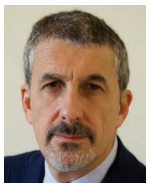

Claudio Casetti

5G Standalone Deployments Are on the Rise

Going Solo

One of the key decisions facing mobile operators worldwide is whether to launch 5G services in nonstandalone or standalone (SA) mode. The key difference is that the former relies upon existing 4G LTE network assets, such as an LTE evolved packet core, while the latter requires the deployment of a 5G core. Besides enabling new features, such as network slicing, 5G SA provides the full range of 5G capabilities in both public and private network deployment. This choice is not simply a matter of the availability of technology but also of spectrum, and we focus on the latter in the first reports of this "Mobile Radio" column.

5G SA for Midband and Millimeter-Wave Launches

On 24 August 2022, it was announced that NTT Docomo launched the world's first commercial 5G SA network allowing smartphones to simultaneously utilize both midband (sub-6 GHz) and millimeter-wave (mm-wave) frequencies, also known as 5G New Radio (NR) Dual Connectivity (DC). Users with the Sharp AQUOS R7, Samsung Galaxy S22, Samsung Galaxy S22 Ultra, and Sony Xperia 1 IV, all powered by Qualcomm's Snapdragon 8 Gen 1 Mobile Platform, which features the Snapdragon X65 5G Modem-RF System, are already seeing downloads of up to 4.9 Gb/s and uploads of up to 1.1 Gb/s, including in crowded areas. Thanks to the speed, reliability, and power of 5G NR-DC, customers with these four devices can access high-speed service in congested areas, notably, major terminal stations; event venues, including stadiums; and commercial facilities.

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Field Trials of 5G SA on Citizen's Band Radio Service Spectrum

In related news, Ericsson announced, on 7 November 2022, that it has successfully achieved a peak data rate of more than 1 Gb/s for a single user device in a recent 5G SA field trial. The trial was done over a live Citizen's Broadband Radio Service (CBRS) multi-operator neutral host-capable network at the company's North American headquarters, in Plano, TX, USA.

The OnGo Alliance coordinated the interoperability of the CBRS ecosystem. The network where this trial took place was supported by a 5G core network as part of the 5G Distributed Innovation Network at Ericsson's facility in North Texas. The network used a Radio 4408 for outdoor CBRS connectivity and a Radio Dot 4459 for indoor CBRS connectivity. Indoor coverage has been challenging for cellular networks, and this was the first time that indoor over-the-air coverage through shared spectrum reached such a high data rate.

Key results of the field trial included

- single CBRS user connection over 1 Gb/s
- 5G SA connection with CBRS spectrum
- seamless outdoor-to-indoor transitions.

The Ericsson Radio Dot 4459 is designed to support CBRS and C-band deployments. The new CBRS indoor Radio Dot uses advanced radio technologies, such as 4 × 4 multiple-input, multiple-output 4G/5G mixed-mode operation; leverages the entire CBRS band (150 MHz); and supports up to five component carrier aggregation on 4G and 5G carriers of up to 100 MHz.

Since its inception, the CBRS, as a shared spectrum, has enabled innovative use cases over cellular networks. Now, with demonstrable 5G gigabit speeds indoors and advanced capabilities, enterprises can feel confident deploying private 5G networks with high speeds and realize the additional benefits that come with 5G, including reliability, coverage, and mobility.

Communication service providers can also leverage the CBRS for supplemental capacity where needed, especially inside buildings and venues, with no added complexity. This also means neutral host network operators can deploy the highest-performing wireless network, bringing superior coverage and capacity to their enterprise and service provider clients.

This combination of 5G over the CBRS will enable diverse new applications for enterprises and sectors, such as health care, energy, and transportation. It will spur the proliferation of private networks and

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Besides enabling new features, such as network slicing, 5G SA provides the full range of 5G capabilities in both public and private network deployment.

further propel the Industry 4.0 evolution. This capability underscores the importance of the CBRS to the development and maturation of 5G.

5G Private Wireless Network for Industry 4.0

On 16 September 2022, Nestlé reported the deployment of the first private 5G network in Latin America, using an Ericsson Private 5G SA network with a 100% on-premises network architecture, operating completely separate from the public mobile network. As a collaboration among Nestlé, Ericsson, and communication service providers Claro and Embratel, this state-of-the-art solution is also a world first for Nestlé. It signals the move away from an automated factory to an autonomous one, a transformation that aligns with the company's Industry 4.0 aspirations.

