-Leading Open NWD.A.F.
for **5G** Network Automation

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5G IQ NWD.A.F.

Enabling MNOs to operate **5G** networks at scale



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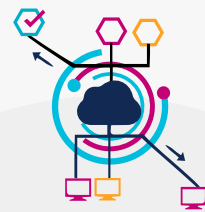
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From the Editor



Zia Askari
Editor, TelecomDrive.com

Securing the 5G Era

Adoption of 5G by telecom operators and CSPs globally is accelerating radio access network (RAN) densification, introduction of new network architectures, and innovative use cases with stringent throughput, latency and reliability requirements.

While telecoms embrace 5G – there are two important aspects of 5G that operators and CSPs are looking at – one is the right choice of transport technology and the second is how to secure their 5G networks.

And in order to be successful in this scenario, network operators need to deploy 5G transport technologies that can be completely trusted and meet these new requirements in a cost-efficient and timely manner.

In a traditional scenario, point-to-point dark fiber has been the transport technology of choice for wireless networks but this can quickly become cost prohibitive in certain scenarios as we move towards full scale 5G deployments.

And that's why, operators and CSPs are looking towards innovative backhaul, midhaul and fronthaul transport

technologies in order to embrace 5G in a cost effective manner.

The right choice for 5G transport is driven by rigorous technical requirements and the vast array of use cases that 5G technology enables, balanced with real-world economic and operational aspects.

Securing 5G

There is no doubt that 5G is one of the most significant technological advancement and societal disruptors of this decade. This technology leap promises to deliver higher bandwidth and greater connectivity to enable new services and capabilities that will impact every aspect of our lives.

As confirmed by various industry stakeholders, 5G is far more than an just an increase in radio access bandwidth to the user equipment—this technological leap also incorporates the cloud-based architecture of the 5G core and its exponential capability to support a huge ecosystem of things and machines.

There are a lot of 5G use-cases and some of the most prominent ones include autonomous cars, integrated smart cities, augmented reality, interconnected

social networks and devices, and even 5G-connected farm management on smart farms. In a nutshell, 5G will be ubiquitous.

Future-ready 5G architectures are designed to close security gaps from previous cellular networks, but the basic nature of 5G is injecting new security challenges in the network and operators must address this thoroughly.

As 5G is starting a new era of communications, these transformative services will likely introduce threat elements not yet seen or experienced before and that why networks need to be well prepared to handle such scenarios.

Security considerations that need to be examined include – various aspects of software, virtualization, automation, and orchestration, as well as Radio Access Network (RAN) considerations. Zero-Trust security and other techniques need to be explored in order to mitigate the threats. 5G is bringing a new future and will also come with a lot of unknowns and that's why laying the right platform for securing 5G networks holds great importance for telecoms today.

CONTENT

5G in the Cloud	4	How the pandemic has accelerated digital enablement at global telcos	18
“Nokia is innovating on-premise and cloud-managed SD-WAN solutions”	10	Guavus: AI-driven Analytics in the 5G Era	21
“We Aim To Make 5G Accessible To Everyone”: MediaTek	12	“RAD is offering backhaul providers the shortest evolution to 5G xHaul”	23
“We are working on rollout of 5G specific courses”: TSSC	14	“We enable 6 billion mobile users around the world to stay connected on our APIs”	25
Turns Out, Not All Wi-Fi 6 APs Are Created Equal	16	IDEMIA Driving Innovations in 5G, M2M and eSIM Space	27

5G in the Cloud

The next phase of innovation in 5G Next Generation Core is focusing on rapid adoption of Cloud Native architecture. The objective of adopting Cloud Native principles and technologies by Service Providers is to achieve web scale and attain the economies of scale



5G is being developed for an extremely mobile and hyper-connected society and to accommodate the need for emerging use-cases and business models. The evolution from Fourth Generation (4G) to Fifth Generation (5G) is significant and unlike previous evolution journeys for Telecom Operators and Communication Service Providers (CSP).

5G is not only affecting the consumer, enterprise and industrial space with new use cases and

business cases allowed by enhanced capabilities, it's also encouraging operators and vendors to re-think and re-architect how the network will be built and managed.

To accommodate the myriad of divergent use-cases proposed in 5G, it is imperative that the network should be architected for inherent flexibility and efficiency. This might be accomplished by making network functions modular so that they can be quickly deployed and scaled on demand to provide service agility and cost-effectiveness.

Cost-effectiveness can be

achieved in cloud native paradigm by the efficient bin packing in the containers, more fault tolerance and deployment flexibilities. Efforts in this direction were started by adoption of Network Function Virtualization (NFV) and Software Defined Networking (SDN) related technologies to make Mobile Core (MC) applications cloud ready.

Along the way, valuable lessons have been learned. In many cases, the true potential of NFV was perhaps wasted a bit; instead of bringing virtual network functions to a common NFV Cloud, the mobile

industry built Cloud silos dedicated to specific Virtual Network Functions (VNF).

In some instances, physical Network Functions were ported as VNFs without necessarily addressing the required changes to the underlying software architecture; this resulted in deployment and operations complexities.

The next phase of innovation in 5G Next Generation Core is focusing on adopting Cloud Native technologies and architecture. Ultimately, the objective of adopting Cloud Native principles and technologies by Service Providers is to achieve web scale and attain the economies of scale. Taking the cue from 3GPP, European Telecommunications Standards Institute (ETSI) has published augmented NFV referenced architecture to accommodate for the Cloud Native Network Function (CNF) and enhancement to NFV framework to include Zero-Touch, Containers, Load Balancers and more as part of the reference architecture.

With the decomposition of Network Functions and Network Services being exposed through Application Protocol Interfaces (API), the push towards Cloud Native in 5G Core is getting more realistic. Also, various use cases proposed and envisioned for 5G demand a more scalable, reliable, distributed and flexible Core Network making the case for adoption of Cloud Native for Service Providers stronger.

There is also a lot of hype and confusion surrounding Cloud Native in general and the adoption of Cloud Native architectures and technologies within 5G in particular. Leveraging a service-based architecture and Cloud Native Network functions in the 5G core has proved challenging during various proof of concept efforts.

While providing implementation flexibility by breaking up existing

network functions into microservices, Cloud Native Functions struggle to maintain the packet processing and latency requirements of 5G.

While control and management plane applications are the immediate candidates for the Cloud Native transformation, operators and vendors are also exploring the migration of Radio Access Network (RAN) functions towards the cloud and container centric environment. This is targeted to help the operator develop a common orchestration and management model for both Core and RAN Network functions.

RAN functionality is extremely sensitive to latency and throughput, typically addressed with custom hardware accelerators for performing Layer1 and Layer2 radio layer functions. Even when most parts of the RAN 5functions will be migrated to Cloud Native platforms, some of the highly computation-oriented and latency sensitive components are expected to stay outside the scope of Cloud Native for some time.

Regardless of the fact that the Cloud Native model is an attractive direction for many good reasons, it does not map completely to the Communication Service Provider's (CSP's) mobile network operational needs.

That said, the standardization community for 5G has adopted a modular approach to the way the 5G core is architected, encouraging a Cloud Native approach to its implementation. However, there are gaps in the architecture, indicating that the telecommunications industry is just at the beginning of the Cloud Native journey.

Welcoming the Cloud Native Era

Cloud Native is a relatively new concept being introduced into the telecommunications domain.

The Internet Technology and enterprise worlds have invested in technologies and methodologies for

agility and efficiency with the result of faster and less expensive services development and deployment.

The journey to Cloud Native started with the introduction and adoption of virtualization-related technologies which led to more efficient usage of the system resources and an agile way to package and deliver applications. The wide-spread adoption of virtualization techniques in the data center was pre-dominantly responsible for the genesis of Cloud as it's known today.

Adoption of Cloud, even in the IT and Enterprise world, has been a major endeavor to move to an "as-a-service" paradigm while bringing dynamicity, flexibility and scalability as system hosting applications became more transient in nature and services endpoints became more predominant.

Moving to the cloud led to the emergence of Cloud Native as an innovative approach of building and running applications in such a way to reap the true benefit of cloud computing models. It is how, not where, applications are created and deployed; thus deploying in a Public, Private or Hybrid Cloud environment has no bearing on an application being Cloud Native. The key is deploying in the "cloud-way" – even if it means a re-architecture.

Network Function Virtualization (NFV) along with complementing Software Defined Networking (SDN) technology and adoption of an All-Internet Protocol (IP) transport network, positioned the telecommunications industry to be well-equipped to adopt cloud technologies to transform the network and build a better ecosystem to promote open innovation.

Adopting Cloud Native methodologies is the next logical step in the evolution, with 5G demanding the future network to

be more flexible, agile and robust to satisfy the service delivery requirements for a variety of different and new use cases.

Reimagining Innovation with Cloud Native

Defining Cloud Native can be tricky. Cloud Native is about the approach to how applications can be built and operated in the Cloud Computing construct. It has become prominent as more and more application deployments are being done in cloud. Concepts of being Cloud Native can be applications to the technologies, architecture and tooling.

Cloud Native Computing Foundation (CNCF), which is an open source software foundation under the umbrella of Linux Foundation (LF), defines Cloud Native as: Cloud Native technologies empower organizations to build and run scalable applications in modern,

dynamic environments such as public, private, and hybrid clouds.

Containers, service meshes, microservices, immutable infrastructure, and declarative Application Programming Interfaces (API) exemplify this approach.

CNCF provides structure and constraints for being Cloud Native, requiring that the applications being developed and architected use microservices methodologies to be deployed as Containers. Traditional applications when broken down into small, reusable components are referred as “microservices.”

To be properly classified as Cloud Native, microservices need to be “stateless” meaning there has to be separation of processing from the associated data and the storage of the data in Cloud.

Dynamic Orchestration is another critical pillar of being Cloud Native. That’s where the CNCF-hosted Open Source container orchestrator

“Kubernetes”⁴ plays a crucial role in actively scheduling and optimizing resource utilization while providing observability, resiliency and an immutable infrastructure.

