



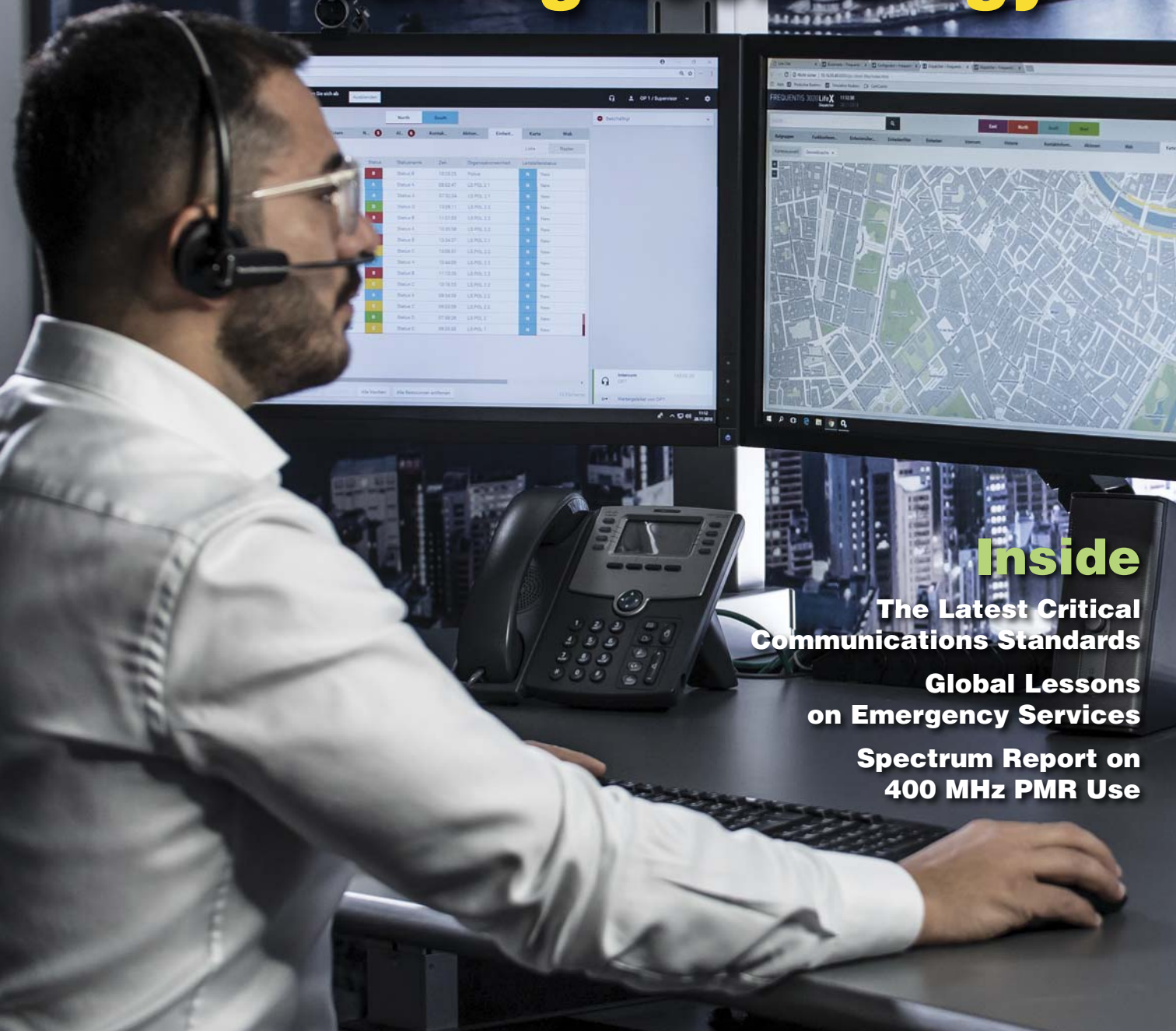
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# RadioResource

## INTERNATIONAL

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# New Emergency Calling Technology



**Inside**

**The Latest Critical Communications Standards**

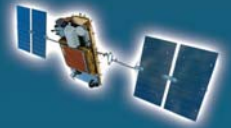
**Global Lessons on Emergency Services**

**Spectrum Report on 400 MHz PMR Use**



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## Hytera Emergency communication solution

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- *Using public network for link supplement and backup*
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- *DMR-compatible*
- *Narrowband-broadband convergence*





# Improving Emergency Services

**E**mergency services and emergency numbers have been gaining traction for several years. When a citizen has an emergency — the person is hurt or sick or is in a dangerous situation such as a fire — governments have a responsibility to provide help as quickly as possible.



The European Emergency Number Association (EENA) has effectively lobbied for 1-1-2 as the single emergency number across Europe. The group has also advocated for enhancing location technology to track callers to 1-1-2 to improve response times and pushed for the transition to next-generation technology that would allow citizens to provide multimedia information such as photos or video to an emergency call center, instead of only voice calls.

The National Emergency Number Association (NENA) plays a similar role in the United States, promoting nationwide funding and policy to transition to next-generation 9-1-1 (NG 9-1-1) based on IP technology. Both groups contribute to and develop emergency calling standards and hold interoperability testing events for vendors of emergency calling products and services.

Asia, the Middle East and Latin America have a more patchwork system of emergency services. There are no homogeneous emergency calling numbers yet in these regions, although that is beginning to change.

The article on Page 14 offers insights into the challenges facing emergency calling and services in developing countries around the globe, with several recommendations and suggestions for areas struggling to provide effective emergency services.

The article on Page 18 outlines a new technology that is helping the deaf and hard of hearing community in Austria make 1-1-2 calls in an emergency. The technology has global implications and could be deployed by other countries around the world to extend emergency services and emergency calling to even more citizens.

Our final article in this issue offers an extensive update on broadband standards for critical communications sectors from public safety to railroads to utilities. As

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our industry has tapped into the Third Generation Partnership Project (3GPP) standards for Long Term Evolution (LTE), new 5G standards specific to critical communications are on the horizon as well. Thanks for reading!

*Sandra Wendelken*

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*RadioResource International* delivers wireless voice and data information for mobile and remote mission-critical operations for professionals who reside or do business outside the United States and Canada. The magazine covers private and trunked mobile radio, wireless data, location technologies, public safety communications, microwave radio, satellite, paging/messaging, remote monitoring, and other wireless applications. Editorial content is international in scope and encompasses emerging technologies, industry reports and trends, innovative applications, product information and comparisons, news, standards and troubleshooting tips.

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**INTERNATIONAL**

# Global Officials Gather to Discuss Public-Safety Broadband

A group of officials from governments around the world came together in Boulder, Colorado, USA, in August to discuss issues surrounding public-safety broadband communications.

Officials from the First Responder Network Authority (FirstNet), which oversees the U.S. nationwide public-safety broadband network (NPSBN), hosted and helped organize the event. The group heard details from FirstNet staff members about how they gather information and engage with public safety, how they developed the request for proposals (RFP) and how the network is progressing. Attendees also received a tour of FirstNet's Innovation and Test Laboratory and the Public Safety Communications Research (PSCR) facility, both of which are in Boulder.

Ed Parkinson, FirstNet executive director, said 18 countries and the European Union (EU) were represented. In addition to the U.S., delegates from the United Kingdom, Germany, France, Estonia, Finland, the Netherlands, Belgium, Denmark, New Zealand, Norway, Poland, Romania, Spain, Switzerland, Japan, Australia and Canada attended. Noticeably absent was a South Korean delegation because testing for a broadband network for railroads was conducted in that country the same week, he said.

Parkinson said many governments, such as Germany, are interested in the



details of FirstNet's governance, including single points of contact and the opt-in process that was written into the legislation that created FirstNet.

While the specifics of spectrum, deployment model, funding, coverage and other details are unique to each country, the event allowed the officials to exchange information and learn about specific approaches they can take back to implement in their own countries.

"Understanding how broadband is being used in various countries gave FirstNet folks insights; often, we hadn't thought about leveraging the technology in that way," Parkinson said.

The U.K. Emergency Services Network (ESN) procurement for air-to-ground (ATG) services to enhance coverage and capacity is an area that intrigued FirstNet officials.

"Just seeing how they went through that procurement process was invaluable for us," Parkinson said. "We haven't spent any time on ATG. Now, we have a direct,

open dialog where we can share information on that. That is a great tangible example of why conferences like this are helpful. We don't have to start from scratch here in the U.S."

The event also grows the marketplace for the vendor community. "It's my hope that we can grow that ecosystem in a way that will ultimately benefit the public-safety users here in the U.S.," he said. "The more companies you can get and the more vendors that enter this marketplace helps drive competition, and users get greater choice. That's only a good thing."

The group is planning another event next year, although dates and location have not yet been determined. A similar event was held in 2018 in Belgium, and the inaugural conference of the International Governmental Operators' Forum (IGOF), a new initiative to advance coordination among national critical communications operators, was launched in Coventry, United Kingdom, in April.

## Huawei Files Patent Infringement Lawsuit Against L3Harris

Chinese company Huawei filed a patent infringement lawsuit against L3Harris Technologies in the U.S. District Court for the District of Delaware, alleging that L3Harris Long Term Evolution (LTE) products infringe five Huawei patents.

The five patents at the heart of the case include U.S. Patent 7439,969, "Single Gesture Map Navigation Graphical User Interface for a Thin Client."

Huawei alleged that L3Harris' BeOn push-to-talk (PTT) application

has several map-related features that infringe features described in the '969 patent, including displaying a map on the display screen of a thin client, performing a method for map navigation using a graphical user interface (GUI) on a thin client, and the ability to distinguish between movement-based gestures and non-movement-based gestures using the distance in pixels a user's touch has moved.

Additionally, Huawei alleged that Harris' tactical 4G LTE radios, used mainly in military applications, infringe its other four patents in a variety of ways. The company said

L3Harris should have been aware of those four patents because of two emails Huawei sent L3Harris in December saying that Huawei's patent portfolio includes several patents essential to the LTE standard, Huawei's complaint said.

Huawei asked for a jury trial in the case. As relief, Huawei is seeking a determination of the conditions of future infringement such as an ongoing royalty, damages resulting from the infringement, and payment of Huawei's costs and expenses related to the case and the infringement.

Harris and L3 Technologies



completed a merger into L3Harris Technologies at the end of June. The products included in the case appear to be products produced by Harris prior to the merger. L3Harris also manufactures Project 25 (P25) radio equipment.

## ASIA PACIFIC

### Australian Regulator Proposes New Radio License Type

The Australian Communications and Media Authority (ACMA) proposed a new transmitter and receiver license type, referred to as the area-wide apparatus license (AWL). This new license is intended to complement existing licensing options and improve apparatus licensing flexibility, particularly by providing a scalable licensing option to support area-wide multidevice deployments.

The AWL type is intended to authorize the operation of one or more radio communications devices within a

defined geographic area at a frequency or frequencies specified on the license, subject to the conditions included on the issued license.

The license type will be scalable, enabling its use for different-sized geographic areas and bandwidths. Unlike existing apparatus license types, which typically align with specific uses and purposes, the AWL type will be capable of authorizing a variety of fixed and mobile services, uses, applications and technologies.