The Ericsson Private 5G solution enables fast data processing—network data transfer speeds up to 25 times higher than 4G—and is particularly suited to supporting business-critical applications that require ultrashort response times in the millisecond range. 5G's high data throughput and low latency will make a significant difference to Nestlé's industrial environment by transforming the company's ways of working, further building on the company's smart factory focus, and enhancing productivity, efficiency, and workplace safety. The project utilizes frequencies for experimental use licensed by Claro.

The past few years have seen Nestlé take advantage of emerging technologies, such as robotics, automation, artificial intelligence/machine learning, virtual reality (VR), and the operation of self-driving vehicles. With the private 5G SA network in place, the company's entire digital ecosystem will become even more reliable and comprehensive, enabling new innovative use cases. This new solution serves as an example for other manufacturers looking to embrace the smart factory digital transformation. The private and closed cellular network will also strengthen network security, with sensitive data remaining exclusively on the factory's local network.

5G Private Wireless Network for Immersive Stadium Experience

On 31 October 2022, Nokia announced that it was working with several industry partners to show how 5G private wireless would significantly enhance the customer stadium and media experience during the 2022 Tissot Track World Championships, held from 12 to 16 October, near Paris. Nokia deployed a 5G modular private wireless network at the Saint-Quentin-en-Yvelines National Velodrome. During the five-day event, enhanced viewing and entertainment experiences were offered to fans, athletes, organizers, and broadcasters, in cooperation with Union Cycliste Internationale and Eurovision Sport for TV production.

Nokia used both 5G mm-wave and 5G centimeter-wave to show how it delivers extreme capacity, ultralow latency, and ultrahigh throughput to meet diverse demands of many stakeholders: spectators, sponsors, and media. Beyond the immersive experience, robust private wireless networks also support video and data sharing to improve situational awareness in stadiums for security and safety teams.

Live video streams of races were shown on a large screen at the Nokia booth. Visitors could tailor their view of the action, thanks to 360° robotic cameras at the velodrome that were operated remotely in real time. Using 5G smartphones, tablets, and headsets, spectators could access multiscreen views and race statistics in augmented reality (AR) as well as hear the sounds of the track, the crowd in the stadium, and audio commentary in the language of their choice. Nokia also showed how 5G private wireless networks support other stakeholders, such as media photographers, who will be able to upload images in an instant.

In-the-Cloud Processing of 5G Data

On 10 October 2022, Swisscom, NetScout, and Ericsson announced a world-first solution enabling 5G packet data processing in the cloud. Data processing and network function monitoring can now be performed in the cloud, thanks to an industry-first solution that provides automatic access to packet data and the ability to analyze raw packet data.

With the established approach to data collection being unsustainable, the updated network solution will overhaul the traditional virtualized mobile network function (where data traffic is routed from the cloud and processed physically in a conventional manner). Instead, cloud-based packet data processing and network function monitoring are enabled, dramatically increasing network service assurance, analytics, and cybersecurity.

The solution has been introduced into Swisscom's newly deployed cloud-native encrypted 5G network and integrates Ericsson's dual-mode 5G core with built-in software (SW) probes and NetScout's vSTREAM. Ericsson's SW probe is a built-in virtual network probe solution for cloud-native architectures that is specifically designed to enable the monitoring and troubleshooting of cloud-native functions and provide data streams for analytics. It provides two data sources: virtual tapping [a virtual terminal access point (vTap)] and event reporting. The vTAP makes packets available to third-party instrumentation, such as vSTREAM, which turns the packet data into smart data extensible to service assurance, analytics, and cybersecurity,

providing actionable intelligence for operations and engineering. The event reporting provides metadata content on signaling procedures ready to be used for monitoring and troubleshooting purposes.

This groundbreaking solution gives Swisscom better visibility into its cloud network and the ability to capture network packets from inside a network at strategic points. Continuous monitoring and deep analysis of networks are essential for guaranteeing network and subscriber assurance, troubleshooting, and security monitoring. In turn, this will help Swisscom secure the 5G customer experience, significantly reduce the total cost of ownership, secure sensitive data, and deliver new and existing 5G mission-critical services within the cloud, including automatic access to packet data and raw data.