The Power of Microservice Architecture

Microservice architecture is a design philosophy based on a general consensus, but there are no strict definitions or standards bodies prescribing for the decomposition of Business requirements into Domains.

Further decomposition breaks each domain into Services (applications) that fulfill the Business requirements; Business requirements are built with the objective to prevent failure. The term “Micro” in Microservices refers to the scope of functionality rather than the scale required to meet the availability and reliability required in an operational environment.

Ideally, each Microservice is a single loosely coupled service where



a monolithic gateway network function includes a Firewall, Routing, Deep Packet Inspection (DPI), and Charging and Datastore.

When re-architected using microservices principles, all the functions are deployed individually and with clear interfaces and dependencies. As architected, the individual functions, such as Charging, can be scaled and managed in isolation.

The appropriate Restful API, to its peer, will provide a constant endpoint for the service being delivered by that particular microservice. This results in an easier upgrade of the specific function represented by each microservice compared to upgrading the complete network function allowing for a faster delivery model.

Breaking the monolithic applications into microservices can also lead to challenges in developing, deploying and operating many more entities. As a result, DevOps along with automation tooling is needed for managing the increased complexity.

DevOps is an important tenet of 'being Cloud Native'. Another important point, is that Microservices Architecture does not prescribe that it has to be a container-based virtualization to deploy the services, but Cloud Native architecture does have that requirement.

How Telecom are Driving Innovation with Cloud Native

Adopting Cloud Native application architecture and development methodologies can get complex. Thus, it is important to understand the value proposition of Cloud Native; adoption is strong in the enterprise and IT domain and recently the telecommunications industry is trending toward Cloud Native for 5G. Key benefits of adopting Cloud Native computing architecture and technologies include:

- **Agility:** Microservices: and container-based applications are optimized for changes in application design. Cloud-native applications enable developers to rapidly change components of an application with minimal disruption to the overarching application structure and edifice. This ability to rapidly change an application enables organizations to

Various use cases envisioned for 5G demand a more flexible Core Network making the case for adoption of Cloud Native

reliably upgrade and modify applications to accommodate the changing needs of the business

- **Enablement of DevOps:** Cloud-native applications illustrate the realization of DevOps because they automate operational processes such as scaling, monitoring, self-healing, redundancy and high availability. The automation of these operational processes enables development and operations teams to collaborate more efficiently and subsequently ship code faster
- **Resiliency:** Cloud-native applications are architected with explicit attention to

resiliency. The loosely coupled quality of microservices architectures, for example, ensures that the degradation of one microservice has minimal impact on other microservices. As a result, development teams can swiftly locate and restore loss of functionality specific to a degraded microservice. Moreover, self-healing processes specific to container orchestration frameworks automate the replacement of unhealthy containers with healthy containers

- **Portability:** Because cloud-native applications are container-based and abstract away dependencies on their external environment, they are more easily transported across different environments than other types of applications. The portability of cloud-native applications renders them less prone to vendor lock-in and subsequently more attractive to customers that are reluctant to deploy their applications to a unitary framework

- **Granular application scalability:** Developers can automate the scalability of container-based applications by means of a container orchestration framework such as Kubernetes. Moreover, orchestration enables developers to scale the container or containers within an application that require scaling instead of scaling the entire infrastructure on which the application runs

- **Efficient resource consumption:** The lightweight quality of containers allows them to be rapidly destroyed and created. In addition, containers can be deployed to a server with

greater density than VMs. Containers deliver more efficient resource consumption than VMs and subsequently facilitate accelerated development, improved operational efficiency, and cost savings

Abstraction and Cloud Agnostic: Container and container orchestration technologies provide inherent abstraction as they are infrastructure and technology agnostic. This makes it much easier to adopt hybrid cloud strategy for Cloud Native application architecture, as an application can run on any cloud platform (private or public) as same set of APIs for managing container lifecycle is exposed and can be managed any available Cloud Native tooling

Orchestration: Due to the immutable nature of containers, it is much simpler to manage the lifecycle of containers than VMs. Kubernetes is the de-facto container orchestrator and has mature constructs available like helm charts and operators for the Create, Retrieve, Update, Delete operations for applications deployed and exposed as service endpoints. Moving to containerized microservices provides the ability to orchestrate the containers such that separate lifecycle management processes can be applications to each service, allowing for each service to be versioned and upgraded separately. If the application is implemented with the appropriate level of state separation, this process can allow for fully automated in-service upgrades and rollback of the containers that

make up the application

Cloud Native in 5G

Arguably, there are two perspectives on the business drivers for the adoption of Cloud Native in 5G (or any wireless generation for that matter). It can be viewed from the Communications Service Provider (CSP), or, it can be viewed from the network function vendor perspective. In both cases, the need to adopt Cloud Native approaches

Cloud Native is about the approach on how applications can be built and operated in the Cloud Computing construct

converge for very different reasons. The actual motivations for adoption by the entities concerned are probably due to a unique set of conditions. Following are some broad generalizations.

From the CSP perspective, the arrival of Cloud Native is an interesting path on cost optimization. Mobile networks are predominantly an access and edge network. The costliest portions of any network tend to occur where there are large amounts of aggregation due to numerous physical points of presence. In mobile networks, this translates to the physical numbers of base stations and their necessary aggregation.

In parallel with this, there has been intense competition between CSPs in saturated markets to gain and

retain subscribers. This competition led to a decline in Average Revenue Per User (ARPU) as witnessed in some markets. Because of this, over many years, there have been focused efforts to bring the cost of access down to levels sustainable by the market subscriber ARPU.

This effort has been successful. However, this success has exposed other areas of cost that need to be addressed. Among these are the operational aspects of the network. This motivated many to contrast and compare CSP network operation with network operation in parallel industries, namely the hyperscale public cloud operators, where large infrastructure has very lean operations.

A number of very appealing facets of a cloud operation were exposed:

- Automated operation and deployment
- Appeal of high service availability based on common (and relatively cheap) infrastructure

Both facets address the newly exposed cost reduction needs. Moreover, these facets when matched with new trends in software development (such as CI/CD) also opened the prospect of delivering new and competitive services more quickly to their customer base, leading the potential of time-to-market advantage.

System design had to be complete before implementation could begin, implementation had to be complete before testing could begin, and so on.

VNF to Cloud Native Network Function

In the initial phase of NFV adoption, the network function migration to a virtual platform used a “lift and shift” approach, resulting in disappointment for operators deploying NFV 1.0. The touted benefits of moving to the virtualized cloud platform (multi-tenancy,

scalability and flexibility) could not be realized.

Furthermore, this initial approach was not as cost-effective when considering additional tooling, integration and operation effort required to make it operational. Moreover, telco “way of working” led to monolithic VNF designs yielding in static and slow-to-respond systems.

However, the exercise of adoption for NFV has resulted in some important lessons learned: network functions should be “abstracted” to be technology-agnostic; the network should be decoupled from the application as much as possible; and applications need to be “stateless” rather than “stateful. All this makes the case for building a “true Cloud Native” network function deployable on network cloud infrastructure.

In NFV 1.0, the network functions were deployed as VMs in conjunction with OpenStack. Operators who already started their NFV journey have deployed VNFs running on an OpenStack platform and probably made significant investment in building tooling capabilities for managing and operating the NFV platform.

Such operators can be tempted to run Kubernetes in VMs as a quick extension to their existing OpenStack ecosystem to support CNFs. This approach for supporting CNFs within VMs can provide fully featured multi tenancy and security. However, it comes at a huge cost of lost workload performance, complex networking, much lesser container density and additional workflow for managing VMs running Kubernetes.

This forces the industry to gravitate towards building co-existing OpenStack and Kubernetes platforms running VNFs and CNFs respectively in an independent fashion. This co-existence model provides a better platform for heterogenous workload with an easy support framework. However,

horizontal legacy integration between CNF and VNF is challenging and lacks a unified resource view, leading to operational difficulties.

Because of these limitations, the potential end state in the evolution of the Cloud Native deployment platform is Kubernetes replacing OpenStack as a single stack solution to manage heterogeneous workload.

Cloud Native Powering 5G Era

The Cloud Native landscape as a technology has a rich Open Source-supporting ecosystem that has enabled the Cloud Native approach to build and run applications that fully exploit the various benefits and cost efficiency of the cloud computing model. This new model includes services architectures, infrastructure-as-code, automation, continuous integration/delivery pipelines, monitoring tools, and etcetera.

Applications built and deployed with the Cloud Native pattern have some common characteristics:

- They are composed of microservices, therefore, each application is a collection of small services that can be operated independently of one another. Microservices are often owned by individual development teams that operate on their own schedule to develop, deploy, scale and upgrade services
- Cloud Native applications are packaged in containers, aiming to provide isolation contexts for microservices. Containers are highly accessible, scalable, easily portable from one environment to another and fast to create or tear down. This flexibility makes them ideal for building and running applications composed of microservices
- Cloud-native applications are built and run on a continuous

delivery model, supporting fast cycles of build, test, deploy, release, and develop. This helps software service developers and infrastructure IT operations teams to collaborate with one another for building, testing and releasing software updates as soon as they are ready, without affecting end-users or developers of other teams. Such a model encourages the adoption of DevOps principles, fostering collaboration between software service developers and infrastructure IT operations. This model also encourages the creation of a behavioral culture where building, testing and releasing services applications more rapidly, frequently and consistently

Cloud Native applications are dynamically managed, often built and run on modern platforms such as Kubernetes, which offer hardware decoupling, and which is critical in terms of deployment automation, scaling and management.

In the context of application developer-operators placing their workloads into public clouds run by large Web-scale cloud service providers, there is no doubt that this approach has been successful.

However, in reviewing the requirements of 5G and applying the Cloud Native model, it is an attractive direction for many reasons including flexibility, cost savings and efficiency. The model does not map completely to the SP’s mobile network operational needs. That said, the standardization community for 5G has adopted a modular approach to the way the 5G core is architected, encouraging a Cloud Native approach to its implementation. There are gaps, and the telecommunications industry is still on the Cloud Native journey.