ACMA is proposing regulatory changes to elements of the apparatus licensing framework and the development of a new license condition determination for the AWL. Comments were due in August.

## EUROPE

### PMeV Tackles Broadband Interface, Cybersecurity

PMeV – Netzwerk Sichere Kom-

munikation, the German association and network for critical communications, established a committee to address a platform for mission- and safety-critical broadband applications and is overseeing the standardization of a control center interface. Critical communications companies and officials from public authorities and organizations with security tasks are represented in the committee.

“Through the introduction of new technologies, the technical requirements imposed on professional control systems will considerably change in the future,” said Volker Hartwein, PMeV vice president and head of the control centers department. “In this conjunction, the control center interface will be of particular importance for the introduction of a mission-critical broadband network (4G/5G) for security agencies in Germany.”

PMeV also established a cybersecurity department. The representatives

# HAL HF Radio Mailbox - High Speed delivery of IMAP Email, text messaging and data over HF radio.

HAL Communications Corporation, has developed the MB5100/2K HF radio mailbox, the first fully synchronised system for the delivery of email over High Frequency (HF) radio links.

The development of the HAL HF radio mailbox is based on the increasing demand for users to be able to communicate from wherever they are, including isolated locations connected only by HF radio, using the existing email client on their personal device, be it a smartphone, tablet or laptop, in much the same way as they can use the public WiFi in a high street café or their own office.



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# P25 Meetings Update Standards, Target Encryption, Geolocation

By Stephen Nichols

The Project 25 (P25) standards groups coordinated through the Telecommunications Industry Association (TIA) updated both FDMA and TDMA standards and identified user needs for encryption and geolocation during June. Significant progress was made in P25 standards development and evolution, and in-depth discussions between manufacturer representatives and P25 users occurred during the meetings, officials said.

Progress included a revision of the Phase 1 FDMA Transceiver Measurement Methods standard, which was approved for ballot. This revision adds a method of measurement to evaluate the ability of a P25 receiver to reject an unwanted broadband base station signal, thereby preventing degradation to the reception of a desired signal. Performance specifications are expected to follow completion of the measurement method.

The group also finalized revisions of the Two-Slot TDMA MAC Layer Specification and the Two-Slot TDMA MAC Layer Messages standards. The revisions and a new Two-Slot TDMA MAC Layer Procedures standard were approved for ballot. This

restructures the P25 Phase 2 TDMA air interface standards for voice and control channels to address errata that have been collected and in preparation for

the addition of Link Layer Encryption (LLE).

Revisions of the Trunking Overview, Tier 1 Location Services Specification and IP Data Bearer Service Specification standards were all approved for ballot. These revisions address errata that have been collected since the last publications.

Officials agreed to begin work to modify the Inter RF Subsystem Interface (ISSI) standard to accommodate interoperability and interworking with Third Generation Partnership Project (3GPP) mission-critical Long Term Evolution (LTE) services based on the Joint LMR and LTE (JLMRLTE) working group Phase 1 study document.

Encryption and geolocation were identified as new user needs. These included the need for a globally unique identifier for Tier 1 GPS devices in P25 systems. This would ensure accurate location tracking of each individual subscriber during a wildland fire or other incident.

Another need is the ability to affiliate



P25 subscriber units with multiple P25 key management facilities (KMF). This would provide for the concurrent over-the-air affiliation of a subscriber unit

with multiple KMFs, allowing seamless roaming with secure encryption updates for users from multiple systems responding to an event or incident.

The Federal Partnership for Interoperable Communications (FPIC) updated its ongoing work with the P25 ISSI/Console Subsystem Interface (CSSI) focus group.

An update on the DHS Compliance Assessment Program (CAP) highlighted recently published documents that include ISSI/CSSI conformance testing requirements, templates, test pass/fail criteria and a series of conformance test cases. CAP draft documents for compliance assessment bulletin (CAB) testing rules and future ISSI/CSSI interoperability testing requirements and templates were published. ■

---

*Stephen Nichols is director of Project 25 Technology Interest Group (PTIG), a not-for-profit organization that promotes the Project 25 (P25) digital radio standard.*

of the PMeV member companies unanimously elected telent's Nico Werner as chairman of the new department.

The association plans to create awareness that secure communications systems for emergency and rescue forces, operators of critical infrastructure and industry are critical for safeguarding security and providing society with the necessary services.

"To ensure the security of these communications systems in the future, cybersecurity must have the highest priority both for operators and responsible persons dealing with professional mobile communication," said PMeV President Bernhard Klinger. "Contributing to and coordinating this work in the interest of critical communications users is our core task."

## ETSI Releases Report on IoT in Emergency Use Cases

The European Telecommunications Standards Institute (ETSI) Special

Committee EMTEL (emergency communications) released a report studying use cases and communications involving internet of things (IoT) devices in emergency situations and providing recommendations on standardization requirements that could enhance the safety of those communications.

A group of experts possessing a mix of both IoT and emergency communications competencies prepared the ETSI TR 103 582 report. The report considers communications involving IoT devices in all types of emergency situations, such as emergency calling, mission-critical communications and public warning system communications. The report adds a new emergency communications domain identified as automated emergency response, where IoT devices can act after receiving a trigger to prevent hazardous situations. A set of eight exemplary use cases illustrate how such communications can be used to provide additional/enhanced

information for communicating parties involved in such situations.

For example, they cover the case where a smoke detector in a rubbish container sends an emergency message in the event of a fire, potentially sending a real-time emergency video in parallel. In another case, an IoT device could immediately turn off a gas tap or slow down a high-speed train when it receives an earthquake public warning (automated response).

The report also helps prepare the potential standardization requirements enabling safe operation of these communications.

"The ETSI report prepares the requirements for communications involving IoT devices in all types of emergency situations," said Michelle Wetterwald, an expert from the ETSI EMTEL committee. "It also leverages from benefits of IoT with data gathering without human interaction, objectivity of IoT data, fast and fail-safe information sharing, translation of



# South Korea Moves Forward on Public-Safety Network, Direct Mode

By Youngsam Hong

In December 2018, South Korea's National Procurement Office awarded Korea Telecom and SK Telecom contracts for the country's nationwide public-safety Long Term Evolution (PS-LTE) network. Korea Telecom won a 714.5 billion Korean won (US\$600 million) contract to build District A and B, and SK Telecom won a 312 billion Korean won (US\$261.7 million) contract for District C.

District A covers Seoul, Daegu, Daejeon, Sejong, Gyeongbuk, Chungnam and Jeju, and District B covers Gwangju, Gyeonggi, Gwangwon, Jeonbuk and Jeonnam. District C covers Busan, Incheon, Ulsan, Chungbuk and Gyeongnam.

In the request for proposals (RFP), 5,647; 6,148; and 3,652 base stations were estimated for Districts A, B and C, respectively, but actual quantities could increase slightly. The network core and operations center are part of District A.

The deployment is targeted to be completed by December 2020. Operations

would start district by district in early 2020, with nationwide operation in 2021.

The network core and operation center will be fully redundant, and all the services will be seamlessly continued by using active pool configuration, real-time database replication and automatic switchover. The system and user equipment (UE) will be based on mission-critical push to talk (MCPTT) and evolved multimedia broadcast multicast services (eMBMS). Direct-to-direct (D2D) communications will be an optional feature.

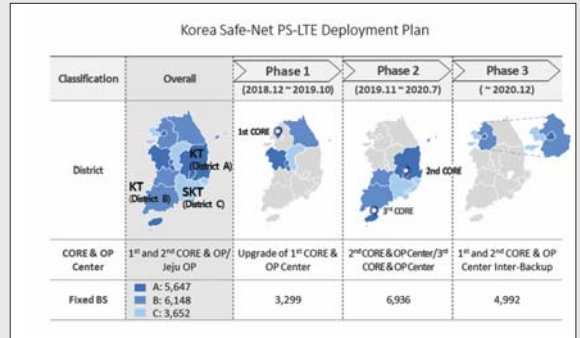
The D2D service will be based on direct discovery for public-safety use and direct communication via sidelink. D2D product purchase and supply is expected to happen next year. Samsung is positive about both the LTE chipset and UE products supporting the D2D feature.

The National Procurement Office also

awarded Korea Telecom a contract to supply PS-LTE UEs for the South Korea National Police. The order includes 4,208 LTE units with a radio form factor and 9,819 units with a smartphone form factor. AM Telecom and Samsung will manufacture the radio and smartphone LTE UEs.

The Ministry of the Interior and Safety estimates the total quantity of UEs at 239,118 units for various user agencies, so more procurements will be announced. ■

*Youngsam Hong is the Safe-Net Forum outreach committee chair.*



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# U.K. Awards US\$78M ESN Air-to-Ground Contract, Improves Coverage

The U.K. Home Office selected Cobham to provide the Emergency Services Network (ESN) Aircraft Communications System (ACS) in a contract worth £64 million (US\$77.7 million). The ACS contract forms part of the Emergency Services Mobile Communications Programme (ESMCP) and is responsible for delivering the equipment and associated services to deliver the communications devices for the air-to-ground (ATG) capability, approved for use on the ESN.

The ACS is an aircraft radio and control unit, enabling communications via the ESN up to an altitude of 10,000 feet. The authority and nominated ESN user organizations (UOs) can use the framework agreement to procure the required goods and services for use on the ESN.

“The award of the ACS contract marks an extremely important milestone in the rollout of the ESN and allows us to look forward towards the deployment of a full 4G LTE air network, which will be a world first,” said Steve Watson, ESMCP deputy director. “We look forward to working closely with Cobham to deliver this capability.”

The system, which the Home Office called the first of its type worldwide, will provide mission-critical push-to-talk (MCPTT) voice and high-speed data services over Long Term Evolution (LTE) for all U.K. police and air ambulances with deliveries during 2021 – 22. The procurement has a call-off period of 10 years with the option to extend for up to an additional five years. The estimated total value of the framework agreement is up to £100 million (US\$121 million). The contract includes ongoing service management but excludes installation.

Separately, ESN staff 30 July made



the first call on a moving London Underground Tube train using a pre-production Samsung ESN device on the live ESN network provided by EE. The handsets used ESN subscriber identify module (SIM) cards.

A call was made from a southbound Jubilee Line train as it traveled numerous times under the River Thames from Westminster Station to Waterloo. The Jubilee Line is one of the deep tubes and is significantly farther underground than other lines.

ESN staff said the calls using 4G VoIP were successful and clear, with numerous people reached quickly and conversations held as normal. Data streaming was fast and without interruptions. The demonstration was part of a predefined period of testing using real ESN devices on the 4G network in the London Underground. All of the devices could make 4G calls over the network using a standard mobile phone dialer.

Alongside ESN and the Operational Communication in Policing (OCiP) team members, representatives from London’s emergency services including the British Transport Police, Metropolitan Police Service and London Fire Brigade, all also used ESN devices to test the network.

Transport for London (TfL) for the past 24 months has installed 332 kilometers of radiating cable and 297 kilometers of fiber-optic cable in the Underground to

support the ESN service. The same infrastructure will also support future mobile services via a concession for which TfL is running a commercial procurement.

ESN also demonstrated the new interworking functionality between the ESN and Airwave networks with Motorola Solutions.

