



ICT Keeping COVID-19-Hit Economy Afloat and Spearheading Recovery

At no time in recent history has there been such a dire need for information and communications technology (ICT) in nearly all walks of life. Gaps left open by the COVID-19 pandemic have been filled thanks to the opportunities offered by ICT: health, education, entertainment, delivery services, and a plethora of other sectors of the global economy have had to rely on remote connectivity not just to improve their quality of service but also to simply stay afloat.

In truth, some of these services, such as remote learning or telemedicine, are not new to the stage, but they have now been deployed on an unprecedented scale and are likely to weave their way even more into our future daily lives. Times of crisis are indeed known to bring out momentous changes. This month's "Mobile Radio" column explores some of the changes, ranging from new services, whether for live sport, entertainment, agriculture, or health, to enhancement in connectivity and other inclusive actions. ICT and mobile services are expected to continue supporting the economic recovery as the world hopefully moves past the worst of the pandemic.

5G for In-Stadium Services

While most sport stadiums across the globe are either shut down or operat-

ICT AND MOBILE SERVICES ARE EXPECTED TO CONTINUE SUPPORTING THE ECONOMIC RECOVERY AS THE WORLD HOPEFULLY MOVES PAST THE WORST OF THE PANDEMIC.

ing at a reduced capacity due to COVID-19 restrictions, several telecom operators report their broadening of in-stadium service offerings by leveraging the full range of 5G features.

During the NFL's Super Bowl LV in Tampa, Florida, USA, on 7 February 2021, Verizon offered an enhanced fan experience, whether at the game or at home. Verizon introduced in-stadium 5G solutions for fans attending in person in Tampa, delivering immersive and interactive viewing experiences and creating the first-ever 5G stadium in Fortnite Creative. The Verizon 5G SuperStadium in the NFL mobile app allowed fans with an iPhone 12 model the opportunity to engage with seven different camera angles while in the stadium and five angles at home as well as to project augmented reality (AR) overlays of the NFL's Next Gen Stats for players. Additionally, Verizon Media's Watch Together, a free covieing experience in the Yahoo Sports mobile app, gave fans the ability to cowatch Super Bowl LV with friends and family on their phones.

Also, in December 2020, it was announced that EE Limited switched on its 5G network at London Stadium in Stratford, U.K., allowing fans to enjoy increased upload and

download speeds anywhere in the stadium and boosting network reliability for those attending events. Network capacity around large gatherings has always been a limiting factor, but the new deployment will ensure high speeds even after COVID-19 restrictions are lifted, when tens of thousands of people will all be accessing mobile data at the same time. The upgrade to 5G will also mean that safety, security, and the general operations at London Stadium will be enhanced. Additional services will include easier support for cashless transactions and improvement of the accuracy of location services.

A similar deployment was announced by Nokia on 21 January 2021, reporting that it has launched 5G services with mobile operator Optus at Optus Stadium in Perth, Australia. The move provides visitors attending sporting or music events with access to incredibly fast indoor and outdoor 5G coverage with speeds over 1 Gb/s. Nokia has supported Optus with the deployment of the technology as well as its ambitious goals for 5G.

Optus is utilizing Nokia's 5G Air-Scale Indoor Radio (ASiR) solution

to provide comprehensive coverage for indoor zones such as corporate boxes or VIP areas. The solution supports major network technologies and is designed to be easy to upgrade from 4G to 5G New Radio (NR). It includes indoor small cells that deliver a consistent 5G user experience with high data rates across multiple zones.

Nokia has provided equipment from its AirScale Radio Access portfolio for seamless outdoor 5G coverage, including 5G radio access networks (RANs), AirScale base stations, and its AirScale Micro Remote Radio Head solution. It has also supplied its market-leading 5G small cells solution for enhanced coverage and capacity in public spaces. These solutions enable Optus to build on its existing network leadership in Australia and deliver connectivity and capacity benefits to consumers.

Low-latency, high-bandwidth connectivity can give spectators access to different camera angles in real time and ultrahigh-definition video from their smartphones as well as information overlays to enhance the performance. Venue operators also benefit with enhanced retail opportunities, enhanced video capture, and processing capabilities for critical functions such as security as well as support for building automation and inventory management. Optus has deployed Nokia's 5G indoor and outdoor radio system and reported peak speeds of 1.1-Gb/s downlink and 100-Mb/s uplink for lightning-fast 5G coverage throughout Optus Stadium.