“Nokia is innovating on-premise and cloud-managed SD-WAN solutions”

As a global vendor with strong enterprise focus, Nokia is enabling a lot of innovative solutions in order to tackle the diverse challenges facing industrial and government customers. The company is offering its innovative on-premise as well as cloud-managed SD-WAN solutions ideally suited for various enterprise verticals.

Sandeep Sehgal, Head Enterprise Business, Nokia India interacts with Zia Askari from TelecomDrive.com about how Nokia is spearheading its effort in the enterprise space

What are the key priorities for Nokia Enterprise today?

The global pandemic demonstrated the need for connectivity and digitalization to bring more resilience to industrial operational models. We've seen an acceleration amongst governments pushing harder on broadband-centric initiatives and physical-process-heavy, asset-intensive enterprises who are looking to accelerate their digitalization strategies to capture the benefits of agility, productivity and to ensure business continuity during the pandemic – or any other situation.

There is a great opportunity for telecom technologies to help these industries along their digital journey. Expanding our enterprise business and working with Service Providers as a channel partner to enterprises for solutions like private wireless solutions



and SD-WAN managed services is a key priority for Nokia.

How has the ongoing pandemic situation affected the technology landscape for Enterprise today? And how is this opening up opportunities for Nokia?

The pandemic tested all organizations' ability to cope with stress to the system. Organizations that were well into their digital transformation journeys were better equipped to cope with the challenges the pandemic presented. Therefore, companies that lagged in their digital transformation will move quickly to catch up and digitalize their operations.

To ensure the business continuity goals mentioned earlier, and deliver on productivity, efficiency, and agility, Enterprises need to accelerate the adoption of more integrated solutions across a greater range of users, technologies and locations in both the IT and OT space. For example, hybrid cloud applications, home-based employees, high-performance Industrial IoT connectivity solutions for Industry 4.0 and fixed and mobile business-grade broadband supplementing traditional MPLS connections.

As more employees (but not all) return to traditional offices, sales teams return to being on the road, and government offices move more functions online, the emphasis will shift again so flexible solutions win over 'one size fits all' approaches. The same is the case for government networks where broadband holds the key to driving economic development to bridge the digital divide.

Forging deeper connectivity within communities, supply chains, factories, utilities, airports and railways, will unlock massive potential for service providers as we partner with them to solve digitalization challenges for

these industries and government.

User and network security is increasingly important in all angles of this. All of these are fundamental elements of Nokia's solutions for industries and the way we partner with service providers to deliver managed services.

What are some of the technology-led challenges that an enterprise is facing today? How can Nokia help solve these challenges?

There can be many challenges depending on the industry and their unique objectives. You can't expect a railway network to have the same needs as a manufacturing plant, or a public school to have the same challenges as a windfarm. Maneuvering or accessing the right ecosystem of partners in many cases is key.

A vendor with a strong enterprise focus needs to be working across the broad ecosystem to tackle the diverse challenges facing industrial and government customers. Nokia has deep in-house industry-focused experts who understand the business challenges and work with specialist industrial partners and service providers to develop and build the best approach for the unique needs of the industry they approach.

Another key challenge facing enterprises is security and safety. A recent analysis from Nokia Deepfield shows more than a 100% increase in daily DDoS peak traffic between January 2020 and May 2021 - making enhanced cybersecurity perhaps the leading priority for 2021. We've seen much news recently on IT environments forcing OT network closures.

Like the Colonial pipeline case in the US for example where a single IT / VPN password leak led to the massive shutdown of the pipeline to secure the OT side of the operation. Securing the much larger enterprise perimeter

that results from hosting applications in public cloud and providing access to employees and partners from remote connections remains a challenge for many organizations.

From day 1, Nokia's SD-WAN solutions have been designed and developed specifically with this in mind – connecting anyone and anything to any application, anywhere – all with centralized policy control to ensure a consistent security approach and a reliable, uniform user experience.

Another major challenge is the engineering and operational skills to deploy and operate large, complex, secure networks. Nokia is helping with this by building and operating cloud-managed services such as Nokia Digital Automation Cloud and Nokia Cloud-managed SD-WAN that service providers can put their brand on and integrate with other solutions to deliver the combination that meets each enterprise's unique needs across any market segment.

The business of sustainability is also one of business continuity. It is not just an environmental imperative, it is an industrial imperative – a financial imperative. Protecting and conserving finite resources, finding new ways to do business, or shifting business models – while at the same time “doing no harm” is fundamental to the Industry 4.0 business financial equation.

Working with carbon neutral, goal-oriented businesses is key. Ignoring this comes at too high a cost for industries and puts their future existence into question. The path to sustainability in part can be addressed with digitalization and automation to help businesses shift and pivot to new business models and get up to speed faster and in a more digitalized manner.

Europe-based Equinor is an international energy company with a growing wind and renewables business and impressive sustainability targets. It is working with Nokia to

deliver the secure, smart, offshore wireless digital fabric that Equinor can use to support its communication and maintenance activities and safety objectives for its offshore windfarms in the UK.

How do you look at accelerated deployment of SD-WAN within the enterprise segment as an opportunity. How is Nokia enabling innovation in this space?

Nokia is innovating both on-premise and cloud-managed SD-WAN solutions that allow service providers and VARs/SIs to meet the needs of all sizes of enterprise customer. Our open architecture, which leverages x86 based CPE hardware, allows integration with 3rd party security and other functions and on-ramps to all the major cloud and SaaS solutions.

SASE is another fast emerging trend that is largely seen as the future of cloud security for enterprise. What is Nokia doing in this space?

SASE is really a collection of component functions that include NGFW (Next-gen Firewall), CASB (Cloud Access Security Broker), SWG (Secure Web Gateway), ZTNA (Zero Trust Network Access) and many others.

Nokia's approach to SASE is oriented around three fundamental enterprise requirements – (1) PREVENT risks and attacks; (2) DETECT threats, anomalies and attacks; and (3) RESPOND with appropriate action when something is detected. Our SD-WAN solutions have embedded NGFW, URL filtering, IPS/IDS and other security capabilities and can be combined with 3rd party security functions deployed either as CPE-hosted VNFs or in the cloud (see diagram below). We are also investing in ML/AI technologies to automate the response to security threats and adapt to changing baseline conditions and behavioral anomalies over time.

“We aim to make 5G accessible to everyone”: MediaTek



Whether it is Smartphones, Smart TVs, Chromebooks, Voice Assistant Devices or Wi-Fi routers MediaTek is one such organization that is on the forefront of delivering innovation which is meaningful for everyone.

With 5G set to become a dominant force in the near future – MediaTek is gearing up towards making 5G accessible for everyone. Anku Jain, Managing Director, MediaTek India interacts Zia Askari from TelecomDrive.com about the company’s current strategy and its future plans

MediaTek has been on the forefront of innovation when it comes to enabling high powered computing for smartphones. How do you look at the current 4G and 5G devices landscape today?

MediaTek powers across brands globally, be it Smartphones, Smart

TVs to Chromebooks, Voice Assistant Devices (VADs), Wi-Fi routers among others. We believe that technology makes the world a more inclusive place where smart and connected is an equal opportunity for all. That is why every innovation at MediaTek has people at its center.

We aim to make 5G accessible to

everyone, across mobiles, homes and other domains. As people are trying to navigate the new normal during the pandemic, smartphones have helped them stay connected, informed and continue with their work/study or entertainment related activities among others.

At MediaTek, we are at the forefront of cutting-edge R&D and innovation that is powering the world’s most capable 5G devices. The MediaTek Dimensity 5G family combines the smart and fast together in order to deliver premium features and superior performance, be it as processor speed, power efficiency, camera features, gaming, or connectivity enhancements. However, at the same time, with chipsets such as the MediaTek Helio G series, one can continue to expect innovations across the 4G ecosystem to ensure that mass consumers have access to the best of both 4G and 5G technologies.

According to a recent Counterpoint Research, emerging markets will be the next big growth driver for 5G smartphone adoption. In India with 5G smartphone sales reaching 7% in Q1 2021 and expected to hit 21% by the end of the year the demand for 5G ready devices is only set to increase.

We are living in a new normal today and this is an era of work from home, school from home and everything from home. Is there anything specific that MediaTek is offering with the help of its processors to deliver enhanced experiences to its users in such scenario?

The Pandemic has been a catalyst for change, accelerating the adoption of digital technology around us, be it smartphones, 5G, cloud computing and smart devices etc. We are working closely with our partners and developers towards introducing newer and more feature-rich chipsets in the market.

MediaTek powered smartphones are preferred by consumers globally and we aim to power premium and immersive smart device experiences for our consumers. According to the 2021 Q1 Global Smartphone AP Market Share by Counterpoint Research MediaTek continued to gain share and reached 35% share in Q1 2021 and the share has increased both in the LTE and 5G smartphones.

Products powered by MediaTek chipsets have ably supported the ecosystem during the pandemic by ensuring productivity, continuity and addressing the work from home, entertainment and gaming needs of end-consumers. The success is attributed to the power-packed performance delivered by MediaTek technology, especially the MediaTek Dimensity 5G series and MediaTek Helio G series. The multi-core design brings smartphones an unrivalled combination of multi-cameras multimedia enhancements, MediaTek

HyperEngine Gaming Technology, AI-enhanced camera and security features, AI and imaging innovations, MiraVision display technology, dual SIM with advanced carrier aggregation along MediaTek 5G UltraSave power-saving technologies.

How important is India for the company today? What kind of investments can we expect from MediaTek in this year?

As mentioned above, India is a leading market for MediaTek thanks to the growing number of smartphone and smart device users. During the 5G era, we hope to build on this momentum and deliver the best-in-class smart devices ecosystem and experience to the users. We believe MediaTek chipsets can enable technology democratization in India, not only with smartphones but other devices in key segments like smart TVs, IoT, voice assistants, and AI-enabled consumer devices. With this goal and to build further momentum on the country's growth towards becoming a fully digital self-sustainable economy, we have collaborated with leading OEMs and indigenous manufacturers to produce innovative devices catered to India and foreign markets.