The interworking function allows users and control rooms that still operate on Airwave to communicate with users who have moved to ESN. Functionality will initially be available to emergency services as part of the ESN Direct 2 release. Further capabilities will then be built into Direct 3 in readiness for the fully functional version needed for national transition to ESN Prime.

ESN staff also said the group met its commitment to build 50 Extended Area Service (EAS) masts by the end of July. The EAS program is responsible for building a new network of masts to cover remote and rural areas of Great Britain. These sites are in addition to new sites provided by commercial provider EE. EAS will extend ESN coverage in these areas. The 50th EAS mast was completed the last week of July.

“Although the primary objective is to facilitate the delivery of ESN coverage within the extended area (the most remote parts of the U.K.), masts will be built where possible to facilitate the delivery of commercial coverage and will be made available to multiple network operators,” an ESN post said.

Separately, an ESN blog post said improving mobile coverage in rural areas is a priority, and ESN officials are considering all options, including rural roaming, to facilitate rural coverage.

human languages not required, real-time data transmission and operation in dangerous environments.”

## Moscow 5G Demo Center Tests New Technologies

A 5G demo center for testing promising technologies and city services is planned for Moscow. The center will be accessible for both Russian and foreign companies. The new laboratory will facilitate access to 5G technologies for entrepreneurs, create a local center of excellence, and help compa-

nies find and retain specialists.

“This space will provide businesses with the opportunity to test new technology solutions and assess the merits of industrial application,” said Alexander Gorbatko, deputy head of Moscow’s IT Department.

“The demo center will be open to major companies, as well as startups and research institutions. Access to the laboratories will be given to companies from different markets, not only the telecom sector. We are interested in finding joint business models for play-

ers in various markets — industry, medicine, transport and other sectors of strategic importance to the city.”

The demo center will operate on the principles of vendor neutrality, openness towards business, info security and compatibility, and patent and technological integrity in regard to equipment.

By the end of 2019, four 5G pilot zones will be developed in Moscow. Each of the zones will be operated by one of Russia’s four major telecom providers. The zones include VDNKh



Park, Skolkovo, Tverskaya Street and Sparrow Hills.

## EENA Releases Report on AML Deployments Globally

The European Emergency Number Association (EENA) released a report card on the deployment of advanced mobile location (AML) technology, used to locate emergency callers.

The document describes how AML is deployed in each country and how it works operationally. Fourteen countries are covered in the report, which will be published annually. The document is organized into 15 sections, each focusing on a country making use of AML. An annex provides tables to easily compare information between the different countries.

British Telecom (BT), EE and HTC first offered AML in 2014 in the United Kingdom to pinpoint the source of emergency calls from mobile phones to a radius of 30 meters or less. In

2015, EENA said the technology should be used throughout Europe.

EENA Members Workshop 2017 underlined the need for the document.

## LATIN AMERICA

### Mexican State Selects Secure MVNO for Public Safety

MXLINK, Airbus' secure mobile virtual network operator, was selected to provide the government of the state of Querétaro, Mexico, with a fully secure mobile broadband communications platform for its COSMOS security and justice model.

MXLINK services will be integrated into the multimedia tablets used by the state and municipalities to securely capture complaints and reports directly at the crime scene. This will ensure a higher level of security and enhance law enforcement efficiency. The city's citizens will also be able to access security and justice.

In addition, MXLINK services will provide a highly secure mobile platform for search-and-surveillance missions and encrypted communications of high command, fully integrated with Mexico's Tetrapol IP radio network that covers 50% of the territory, reaches 85% of the population and has more than 100,000 terminals in operation.

Querétaro officials designed the COSMOS management model for the implementation, operation and consolidation of the Accusatory Criminal Justice System.

Launched in May, Airbus said MXLINK is the first of its kind in Mexico, offering multioperator coverage, interoperability with the national Tetrapol network, and end-to-end voice and data security. MXLINK takes advantage of Red Compartida, built and operated by Altan Redes and aims to be the first fully wholesale mobile Long Term Evolution (LTE) network in the world.



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# Global Lessons on Emergency Services

Developing countries are finding numerous solutions to improve emergency medical services delivery.

By Jeffrey Winbourne

**D**eveloping nations face numerous challenges to the delivery of emergency medical services. This article will address the challenges, what is driving change in the delivery of these services and some of the available solutions.

Emergency medical services — ambulances, emergency medical technicians (EMTs), paramedics, hospital emergency rooms and training — are a pressing need worldwide. The process of delivering these services is emerging in many different forms internationally, especially in the developing world. Although many countries in the developing world have minimal or no emergency medical services, this is starting to change. The actions taken by governments, nongovernmental organizations (NGOs) and private entities have influenced the ability to provide emergency medical services in the developing world.

The key challenges facing the development of emergency medical services, outside of funding, include using a single emergency phone number, private versus public medical services, war and terrorism, and vehicular traffic.



**Single Emergency Telephone Number.** When you have an emergency, seeking immediate help is the first reaction. In the U.S., for example, that means calling 9-1-1. In many developing countries, there is not a single number to call. Generally, people will call the police emergency number; however, the police

do not always transfer the call to the emergency medical services call center or local hospital as a matter of immediate procedure or vice versa. Most countries in the developing world have three different emergency numbers for police, fire and medical. Dialing the right number in a crisis can be confusing for anyone.

Consolidating to one emergency number is not always a simple matter of selecting one number. In Jamaica, Vietnam and Indonesia, consolidating to one number requires national legislative or regulatory action. The emergency number for these functions is many times included in the authorizing legislation for ministries, so changing the emergency numbers is not always just a technical or public education issue.



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During the next 10 years, this situation should change with the use of a single emergency number in most countries. The International Telecommunication Union (ITU) set 1-1-2 and 9-1-1 as standard numbers. Yet, many countries will use the current number that is most well known by their citizens.

**Private Versus Public Emergency Medical Services.** In many developing countries, ambulance services are private and generally tied to a private hospital. For example, Jamaica has only private ambulance service providers. People must pay for the service, and most cannot afford the rate, forcing them to use either their own car or a taxi to transport someone to a hospital. Currently, the Jamaican Fire Department is in the process of purchasing ambulances and plans to train its staff as EMTs and paramedics. In India, emergency medical services are well funded, and the telephone number 1-0-8 is used. NGOs contract with the state governments to provide the 1-0-8 call centers and ambulance services. The 1-0-8 services significantly impact rural areas of India, which are heavily populated and have limited access to hospitals.

**War and Terrorism.** In some parts of the developing world, war and terrorist-related conflicts limit any ability to provide emergency medical services. However, war-torn places such as Syria, Somalia and the Kurdistan region have officials who serve as examples of emergency medical professionals providing services under extreme conditions.

In Syria, the White Helmets are recognized for saving hundreds of lives. The White Helmets' personnel and vehicles are targets of Syrian and Russian airstrikes in the nongovernment-controlled areas. The volunteer organization provides medical evacuation, urban search and rescue in response to bombing, evacuation of civilians from dangerous areas and emergency medical services delivery.

An all-volunteer emergency medical services provider called Aamin



The lack of a single emergency number is a problem in many developing countries.

Ambulance was established in civil-war-torn Somalia in 2006. Aamin Ambulance is also an NGO that survives on donations and receives no funding from the government. Before Aamin Ambulance was established in Mogadishu, there was only private ambulance service, and few people paid for it. Aamin Ambulance currently has 24 ambulances in Mogadishu.

In Kurdistan, the regional government and the World Bank built an emergency communications solution that includes three call centers and systems, ambulance communications and a radio network. Prior to this project, a single individual and his mobile phone managed emergency medical services for millions of people.

**Vehicular Traffic.** Ever-increasing vehicle traffic is possibly the biggest challenge facing public safety as a whole. Why is traffic such an issue? Basically, firetrucks, police cars and ambulances can't get

through the traffic to an incident in a timely manner. Traffic delays that affect the delivery of these services are the source of widespread community concern and angst, especially when lives are at stake.

Jakarta, Indonesia, a city of 10 – 12 million residents, may have the worst vehicle traffic in the world by some indexes. In 2012, there were six government-owned ambulances in the city. Today, there are more than 60 advanced life support (ALS) vehicles, with plans to increase that number. The city also started using medics on motorbikes to get around the traffic faster. Mass first-aid training has also been employed to assist patients until a medic can arrive. Modern, efficient call centers for general emergency calls (1-1-2) and emergency medical calls (1-1-8) have been established, and call-taker, dispatcher and medic training is an ongoing process.

Ho Chi Minh City, Vietnam, has a similar population of some 10 million residents and is in the process of upgrading its emergency communications systems to include use of a single telephone number for all emergencies. The city has two basic life support (BLS) ambulances posted at each district's public hospital. In addition, it assigns doctors and nurses to each ambulance. The city is in discussions with the national health ministry about potential changes to legislation that will allow the city to transition to a paramedic/ EMT model. Traffic problems in the city cause long response times, so the city government is looking into using EMTs on motorbikes as a means to get around traffic quickly and triage a patient while the ambulance works its way through the city's dense vehicle traffic.

### The Philippines Example

Planning and implementing a national integrated emergency communications and emergency medical response system takes strong national leadership. The Philippines has mandated a transition to a single national

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#### White Helmets

<https://whitehelmets.org/en>

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<https://aaminambulance.com/>



emergency telephone number and is one Southeast Asian country that has pioneered building an integrated emergency communications system nationwide.

In 2018, the country institutionalized the three-digit number 9-1-1 as the nationwide emergency hotline, replacing Patrol 1-1-7, to conform to the ITU's international standards. The 9-1-1 system has one public-safety answering point (PSAP) at a national level — a national call center — under the Department of Interior, and local government and 9-1-1 call centers at local levels. The services are free 24/7.

The Bureau of Fire Protection (BFP) is the leading provider of emergency medical services. All of its ambulances are equipped with at least BLS devices and a communications system with one base radio and one handheld radio or cellphone. Each ambulance crew consists of one medical officer, two BLS trained nurses, one ambulance driver and one aide. Recently approved legislation requires new personnel of the BFP to be certified EMTs. In addition to ambulances, motorcycles with basic medical equipment are used to cope with traffic in metro Manila.

The Philippine Red Cross (PRC) is an active contributor to the community-based endeavor in emergency medical services. Its free ambulance services are operational 24/7 with 97 chapters across the country. PRC has a team of well-trained first responders and 126 ambulances. With ambulance services provided by multiple stakeholders including the BFP, PRC and private companies, the ratio of population to ambulances in the Philippines was 2,106 to one in 2015.

The country recognized emergency medicine as a specialty in 1988. There are even dedicated emergency medical services societies, such as the Society of Emergency Medical Technicians and the Philippine College of Emergency Medicine. The Philippines also has about 3,300 certified professionals.

## The emergency number is many times included in the authorizing legislation for some ministries, so changing the emergency numbers is not always just a technical or public education issue.

### What's Driving Change?

Emergency medical services are the focus of change in emergency response, using many innovative and courageous efforts. What is driving this transformation? The drivers include the increase of wealth globally, raising quality-of-life expectations and TV shows about emergency medicine. In addition, multilateral agencies such as the World Bank, United Nations and others have emphasized improving medical care to recipient nations.