In related news, on 9 February 2021, Verizon Business announced that the company is working with Zyter, a leading digital health and Internet of Things (IoT)-enablement platform, to help improve sports and entertainment venue operations while delivering a smarter, more immersive fan experience.

Zyter ThermalAlert, an award-winning thermal imaging platform, can automatically monitor the temperatures of fans as they walk into a ven-

WHILE VIRTUALLY ALL URBAN AREAS IN THE WORLD ARE COVERED BY A MOBILE BROADBAND NETWORK, WORRYING GAPS IN CONNECTIVITY AND INTERNET ACCESS PERSIST IN RURAL AREAS.

ue. Paired with the high bandwidth, low latency, and massive computing power of Verizon 5G Ultra Wideband and 5G Edge, the process can be streamlined for quicker entry, fewer choke points, and less congestion compared to manual solutions utilizing in-person, handheld temperature scanners. The two companies recently implemented Zyter ThermalAlert at Hard Rock Stadium in Miami Gardens, Florida, USA, one of Verizon's 25 5G Ultra Wideband stadiums, to screen employees and staff.

5G for Precision Agriculture

On 3 February 2021, Intel and partners of the 5G Open Innovation Lab announced the launch of the Snohomish County 5G Food Resiliency Project. The project resulted in the first application development field lab for the agricultural industry. The project, in the U.S. state of Washington, will develop commercial use cases to work with farmers on new 5G, edge, and cloud technologies that can be employed today. Established through an economic development initiative, the 5G Food Resiliency Project is funded by a grant through the Coronavirus Aid, Relief, and Economic Security Act. It establishes a virtual and physical space for Snohomish County food growers and distributors to collaborate with technology companies to develop new capabilities that will improve the resiliency of Snohomish County's agriculture sector and minimize future food service disruptions for consumers and regional agribusiness.

"We are passionately committed to ushering in the full potential of 5G and edge by supporting a range of industries including ones that power our societal fabric, like agriculture," said Caroline Chan, vice president of the Data Center Group and general manager of the Network Business In-

cubator Division at Intel. "This first-of-its-kind field lab is showcasing the benefits of 5G-to-farm-to-table and is a strong example of how industry collaboration can drive innovations that address both business and human challenges." The foundation of the field lab is a dynamic testing platform with dedicated access to a 5G-capable Citizens Broadband Radio Service LTE private network through codevelopment access points. It provides an open, robust environment for developers to create and test precision agriculture and food supply logistics applications using 5G network infrastructure.

Mobile Broadband Access in Urban and Rural Areas

In its report "Measuring Digital Development: Facts and Figures 2020" [1], dated 30 November 2020, the International Telecommunication Union (ITU) underscored that, while virtually all urban areas in the world are covered by a mobile broadband network, worrying gaps in connectivity and Internet access persist in rural areas. This matters even more due to the COVID-19 crisis. Connectivity gaps in rural areas are particularly pronounced in the least developed countries, where 17% of the rural population live in areas with no mobile coverage at all and 19% of the rural population are covered by only a 2G network. Furthermore, according to 2019 data, globally about 72% of households in urban areas have access to the Internet at home, almost twice as many as in rural areas (38%). "How much longer can we tolerate the significant gap in household connectivity between urban and rural areas?" said ITU Secretary-General Houlin Zhao. "In the age of COVID-19, where so many are working and studying from home, this edition of 'Measuring Digital Development:

A JOINT VENTURE CALLED PROJECT XCELERATE WAS FORMED FOR THE PURPOSE OF ESTABLISHING THE FIRST COMMERCIAL DRONE CORRIDOR IN THE UNITED KINGDOM, RUNNING IN UNRESTRICTED AIRSPACE.

Facts and Figures' sends the clear message that accelerating infrastructure rollout is one of the most urgent and defining issues of our time."

The latest ITU data demonstrate that the rollout of mobile broadband networks has been slowing in 2020. Between 2015 and 2020, 4G network coverage doubled globally, and almost 85% of the global population were covered by a 4G network at the end of 2020. Yet annual growth has been slowing down gradually since 2017, and 2020 coverage is only 1.3 percentage points higher than 2019. In addition to infrastructure rollout, the digital gender divide, lack of digital skills, and affordability continue to be major barriers to meaningful participation in a digital society, especially in the developing world where mobile telephony and Internet access remain too expensive for many.