We have increased our R&D investments with a focus on the latest technologies like 5G, edge computing and AIoT and support the application's needs in areas like connectivity and networking, health-tech, telemedicine, and remote education among others. MediaTek's Indian design centers have a strong understanding of the booming integrated circuit (IC) design industry. We believe these efforts will largely benefit the smart devices ecosystem in India.

How do you look at the competition today? How is MediaTek creating better opportunities for its ecosystem partners?

The smartphone market in India is very dynamic and we are working closely with our stakeholders to rollout solutions that meet customer expectations and demand. The 5G device ecosystem is growing much faster compared to earlier generation technologies and we are leading the 5G wave in India across the smartphones and smart device ecosystem.

Powered by 5G, and next-gen technologies like Artificial Intelligence (AI), IoT, Machine Learning, Image understanding and Cloud Computing, devices are becoming less technical and more intuitive, intelligent and user-friendly. The demand for 5G enabled devices especially handsets, smart devices, connectivity solutions with multi-tasking capabilities and wireless networks among others is bound to increase over time. The key factor that differentiates MediaTek is the diversity, R&D and innovation, making us a preferred choice for popular brands both in India and globally.

What more can we expect from MediaTek in the coming months?

The next big wave will be around 5G smartphones and other smart devices, so we are preparing to address the market needs. Already MediaTek Dimensity 5G series of chipsets including the flagship MediaTek Dimensity 1200 has hit the Indian market, and several smartphones powered by this are available for consumers. In the coming months, our focus will be to raise awareness about the capabilities offered by these technologies and thus help reach their benefits among a wider customer segment. Simultaneously we are focusing on innovation in areas where we can deliver further enhancements, for example, connectivity, performance, multimedia, and performance for an incredible user experience.

“We are working on rollout of 5G specific courses”: TSSC



Telecom Sector Skill Council (TSSC) is largely seen as a torchbearer committed to enabling skilled manpower for India's telecom industry. Growing along with the industry and catering to their manpower needs in a timely fashion, TSSC is focusing its effort towards rolling out 5G specific courses.

Arvind Bali - CEO, Telecom Sector Skill Council (TSSC) speaks with Zia Askari from TelecomDrive.com about TSSC's focus on providing adequate manpower for India's telecom sector

India's telecom sector always looks forward to having skilled workforce when it comes to delivering services not only in big cities but small locations. How is TSSC helping the sector in this direction?

TSSC is committed to providing adequate manpower for the telecom industry through its robust mechanism of subject matter expertise and thought leadership in the telecom sector. Our operations cater to all touchpoints in the telecom sector. We have 600+ training partners with 1000+ training centres across all 36 states and UTs across the nation. This gives us the ability to mobilise candidates quickly and effectively.

Additionally, we have 350+ industry partners which gives us a deep understanding of the job market. Through our network of industry and training partners, we analyse the urban and rural density of manpower, current and future industry requirements in those areas and fill out the gaps wherever required. We anticipate the current and future requirements with high precision and develop courses and teaching methodologies to cater to the requirements at hand.

Telecom is one segment where there is advancement happen at a very rapid pace. How do you ensure that workforce is skilled rightly and in a timely fashion?

At TSSC, we routinely survey our partners for in-depth on ground information. We reach out to interested candidates and track the supply and demand across the nation. This lets us rapidly mobilise candidates. Additionally, through constant contact with the telecom industry, we understand the prevalent skill-gap. This helps

us promote courses relevant to the region and bridge the existing skill gap. Our PAN India presence helps us mobilise candidates quickly while ensuring the quality of manpower.

While we are looking at 5G rollout today, there is a lot of research and development happening around 6G standards. How do you plan to equip workforce with 5G/6G capabilities?

We are already working on rollout of 5G specific courses. As thought leaders in the telecom skill development ecosystem, we maintain an overview of all emergent technologies and create courses to tackle the future skill demand. We are also working on other technologies like drone technology and IoT.

A lot of operators go for having their own research Labs in order to develop innovative solutions that are future ready. How do you look at partnering with telecoms to place future ready workforce there?

The NAPS program is designed to promote apprenticeship among candidates. This helps them learn on the job through experience. We also collaborate with academia to create Centres of Excellence where candidates get exposure to high-end technology and skill training. We also partner with leading companies like on CSR projects further increasing our scope of work.

What are the global trends in telecoms skill development that India can follow and possibly take lead in. What is the role of TSSC here?

Technology is being increasingly used to better the skill development process and eliminating operational bottlenecks, reduce costs and

increase scalability. Concepts like e-learning have expanded the reach of knowledge by utilising the internet to achieve better last-mile connectivity. Courses are being gamified to improve intuitive understanding and knowledge retention. Other technologies like augmented reality and virtual reality are being used to simulate learning environments and drastically reduce the capital expenditure for training. TSSC is launching its own LMS and e-learning platform to enhance accessibility of ICT related skill training to both institutes and individuals. We are also working to incorporate AR & VR into our courses designed for digital access.

What's the size of India's telecom workforce today and what kind of growth do you foresee here?

Currently India has a total of 4.2 million strong workforce in telecom (2.4 million direct and 1.8 million indirect). While the COVID pandemic was estimated to cut down the total workforce by almost 70,000, the sector was instrumental in tackling the pandemic by enabling 30-35% of the GDP through its infrastructure and services.

The government has launched various schemes and plans designed to expand the telecom industry. The DoT is targeting around 3 million kms of optic fibre by December 2022 and about 5 million kms of fibre by December 2024. PLI schemes under Atma Nirbhar Bharat Abhiyan, increasing internet revenues, the BharatNet project and the Prime Minister Wi-Fi Access Network Interface (PM-WANI) are all major government initiatives that will increase the need for skilled manpower in the telecom industry. An estimate 4.7 million total workforce will be required by as early as 2022.

Turns Out, Not All Wi-Fi 6 APs Are Created Equal

By Rowell Dionicio, Founder & Managing Director of Packet6

Many organizations are now trying to support a combination of streaming media, VoIP and data downloads on their Wi-Fi networks, and they're considering upgrading to Wi-Fi 6 access points (APs) to improve performance. We've seen the marketing language of Wi-Fi 6 promising multi-gigabit throughput, so it seems that any AP with the Wi-Fi 6 designation should easily support various high-load scenarios found in enterprises, schools, hotels, hospitals

and other organizations.

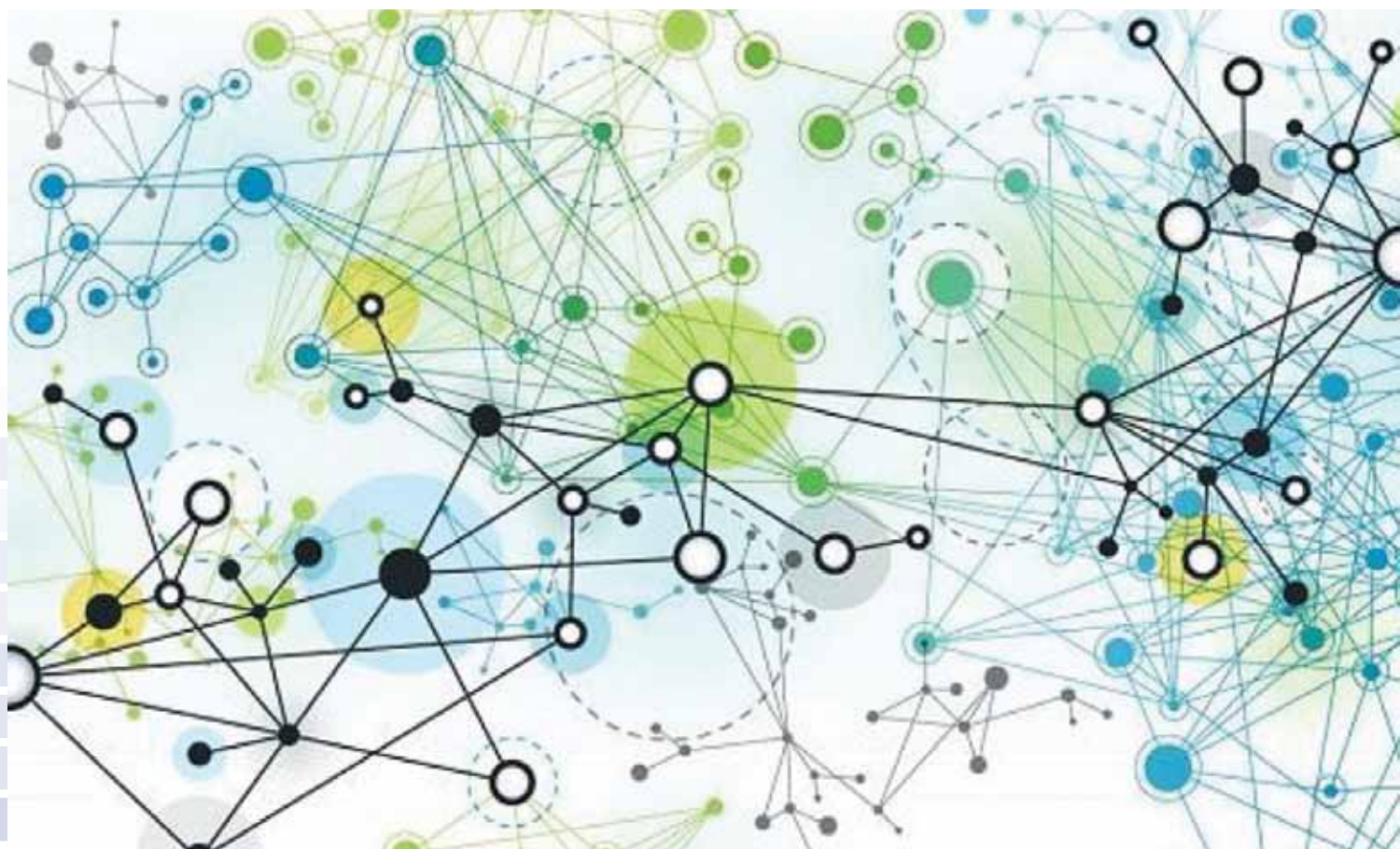
To test this theory, we recently validated a set of "stress tests" on five popular enterprise-grade, cloud-managed 4x4:4 Wi-Fi 6 APs from HPE Aruba, Extreme Networks, Juniper Mist, Cisco Meraki and CommScope RUCKUS. Many of these APs we've worked with on numerous projects. CommScope RUCKUS assembled and operated the test environment and sponsored Packet6 for the validation of the test.