The impact of the U.S. and European Union (EU) diaspora on their home countries is also a factor. When someone calls 9-1-1 in the United States, there is a general expectation that the ambulance will arrive within four to eight minutes, depending on the jurisdiction. As everyone knows, the United States is home to people from many nations. For instance, Indians or Vietnamese living in the U.S. are part of the Indian or Vietnamese diaspora. To some degree, by bringing the U.S. or EU experiences with emergency response to their families and friends still living in the country of origin, expectations of the delivery of emergency medical services begin to change.

### Solutions for Delivery

Several low-cost solutions are being implemented in developing nations. Many of these solutions are being used or considered by U.S. cities and counties to overcome local challenges to providing service. Cost is always a factor, and many of these solutions are low cost. Others are aimed at reducing traffic. These solutions include:

■ **Motorbike Medics/EMTs.** While not new, this option is becoming

common throughout southern Asia as an alternative to ambulances and to move quickly through traffic to an incident.

■ **Mass First-Aid Training.** Training volunteers and linking their mobile phones to emergency communications systems to alert them if there is an incident near them is increasing.

■ **Taxi Driver First-Aid Training.** Many times, taxis are the first option for getting a patient to a hospital.

■ **Social Media.** Many agencies are using social media to communicate with the public on traffic problems. Jakarta's traffic police have more than 1 million followers on Facebook, Instagram and Twitter.

■ **Electronic Traffic Law Enforcement (E-TLE).** Expanded traffic monitoring camera systems coupled with electronic messaging systems are being implemented in Jakarta.

■ **E-Tolling.** Charging a toll for entering downtown areas of major cities has been implemented in Singapore.

As traffic continues to snarl U.S. cities, impacting the ability of first responders, especially emergency medical units, to get to the incident quickly, learning how developing nations are addressing the problems could serve as a lesson for other countries. ■

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Jeffrey Winbourne is the president of Winbourne Consulting, international services. He has worked in the emergency communications industry for more than 25 years. In addition to working on many projects in the United States, he has worked on emergency communications and emergency management projects in more than 20 countries since 2004. He can be contacted at [jwinbourne@w-llc.com](mailto:jwinbourne@w-llc.com).



# Austria's Emergency Calling Solution

Photo courtesy Frequentis

**E**mergency communications services are primarily voice only, along with a marginal share of data and multimedia used by public-safety answering points (PSAPs). The news recently told the tragic story of a young European woman who was killed because her exact location was not known, and if she had had the means to text instead of speak with the police, she might have lived. Improving access to emergency services for citizens, especially for the deaf and hard of hearing, requires PSAPs and people in need to handle new modes of communications such as text.

In Austria, dialling 0800 133 133 allows people to contact the police via fax or short message service (SMS). Officials don't have detailed data indicating how often this ser-

## A private initiative to provide accessibility to emergency services could be used worldwide.

**By Wolfgang Kampichler**

vice is used or how successful it is, but people have repeatedly reported problems. For example, a former Austrian member of parliament's kitchen burned down because she couldn't contact the fire brigades in time. An obvious drawback is that any message received at the Vienna Police Department requires several steps and time until proper resources are dispatched.

Organizations that support deaf and hard-of-hearing individuals have expressed the need for text to emergency services and location-based emergency call routing. Technical

standards that enable next-generation emergency calling or next-generation 1-1-2 (NG 1-1-2) are available, so it is a matter of implementing the technology. In 2016, a group of engineers started a private initiative, called Deaf Emergency Calling 1-1-2 (DEC112), to provide a better way to support deaf and hard-of-hearing people. For Austria, this means a solution that allows direct conversations between a person in need and the federal states' control center, and provides location information that can easily be integrated to the control room. The challenges with Austrian



emergency services include different emergency numbers and the fact that emergency services are the responsibility of federal states using different call-processing equipment (CPE) or CAD systems. In technical terms, it means different services — at least for fire, ambulance and police — and service regions for each federal state, combined with next-generation core services and standardized interfaces that make up an NG 1-1-2 architecture.

### Technical Architecture

Emergency calling is based on straightforward technical building blocks and a few legal and regulatory aspects. Technical elements, typically part of an incumbent telephone service provider, ensure that emergency calls are routed to the most appropriate emergency center. Routing uses static information such as dialing code/area code and a table that maps those codes to centers that are identified by unlisted and often

## Organizations that support deaf and hard-of-hearing individuals have expressed the need for text to emergency services and location-based emergency call routing.

undialable numbers. That works well in a legacy environment but is a challenge when calls originate from different sources or use different technologies such as DEC112.

NG 1-1-2 architecture combines a session initiation protocol (SIP)-based architecture and functional elements to implement a mapping and routing process that has the potential to support any originating technology subject to the condition that proper location information is available for routing purposes. At the inception of the DEC112 project, funded by the Internet Foundation Austria, it was immediately obvious that core services of the NG 1-1-2 architecture needed to be implemented.

DEC112 open source operation in Austria includes several main elements. The emergency services routing proxy (ESRP) is the base routing function for emergency calls, and the primary input to an ESRP is a SIP message, which means that only the call setup via SIP signaling is routed through intermediate functional elements. Media (audio, video or text) is transmitted end to end. The output is a SIP message with a route header (possibly) rewritten and, in some cases, additional manipulation of the message content. To do this, the ESRP maintains an interface to the emergency call routing function (ECRF) for location-based routing information. Emergency calls are routed to the appropriate PSAP

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# DEC112's Global Benefit

By Walt Magnussen Jr.

The work done on the U.S. National Emergency Number Association (NENA) i3 next-generation 9-1-1- (NG 9-1-1) implementation in Austria shows considerable thought leadership. The text-to-9-1-1 implementations in the United States are all based on short message service (SMS) gateways. While they provide a transitional solution, they do not offer the full suite of capabilities that a full NG 9-1-1 implementation would offer.

The Austrian solution not only blazes the trail for the rest of the world while eliminating the obstacles for the hearing impaired in Austria, but it also points out the next steps. The DEC112 solution requires an application to be installed on a caller's smartphone. While this was the

best solution available to the development team at the time, it would be an enhancement to work with the phone manufacturers and the service providers to embed this capability into the native IP multimedia subsystem (IMS) client in the phone and the network so that foreigners traveling to Austria can enjoy the same personal safety benefits using the same interface that they would use at home.

The industry needs to work together to make this a global capability while not forgetting that it began in Austria. ■

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*Walt Magnussen Jr. runs the Internet2 Technology Evaluation Center (ITEC), an emergency communications lab at Texas A&M University (TAMU) in College Station, Texas, United States.*

based on the location of the caller. The functional element responsible for providing mapping information to querying entities is the ECRF. The ECRF supports the location to service translation (LoST) protocol by which location information and a service uniform resource name (URN) serve as input to a mapping function that returns a uniform resource identifier (URI) addressing the most appropriate PSAP for the caller's location.

Assuming a single, countrywide PSAP receives emergency calls via a single number, routing of SIP-based emergency calls may be that simple. A SIP proxy could know the whereabouts of calling and called parties, even without caller location and would forward incoming requests. But in Austria, an emergency center serves a certain region (jurisdiction) and has a unique emergency number — 1-4-4 for ambulance, 1-2-2 for fire brigades and 1-3-3 for police, for example. Such a setup requires extended features supported by a SIP proxy, and the aggregate of such extended features paired with the basic features of a SIP proxy make up an ESRP.

Defined as a functional element of the NG 1-1-2 architecture, an ESRP is a SIP proxy that selects the next hop routing based on location, service URN and policy.

To understand the end-to-end message flow, the ECRF must be explained further. In simple terms, the ECRF is a geographic information system (GIS)-enabled component used for storage, retrieval, mapping and analysis of geographic data. Geographic data may include digital map layers representing the real world using points, lines and polygons, as well as aerial and satellite imagery. The DEC112 open-source ECRF has GIS data defining Austrian PSAP service areas that are polygons of Austrian federal states and counties. Remarkably, the boundary of one federal state, Lower Austria, has one exterior and one interior boundary.

A LoST request provides a service URN and coordinates, point or circle of a calling party to be intersected with the PSAP boundary polygon map, which further provides the SIP address to the ESRP for routing purposes. Indeed, the calling party just selects the

required service — ambulance, fire or police — and the DEC112 app gets the current location from device sensors, and both data are used as inputs to the query. Therefore, a calling party does not need to know the address of the correct PSAP nearest to or responsible for the location where the emergency call originates. When receiving a message or call, two tasks can be distinguished at a PSAP: call-taking and dispatching.

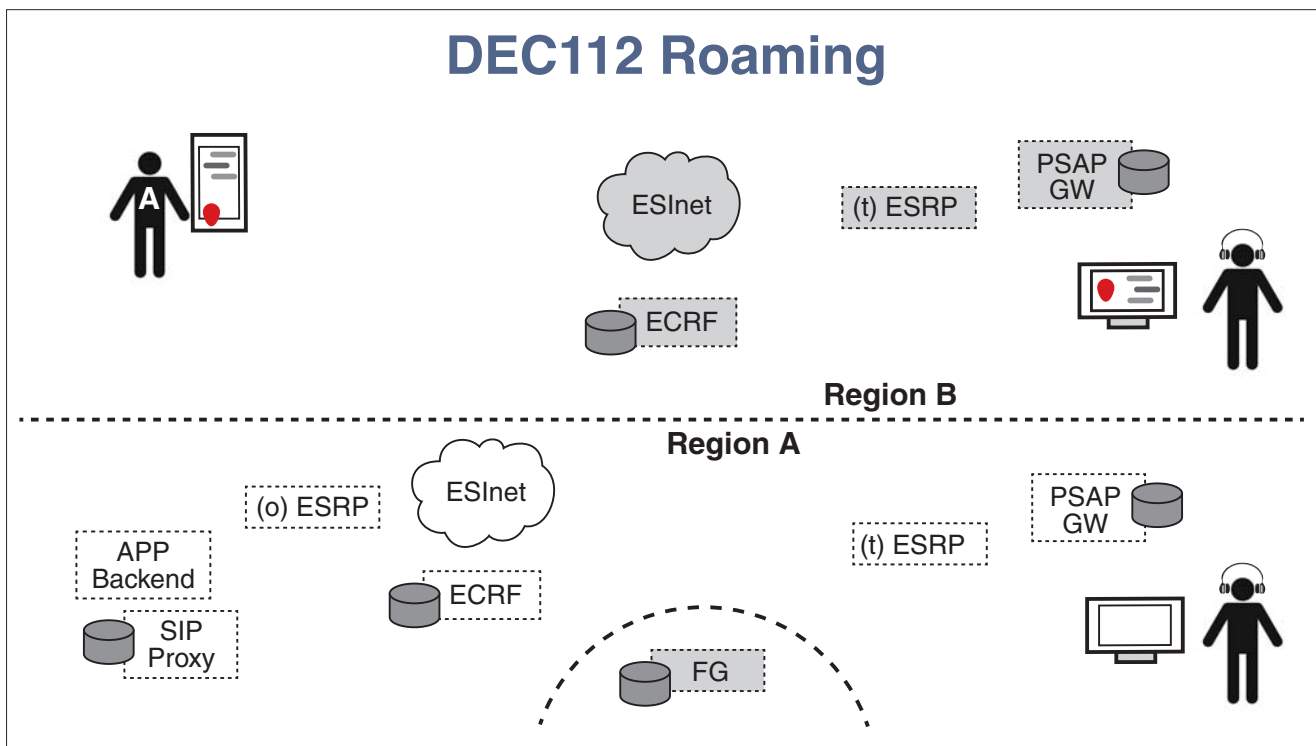
Call-taking is a well-trained operator or call-taker answering the emergency call. A call-taker's task is complex and requires analytical skills, multitasking, and interpersonal and crisis management skills. From a technical view, when an emergency call arrives at the PSAP, it is routed through a CPE. The CPE may use an automatic call distribution (ACD) algorithm to forward the call to the next free call-taker, and the information of the calling party is shared with the CAD system. As soon as all relevant incident data is collected, the proper units are dispatched to the incident.