5G for Drone Connectivity

A solution often touted as capable of closing connectivity gaps before a full-fledged infrastructure rollout is in place is the use of drones. In December 2020, it was reported that a consortium led by British Telecommunications (BT) won the Future Flight Challenge Fund competition backed by the U.K. government's Industrial Strategy. A joint venture called Project Xcelerate was formed for the purpose of establishing the first commercial drone corridor in the United Kingdom, running in unrestricted airspace. In addition to BT, the members of the consortium include several U.K. tech start-ups and drone technology experts. The use cases that will be demonstrated aim at addressing real-world, time-sensitive services such as medical deliveries, emergency response, and infrastructure inspection. The over-

arching goal is to demonstrate the suitability of 5G technology for drone connectivity, thanks to its millisecond latency and large bandwidth through which drones can stream high-definition video content. BT/EE's 4G and 5G networks will be used in the trials to provide radio connectivity to the drones.

Comparing Worldwide COVID-19 Contact-Tracing Systems

A report [2] unveiled by the European Telecommunications Standards Institute's (ETSI's) Europe for Privacy-Preserving Pandemic Protection (E4P) group on 2 February 2021 compares existing pandemic contact-tracing systems, including the characterization of a representative series of apps, from among those currently available, ranging from the United States to Japan as well as a list of the most relevant existing digital contact-tracing methods. The study also offers a comparative analysis of these different methods and, finally, outlines a series of challenges that are yet to be tackled.

"Our work today is to enable better global pandemic contact-tracing solutions in the future. Unfortunately, this pandemic is not the first and will not be the last one the world will go through," comments Miguel Garcia-Menendez, vice chair of the ETSI E4P Industry Specification Group (ISG). "As many of us commute from one country to another very often for business and leisure, interoperable applications represent one of the mitigation measures that can serve all citizens. We have already identified a series of challenges in our report and compared a number of different technologies and protocols. There is still a lot to achieve, and we welcome all ETSI members and nonmembers to join the effort," he adds.

ETSI E4P ISG's next steps are focused on finalizing the definition of the general requirements of this type of solution, conducting an analysis of the mechanisms related to the devices (essentially smartphones) used, specifying the requirements of the back-end systems involved, and releasing a reference framework for the interoperability of the different existing digital tracing methods. Future stages will evaluate how to improve the systems specified and explore and develop new ones.

MEC Sandbox for Edge App Developers

On 6 January 2021, ETSI announced the launch of the ETSI Multiaccess Edge Computing (MEC) Sandbox, available at <https://try-mec.etsi.org/>. The Sandbox is designed so that application developers can experience and interact with an implementation of ETSI MEC application programming interfaces (APIs) and test out their applications. MEC Sandbox is an interactive environment that enables users to learn and experiment with ETSI MEC Service APIs. These standardized RESTful APIs are targeted at MEC application developers to utilize the value-added services offered by MEC, including real-time access to network and context information (either fixed or mobile) as well as location information on infrastructure and user equipment (UE). The design principles for developing the APIs have also been specified in ETSI GS MEC 009, along with http methods, templates, conventions, and patterns. The MEC service APIs are available at <https://forge.etsi.org>, presented via OpenAPI-compliant descriptions.

"With the Sandbox, developers with existing applications can configure them to access and use the live MEC APIs running in their own test environment, which is essential for them. MEC Sandbox highlights ETSI's commitment to accelerate the market and enable developers by pioneering new techniques to take standards to the market," explains

Walter Featherstone, chair of the ETSI MEC DECODE working group.

The MEC Sandbox provides the user with a choice of scenarios combining different network technologies (4G, 5G, and Wi-Fi) and terminal equipment, such as vehicles, pedestrians, or connected objects. Combining these simulated assets in a geolocated environment, a user can gain hands-on experience with the behavior and capabilities of location (MEC 013), radio network (MEC 012), and wireless local area network (MEC 028) service APIs. Such contextual information can offer outstanding differential performance for edge-based MEC applications.