We were surprised with the findings: Performance varied substantially across AP models.

While all of the tested APs share the same Wi-Fi 6 specification, vendor implementation clearly yields significant performance differences under the high-demand traffic which the APs were evaluated.

What We Tested

The test was designed to gauge these APs' overall performance in a mixed traffic environment that included large and small file transfers, high-definition (HD) video streaming and VoIP. (We also tested to learn how each vendor's cloud management system reacted to and



enabled administrators to respond to network incidents – see our full report for details).

We set up 30 Dell Latitude laptops with Wi-Fi 6 capability in one room and had them play a HD (1080p) video. Each laptop played a unicast HD video stream before, during, and after the test. Co-located with the laptops were five Apple iPads running a bi-directional Voice-over-IP (VoIP) test to simulate a VoIP conversation. Five additional iPads conducted data downloads in this room. In an adjacent room, associated to the same access point, were twenty Apple MacBook Pros, each conducting downloads of varying data sizes to simulate traffic such as web browsing, email, and file transfers.

The AP was placed in the back of the first room near the wall separating the two rooms, and a RUCKUS switch provided Power-over-Ethernet (PoE) to the APs, each connected to a multigigabit Ethernet port and auto-negotiated to full speed. To maximize

the performance of each AP, we tested for throughput and other performance metrics using an 80 MHz-wide channel. We don't normally recommend 80 MHz-wide channels in a high-density deployment but to realize full performance potential we used 80 MHz-wide.

The Test

We started video streams on the Dell laptops before the test began and played them nonstop during and after the test. During the test, five iPads simulated VoIP traffic while five other iPads ran data downloads. In the adjacent room, twenty MacBook Pros also ran data downloads.

We measured overall network throughput, multimedia performance and MOS (VoIP call quality), among other metrics.

Network Throughput

The APs delivered varied network throughput, ranging from 100 Mbps on the Mist AP to 441 Mbps on the RUCKUS AP. In fact, the RUCKUS AP delivered roughly 40 percent better throughput than the APs from Aruba, Extreme, and Meraki.

Video Streaming Results

While four out of the five APs supported trouble-free streaming performance before the test, the RUCKUS AP was the only one that delivered 30 stall-free streams during the test. Other APs caused video streams to stall on one or as many as 25 laptops, and we couldn't get the Mist AP to support 30 video streams (it managed only 24) before the test began. Multiple laptops running video tests is similar in today's environments using video conferencing.

MOS Results

The RUCKUS AP outperformed all other APs on the MOS metric, providing significantly higher voice call quality under heavy network load. More specifically, only the



Rowell Dionicio, Founder & Managing Director, Packet6

RUCKUS AP supported a MOS value that would meet typical enterprise service level agreements (SLAs) requiring “good” voice quality. Many organizations are leveraging VoIP and conferencing applications requiring good call quality.

Our Takeaway: Test Before You Buy

The RUCKUS AP significantly outperformed all of the other access points in every test. It was the only access point capable of meeting real-world success criteria—maintaining a “good” MOS score while simultaneously delivering stall-free HD video streams to 30 clients and maintaining “high” throughput for all data clients.

As they say, your mileage may vary; but this test points out that different Wi-Fi 6 APs perform differently in high-demand environments. We strongly recommend that you stress-test multiple vendor APs in your own environment before deciding on a Wi-Fi 6 upgrade.

If you'd like to learn more about the test see our full report for details or contact us today to learn how we can help you with your Wi-Fi 6 migration.



How the pandemic has accelerated digital enablement at global telcos

By Pankaj Garg, Director – Product Management, Alepo Technologies



Introduction

Communications service providers (CSPs) have been pivotal in enabling the shift to a more digital lifestyle since the beginning of the pandemic. What can they do to keep up? Overwhelmingly, and accurately, global CSPs are responding with digital transformation. Of course, many telcos have already been on the path to digitizing their networks for some years now, but this past year has accelerated modernization faster than ever before. And this is only the beginning.

The pandemic has had an immeasurable impact: on lives, lifestyles, society, and industry. For

millions around the world, digital connectivity has helped redefine a new normal, keeping businesses, governments, and societies connected and afloat. With lockdowns across countries forcing them to stay home, people switched to working, streaming, and learning online, even consulting doctors through telemedicine. Retail businesses, which had to down the shutters of their physical stores, moved online – where they will likely stay for the foreseeable future.

The growing dependence on digital services has put the spotlight on the role telcos can play beyond providing simple connectivity.

Customer needs in the pandemic

To support more relevant and innovative use cases, operators must first understand how the pandemic has shaped retail and enterprise customer expectations. Different geographies each have unique requirements depending on their infrastructure, regulatory demands, and so on, but some themes are common around the world:

- Virtual services: many countries are yet to vaccinate large parts of their populations, which means it's still necessary for people to stay at home. Several enterprises and their employees

have realized in the past year that can not only survive but thrive through remote working, so long as there is telecom infrastructure to enable social distancing.

- **Bandwidth:** as more people work from, study, and live at home, they need residential networks that can support increasing bandwidth consumption, much of which was earlier handled by enterprise networks.
- **Secure and reliable connectivity:** offices earlier ensured security through enterprise networks. As more and more office devices are connecting to the internet from home networks, the residential network now needs to provide enhanced security and reliability.
- **Speed, latency, and improved network offerings:** Public and 5G open a world of possibilities for consumer and enterprise use cases, and telcos need infrastructure to support diverse needs such as ultrafast speeds, low latency, reliability, security, network slicing, and more.

The three key drivers for digital transformation

Digital enablement provides a host of benefits to operators: it increases operational efficiency, drives profitability and revenue, helps bring services to market faster, and improves company agility. Most importantly, it facilitates CSPs to keep pace with newly evolved customer needs by enabling:

Customer centricity

The way customers interact with their CSP is changing. Many of our telco clients have reported a steady rise in the number of digital customer interactions versus offline ones over

the past few years, but they have witnessed a far more pronounced increase since the beginning of the pandemic.

With more customers now expecting a digitalized, personalized, ultra-fast, and zero-touch experience, here's what telcos can deliver today:

- **Provide the in-store customer experience through a digital channel:** digital stores, e-KYC, and self-onboarding mean customers can go online to complete many of the tasks that could earlier only be completed in stores.
- **Automate customer touchpoints:** provide a friendly, easy-to-use, and clean UX on all channels that customers use to interact with the CSP. Digitization makes it possible to minimize physical contact through virtual troubleshooting and omnichannel self-care over social platforms like WhatsApp, Facebook Messenger, Skype, and virtual assistants like Alexa and Cortana. This includes digital interactions with agents or chatbots.
- **Leverage data to create personalized offers, promotions, and plans:** personalize CX using technologies like AI, ML, and loB (Internet of Behavior).

Anywhere Culture

One of the main requirements today is enabling 'anywhere operations' for retail customers, enterprise employees, as well as distribution channels to support their customers from any corner of the world. This also holds true for telco operations; operators should aim to reduce manual and in-person touchpoints. Removing location constraints demands robust and flexible backend systems that are supported through digital OSS/BSS.

5G, with its high speed, reliability, low-latency connectivity, and more,



Pankaj Garg, Director – Product Management, Alepo Technologies

also facilitates the introduction of a new era of services. The possibilities are truly limitless: doctors performing surgery from anywhere in the world, high-speed internet services for students to attend virtual classes via video conferencing from an otherwise inaccessible village, millions of devices talking to each other and sharing data to help the health department identify probable COVID clusters, self-driving vehicles and smart traffic management, and much more.

Process Automation

Digital transformation helps integrate automation across all business processes and at all levels. Improved internal processes through automation result in higher productivity and improved operational efficiency.

Automating backend processes lets operators efficiently handle complex and repetitive tasks, free up network resources, reduce dependence on staff, minimize errors caused by manual intervention, and keep operational costs low.

Investing in modernizing their OSS/BSS stack enables telcos to launch, manage, and monetize new services faster. It achieves this through a combination of capabilities such as cloud-native services, microservice-based architecture, open APIs and standardized workflows, automated provisioning, fulfillment, testing, chatbots, as well as support for workflows, RPA, and other modern use cases.