New Cellular Router for Industrial Internet of Things

On 13 September 2022, Sierra Wireless announced the AirLink RX55 LTE cellular router solution to bring advanced networking capabilities to the Industrial Internet of Things IoT (IoT) and deliver intelligence securely at the edge for mission-critical applications on both public and private networks. The new AirLink RX55 cellular router solution provides ultralow power consumption, which, combined with its wide operating voltage, makes it ideal for solar- and battery-powered remote monitoring installations. Its compact rugged design is built to withstand harsh conditions, and with edge intelligence capabilities, the router's future-proof design enables applications including grid modernization, smart cities, automation, and remote machine and sensor monitoring.

The AirLink RX55's design along with its ultralow power, Ethernet, and dual-serial port make it ideal for use in both fixed and mobile industrial applications, including power and water utilities, oil fields, pipelines, mines, agriculture, manufacturing, waste management, private networking, and supervisory control and data acquisition (SCADA) applications. The RX55 solution delivers multiband worldwide support providing extensive public network coverage and best-in-class private networking coverage. The router supports Band 71 as well as most private networking bands, including CBRS Band 48 in the United States and private Band 42 and Band 43 in Europe.

This combination of 5G over the CBRS will enable diverse new applications for enterprises and sectors, such as health care, energy, and transportation.

The AirLink RX55 solution includes AirLink Complete, which provides remote management of the solution via the AirLink Management System (ALMS), a cloud-based management platform. Managed by the ALMS, the RX55 router leverages Sierra Wireless' next-generation web-based multinetwork router operating system, AirLink OS. With its flexible wide area network routing capabilities, AirLink OS enables industrial customers to create multiple concurrent data sessions through a new multiple-access point name (APN) solution. This multi-APN allows the separation of different traffic types, for example, separating network management traffic from SCADA traffic.

AirLink OS seamlessly integrates with the ALMS management platform to manage these features remotely and securely. Further, AirLink OS delivers industry-leading end-to-end security capabilities, including multilayered device-to-cloud security with unique cryptographic keys that connect the router to the ALMS virtual private network for secure transport, secure firmware updates, and use of the Wi-Fi Protected Access 3 protocol. Sierra Wireless' AirLink RX55 LTE cellular router solution was expected to be available commercially in the fourth quarter of 2022.

Toward Wi-Fi 7

On 8 September 2022, Intel and Broadcom showcased the industry's first cross-vendor Wi-Fi 7 demonstration, with over-the-air speeds greater than 5 Gb/s. The trial used an Intel Core processor-based laptop with a Wi-Fi 7 solution connected to a Broadcom Wi-Fi 7 access point.

Wi-Fi 7 is the platform for the next 10 years of wireless experiences, which require higher speeds, lower latency, improved reliability, and greater capacity. Wi-Fi 7 leverages new features, including wider 320-MHz channels in unlicensed 6-GHz spectrum, higher-order 4K quadrature amplitude modulation of data, and simultaneous connections across multiple bands, with multilink operation and improved channel utilization efficiency with multiresource unit puncturing.

Wi-Fi 7's deterministic operation enables new product classes, including AR and VR, ultrahigh-definition 16K media streaming, and superresponsive and reliable gaming, while supporting large numbers of connected devices in homes and offices. And with Wi-Fi 7's greatly increased speeds, broadband subscribers will get full value from their multigigabit Internet plans.

WiFi and 5G Link Aggregation

Qualcomm Technologies and Quectel Wireless Solutions, a global IoT solutions provider, reported, on 29 September 2022, the showcasing of the first 5G cellular module in the PC/laptop industry that enables Wi-Fi and 5G cellular link aggregation, a feature that significantly improves data speeds in poor Wi-Fi scenarios. The demonstration took place in Quectel's booth at the 2022 Mobile World Congress, in Las Vegas, NV, USA.

Wi-Fi and 5G cellular link aggregation supplements poor Wi-Fi with cellular data on an as-needed basis to significantly enhance high data speeds while also keeping cellular data usage to a minimum. This smart adaptative

feature significantly improves a user's web browsing experience in poor Wi-Fi scenarios, including when Wi-Fi signals are weak and overloaded, while also keeping the use of cellular data to a minimum, which can reduce costs. The demonstration used Quectel 5G cellular modules: the RM502Q-AE and RM520N-GL powered by Snapdragon X65/X62/X55 5G Modem-RF Systems connected with a commercial laptop and enabled by an app developed by the company's engineering team.

Communication Among Satellite Constellations

In October 2022, Intel announce that it was selected by DARPA for phase 1 of the Space-Based Adaptive Communications Node (BACN) program, which aims to create a low-cost reconfigurable optical communications terminal that will translate information among diverse satellite constellations. A Space-BACN satellite terminal will enable communications among satellite constellations, letting data be sent anywhere around the planet at the speed of light.