Cognitive Mobility at the Edge

The latest edition of MEC Hackathons endorsed by ETSI took place on 25–26 November 2020, hosted by Droidcon Italy 2020 as a fully virtual event. The competition was open for developers to test their applications with ETSI MEC APIs in a variety of use cases. The organizing committee received a total of 14 submissions, including several topics from AR for the construction sector as well as consumer, media, and entertainment applications and automotive services. Qualifying teams were offered remote access to MEC servers and software platforms to develop mobile applications for advanced services in MEC-enabled 5G networks, using ETSI MEC technologies. They were also required to onboard their applications in real-life MEC systems and connect with the MEC APIs to receive simulated in-network data.

The MEC Hackathon winner, UniMore, showcased a project on Cognitive Mobility at the Edge, an automotive application solution exploiting features and services provided by the 5G MEC architecture (including an MEC location API) to deliver low-latency, location-based event notifications about traffic, congestion forecast, and mobility patterns.

The Droidcon MEC Hackathon 2020 was organized by Intel, Cisco Systems, Gruppo TIM, Equinix, and

RELEASE NINE COINCIDES WITH THE ANNOUNCEMENT OF A NEW PRODUCTION DEPLOYMENT, CONFIRMING OSM AS THE MOST COMPREHENSIVE OPEN SOURCE NFV ORCHESTRATOR AND A KEY ENABLER FOR ZERO-TOUCH END-TO-END NETWORK AND SERVICE AUTOMATION.

the LINKS Foundation and endorsed by ETSI with support from the Global System for Mobile Communications (GSMA) and the city of Turin, Italy.

Dario Sabella, vice chair of ETSI ISG MEC commented, “All these MEC Hackathons revealed talented teams who have experienced the benefits gained from using real MEC platforms and MEC APIs in their edge computing applications. It’s exciting to note how this community keeps on creating interoperable systems that will bring the full benefits of MEC to emerging 5G services.”

Zero-Touch Automation in Open Source MANO

On 18 December 2020, ETSI announced the launch of Open Source MANO (OSM) Release Nine. With an array of new features, this release completes the alignment process with ETSI network functions virtualization (NFV) specifications, culminating in the native adoption of ETSI GS NFV-SOL 006 for network functions and service modeling. Standardizing the onboarding process for virtual network functions (VNFs) into OSM fosters interoperability and boosts the growth of OSM’s VNF ecosystem. Release Nine coincides with the announcement of a new production deployment, confirming OSM as the most comprehensive open source NFV orchestrator and a key enabler for zero-touch end-to-end network and service automation.

OSM Release Nine is the result of almost five years of development and part of the industry’s greater effort toward adopting standards, striving to ensure a healthy and diverse ecosystem of interoperable orchestrators, clouds, and network functions.

Alongside comprehensive support for the latest developments in

Kubernetes, which is being increasingly adopted in the network industry, OSM is also embracing the most recent use cases from ETSI MEC and an O-RAN, ensuring that it is ready to facilitate their deployment and operation.

5G RAN Slicing

On 26 January 2020, Ericsson reported the launch of a 5G network slicing solution for RANs that will enable communications service providers to deliver customized 5G services with guaranteed performance. Now commercially available, Ericsson 5G RAN slicing allocates radio resources at 1-ms scheduling and supports multidimensional service differentiation handling across slices. This strengthens end-to-end slicing capabilities for dynamic resource management and orchestration to ensure the high-quality end-user experience required by diverse use cases. Network slicing supports multiple logical networks for different service types over one common infrastructure. An Ericsson report estimates US\$712 billion in an addressable consumer market for service providers by 2030. The addressable market for network slicing alone in the enterprise segment is projected at US\$300 billion by 2025 (GSMA data). As 5G scales up, service providers are looking to maximize returns on their investments by targeting innovative and high revenue-generating use cases such as cloud gaming, smart factories, and smart health care.

AI-Powered Radio Access Trial on Live 5G Network

On 21 January 2021, Nokia and China Mobile (CMCC) announced that they had successfully completed live trials of an artificial intelligence (AI)-powered

RAN over CMCC's network. Utilizing CMCC's 4G and 5G networks, the companies completed an AI-based real-time UE traffic bandwidth forecast trial in Shanghai as well as a network anomaly detection trial in Taiyuan, the capital city of China's Shanxi province.

During the trial, CMCC introduced its i-wireless-intelligent and simplicity 5G network concept, a series of technologies designed to create a greener, smarter, and more efficient 5G network. The near-real-time RAN Intelligent Controller (RIC) is one of these technologies and a new network element that enables near-real-time control and optimization of RAN elements enabled by real-time data exposure and cross-layer perception capabilities utilizing AI and machine learning applications.