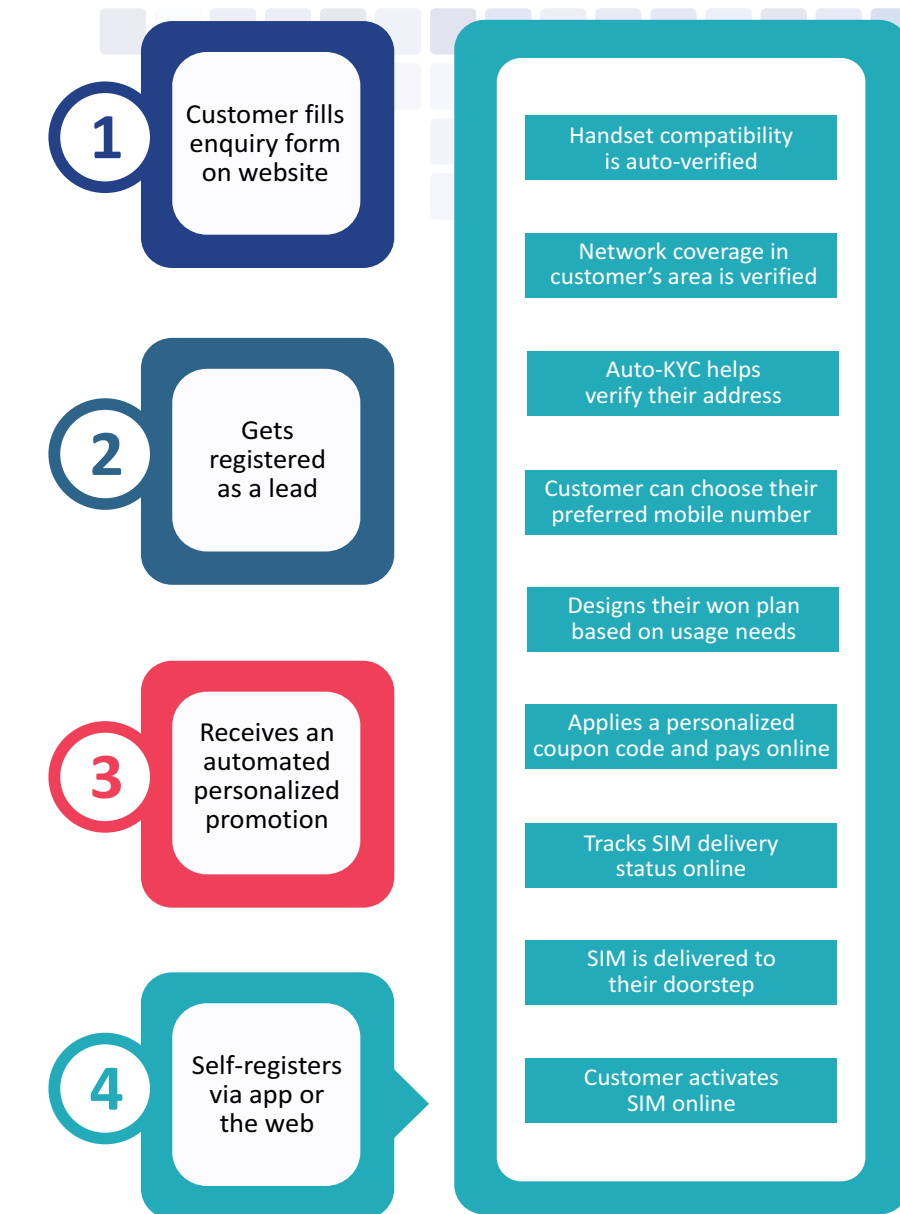
CSPs can also automate sales processes, streamlining the sales life cycle, centrally managing day-to-day operations, organizing customer databases, sending timely quotations, ensuring prompt responses to clients, and managing the sales pipeline. They can reduce the workload of creating workflows, sending emails, and configuring alerts and notifications. In addition, they can also leverage data using advanced analytics to make constant improvements to their sales process, identifying potential lucrative sales.

The benefits of sales automation include higher volumes of sales conversions, personalized offerings that help then boost brand loyalty, and more.

What the future holds

There is, without doubt, scope for telcos to evolve and grow even in these challenging times. The fate of the virus is unknown, but digitalization is here to stay. The key is to consider investing in future-proof digital innovations that help streamline business operations and optimize network infrastructure.

A combination of modern technologies such as sophisticated artificial intelligence (AI) and machine learning (ML) facilitates richer and more advanced CX and takes automation to new heights. It enables telcos to reinvent the way they engage with customers and keep pace with their evolving digital lifestyle needs.



How digital onboarding works

Operators can deploy many next-gen use cases on legacy networks by implementing modern business support systems. And 5G, with its ultrafast speeds, high bandwidth, and low latency, is set to revolutionize telecom services as well as industries, with applications across manufacturing, healthcare, transport, the Internet of Things (IoT), entertainment, and countless others. It remains just as relevant if not more in the pandemic, with increasing demand for its modern and advanced applications. As early movers in helping operators implement 5G, we at Alepo

are confident that next-gen success is possible with an action plan that involves selecting the right deployment model for your business goals, striking lucrative cross-industry partnerships, creating a cybersecurity strategy, and beginning with use cases that you can easily monetize by catering to your customers' unique needs.

Pankaj Garg is a seasoned product leader who has extensively designed telecom and FinTech innovations for nearly two decades. He continues to facilitate digital innovations during the pandemic for Alepo's global clients, enabling them to rapidly launch products and services with minimal risk. Pankaj also plays a key role in growing the company's 5G portfolio.

Guavus: AI-driven Analytics in the 5G Era



“The scale and complexity of 5G networks demand that operators leverage AI/ML and analytics to take human operators out of the loop for time-critical decisions and actions...to drive closed-loop automation for network operations and service orchestration.”

With 5G fast becoming mainstream for telecoms today, it brings a greater level of complexity, more connected devices and more data running over the network. This increased level of complexity can only be handled with the help of AI/ML and analytics – and starting with the right architecture upfront to enable efficient growth and automation.

With its deep expertise and focus on telecom AI and analytics – Guavus is enabling its operator customers to gain new insights on their subscribers and network operations in real-time – and to improve their customer experience, reduce operations costs, and deliver innovative new 5G services.

Chris Neisinger, CTO of Guavus speaks with Zia Askari from TelecomDrive.com about the top trends and issues Guavus is seeing working with operators globally, how operators are looking to better monetize their 5G investments, the role the 3GPP 5G Network Data Analytics Function standard is playing, and the latest edge-to-core-to-cloud analytics innovations from Guavus and what it has in store for the future

A lot of operators are moving towards 5G today but they struggle to achieve better ROI projections. In such a scenario, how can they better monetize their network infrastructure?

We’re seeing a number of our operator customers looking to private networks, to Multi-access Edge Computing (MEC), and to new enterprise vertical services to better monetize their 5G infrastructure.

In terms of private networks, they’re looking to offer their enterprise customers individual slices from their 5G network. These slices can take advantage of our AI-based analytics for correlated customer and network operations insights, and provide advanced security.

With MEC, they can distribute compute and storage resources to the edge of their 5G network to assure the

performance of new real-time 5G and IoT services. And by adding streaming analytics at the edge, they can further enhance performance.

And to continue to move up the value stack, many of our operator customers are eager to deliver new vertical services customized for their customers in key industries. By capturing analytics insights from their own mobile network data, combining that with their vertical customer data, they can then package and sell analytics as a new service to their customers in manufacturing, transportation, healthcare, local government, etc.

How can AI and the right analytics help operators to future-proof their investments?

One of the best ways to future-proof a new network investment is to get the architecture “right” upfront. Starting

out with a strong architecture enables efficient growth and automation.

The 5G Network Data Analytics Network Function (NWDAF) architecture defined by 3GPP is a great example of this. Simple rollouts of 5G can be done without any automation by using brute-force rules, but taking this architecture “shortcut” will quickly bite the unprepared.

The scale and complexity of 5G networks demand that operators leverage AI/ML and analytics to take human operators out of the loop for time-critical decisions and actions... to drive closed-loop automation for network operations and service orchestration. NWDAF provides the AI/ML in the 5G Core and is a must for 5G automation.

Analytics can’t be a bolt-on later as operators might have been done in previous 3G and 4G generations. In

defining the NWDAF standard -- 3GPP, and the operators who contributed to the standard, have recognized that the complexity and scale of 5G demand analytics be addressed upfront, not as an afterthought or overlay later.

How can AI and analytics enable CSPs to achieve better 5G scale and at the same time reduce their network complexities?

With 5G, there are far more moving parts involved -- more connected devices, 5G cell sites, radio elements and antenna, etc....and more data running over the network. We all can get our heads around a 3x increase in network complexity but, with 5G, network complexity will increase exponentially and that demands operators use AI/ML and analytics.

AI-based analytics are essential for automation and providing the in-depth insights on this vast amount of data and numbers of devices, as well as overall network operations. Operators need to be able to not only monitor but predict and address potential issues before they impact their subscribers, and to really understand how each individual subscriber is experiencing their 5G services.

What kind of innovations are being driven by Guavus in this AI and analytics space?

As you know, we've been in the market focusing exclusively on CSPs and big data analytics for more than 15 years now, and we've had the opportunity to partner with some of the world's leading operators. They are using our analytics to really improve their customer experience, reduce opex, deliver new types of services to increase revenue and better monetize their big 5G investments.

Last year, we announced our Guavus-IQ products portfolio which builds on our previous solutions and provides operators highly correlated 'outside-in' insights on each of their subscribers' experience and 'inside-out' insights

on how their own network operations are impacting each subscriber. The products use big data collection, in-memory stream processing, AI-based analytics to ingest, correlate, analyze data in real time.

Within that portfolio, we've gotten a number of new operator wins globally with our Service-IQ Device Management Analytics solution. It provides multiple stakeholders within an operator the real-time insights to understand the capabilities and behaviors of the devices on their network. Network planning teams can make data-driven decisions about network rollout strategies based on connected device radio capabilities to plan current investments and future upgrades to their network infrastructure. Product and marketing teams can leverage customer segmentation insights to position the best offers to targeted audiences based on data showing the most adopted device capabilities. And network operations teams can quickly identify suspicious behavior patterns and inform their security and fraud management teams.

We've also gotten a lot of interest in our newest member of the family, just announced this month-- our 5G-IQ Network Data Analytics Function (NWDAF) product. It provides operators a vendor-agnostic, 3GPP-standard 'Open NWDAF' solution that generates real-time operational intelligence in 5G networks to drive closed-loop network automation and service orchestration. As I mentioned earlier, with the complexity and scale of 5G, this is critical.

5G-IQ NWDAF, and our other Guavus-IQ products, provide operators multi-vendor analytics interoperability from their 5G network edge-to-the-core-to-the-cloud. As operators and some of the industry analysts have told us -- this is quite unique in the industry -- to deliver in-depth analytics insights across all these domains in an operator's multivendor 5G network environment.