Text messages are quite different than plain voice but need to be integrated in the same workflow, which, depending on the capabilities of the PSAP system, might be challenging. If either the CPE or the CAD provides interfaces to external communications sources and supports the reception of a so-called trigger message, it is possible to indicate an incoming DEC112 message on a call-taker's position. But how would a call-taker be able to chat with the person in need? The following points are an example of how to integrate, but there might be different options. Because DEC112 will integrate with different PSAP systems, and based on the workflow previously explained, the team moved on with the following ideas:

■ Choose the simplest standardized mechanism available for chat — the SIP SIMPLE instant messaging protocol. European Telecommunications Standards Institute (ETSI)



# DEC112 Roaming



TS 103 479, the European version of U.S. National Emergency Number Association (NENA) i3 standard, is a stable draft to be released later this year. The core services are the same as introduced in i3.

- Implement a PSAP border device or gateway connecting to DEC112 backends

- Send a trigger message (adaptable to local needs) if a message arrives, which contains location, reference data (calling party) and a URL pointing to a local web user interface (UI) with a chat feature. The PSAP CPE or CAD receiving the trigger must support a UI web object that automatically connects to the border device via the URL.

- When integration is impossible, provide a web-based UI to display location, reference data and chat features that can be accessed via a browser

DEC112 implemented the mobile app with a proper backend to register users, considered a public part of DEC112. In addition, core ESRP and ECRF services considered as emergency services IP network (ESInet) are part of DEC112 to

interconnect the public side with the PSAP. Functional elements to integrate with a PSAP are a terminating ESRP and PSAP gateway. This separation allows not only a secure separation by extending the ESRPs with minimal border control function (BCF) capabilities but also different routing policies or even different vendor equipment in a future rollout. DEC112 also covers a session mode extension to SIP SIMPLE based on well-known mechanisms already used to serve domain specific extensions needed in an NG 1-1-2 architecture.

When developing app and core services, the team used business and leisure travel to test how well DEC112 works if connected from another country and found no matter where the caller was, the app worked well if there was data connectivity. But, messages are always routed to the default PSAP because no PSAP mappings are available outside of Austria. One obvious approach is to create mappings for each country stored in the Austrian ECRF, but there is a better way. Assuming each country runs an ECRF and ESRP and both support

standardized interfaces, it is only necessary to have another ECRF to make up a so-called LoST hierarchy. In simple terms, such an ECRF or forest guide (FG) provides mappings to national ECRFs based on national boundaries.

For example, as referenced in the figure above, a person from region A has a configured DEC112 app, meaning that any emergency text message is sent to the local ESRP/A. This person uses DEC112 in the home country, ECRF/A provides national mapping, and messages are forwarded accordingly.

Traveling to region B would not change the app configuration, and messages would still be sent to ESRP/A; however, because ECRF/A would not have an authoritative mapping for the location provided, it would simply ask the FG. The FG would respond with a redirect message (iteration), telling ECRF/A that ECRF/B has the authoritative mapping for region B or the location provided in the request. As a next step, ECRF/A would send a request to ECRF/B and get the URI of PSAP/B, which it would return to the ESRP/A (recursion). Finally, the

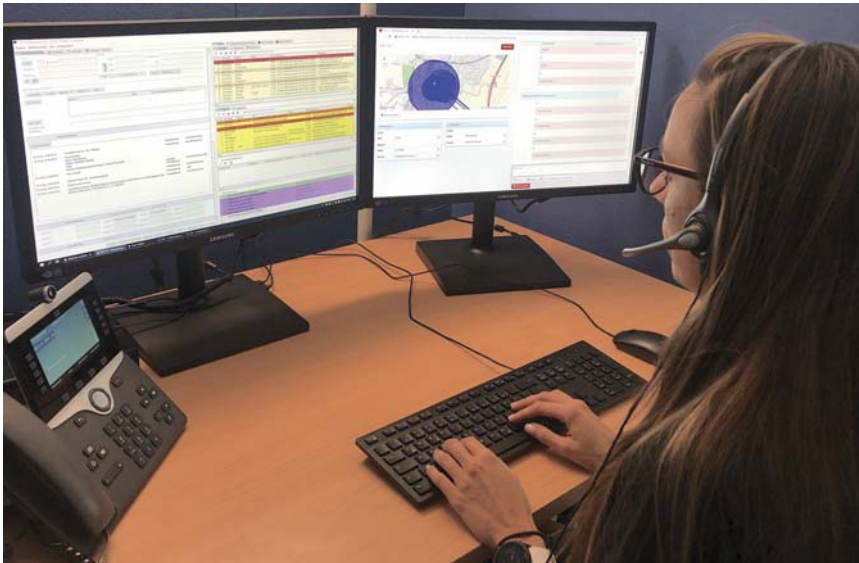


Photo courtesy Stefan Spielbichler, Notruf NOE

DEC112 provides a web-based user interface for chatting and has 500 registered users.

originating ESRP/A would forward the message to the terminating ESRP/B, which would know how to contact PSAP/B.

The advantage of this approach is that each country maintains its own infrastructure and authoritative mappings. The FG just redirects to national ECRFs and does not need to know about national PSAPs and how they are organized. Additionally, national borders do not change often, so there is little effort in running an FG, and peering agreements are only necessary between ECRFs for mapping and ESRPs for international routing. Such a deployment will be tested later this year in an European Emergency Number Association (EENA) project. DEC112 roaming will be tested in Austria, Italy and Denmark.

“DEC112 clearly shows the benefits of standardized interfaces,” says Michael Proestler, CEO of GridGears. “Independent services from different vendors can be integrated into a valuable system to improve emergency services. We are very proud to be a part of this journey.”

### **Austria's DEC112 Application**

Since February, anyone in Austria may use the DEC112 app to contact emergency services if that person has downloaded and properly

installed the app. Properly installing the app requires going through the steps of two-factor authentication requiring a valid email address and, of course, the mobile number of the device hosting the application. Further, to ensure efficient processing of administrative issues associated with an emergency text, one should also provide additional personal data. In the case of emergency, an emergency call requires just two clicks — one to open the app and another one to choose the required service by selecting one of the icons. Selecting a service immediately triggers a message sent to the proper PSAP including location, reference data and the configured name of the person in need.

As a next step, the PSAP receiving the text messages provides an immediate answer to indicate that the message has been received at the PSAP and to provide technical information about how the PSAP can be contacted — a URI pointing to a BCF or terminating ESRP — during the chat conversation. In the case one is unable to chat, location update messages are sent automatically every 20 seconds. Otherwise, the person starts explaining the emergency to the call-taker by either typing a text or selecting a predefined message from the app's session control bar. Depending on how DEC112

integrates with a PSAP, location and reference data may be displayed in an additional web view or just forwarded in the trigger message generated as soon as messages arrive at the PSAP. DEC112 provides a neat, web-based user interface for chatting and has more than 500 registered users and averages one emergency conversation per week.

“I am very pleased to see that our industry partners' contribution in NG 1-1-2 standardization comes now to the hearing-impaired people to communicate with the first responder organizations with 21st century technology,” says Frequentis Vice President Public Safety Robert Nitsch. “In accordance with our mission statement, ‘for a safer world,’ Frequentis considers that we have a social responsibility and an obligation to make our contribution in that field. I am particularly proud to support this initiative of an emergency call app for people with special needs.” ■

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Wolfgang Kampichler is initiator and co-developer of DEC112, a private initiative to provide accessibility to Austrian emergency services. As principal scientist at Frequentis, Kampichler actively contributes to innovation and technical expertise for future public-safety communications technologies in Europe and abroad. He is an engineer who started his career as a research assistant at the Department of Computer Science at Vienna University of Technology and attained a doctorate degree in technical sciences in 2002. He chaired and co-chaired the planning committee for the National Emergency Number Association (NENA) Industry Collaboration Event (ICE) #5 and #6 and supported European Telecommunications Standards Institute (ETSI) NG 1-1-2 Plugtests and standardization work as a technical expert. Kampichler supports standardization working groups in public safety and air traffic management and is co-chair of the European Emergency Number Association (EENA) Technical and Operational Committee. Email feedback to editor@RRMediaGroup.com.



# Enhanced operational efficiency on the field with Tactilon Agnet

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In a constantly evolving world consumers want to use communication tools which make their life easier. Professional users express the same requirements as consumers, while enhanced operational efficiency, state-of-the-art resistant and resilient technology, and flexible collaboration solutions are their key requirements nowadays.

The professional application, created by Airbus, called Tactilon® Agnet offers full critical connectivity for smartphones through features which give a new momentum to media exchange on a professional level. Its mission-critical voice capabilities, such as group and individual calls, are aligned with the international telecommunications standards of the Third Generation Partnership Project (3GPP), dealing with Mission Critical Push to Talk (MCPTT) functions of future critical communication networks. That includes the application's multimedia functions, such as mission-critical data and video over LTE, also based on the 3GPP standard.

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technologies and allows secure and flexible communication between smartphone users and radio terminal users. It also offers enhanced services such as permanent geolocalisation of each user and status displays on the map for commanding officers.

Tactilon Agnet flexibly scales from simple push-to-talk (PTT), to an extensive group collaboration solution taking full advantage of smart device capabilities in a secure and controlled way. Staff necessary to an operation can be easily and securely connected, even when using different devices and technologies.

## Sharing data on duty is a must

Tactilon Agnet provides the security and administration features that help deliver the right information, to the right people, directly from a smart device.

With Tactilon Agnet, smart device users become part of the professional world – voice, data, video and location services are brought to their fingertips with the reliability and security that all

professional users expect. Essential information and various types of data such as photos, messages and videos can be sent to a control room or other colleagues immediately and securely at the push of a button.

## Pushing secure functionalities to the next level

Tactilon Agnet offers an array of secure features such as end-to-end encryption of all types of communication, individual and group voice and data communication between users and a very simple and intuitive user interface for field users as well as for dispatchers for volatile and optimized use.

When something unexpected happens, there is no time to waste. Help is promptly and easily at hand through the dedicated emergency button on the application. An audio alert is immediately activated and the position of the alerting device tracked and shown on a map.

Tactilon Agnet presents itself without any security compromises bringing all the benefits of data in critical communications. It runs on standard or ruggedized smart devices and is not limited to public safety users. Industries in the field of mining, transportation, utility and material processing will all appreciate a new way of secure mobile communications because it brings their operational efficiency to a whole new level and is vanguard for the future of professional communication.