In the trial, the RIC was included in the edge cloud using Nokia's AirFrame Open Edge server platform. The RIC platform enables increased network optimization capabilities through policy-guided, closed-loop automation. These are fundamental to further advance the 5G RAN architecture, enabling a wide range of intelligent, real-time, data-driven network automation and optimization applications.

In Shanghai, the trial confirmed that AI-based real-time UE traffic prediction accuracy exceeded 90% in a live 5G network test. This was achieved by estimating the UE radio quality and related throughput for 100 ms. With the real-time RAN data exposure capability, Nokia's 5G AirScale base station was able to send UE radio-quality information to the RIC in real time, which is critical for the accuracy of the predictions.

The trial's test specifications were defined by the China Mobile Research Institute, Shanghai Mobile, and Nokia.

5G Mobile Platforms

On 9 February 2021, Qualcomm Technologies announced the Snapdragon X65 5G Modem-RF System, its fourth-generation 5G modem-to-antenna

solution. It is the world's first 10-Gb 5G and the first 3rd Generation Partnership Project (3GPP) Release-16 Modem-RF system, which is currently sampling to original equipment managers and targeting commercial device launches in 2021. Snapdragon X65 is the company's biggest leap in 5G solutions since the commercialization of its first modem-RF system. It is designed to support the fastest 5G speeds currently available with fiber-like wireless performance and make best use of available spectrum for ultimate network flexibility, capacity, and coverage. In addition to the Snapdragon X65, Qualcomm Technologies also announced the Snapdragon X62 5G Modem-RF System, a modem-to-antenna solution optimized for mainstream adoption of mobile broadband applications. Key innovations in the flagship Snapdragon X65 5G Modem-RF System include

- upgradable architecture, allowing for enhancements, expandability, and customization across 5G segments and enabling major new forthcoming features, capabilities, and rapid rollout of new 3GPP Release-16 features via software updates
- the Qualcomm QTM545 fourth-generation millimeter-wave (mm-wave) antenna module engineered for extending mobile mm-wave coverage and power efficiency
- the world's first AI antenna-tuning technology, an initial step in taking advantage of more than a decade of groundbreaking AI research and development in mobile-RF systems.

Commercial devices based on these modem-RF solutions are expected to launch by late 2021.

5 Gb/s Download Speed on a Commercial 5G Network

On 19 January 2021, Telstra, in collaboration with Ericsson and Qualcomm Technologies, announced the successful completion of a new 5G maximum download speed record on a commercial network of 5 Gb/s for a single user. The 5G NR data call was

performed at the 5G Innovation Centre on Australia's Gold Coast using the commercial production network.

This world first, using the commercial production network and a smartphone form factor mobile test device, is a result of the continued effort not only to increase the speed capability of the network but also to unlock key lessons for Telstra to implement in the immediate future.

The three companies have reached a new maximum throughput speed record in the live network with the Ericsson Radio System complete base station for mm-wave, the Streetmacro 6701. The throughput was achieved via NR carrier aggregation (CA) of eight 100-MHz n257 mm-wave carriers combined with LTE CA of two 20-MHz Band-7 carriers—in total, 840-MHz spectrum was used for a single user, which is a major milestone for wireless communication. The device used was a smartphone form factor mobile test device, powered by the Qualcomm Snapdragon X60 5G Modem-RF System with third-generation Qualcomm QTM535 mm-wave antenna modules.

5G SA Core

As the communication network continues to transform, a 5G standalone (SA) core with a new service-based network architecture is needed to deliver the full promise of 5G across enhanced mobile broadband, ultrareliable, low-latency communications, and the IoT. In this context, improvements in overall core network performance and throughput are critical to deliver more immersive 5G experiences. Samsung Electronics Co. Ltd., along with Intel, announced on 17 December 2020 a significant performance breakthrough on its 5G SA core. Optimizing with the second-generation Intel Xeon scalable processor and the Intel Ethernet Network Adapter E810 with Enhanced Dynamic Device Personalization, Samsung reached a 5G SA core data processing capacity of 305 Gb/s per server. The two companies verified this performance in a mobile network environment with

commercial features enabled. Samsung and Intel implemented a simplified system configuration and optimized packet processing to boost network performance. Achieving the 305-Gb/s-per-server milestone implies that each server has the capacity to host more than 200,000 users livestreaming standard definition videos simultaneously.