Our SQLstream real-time streaming analytics plays a critical role, as do our partnerships with the leading cloud providers, to give operators the flexibility to deploy our analytics where they'll achieve the biggest benefits -- the 5G edge, core, on-prem or in the cloud. At the Mobile World Congress in Barcelona this week, we've partnered with AWS to demonstrate the new 5G-IQ NWDAF product -- it's the first public demonstration of an NWDAF product and in the cloud, as far as I'm aware.

Where are the big growth opportunities in this space and how do you plan to target these opportunities in the coming months?

We see 5G in all aspects of telecom and adjacent businesses. Private networks and purpose-built network slices will bring advances in traditional telecom services and will enable new collaborations with Massive IoT and the advent of Industry 4.0.

And as I was discussing earlier, a number of operators are looking to deploy private 5G networks for their vertical customers as a new revenue opportunity. To do that, they need to deploy 5G network slicing -- AI and analytics are very important to this. By capturing analytics insights from their own mobile network data, combining them with their vertical customer data, they can then package and sell them as new vertical services over private 5G networks to customers in manufacturing, transportation, healthcare, local government, etc.

We're in a unique position -- our AI-driven analytics combined with the verticals expertise and solutions of our parent company, Thales-- which spans manufacturing, smart cities, transportation, and other key verticals--gives us the unique opportunity to help operators offer these new value-added services to their vertical customers.

“RAD is offering backhaul providers the shortest evolution to 5G xHaul”



Over the past many years, Israel based RAD has been on the forefront of innovation when it comes to delivering solutions for telecoms. As telecom operators look for cost effective and most meaningful 5G strategy – RAD is offering its innovative backhaul solutions to enable this in a seamless manner.

The company's solution provides comprehensive support for 5G fronthaul, midhaul, and backhaul using a single economical cell site gateway. Since it is field programmable, the network can be evolved in the future without hardware upgrades and truck rolls.

Udy Kashkash, RAD's newly appointed President and CEO speaks with Zia Askari from TelecomDrive.com about the company's key priorities and how it continues to drive innovation in the market

What are your key priorities after becoming RAD's CEO?

My main priority is to maintain and strengthen the very good momentum RAD has been experiencing over the past several quarters. We see a steady growth in demand, especially in the areas of Ethernet access devices (EADs) and industrial IoT (IIoT), which tells me we are well positioned to help address our customers' needs. We also intend to play to our strength and continue leveraging our vertically integrated operations that encompass all departments – R&D, Marketing, Sales, and Production – to deliver predictable, market-leading short lead times.

Most critical in my view is to maintain stability, especially in these times of global uncertainty. That's why we're very determined to keep on track and execute our strategy. I'm very encouraged to see that the entire company as one is dedicated to this goal.

How does RAD look at the new

normal. What is your strategy to drive the organization ahead in this pandemic era?

Despite the drastic change in circumstances that was brought on by the pandemic almost overnight, RAD was able to adapt to the New Normal very quickly and, most importantly – seamlessly. Throughout the outbreak, RAD has remained open for business on a full scale. One of our key advantages is our in-house manufacturing facilities in Israel, which gives us greater control over production and frees us from lead time dependency on overseas subcontractors. Such dependency has severely affected most other vendors in the past year while we have been able to continue delivering customer orders on time. Parts of our workforce had to intermittently switch to a WFH format, which not only went smoothly but had a positive effect on productivity. We have also shifted our focus online and to digital tools that help us give customers our undivided attention. One of the paradigm shifts

of the New Normal is that in-person meetings are no longer a pre-requisite for business success. Even before the outbreak we were already conducting online training to customers and partners. Now we've quickly learned how to conduct meetings, events, proofs of concept, and demos in remote mode as well.

RAD has always played an important role on the access side of networks. What kind of innovations can we expect from RAD in the coming months?

A major focus area for RAD is IIoT – specifically Industrial IoT for smart cities, smart energy, connected industry, and other verticals and industries. We've introduced edge computing within our IIoT gateway so that compute resources and cloud environment are moved closer to automation-enabled devices at the edge of the network rather than at the data center.

Our SecFlowIIoT gateway is a true “Swiss Army knife” that combines, in a single box, functionalities that

would typically require separate dedicated appliances. This is a much-appreciated feature among IoT project managers as it simplifies deployment and operations by reducing the number of devices and contributes to increased security. The SecFlow is the only solution in the market that combines a router, firewall, and an LTE modem, together with a PLC, LoRaWAN® gateway, protocol converter, video surveillance DVR, and other functions hosted as containers.

We are growing our ecosystem to fit more and more use cases, such as our recently announced partnership with Actility and our participation in the US-Israel consortium that develops cyber security solutions for the energy sector.

5G is increasing gaining importance for telecoms today. How is RAD looking at enabling 5G strategy for CSPs?

Our focus is to help CSPs with an effective migration path from where they are today. For example, one of the most important steps in 5G long-term planning is the decision on the appropriate RAN splits and fronthaul configuration, to handle the many demands of 5G applications while balancing network topology with a level of investment that makes sense. RAD is offering backhaul providers the shortest and most cost-effective evolution path to 5G xHaul, so that they don't need to have their fronthaul strategy all figured out to start seeing revenues from 5G. Instead, RAD enables them to start offering 5G services using their existing infrastructure without extensive preparations. This is because ultra-fast 5G isn't needed right away. Instead, the immediate benefits come from getting the bandwidth and latency right and this can be achieved fairly quickly, while laying the groundwork for future upgrades.

Our solution provides comprehensive support for 5G fronthaul, midhaul, and backhaul using a single economical cell site gateway. Since it is field programmable, the network can be evolved in the future without hardware upgrades and truck rolls. We also provide a smart solution for other related requirements, such as 5G timing, business services over 5G, and IIoT services over 5G.

What kind of growth are you looking forward to in this year? And where (verticals and segments) is this growth going to come from?

There are several areas in which we already see increase in market demand: First, for EADs and cell site gateways, driven by 5G rollouts and higher bandwidth demands of enterprise customers. What we're witnessing today is that 10G has become the new 1G and the rush to 100G is on. Another area is industrial IoT backhaul, and that is due to the faster adoption of big data analytics for remote asset management and preventive maintenance. Such automation requires higher "connectedness" and fast delivery of field data from smart devices. There's also the area of vCPE. We anticipate growth there due to a wider spread of telco cloud in various network locations, to deliver all types of services while meeting specific delay and local storage/processing requirements.

Enterprise segment has become a key focus for a lot of CSPs and telecom operators are positioning their offerings to them. How is RAD positioning its solutions in this space?

Indeed, there have been major shifts in the enterprise market, especially the acceleration in enterprises' digital transformation, which drives major changes in telcos' business customer needs. From SMEs relying on SaaS, enterprises moving to XaaS and all the way to "Born

in the Cloud" organizations, these changes drive the transformation of the network and CSP offerings. In addition to businesses transitioning to the (multi) cloud, other trends are challenging the CSP landscape, including the rise of the mobile worker and the work from home boom – especially as COVID-19 work patterns have become the New Normal. Pre-pandemic IP VPN topologies and business network services no longer fit the new "work from anywhere" paradigm. And as if that isn't enough of a challenge, over the top (OTT) SD-WAN and secure access service edge players are cannibalizing traditional telcos' market share.

All this means the CSPs are looking for ways to move their business customers from legacy VPNs to cloud access services, connect new locations and IoT devices, deliver business class networking for WFH employees, and host value added services either at the CSP edge or at the customer edge.

RAD is determined to help CSPs move up the cloud value chain with a vCPE edge portfolio that enables them to leverage their edge "real estate" in introducing value added services beyond simple connectivity. Our focus is to provide a truly open solution that allows CSPs the freedom to choose any vCPE hardware or VNF to meet specific branch site requirements. We offer thin and thick CPEs that host VMs and containers on premises or in the data center/cloud as needed, so that CSPs have flexibility in matching the vCPE platform to the business case. At the heart of our solution is an operating system that can work with any hardware or VNF and is used in all vCPEs (thin and thick CPEs alike) to minimize integration efforts and reduce costs.

The idea here is simple – help CSPs maximize ROI, cater to the needs of their Cloud First customers, and gain a competitive edge.

“We enable 6 billion mobile users around the world to stay connected on our APIs”



Reloadly is a telecom startup based in Barcelona, Spain - that lets users top-up mobile phone plans. It was born out of a need for immigrants to ensure relatives back home had phone service on their unblocked, prepaid phones.

And while most Americans opt for post-paid plans, prepaid phone plans are also an excellent option for students, travelers, and customers with low credit scores, like young adults still establishing themselves. The Reloadly app, allows parents to top up their children's prepaid airtime, data, and even digital goods with almost every mobile operator across over 140 countries.

*Being an immigrant himself, **Michel Francis, CEO and co-founder of Reloadly** speaks with **Zia Askari** from **TelecomDrive.com** about the need for starting Reloadly App and how it is bringing innovative experience for telecom operators*

Please introduce Reloadly to us?

Emmanuel Piard and I both grew up in Miami, Florida but are originally from Haiti, where 99% of mobile subscribers have prepaid phones with archaic, brick-and-mortar systems to recharge phone credit. So we decided to create a way to make the user experience as easy as possible. As you probably know, telecom companies are notoriously difficult to build for.

We enable 6 billion mobile users around the world to stay connected on our APIs. Our mission is to fuel the future of connectivity and digital mobile payments across all emerging regions. We do this by connecting telcos with millions of developers in order to send prepaid mobile credits across a multitude of digital platforms.

What's the story behind starting this app?

Frustrated by how complicated and laborious it was to send mobile airtime to loved ones back in Haiti, Emmanuel and I created Reloadly as an opportunity to build a developer-friendly platform that applies API technology to an antiquated system of mobile operators to boost cellular connectivity worldwide.

How difficult is it to be an immigrant - to create something out of scratch?