DARPA is planning for a future where tens of thousands of satellites from multiple private sector organizations deliver broadband services from low-Earth orbit. The goal of the Space-BACN is to create an "Internet" of satellites, enabling seamless communication between military/government and commercial/civilian satellite constellations. The program will facilitate collaboration among partners to ensure that the terminal being designed is reconfigurable to provide interoperability among the participating constellation providers.

There are three technical areas (TAs) in the program. DARPA selected Intel for TA 2 along with II-VI Aerospace and Defense and Arizona State University to design a reconfigurable optical modem that will support both current and new communication standards and protocols to enable interoperability among satellite constellations. TA 1 focuses on the development of an optical aperture, or "head," which is responsible for pointing acquisition and tracking as well as the optical transmit and receive functions. DARPA selected CACI, mBryonics, and Mynaric for this TA. TA 1 will interface to TA2 using single-mode optical fiber.

In TA 3, DARPA selected constellation providers Space Exploration Technologies, Telesat, SpaceLink, Viasat, and Kuiper Government Solutions (an Amazon subsidiary) to identify critical command and control elements required to support cross-constellation optical intersatellite link communications and develop the schema necessary to interface between the Space-BACN and commercial partner constellations.

Intel is developing its optical modem solution by bringing together experts from its field-programmable gate array (FPGA) product group, packaging technologists from its Assembly Test Technology Development division, and researchers from Intel Labs. Based on its leading-edge low-power Intel Agilex FPGA, Intel will also design three new chiplets that will be integrated using Intel's embedded multidie interconnect bridge and advanced interface bus packaging technologies into a single multichip package that includes

- a digital signal processing/forward error correction chiplet on Intel 3, the most advanced digital node, which enables low-power high-speed digital signal processing
- a data converter/transimpedance amplifier (TIA)/driver chiplet on Intel 16, which provides best-in-class fin-shaped field-effect transistor radio-frequency (RF) signal processing for the integration of high-speed data converters, TIAs, and drivers.
- A peripheral interface controller chiplet based on Tower Semiconductor photonic technologies that offers low-loss waveguides and options, such as V-groove, enabling automated high-volume fiber coupling integration and assembly.

Underwater Broadband Wireless for Remotely Operated Vehicles

The NTT, NTT Docomo, and NTT Communications announced, on 1 November 2022, that they performed a joint experiment on achieving broadband wireless communication and succeeded at 1-Mb/s/300-m underwater transmission in a shallow sea area (with a water depth of about 30 m), using underwater acoustic communication in field experiments.

These experiments demonstrated the world's first 1-Mb/s wireless transmission over 300 m in a shallow sea area, using spatiotemporal equalization technology for broadband transmission and improved resistance technology for environmental noise. In addition, the companies developed a wireless remotely operated vehicle (ROV) using these technologies.

NTT and NTT Docomo started considering applying these technologies to a nonterrestrial network for 5G evolution and 6G powered by the Innovative Optical and Wireless Network, and they are studying solutions to extend coverage to underwater areas, which have been unexplored for high-speed wireless communication. In addition, NTT, NTT Docomo, and NTT Communications are going to experiment, in Shizuoka Prefecture, Japan, with underwater equipment inspection using this wireless ROV. The ROV can be controlled on a ship while checking real-time underwater video. A transmitter sends a control signal to the ROV. The ROV moves and shoots on the basis of this control signal and transmits streaming data to an acoustic demodulator on the ship. With this wireless control, the ROV can be operated remotely while real-time underwater video is checked, even in narrow areas with reefs and structures that are difficult to navigate with conventional tether cable ROVs. It is possible to improve the workability and efficiency of underwater facility inspections using underwater drones.

The ROV is expected to be deployed in areas where conventional

tether cable ROVs already operate, leading to further expansion of the ROV market. Today, the market for ROVs in Japan and overseas is increasing by about 10% annually, but this achievement is expected to further expand the market. NTT Communications is going to work toward practical applications in the field of fisheries (for example, marine environment surveys in the aquaculture industry) and expand the use of underwater drones in other fields, such as port facility inspections and recreational diving.