Voice and Data on 5G SA

In a news report dated 17 December 2020, Swisscom, in partnership with Ericsson and handset maker OPPO, announced the successful carrying out of 5G voice and data calls over a commercial 5G SA network. Today, all of Europe's live 5G networks are deployed in 5G non-SA mode, providing greater data rates, while the signaling is supported by the underlying 4G network. Gradually, most if not all 5G non-SA deployments are expected to make the transition to 5G SA mode, offering even faster connection times and immediate access to the wide 5G bandwidth. With lower latency performance characteristics and opportunities for end-to-end network slicing, the flexible 5G SA architecture will enable new opportunities for innovation for use cases such as AR and virtual reality (VR), smart factories, and connected vehicles. In a major step toward full deployment of the 5G SA architecture nationwide, Swisscom recently carried out live 5G SA voice and data calls using voice over NR and CA along with Ericsson Spectrum Sharing. The calls were made on Ericsson 5G Radio Dot, 5G core, and an instant messaging system (IMS) deployed on Ericsson NFVI, using the smartphones OPPO Find X2 Pro and OPPO Reno 4Z 5G with two different chipsets. By combining the low-band, wide-coverage frequency division duplex (FDD) spectrum and the midband, high-capacity time division duplex (TDD) spectrum, Ericsson's 5G CA solution will aim at boosting 5G coverage and capacity. Ericsson Spectrum Sharing, on the other hand, is expected to continue to

play an integral part in Swisscom's transition to the 5G SA architecture and wider 5G area coverage.

5G Deployments in New Bands

On 16 November 2020, Huawei unveiled an innovative 5G microwave long-reach E-band solution that combines an intelligent beam tracking (IBT) antenna with high-power E band. Such a combination increases the reachable distance of E-band transmission from 3 km to 5 km while providing a 20-Gb/s capacity and loosening the requirements of site deployment, which further accelerates the deployment of 5G. E band is a major solution for 5G microwave transmission. The band is in the range of 80-GHz radio frequencies and provides a bandwidth as high as 20 Gb/s. High-frequency spectrum requires small beam angles, which call for a higher tower stability to deploy larger-diameter antennas. Due to this requirement, antennas with a 0.3-m diameter are mainly used to deploy the E band in industry. However, the transmission distance is too short to support scaled deployment of 5G.

The innovative IBT antenna is the industry's first-ever active microwave antenna. It leverages intelligent algorithms to maintain the stability of beams, thereby significantly reducing the requirements of E-band deployment on tower stability. This further breaks through the limits of setting up E-band antennas with a larger diameter, enabling deployment of both 0.6- and 0.9-m E-band antennas. In addition, this innovation allows the transmit power to increase by 6 dB for E-band signals. With these two improvements, the E-band transmission distance is increased by more than 50%, reaching 5 km, while providing a 20-Gb/s capacity. This level of performance can fully meet the deployment requirements in urban areas.

In related news on 5G deployment in new frequency bands, on 10 February 2021, China Mobile Shanghai and Huawei announced the deployment of the world's first 4.9-GHz commercial

network in Shanghai, China. This is the first time that an aggregate bandwidth of 200 MHz on the 2.6- and 4.9-GHz bands and distributed massive multiple-input, multiple-output have been simultaneously implemented in digital indoor networks. With the peak rate exceeding 3 Gb/s, the performance is comparable to that of an active antenna unit, satisfying the network requirements to provide premium service experience at large stadiums where the traffic demand and user density are high. This deployment was completed at the Shanghai New International Expo Center, where Mobile World Congress Shanghai, an annual telecom industry event, is hosted. The latest 4.9-GHz LampSite units supporting a bandwidth of 100 MHz were adopted to work together with the incumbent 2.6-GHz band to ensure a bandwidth of 200 MHz through CA. This enhances the coverage of indoor networks at capacity-demanding indoor hotspots, including stadiums, airports, and railway stations, to deliver premium experience to mobile users. To enhance coverage in indoor hotspots, 4.9 GHz is an ideal option for telecom carriers, ensuring premium indoor experience.