I do think it has its challenges, but specifically with Reloadly, it allowed us to spot a real need that wasn't being addressed by companies without our background. For us it has been a real asset.

What are your big learnings so far? And what's one message that you want to give to the immigrant community looking to innovate in the telecom segment?

I really think the immigrant community knows what the mobile market looks like. Many of them have worked exclusively on a mobile

device for all of their daily needs, whereas in the west you tend to sit down at a computer. That means that immigrants inherently know what experience should look like for any mobile applications.

What is your go to market strategy and how do you look at partnering with telecom operators for your products?

Our market strategy is to be the go-to app for consumers. That, of course, means partnerships with the larger telecom industry. Most of our partnerships to date have come from word of mouth. Telecom companies are often the first to initiate contact. What we look for is a trusted partner that will help us do well by our customers.

Operators always look for innovative ways to engage with their customers. How can Reloadly enable innovation for the telecoms community?

Though many markets have been revolutionized by this new approach to technological integration, the \$1.4 trillion-a-year mobile communications market remains behind this forward-thinking movement. Indeed, mobile operators have so far been slow to open their APIs to developers and deploy digital products, with many still operating on legacy BSS infrastructure. This has led to a divide in this field between mobile network operators and potential innovators.

This particular climate means that Reloadly's API toolkit both democratizes the mobile operator field for developers, and opens a pioneering sales channel for mobile network operators that will boost average revenue per user for those companies. Against the backdrop of monolithic tech infrastructures giving way to multiple, shared alternatives, the new Reloadly mobile operator API platform strips away the heavy lifting and complicated set-up for

developers to make the integration of technologies more straightforward than ever before.

We're working on a few things to help our partners engage with their partners. When you think of mobile, an obvious starting point is the SMS system that is already baked into every device, but there are so many other ways that we'd really like to explore. The main point for us would be that it adds value to our customers' experience. That's our priority

What are your key geographies of operation today and what are your plans for the near future?

We are a global company and we have HQs in the USA, Canada, Spain, and France and operate all around the world. Our goal is to improve connectivity, especially in developing countries in Africa, Asia and Latin America. Most people in the west forget that the vast majority of people on the planet do almost all of their business on a phone, rather than a computer. Servicing these countries through new partnerships will remain a top priority. But there is also a large immigrant community in the west that still continues to do business in this way. We also want to be able to service those communities as well.

What kind of product innovations can we expect from your organization in the near future?

The GIFT CARDS Product. Fast, flexible and easy to manage. We enable gift card transfers that arrive to recipients' mobile phones within 5 seconds, no matter where they are located. Users can easily manage their wallet balances using over 100 currencies through one convenient dashboard that integrates with payment services like Stripe or PayPal. And it provides the advantage of sending automatic bulk gift card orders to put incentives and rewards programs on auto-pilot.

IDEMIA Driving Innovations in 5G, M2M and eSIM Space

With a deep focus on Augmented Identity - Courbevoie, France based IDEMIA has got 25 years of special relationship with India and is driving a lot of innovation in the fast emerging 5G, M2M and eSIM space.

Matthew Foxton, India Regional President, IDEMIA speaks with Zia Askari from TelecomDrive.com about the company's focus in the Augmented Identity space and its future plans for India

IDEMIA is playing a critical role in the Augmented Identity space. How big is this market globally as well as in India? Can you share some figures?

We live in a world today where identity is core to any transaction we make in the physical or digital world. It can be to pay, travel, communicate, vote or access private or public spaces. Given the vast range of environments and usages, securing our identity has become vital in the world we live in today; hence, the need for an IDTech like IDEMIA is colossal.

IDEMIA is well-positioned serving clients in **180 countries**

#1 in police biometric systems

Trusted by **1,900** financial institutions and FinTechs

#1 in civil identity solutions

Trusted by **500** mobile operators

#1 in US driver's license issuance

Owing to an extensive global presence and our innovative identity technological expertise, IDEMIA is the global leader in facilitating Identity



technologies to the specific needs of four major industries- Financial services, Telecom, Citizen Identity and Public Security.

The digital economy was already manifesting globally and in India, but the pandemic gave it a boost. The landscape has been transformed with millions of transactions – social, personal, and professional – being managed digitally every day. Core to all these transactions is secure and convenient identity authentication. According to Markets and Markets report, the Identity market size is expected to grow from USD 36.6 billion in 2020 to a whopping USD 68.6

billion by 2025.

We can expect a global increase in demand and desire for Identity Technologies across our four markets worldwide. We are also expecting Identity Technologies to play a greater role in border security, transportation and automotive industries.

What is your go-to-market strategy to target India as geography and how important is the Indian market for IDEMIA?

We share a deep historical relationship with India. Over the last 25 years in the country, IDEMIA has powered many mission-critical and digital transformation projects in partnership with the Government and other leading players in the private sector. We believe in “Made in India”. In our Noida factory, we produce more than 600 million SIM cards and credit cards per year for our Indian as well as global clients. We cater to more than 300 clients across the globe from our Noida factory. We also recognize the innovation and technology resource power of India and hence India is a base for our Global R&D and Digital Platforms, which cater to innovative and cutting edge identity solutions in India and across the globe. We have also invested in a standalone IDEMIA Tower in Noida with 1000+ seating.

What are some of the big innovations that IDEMIA is driving in the Augmented Identity space?

We have always led innovation in Identity Technologies globally, be it in telecom, identity and security, or the payments landscape across the world. We have an array of innovations.

On the Telecom front, IDEMIA is at the forefront in India and the globe in developing offers in 5G and M2M and IoT rollouts. We are also leading the structural change and adaptation to eSIMs.

For the financial sector, we have introduced GreenPay payment cards which are made from recycled PVC and help banks reduce their carbon footprint. We are also leaders in providing Metal Cards to Banks and Fintechs to achieve top-of-wallet.

As the world is shifting to physical distancing and contactless, our MorphoWave compact by IDEMIA enables touchless identification with a wave of the hand by scanning our four fingers. MorphoWave technology has become the benchmark in frictionless access, securing high traffic access points in the world's largest financial institutions, critical infrastructure facilities, universities and healthcare organizations. We have had great success in India with MWC, our range of customers vary from an oil refinery to an e-commerce giant to a PSU bank to a National Thermal Power and a Legislative assembly.

As an airport solution, IDEMIA has automated self-service programs based on biometric technology and identity management, increasing passengers' convenience without compromising security. Changi Airport which has been voted Best Airport in the world more than 6 times, is powered by IDEMIA technology.

We believe that the future of our innovations will only grow from here. The post-pandemic world is looking for secure and efficient digital solutions and we at IDEMIA hope to fill that vacuum as we continue to think about how to make lives better, transactions more secure and identity ironclad and safer at the same time.

Please share information about your Indian operations and what are your investment plans here?

IDEMIA has had an influential presence in India for more than 25 years with a team strength of almost 5000+. Our customer base in India is strong in terms of private players such as financial institutions and mobile operators. We also work with government institutions and security organizations in India. We have an existing R&D base and plan to develop it further.

We plan to continuously invest in Indian R&D, manufacturing and service centres as part of realizing the "Make in India" ambition. At present, we have one of the largest telecoms and payment card production factories in Noida, a Centre of excellence in Bangalore that works around border control biometric devices and service centres in Delhi and Mumbai for the personalisation for financial and connectivity solutions.

Across 11 states, IDEMIA is running operations to improve transportation, mobility and ensuring safer roads. IDEMIA has issued over 90 million driving licenses and oversees operations of 300+ RTOs.

IDEMIA is an integral part of Indian citizens' lives through the country's Aadhaar program. Since its inception, we have provided biometric technology through biometric enrolment kits and authentication devices. We are also heading operations for De-Duplication that ensures there is no Aadhaar duplication.

What kind of market verticals are you targeting for your products and solutions in India?

India offers us a plethora of opportunities for innovation, We want to push the boundaries in biometrics, Cloud, AI, IoT and cryptography as well.

We are eyeing the aviation industry and working closely with airport infrastructure. We are also working on the development of tech products in

the healthcare sector. In telecom, we are pushing for a wider adaptation of eSIM technology in the IoT segment and sustainable services across fintech organizations. We are also expecting biometrics to play a pivotal role in assisting with border security.

IDEMIA has recently collaborated with ClimateSeed to bring to offer its customers sustainable payment cards.

eSIM is gaining a lot of traction in the telecoms space today. How do you look at developments and trends in this space and what are your offerings here?

Driven by demand from consumers, industry, and a variety of enterprise businesses, the number of devices equipped with an eUICC is growing steadily. Unlike the removable SIM card, an eUICC is embedded in a device at the manufacturing stage – to be configured and managed later via an Over-The-Air connection. As device manufacturers look to optimize their logistics and offer an easy connectivity experience, IDEMIA provides them with eSIM solutions for the seamless management of eUICC cards – offering greater convenience and choice.

We are one of the key stakeholders in evolving M2M/ IoT ecosystems in India and the only one to have the right certification to have our eUICC SIM roll out in India.

IDEMIA's Smart Connect solution centralizes the activation and provisioning workflows across all operational systems, ensuring seamless eSIM lifecycle management and helps MNOs to manage the eSIM device profile life cycle. We are working with top MNOs in India. With the rapid growth in connected objects in a wide variety of IoT applications including Automotive, IDEMIA's eSIM solutions enable these objects to be constantly connected and to be securely managed remotely so that no local maintenance is required.



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

GO DIGITAL-FIRST WITH



Digital BSS



Interactive Chatbots



Virtualized AAA



Promotions and Campaigns



Omnichannel Self-Care

Industry-trusted solutions that enable telcos of all sizes to:

- ◆ Automate processes
- ◆ Deliver digital-first CX
- ◆ Offer omnichannel support
- ◆ Ensure 5G and NFV compliance
- ◆ Reduce operational costs
- ◆ Monetize data
- ◆ Forge diverse partnerships
- ◆ Accelerate sales conversions
- ◆ Improve response times
- ◆ Boost revenue and ARPU

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