First Open Radio Access Network Specification by the European Telecommunications Standards Institute

The European Telecommunications Standards Institute (ETSI) announced, on 15 September 2022, the adoption of the first Open Radio Access Network (O-RAN) technical specification (TS) as ETSI TS 103 859, namely, "O-RAN Fronthaul Control, User and Synchronization Plane Specification v7.02" [1]. The document focuses on open fronthaul, one of the interfaces in the O-RAN architecture for open and intelligent RANs. It specifies the control plane, user plane, and synchronization plane protocols used over the fronthaul interface linking the O-RAN distributed unit and the O-RAN radio unit for lower-layer functional splits. The scope of TS 103 859 includes both LTE and NR (hence, 5G) O-RAN.

The ETSI Publicly Available Specification (PAS) process enables an ETSI partner to submit one or more of its PASs for adoption. A PAS can then become an ETSI TS or ETSI technical report. The organization asking for this must be a legal entity, have an intellectual property rights (IPR) policy compatible with ETSI's or agree to apply ETSI's IPR policy, and sign a cooperation agreement. O-RAN is preparing to submit more of its specifications to the ETSI PAS process to recognize additional parts of the O-RAN architecture as ETSI specifications.

White Papers on 5G and Extended Reality

In November 2022, 5G Americas, the voice of 5G and 4G LTE for the Americas, announced the release of two white papers covering topics in mixed and extended reality (M/XR) and wireless cellular networks support. XR, an umbrella term for VR, AR, and mixed reality, will be the next-generation computing platform that aims to create virtual experiences indistinguishable from reality.

There are numerous XR experiences with applications in a variety of scenarios. Additional VR applications may include online gaming, virtual event participation, and educational experiences, while mobile AR use cases may include video gaming, mission-critical services, online shopping, spatial audio multiparty calls and conferences, and digital codesign.

The first white paper, "Distributed Compute and Communications in 5G" [2], introduces readers to the concept of a "distributed compute and communications (DCC) fabric" as a construct to cope with the expected needs of 5G and future wireless cellular networks. It examines progress toward the DCC fabric by reviewing the evolving cloud computing and mobile communications landscape as well as delving into social and economic needs and opportunities met by these technologies. In addition, it also richly discusses DCC fabric impacts on emerging applications in M/XR, the metaverse, factories of the future, Industry 4.0, assisted living, and connected vehicles. Finally, the white paper highlights significant ongoing activities on free open source SW and initiatives from industry and academia.

The white paper explores the following key topics around the DCC fabric:

- introduction
- vision and driving forces
- evolution, expected benefits, and anticipated technology innovations
- challenges and potential directions
- tying benefits to applications
- early ecosystem, including open source initiatives by standards organizations, industry, and academia.

It was developed by a 5G Americas technical workgroup coled by VMware and Intel subject matter experts.

The second white paper, "Extended Reality and 3GPP Evolution" [3], deals with the support provided by 5G NR for emerging XR uses cases that require rigorous key performance indicators. Specifically, low latency, high reliability, lower power consumption, and high capacity are key requirements for the success of XR. Such demands may include quasi-periodic traffic in large chunks, irregular intervals, and variable size as well as high data rates, including uplinks for AR services, the simultaneous transmission of 3D video streams, and controlling data over the same end-to-end connection.

While 5G benefits XR, emerging use cases will require further end-to-end optimizations and potential enhancements for 5G networks, which continue to evolve with each new 3rd Generation Partnership Project (3GPP) specification release. Release 15 and Release 16 offer a decent foundation for XR, but they were not specifically designed and optimized for XR support. Potential enhancements in 3GPP Release 17 and Release 18 are expected to optimize XR support, including XR awareness, power optimizations, and capacity enhancements.

The white paper explores the following key topics:

- evolution of XR
- XR key facilitators and use cases
- VR use cases
- AR use cases
- XR service characteristics and delivery requirements
- XR key enablers
- XR in 3GPP standards.

A Fully Connected World Is Still an Elusive Goal

On 8 September 2022, new data provided by the International Telecommunication Union (ITU), the United Nations specialized agency for information and communication technologies, pointed to slower growth in the number of Internet users than at the height of COVID-19. The data show that an estimated 2.7 billion people—one-third of the world's population—remained unconnected to the Internet in 2022.

An estimated 5.3 billion people worldwide are now using the Internet. While continued growth is encouraging, the trend suggests that without increased infrastructure investment and a new impetus to foster digital skills, the chance of connecting everyone by 2030 looks increasingly slim.

"The COVID-19 pandemic gave us a big connectivity boost, but we need to keep the momentum going to ensure that everyone, everywhere can benefit from digital technologies and services," said ITU Secretary-General Houlin Zhao. "This can only be achieved with more investments in digital networks and technologies, implementing best practice regulation, and a continued focus on skills development as we move to a postpandemic era."