ITU World Radiocommunication Seminar and Network of Women

On 14 December 2020, the ITU reported that the biennial staple in its calendar, the World Radiocommunication Seminar 2020 (WRS-20), held from 30 November to 11 December 2020, was for the first time presented as a two-week (fully virtual) online event. WRS-20 attracted over 3,400 participants from more than 140 countries to learn about regulatory aspects of radiocommunication. Also, for the first time, the seminar plenary sessions were open to everyone, including entities that are not members of ITU-R, the ITU Radiocommunication Sector.

Together with regional radio seminars, world radiocommunication seminars provide an opportunity to gain deeper insight into revised regulations following the last World Radiocommunication Conference

MOVING FORWARD, NCELL WILL WORK WITH ZTE TO ACHIEVE MOBILE NETWORK COVERAGE OF THE WHOLE ROUTE OF MOUNT EVEREST.

2019 (WRC-19). These seminars also aim to provide participants with essential technical and regulatory background information to assist them as they prepare for the next ITU WRC, to be held in 2023.

The seminar covered topics related to spectrum management at national, regional, and global levels. Participants were presented with an overview of ITU Radio Regulations, as updated by WRC-19, to help them better understand the regulatory framework for terrestrial and space radiocommunication services including frequency allocations, software, and tools. Participants were also updated on the current activities and hot topics being undertaken by the ITU Radiocommunication study groups.

On the opening day of WRS-20, the ITU also launched its Network of Women for WRC-23 (NOW4WRC23), an initiative to encourage and empower more women to actively participate in its preparatory process and as delegates to WRC-23. The main objectives of the NOW4WRC23 initiative are threefold: to strive for gender balance among delegates, to advocate for and prepare women delegates to play key roles in WRC-23, and to grow the community of women contributors and delegates to the crucial conference.

News From 5G Americas

With 5G networks having just finished their second year in existence, wireless industry leaders are already exploring the path to future wireless networks beyond 5G. On 17 December 2020, 5G Americas, the wireless industry trade association and voice of 5G and LTE for the Americas, announced the publication of a white paper, "Mobile Communications Beyond 2020—The Evolution of 5G Towards Next G" [3], which details this global work from several aca-

demic and industry organizations' viewpoints and presents potential use cases and technologies integral to the evolution of 5G toward the "next G." Chris Pearson, president of 5G Americas, said, "5G is in the second inning of a nine-inning baseball game with a huge roadmap of innovation ahead. Yet the mobile wireless industry is going through a transformational change right now. Despite COVID, industries and societies are rapidly digitizing, so it is imperative that conversations around the next generation of mobile cellular wireless technologies begin to take place."

While 5G is still early in its lifecycle, it continues to be enhanced through continuous updates via the 3GPP releases. These enhancements to networks, architecture, technologies, and standards will continue through 3GPP Release-17 and beyond. However, it is expected over the next few years that requirements for the next generation of mobile wireless will be outlined in the upcoming International Mobile Telecommunications 2030 (IMT-2030) update from ITU. Early thought leadership around next-generation wireless use cases may include scenarios involving tactile or haptic communications, high-resolution terahertz spectrum use for imaging and sensing, cyberphysical systems in manufacturing, and enhanced public safety and national security applications. The announced 5G Americas white paper, freely downloadable, covers the following three main topics:

- a review of activities looking beyond 5G in both North America and globally
- how communications will change beyond the 2020s, including several use cases
- how North America can establish and maintain technological lead-

ership in future communications standards.

Mobile Connectivity on Mount Everest

ZTE Corporation announced on 30 November 2020 that it has supported Ncell in the successful completion of the preventive network maintenance at the southern slope of Everest Base Camp (EBC) at an altitude of 5,363 m, further ensuring the network coverage quality of 2,000-m range around EBC. The landmark base station of Ncell is the highest base station on the southern slope of EBC. For the network operation and maintenance (O&M), ZTE's engineers have overcome various environmental difficulties, such as high altitude, storm wind, and low temperature, and eventually completed the preventive network O&M, including power equipment replacement, wireless and transport network maintenance, and network quality optimization. The landmark base station is mainly powered by solar energy and standby batteries. As it is located at a high altitude in a severe environment, the maintenance of the base station is really challenging. In total, there are 10 base stations located in the Sagarmatha National Park area of Nepal, which are all constructed and maintained by ZTE. Since 2010, the base stations have continuously provided around-the-clock mobile network services for local residents and climbers. Moving forward, Ncell will work with ZTE to achieve mobile network coverage of the whole route of Mount Everest.

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