# AIRBUS

For more information, visit [www.securelandcommunications.com](http://www.securelandcommunications.com)



# The Latest Communications Standards

Standards for 5G are advancing, with critical communications now in the mix for 4G technology and beyond. **By Philippe Agard**

Photo courtesy Nokia

All vertical markets, including public safety, transport, energy, mining, and oil and gas, are seeing increased demand for Third Generation Partnership Project (3GPP) standardized broadband-based solutions for mission-critical communications. The story for the critical communications sector began in 2013 when, catalyzed by TCCA and other stakeholders to align the industry on common standards, 3GPP began standardization of broadband mission-critical services, with mission-critical push to talk (MCPTT) first included in 3GPP Release 13 in 2016. Key applications common to all services, such as MCPTT, mission-critical video (MCVideo) and mission-critical data (MCData) — known collectively as MCX — are continuously improved, with new study items introduced in each release.

## The Status of Standardization

With work on Release 16 ongoing, the remit for critical communications continues to expand. In addition to the various MCX service enhancements, highlights of the current release include:

- Mission-critical multimedia broadcast multicast services (MBMS) user equipment (UE) application programming interface (API) creation: Enables third-party mission-critical apps to access MBMS functionality on the UE;

- Railway communications (MONASTERY2): Support for functional alias for all services and call types, including commencement modes for MCPTT group calls and call-forwarding support for MCPTT private calls; and

- Mission-critical services over 5G study item: Identified the use of multicast, use of proximity services (ProSe), deployment scenarios, resource control quality of service (QoS) class identifier (QCI) versus 5G QoS indicator (5QI) and the impacts of 5G network slicing as gaps that need to be addressed to enable mission-critical services over 5G. The study item is expected to be completed in September 2020.

While content for 3GPP Release 17 is still being defined, some work items and studies of interest for critical communications are progressing:

- eMONASTERY2: Enhancements to application architecture for railways

- Mission-critical interoperability (MCIOPS): Mission-critical services support on IOPS mode of operation

- Edge application enablement: A full architecture for edge applications including enabler functions on both the edge network and UE has been defined. The study is based on key architecture principles such as UE mobility, edge application portability, service differentiation and flexible deployment. It is expected to be completed by December 2019.

- Application layer support for European Union's (EU) Factories of the Future public-private partnership

- Unmanned aerial systems (UAS). This study evaluates the necessary application layer architecture and solutions to enable the UAS application aspects — fly route authorization, location management, group communication, and UAS to unmanned traffic management (UTM) communications — on the 3GPP network.

## Evolution to 5G

Vertical markets are already adopting broadband technologies by implementing private Long Term Evolution (LTE) networks or mission-critical services on top of commercial LTE



networks through secure mobile virtual network operators (S-MVNOs), which have been considered for some nationwide public-safety networks. Internet of things (IoT) using LTE for machines (LTE-M) and narrowband for IoT (NB-IoT) and first machine communications can also be done with 4G networks and technology. This enables new capabilities for better operational efficiency and enhanced situational awareness to first responders and critical users, including streaming video and connected wearables. 5G adoption is expected to follow an incremental path enabling enhanced capabilities as shown in the graphic on the right. Early 5G standards have been focusing on extreme mobile broadband, and critical communications and massive machine communications are being planned.

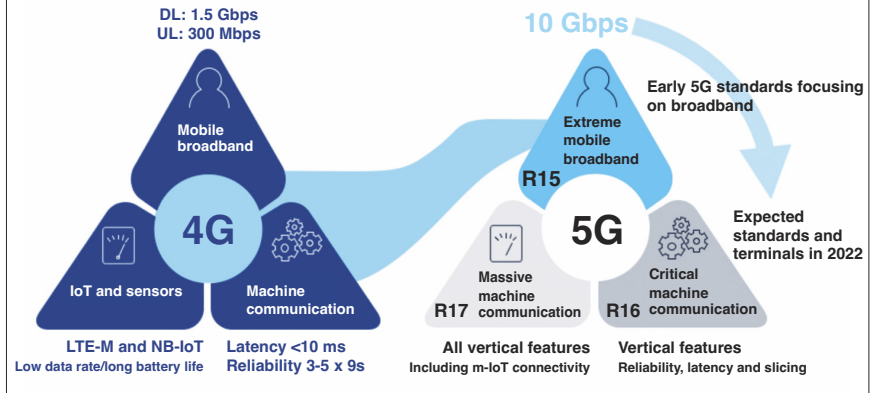
As Release 17 is now in the content planning phase, Europe's 5G public-private partnership (5G PPP) organized a 5G vertical user workshop in July to try and align the technical interest of the key vertical markets on possible new common features through their respective industry associations. This coordination of effort between vertical markets of critical communications users is needed, as only a subset of the work areas identified by the respective verticals can be onboarded as Release 17 content, considering the workload of the 3GPP radio access network (RAN) and service and system aspects (SA) groups. The release planning will be done in two stages:

- SA/RAN/CT Plenaries 16 – 20 September, Newport Beach, California, U.S.

- SA/RAN/CT Plenaries 9 – 20 December, Sitges, Spain

Features under study and of interest to critical communications users in key vertical markets are sidelink enhancements — vehicle to everything (V2X), ultra-reliable low-latency communications (URLLC)/time-sensitive networking, positioning, nonpublic networks (nonspectrum related), non-terrestrial networks and 5G multicast broadcast services (5MBS).

## Evolution to 5G



## Device Ecosystems and Interoperability

While the critical communications community is expecting devices that will deliver ProSe services, the ecosystem has been stimulated by public-safety LTE networks in the United States, Qatar, United Kingdom, South Korea and Dubai, as well as private networks in large mining operations or those deployed by Industry 4.0 players.

Interoperability and mission-critical service harmonization are critical challenges for the successful deployment and operation of mission-critical communications and the growth of the ecosystem. The European Telecommunications Standards Institute (ETSI), with the support of TCCA, the European Commission and Finland's Eri-lisverkot, organized the fourth MCX Plugtests event, held 23 – 27 September in Kuopio, Finland. The goal was to validate the interoperability of a variety of implementations using different scenarios based on 3GPP mission-critical services in Release 14.

## Spectrum

There is need for spectrum to support broadband critical communications, and important developments made at the 2015 World Radio Conference (WRC-15) include the decisions to allow the use of 694 – 864 MHz on a global basis, as well as 380 – 470 MHz and 4.94 – 4.99 GHz in some International Telecommunication Union (ITU) regions, for public protection and disaster response (PPDR) broadband. European Communications Committee (ECC) Decisions (19)02 and (16)02 also address the use of bands including 410 – 430 MHz and

450 – 470 MHz for professional mobile radio (PMR) applications. These ECC decisions include harmonized technical conditions for land mobile systems with channel bandwidth of 1.4, 3 or 5 megahertz.

More national regulators are allocating spectrum for verticals or for unlicensed users, and this is fueling further development of the ecosystem. Some example markets include the United States (CBRS 3.5 GHz), France (2.6 GHz), Germany (3.7 GHz), United Kingdom (1.8, 2.3 and 3.8 GHz) and Japan (4.7 and 28 GHz).

The WRC-19 in Egypt in November will have several agenda items of interest for vertical and critical communications markets. These include:

- Agenda Item 1.3 addressing the use of 460 – 470 MHz;

- Agenda Item 1.11 addressing railway radio communications systems between train and trackside (RSTT) for both coverage and capacity;

- Agenda Item 1.12 addressing intelligent transport systems (ITS) spectrum needs; and

- Agenda Item 1.13 addressing millimeter wave (mmWave) spectrum in 26, 40 and 66 GHz.

The broadband critical communications industry is growing steadily. There are opportunities at stake for the end of 2019 at 3GPP through Release 17 content planning and at WRC-19. ■

Philippe Agard has been public-safety and defense markets leader at Nokia since 2013. He also chairs the Broadband Industry Group (BIG), a working group of TCCA, and is a board member of TCCA. Email feedback to editor@RRMediaGroup.com.



## Airbus Defence and Space

Tactilon Dabat is a smartphone and TETRA radio in a single device. The product combines the reliability of TETRA with the intelligence of smartphones and the speed of broadband. The device is smart, strong and secure for public-safety and business-critical operations, and operates



on any standard TETRA network on 380 – 430 MHz. The device has a changeable, long-lasting battery and both IP65 and IP67 ratings. The product can be used as a TETRA radio for critical communications and as a smartphone for mobile applications and special professional apps.

[www.securelandcommunications.com](http://www.securelandcommunications.com)

## Alinco, Electronics division

The DJ-MD5TGP, featuring 5-watt (W) Digital Mobile Radio (DMR) Tiers 1 and 2 technology, is the newest addition to Alinco's line of compact dual-band DMR VHF/



UHF portable transceivers. The product supports business communications and professional or amateur use. Features include GPS; a color display; 4,000-channel memory; and an IP54-rated polycarbonate body. The radio uses Digital Voice Systems Inc.'s (DVSI) AMBE+2 vocoder technology for outstanding audio performance at an affordable cost.

[www.alinco.com](http://www.alinco.com)

## Barrett Communications

The Barrett 4050 HF SDR is a high-frequency (HF) software-defined radio (SDR) with IP network connectivity that



simplifies integration with existing networks.

Onboard Wi-Fi allows for

secure and seamless operation and control of the transceiver via iOS-, Windows- or Android-based devices. When teamed

with other Barrett HF products, the SDR transceiver can provide secure email, data transfer and telephone within an HF network, as well as international telephone network and internet connectivity.

[www.barrettusa.com](http://www.barrettusa.com)

## BridgeCom Systems

The AnyTone AT-D878UV PLUS is a dual-band Digital Mobile Radio (DMR) portable that transmits at 6 watts (W) on UHF and



7 W on VHF. The radio is suitable for applications such as commercial, emergency management, firefighters, and search and rescue.

The PLUS model features Bluetooth; a digital and analog automatic packet reporting system (APRS); GPS; roaming; and the company's phone, email and video support.

[www.bridgcomsystems.com](http://www.bridgcomsystems.com)

## Entel UK

Ideal both for high-density city center and wide-area operations, the DN400 Long Term Evolution (LTE) Wi-Fi push-to-talk (PTT) over cellular (PoC) radios combine traditional PTT with cellular network opera-



tion for strong performance. Features include Tier 3-plus hosted data centers, fully redundant and remotely hosted backup servers, 3 watts (W) of clear audio, IP68-rated (2 meters for up to 4 hours of submersion)

compact and rugged construction, advanced encryption standard (AES)-256 encryption, emergency button, and lone worker and man down as standard. Entel's complete line of E-PoC products and services, including gateway, smartphone app and dispatcher, further extends the DN400 series' capabilities.

[www.entel.co.uk](http://www.entel.co.uk)

## GME

The CM60 line of Project 25 (P25) Phase 1 mobile radios provides a cost-effective



P25 solution for large and small operators. Compact and robust, the series is offered in three frequency bands:

136 – 174, 400 – 470 and 450 – 512 MHz. Available in under-dash or two remote mounting configurations, the versatile radio is easily and quickly installed in any vehicle. The standard conventional P25 operation can be upgraded to trunking, and encryption and data features are also readily accessed through GME's intuitive programming tool.