The ITU's new estimate of 2.7 billion unconnected people compares with an updated estimate of 3 billion unconnected people worldwide in 2021. In 2019, prior to the COVID-19 pandemic, an estimated 3.6 billion people, or nearly half the world's population, were unconnected.

Amid concerns about slowing progress, the ITU analysis indicates two major challenges in terms of advancing the world's digital transformation. First, achieving universal connectivity, which, in effect, means bringing the remaining one-third of humanity online, will prove increasingly difficult. Most relatively easy-to-connect communities now have access to technologies such as mobile broadband, spurring a rapid and widespread uptake of digital services. Those still offline mostly live in remote hard-to-reach areas.

Second, the shift from basic to meaningful connectivity, by which people not only have ready access to the Internet but are able to use it regularly and effectively to improve their lives, is complex. Often, such challenges are overlooked and underestimated. Barriers can include slow Internet speed, limited affordability of hardware and subscription packages, inadequate digital awareness and skills, and linguistic and literacy barriers as well as issues such as gender discrimination and a lack of reliable a power source. All these need to be addressed if everyone is to enjoy equitable access to online resources.

Doreen Bogdan-Martin, director of the ITU Telecommunication Development Bureau, added that we should target not just universal connectivity but "universal meaningful connectivity." The ITU defines meaningful connectivity as a level of connectivity that allows users to have a safe, satisfying, enriching, and productive online experience at an affordable cost.

New U.S. Broadband Maps Released

On 18 November 2022, the U.S. Federal Communications Commission (FCC) announced the release of a preproduction draft of its new National Broadband Map. The map will display specific location-level information about broadband services available throughout the country, a significant step forward from the census block-level data previously collected. This release of the draft map kicks off a public challenge processes that will play a critical role in improving the accuracy of the map. An accurate map is an important resource for targeting funding and other efforts to bring broadband to unserved and underserved communities.

"Today is an important milestone in our effort to help everyone, everywhere get specific information about what broadband options are available for their homes, and pinpointing places in the country where communities do not have the service they need," said FCC Chair Jessica Rosenworcel. "By painting a more accurate picture of where broadband is and is not, local, state, and federal partners can better work together to ensure no one is left on the wrong side of the digital divide."

The public will be able to view the map at https://broadbandmap.fcc.gov and search for addresses to see information about the fixed and mobile services that Internet providers report are available there. If the fixed Internet services shown are not available at a user's location, he or she may file a challenge with the FCC directly through the map interface to correct the information. Map users will also be able correct information about their location and add their location to the map if it is missing. The draft map will also allow users to view the mobile wireless coverage reported by cellular service providers.

5G for Emergency Communication in Earthquake-Stricken Area

On 16 September 2022, ZTE together with the Sichuan Branch of China Mobile announced the delivery of 5G CampSite to Shimian County, Sichuan Province, China, rapidly providing a comprehensive emergency communications guarantee system for mobile phones and emergency communication backhauls in the command center and temporary shelters. This is the first time that 5G CampSite has been used in emergency rescue scenarios. Developed by ZTE and China Mobile, 5G CampSite is a small movable 5G base station with cloud functions. Supporting 24/7 plug-and-play operations, it features high performance in latency and coverage and local data real-time calculation.

In the stricken area, there were high requirements for images, videos, and voice information transmission. Within one hour of arriving at

the area, 5G CampSite immediately started to run to guarantee communications. The integrated RF antenna equipment provided the disaster-stricken residents with 4/5G multifrequency multisystem capacity. In addition, the CampSite connected to the local emergency command center through its edge computing engine to build a wireless rescue private network.

The difference between 5G CampSite and the traditional dedicated User Plane Function (UPF) + multiaccess edge computing (MEC) is that the former needs to insert only one board into existing equipment, without occupying any further supporting resources. However, the traditional UPF + MEC needs at least three servers, two switches, and two firewalls, with its power consumption over 3 kW. Through the local computing power private network of 5G CampSite, rescuers and command centers can share rescue images, videos, and voice information. And the latency in local information exchange is reduced by 80%, with a 20-Gb/s processing capability, so that the rescue speed can be greatly improved.

As rescue efforts moved forward, rescue groups needed to move from Xinmin to the front line, and big and heavy emergency communication vehicles could not reach the area. On-site engineers immediately deployed a wireless multilevel cascading solution as well as multiple 5G CampSites to extend the coverage of the private network to guarantee frontline rescue operations in a harsh environment.

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