[www.gme.net.au](http://www.gme.net.au)

## Hytera Communications

The PNC370 push-to-talk (PTT) over cellular (PoC) radio provides nationwide radio communications over cellular Long Term Evolution (LTE) and Wi-Fi networks. The



radio features instant group calling with digital noise suppression for excellent voice quality in loud areas. The radio has built-in Wi-Fi and Bluetooth. The Wi-Fi capability enables calls inside buildings with Wi-Fi network

connectivity, and the device can automatically and seamlessly switch to an LTE network when a caller moves outside Wi-Fi network range. Bluetooth provides wireless connectivity to accessories such as earpieces. An Android app allowing access to PoC services comes pre-installed on the radios.

[www.hytera.com](http://www.hytera.com)

## Icom

The IC-M501M is a mobile version of the IP501H/IP503H Long Term Evolution (LTE)



handheld radio and uses 4G and/or 3G networks to provide nationwide

coverage and stable communications. The radio features a speaker microphone with emergency button or an optional command



microphone (HM-230HB) that provides a handheld-like user interface with a full keypad and large display. Both mobile (IP501M) and handheld (IP501H/IP503H) radios are interoperable with each other, and the company's LTE push-to-talk (PTT) radio system satisfies a wide range of customer needs.

[www.icom.co.jp/world](http://www.icom.co.jp/world)

### Irvees Technology

The TK1100 does not require the user to manually select Long Term Evolution (LTE)



or Digital Mobile Radio (DMR) mode and can function with both LTE and DMR modes on concurrently. This allows the device to function as a relay DMR channel and automatically assigns that role to another TK1100 in

the vicinity when its own battery drops to a preset level. The radio is ergonomically designed to emulate the form factor of nar-

rowband two-way radios but has a 3.1-inch touchscreen in a rugged IP67 body.

[www.tokie.co](http://www.tokie.co)

### JVCKENWOOD

The NX-1000 series supports the NXDN or Digital Mobile Radio (DMR) digital proto-



cols to enhance business efficiency or FM analog for its simplicity. The company's One-"K"-Fits-All solution

offers a selection of two-way radios with the same operability as predecessor

radios. The model matrix also includes body variations, with or without a backlit LCD and a keypad. Other features include a seven-color LED indicator and the popular KENWOOD two-pin audio accessory connector. Plus, mixed-mode operation ensures seamless integration with legacy radios while smoothing the onward migra-

tion path to digital.

<http://comms.kenwood.com>

### Kirisun Communications

The DM588 Digital Mobile Radio (DMR) Tier 2 mobile features smart digital-analog auto detection and the ability to be configured to analog, digital or mixed mode.



Automatic roaming allows the mobile to be used freely among all sites

of IP Multi-Site Connect systems.

Pseudotrunking improves frequency efficiency. The radio provides versatile voice calls with multiple functions such as group calls, text messages and emergency. Secure communications provides basic and enhanced encryption capability, including ARC4 standard. The product supports GPS and multiple signaling formats, including MDC1200, DTMF, and two and five tone.

[www.kirisun.com](http://www.kirisun.com)

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[www.radiotrans.com](http://www.radiotrans.com)



## L3Harris Technologies

The XL line of portable radios includes the single-band XL-185P with Long Term Evolution (LTE), the multiband XL-200P with LTE, and the intrinsically safe (IS) XL-185Pi



and XL-200Pi. Each radio features loud-and-clear audio, extended-life batteries, a compact design and rugged construction. The XL line adheres to Project 25 (P25) standards for interoperability, allowing users to

connect and communicate with partners on other networks. The XL-185Pi and XL-200Pi are UL-certified Class 1, Division 1 (C1D1), allowing safe operation in potentially explosive and hazardous environments.

[www.l3harris.com](http://www.l3harris.com)

## Lisheng (Fujian) Communications

The R79 single-band (VHF or UHF) Digital Mobile Radio (DMR) offers three operation modes: digital/analog compatible, digital and analog. The product supports DMR



Tier 2, and has two time slots and a DVIS HRV3000 vocoder. The radio complies with IP54 and can be upgraded to IP67. A 4.5-centimeter display and full digital keypad make it easy to send messages. The radio has 32-bit voice encryption, making it

suitable for business communications applications.

[www.cnlisheng.com](http://www.cnlisheng.com)

## Motorola Solutions

The APX 8000H Project 25 (P25) portable radio supports all commonly used P25 frequencies, allowing users to connect and communicate with different agencies and organizations using the same radio. The



product has an adaptive audio engine that provides loud, clear audio at any volume in any environment. Certified to the stringent Division 1 hazardous location standards, the radio is designed for use in areas where dangerous concentra-

tions of flammable gases, vapors, liquids or combustible dust routinely exist.

[www.motorolasolutions.com](http://www.motorolasolutions.com)

## Nautic Devices

The Yपालong-5000 series full-duplex radio consists of a mesh network, which requires neither a base station nor master unit. The radio's real-time digital communications conveys fully encrypted high-definition (HD)



sound, and up to 16 users can talk simultaneously with an unlimited number of listeners. Available in 800 and 900 MHz models, the product has a range of 1,000 meters and a 10-hour battery life.

The device enables subgrouping and switching between two channels. Yपालong products are widely used in sports, emergency response, industrial operations, construction, event planning and outdoor activities.

[www.yपालong.com](http://www.yपालong.com)

## Quanzhou Risen Electronics

The RS-569D dual-band digital/analog dual-mode Digital Mobile Radio (DMR)



radio ensures a smooth analog-to-digital transition. The radio works in VHF, UHF and customized frequencies, and complies with the two-slot TDMA protocol of the DMR standard. Functions include call digital encryption, individual call,

group call, all call and messages.

[en.recentchina.com](http://en.recentchina.com)

## Talkpod Technology

The N59A 4G push-to-talk (PTT) network radio has the newest Android 9 open



application programming interface (API) that allows multiple PTT applications. The radio features a 36-millimeter

loud-and-clear speaker, 6.1-centimeter touchscreen that works with gloves, 8-megapixel back camera, 2-megapixel front camera, 1 Gigabyte (GB) RAM and 8 GB

storage. The radio supports up to 128 GB micro SD external memory, micro subscriber identity module (SIM) and nano-SIM dual card. Other features include built-in GPS, GLONASS, BeiDou, Bluetooth 4.0, accelerometer, gyroscope, haptic vibration, IP66 rugged design, channel and volume knob, PTT button, alarm button and K-type audio connector.

[www.talkpod.com](http://www.talkpod.com)

## Unimo Technology

The UDR-100/400 is a compact, durable and high-quality portable VHF/UHF Digital Mobile Radio (DMR) for the 136 – 174/400



– 470 MHz bands that offers loud, clear voice; short message service (SMS); transmit (TX) interrupt; and advanced encryption standard (AES) 256 encryption. The radio supports Digital Mobile Radio (DMR)

Tiers 1 and 2 and complies with IP67 for waterproofing. A 2.6 ampere-hour (Ah) high-capacity battery allows the radio to operate for more than 17 hours at 5:5:90 (TX:RX:standby).

[www.unimo.co.kr](http://www.unimo.co.kr)

## Wireless Pacific

The X10DR Elite allows three X10DR Elite handset users to digitally communicate, with advanced encryption standard (AES) encryption, in push-to-talk (PTT) or hands-free mode up to 365 meters from each other on an exclusive frequency-hopping spread



spectrum (FHSS) created license-free channel. Each user's handset signal is repeated by a centrally located X10DR gateway controller that also allows interconnection to a radio, Iridium PTT, satellite or console devices.

Multiple gateway units can be cross connected to allow larger user groups. Because the system continually changes encryption keys during the day, the digital radios are more secure for tactical operations than traditional AES Project 25 (P25) radios. The remote-speaker-microphone-sized radios weigh 113 grams and are suitable for many local on-site secure applications.

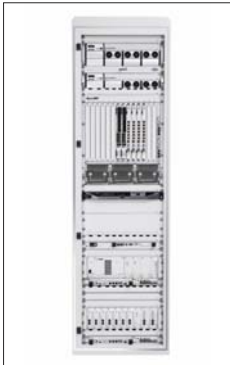
[www.wirelesscorp Ltd.com](http://www.wirelesscorp Ltd.com)



## Upgraded Infrastructure, Outdoor Base Station

Teltronic released a new generation of eNEBULA infrastructure that fully integrates Long Term Evolution (LTE) broadband capabilities with TETRA. The integration includes the infrastructure hardware and network management system, control center solution for both radio accesses, and terminals with dual TETRA and LTE technology. The solution preserves the investments of TETRA customers, allowing them to gradually add broadband services. The portfolio also includes a catalog of cybersecurity licenses and services specifically designed to protect critical infrastructure.

Teltronic also introduced the MCBS, a new outdoor base station with multicarrier capabilities, offering users a significant reduction in costs through optimization in



network design, energy savings, and simplification of installation and maintenance tasks.

[www.teltronic.es](http://www.teltronic.es)

## Multimode Radio

The new multimode PTC680 from Hytera Communications is a hybrid device that combines a professional TETRA radio and an Android-based smartphone plat-



form. The device offers mission-critical voice and multimedia services. The unit adopts human-oriented interaction design, and a specially sized touchscreen allows one-handed operation and gloved touch. Programmable buttons allow users to customize the radio, and a multipurpose push-to-talk (PTT) button helps users communicate immediately. The unit also has a video camera and supports advanced location positioning through five global navigation satellite systems (GNSS): GPS, BeiDou, Galileo, GLONASS and QZSS. The positioning

allows seamless connections indoors and outdoors and allows continuous tracking and recording of front-line personnel and equipment. The unit features IP68 dust and waterproof certifications, as well as Mil-Std-810G for drop and shock testing. The radio weighs 325 grams.

[www.hytera.com](http://www.hytera.com)

## VHF TETRA Radio

Damm Cellular Systems launched the first VHF TETRA radio, the VHF FT5, which can use VHF spectrum for added coverage in open, rural areas while maintaining all TETRA features. The radio is



the result of a joint project between Damm and Funktel and includes 3-watt (W) output for power infrastructure

savings because of wider coverage. A shock-resistant rubber coating protects against drop damage, and IP65 protection allows outdoor use. Positioning in the device includes GPS, GLONASS, Galileo and BeiDou.

[www.damm.dk](http://www.damm.dk)

## Intrinsically Safe Portable

Intel launched the ultra-durable DTE series radio, the latest in its intrinsically

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safe range. In addition to its IP68 submersible rating, the portable meets ATEX IIC and is available in ATEX and IECEx IIA-certified variants. Outstanding range and performance coupled with lone-worker, man-down (optional) and emergency buttons ensure the radio is equipped to support workers in challenging operations. The ultra-tactile, ergonomic controls are designed for gloved-hand use, while the strengthened alumina silicate glass provides contrast to the white-on-black OLED — customizable to two- or five-line display — for readability in varying light conditions. Entel's intelligent speech tailoring technology supports a range of certified and approved accessories, optimizing accessory audio performance. The radio has analog and Digital Mobile Radio (DMR) technologies, ensuring backward compatibility with existing analog radio

systems. Entel also added an end-user programming PC app. [www.entel.co.uk](http://www.entel.co.uk)

### NG eCall Testing

Anritsu introduced an extended eCall test solution consisting of its signaling tester MD8475A/B base station simulator and MX703330E eCall tester software. The



solution verifies the next-generation emergency call system (NG-eCall). eCall is a pan-European emergency call system for sending road accident information to a public-safety answering point (PSAP). The European Union (EU) mandated that all new M1- and N1-category vehicles have 1-1-2-based eCall in-vehicle systems (IVS) effective March 31, 2018. Anritsu

added the NG 1-1-2 Long Term Evolution (LTE) eCall option to its eCall GSM-based test solution to implement RFC 8147-defined NG-eCall function tests and end-to-end voice evaluation. Anritsu also offers solutions to validate telematics control units (TCUs) with eCall functions by supporting 1 Gigabit LTE simulation and NG-eCall tests using one MD8475B unit. EU operators plan to shift to all-IP infrastructure during the next 10 years, and NG 1-1-2 eCall is expected to be deployed in the near term, the company said.

[www.anritsu.com](http://www.anritsu.com)

### TETRA and LTE Roaming

Dabat Hybrid Roaming from Airbus is a combination of Airbus' Tactilon Dabat hybrid terminal and the Tactilon Agnet 800 app. The new solution will extend and secure end users' operations by maximizing the benefits of hybrid network communications. The terminal combines and offers both TETRA and Long Term Evolution (LTE) radio technologies.

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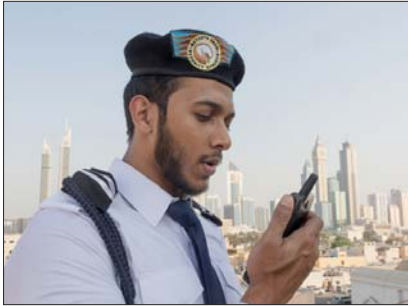
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Tactilon Agnet 800 is an app for push to talk (PTT), status notifications and other services on smart devices. Dabat Hybrid Roaming extends TETRA coverage by switching to LTE coverage through the app installed on the device, enabling seamless network changes to support public-safety operations. All traffic is securely protected via the secure client virtual private network (VPN).

[www.securelandcommunications.com](http://www.securelandcommunications.com)

### TETRA Mobile

Sepura launched the SCG22 TETRA mobile terminal for in-vehicle and control

room applications. With a 10-watt (W) RF power rating and full gateway and repeater functionality, the SCG22 keeps users connected. The radio incorporates Sepura AppSPACE technology, delivering extended functionality and apps. Enhanced communications options through Wi-Fi and Bluetooth, as well as an expanded operating bandwidth of 380 – 470 MHz, provide user flexibility.



Sepura also announced a new over-the-air programming (OTAP) capability developed to make managing and upgrading TETRA radio fleets easier. The capability enables remote software updates and upgrades on Sepura's latest SC series of radios through Wi-Fi connectivity.

[www.sepura.com](http://www.sepura.com)

### Interoperability and RoIP Gateway

Omnitronics launched a two-in-one interoperability and radio over IP (RoIP) gateway. The IPR400 RoIP gateway now



includes command and control for multiple radio types, push to talk (PTT) over cellular (PoC) and instant linking via an online application. The unit was redesigned to tackle incompatibility of two-way radio technologies and users migrating from analog to digital. The gateway also offers more processing power and memory to enable a greater number of session initiation protocol (SIP) connections, as well as software-configurable radio ports. The omnilink app offers instant web linking and crossbanding, along with the capability to make and receive PoC calls via ESChat.

[www.omnitronicsworld.com](http://www.omnitronicsworld.com)



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# TK1100

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- ✓ Speaker 36mm  $\Phi$  2.0W @ 90d
- ✓ Dynamic Relay between POC and DMR with self-balancing





**12 – 14 November: 5G Africa**, Cape Town, South Africa. Knect365: <https://tmt.knect365.com/africacom/5G-africa>

**13 – 14 November: BAPCO Satellite Series – Newcastle**, Newcastle, United Kingdom. British APCO (BAPCO): [www.bapco.org.uk/events/satellite-series/newcastle](http://www.bapco.org.uk/events/satellite-series/newcastle)

**26 – 28 November: Comms Connect**, Melbourne, Australia. Westwick-Farrow Media: <http://melbourne.comms-connect.com.au>

**26 – 28 November: PMRExpo**, Cologne, Germany. PMeV Professionller Mobilfunk: [www.pmrexpo.de/en](http://www.pmrexpo.de/en)

**3 – 4 December: International Security Expo**, London. Nineteen Group: [www.internationalsecurityexpo.com](http://www.internationalsecurityexpo.com)

**3 – 5 December: AusRAIL Plus Conference and Exhibition**, Sydney. Australasian Railway Association (ARA), Informa Australia: [www.ausrail.com](http://www.ausrail.com)

**3 – 5 December: International Critical Control Rooms Alliance Congress**, Athens, Greece. International Control Rooms Alliance (ICCRA), Knect365:

<https://tmt.knect365.com/critical-control-rooms>

**3 – 5 December: PSCE Conference**, Paris. Public Safety Communications Europe (PSCE): <https://www.psc-europe.eu/news-events/events/psce-conference-in-paris-2019.html>

**13 – 15 December: International Microwave & RF Conference (IMaRC)**, Mumbai, India. Institute of Electrical and Electronics Engineers (IEEE): <http://www.imarc2019-ieee.org>

**18 – 20 December: International Conference on Information and Communication Technologies for Disaster Management (ICT-DM)**, Paris. Institute of Electrical and Electronics Engineers (IEEE): [www.ict-dm.org](http://www.ict-dm.org)

**2020**

**10 – 11 March: BAPCO Conference and Exhibition**, Coventry, United Kingdom. British APCO (BAPCO): [www.bapco-show.co.uk](http://www.bapco-show.co.uk)

**18 – 19 March: RF & Microwave**, Paris. Bureau International de Relations Publiques (BIRP): [www.microwave-rf.com](http://www.microwave-rf.com)

**29 – 31 March: 5G Middle East and North Africa (MENA)**, Dubai, United Arab Emirates (UAE). Knect365: <https://tmt.knect365.com/5G-mena>

**30 March – 3 April: International Wireless Communications Expo (IWCE)**, Las Vegas. Informa: [www.iwceexpo.com](http://www.iwceexpo.com)

**1 – 3 April: EENA Conference and Exhibition**, Riga, Latvia. European Emergency Number Association (EENA): <http://eenaconference.org>

**9 – 11 June: 5G World Summit**, London. Knect365: <https://tmt.knect365.com/5gworldevent>

**10 – 11 June: Mission Critical Technologies**, London. Knect365: <https://tmt.knect365.com/mission-critical-technologies>

**17 – 19 June: Critical Communications World**, Madrid. TCCA, Mark Allen Group: [www.critical-communications-world.com/madrid](http://www.critical-communications-world.com/madrid)

**2 – 5 August: APCO Conference and Expo**, Orlando, Florida. Association of Public-Safety Communications Officials (APCO) International: [www.apco2020.org](http://www.apco2020.org)



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# European Spectrum Report Addresses 400 MHz PMR Use

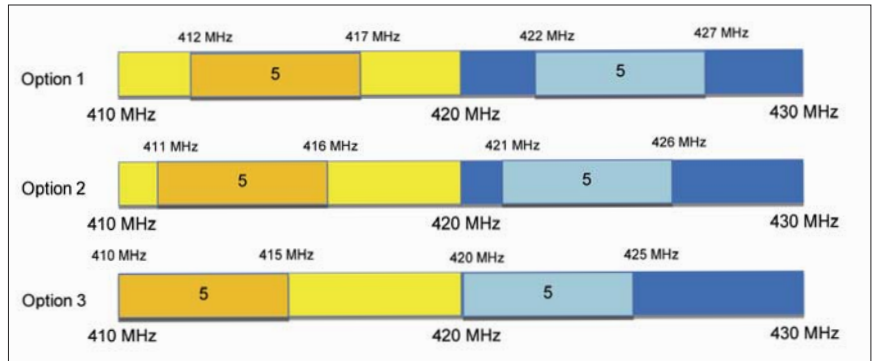
A report from the Electronic Communications Committee (ECC) of the European Conference of Postal and Telecommunications Administrations (CEPT) offers updates on current and future use for the 400 MHz professional mobile radio (PMR)/public access mobile radio (PAMR) frequencies.

While 450 – 470 MHz is a common band for PMR/PAMR, certain countries have licensed up to 2-by-5 megahertz of spectrum at 450 – 470 MHz and deployed commercial CDMA networks. The Netherlands, Austria, Germany, Latvia, Russia, Sweden, Norway, Denmark, Finland, Hungary and the Czech Republic already have networks providing connectivity for millions of devices using CDMA450 or LTE450 technology. These networks have been assigned nationwide licenses, and existing CDMA networks are likely to migrate toward Long Term Evolution (LTE) technology.

Future LTE networks in the 400 MHz band may operate on a national, regional or local basis. Spectrum used for narrowband PMR/PAMR is assigned based on nationwide, regional or local use. Whereas the spectrum assigned for cellular technologies is typically nationwide only, it can't be used for PMR networks anymore. Such discrimination between 12.5 kilohertz-based PMR and Mobile/Fixed Communications Networks (MFCN) will be significant if more cellular technologies are introduced for current PMR/PAMR users.

Users should be allowed to use their current PMR licenses based on the current regulatory framework and evolve without being disrupted by a frequency policy that favors a single player's access to spectrum nationwide.

“The evolution of market demands, the availability of cellular mobile technologies in 400 MHz bands, as well as evolving requirements for mission-



Nonexhaustive spectrum arrangement options for the 410 — 430 MHz band

critical M2M applications should be carefully reflected in spectrum management activities and in national frequency policies,” Report 292 said.

Depending on PMR use in a country, CEPT administrations may decide on spectrum for PMR systems based on specific narrowband, wideband or broadband technologies. It is often difficult to identify continuous spectrum to reach LTE channel sizes of 1.4, 3 or 5 megahertz. National regulations are required for migration of narrowband use to certain frequency bands to achieve a contiguous range of spectrum for land mobile systems based on LTE technology. The report describes options for administrations.

To increase shared use of PMR frequencies, administrations could create “spectrum headroom,” especially in local situations with congested spectrum, most frequently in urban, metropolitan centers or border areas. The sharing headroom is defined as the minimum amount of usable spectrum available to an additional number of users, irrespective of the technology those additional users are applying.

Channels can be cleared following the introduction of a sharing number and could be repurposed towards data-only use and exclusive use as well as providing further opportunity for general growth. It is also possible to start with a sharing number of two and

increase to three. This means, if the sharing number introduced is two, the channels made available are 50% of the total in use. Each sharer would be permitted only half the available capacity, leaving 50% to the other.

The committee proposed that the Third Generation Partnership Project (3GPP) should consider standardization activities for 410 – 430 MHz to coordinate LTE and radar systems. The report also recommends a work item for European Telecommunications Standards Institute (ETSI) standards for a means to facilitate PMR spectrum sharing. In addition, improved receiver specifications may offer more effective spectrum use by avoiding guard bands between different land mobile systems operating in adjacent 400 MHz frequency ranges.

The report also said the potential impact of intermodulation distortion in PMR receivers caused by neighboring broadband signals should be taken into account. This is dependent on frequency offset of the LTE carrier from the victim PMR receiver, the received power and the intermodulation performance of the victim PMR receiver at that frequency offset. No conclusion on the intermodulation effect from broadband interferers into narrowband victims could be reached in ECC Report 283 [43], and ECC will conduct additional investigations. ■



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