CRITICAL COMMUNICATIONS TODAY

The global information resource for mission-critical communications

Life in the fast lane: comms for motorsport

p14
Believe the hype
The head of European wireless product management for Huawei discusses the evolution of 5G for mission-critical comms

p20
The new reality
Exploring the revolutionary potential of virtual and augmented reality technology in the public safety space

p24
In for the long haul
CCT talks to the Red Cross about the challenges of setting up and managing communications during the world's worst disasters

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CRITICAL COMMUNICATIONS TODAY

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MA Exhibitions
Part of
Mark Allen
www.markallengroup.com

Critical Communications Today
is published by:
MA Exhibitions Ltd, St Jude's Church, Dulwich Road, London, SE24 0PB, United Kingdom
Tel. +44 0207 738 5454

Online edition:
www.criticalcomms.com

Twitter: @CritCommsToday

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(Print) ISSN 2517-2719
(Online) ISSN 2045-8673

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Quarterly Direct Debit	£13.50
Annual Direct Debit	£55
Annual Credit Card	£58
2yr Annual Credit Card	£99
3yr Annual Credit Card	£139.50

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SEPTEMBER 2021

4 Editor's letter
Philip Mason introduces the latest issue of *Critical Communications Today,* focusing in particular on the central theme of 5G

6 Who, what, where
English ambulance body worn-video deployment; Hungarian emergency communications put to the test; Nokia's renewable energy collaboration; Spanish autonomous community chooses TETRA for emergency services; TETRA systems link Chinese airports; Airbus roll-out helps ensure pilgrimage safety

10 News
ESN testing on the London Underground; Swissphone appoints new CEO; ETSI industrial IoT testing specifications

12 CCBitesize report
The first Critical Communications Bitesize event focused on narrowband technology

14 Do believe the hype
Head of Huawei's European wireless product management team Ray Williamson talks about the ongoing development of mission-critical 5G, the road towards 6G, and the impact of the British government's decision to ban the company's network components

16 Life in the fast lane
Philip Mason explores how the deployment of critical communications technology in motor racing is helping to transform both the sport and the circuits

20 Embracing the new reality
James Atkinson reports on a variety of current uses of virtual/augmented reality by public safety organisations, while also exploring the revolutionary potential of 5G when leveraged in the VR space

24 In for the long haul
Richard Martin talks to the Red Cross about the challenges of setting up emergency communications in disaster situations across the globe

28 New world
Following a recent white paper, chair of TCCA's SCADA, Smartgrid and IoT Working Group, Nick Smye, discusses the benefits and challenges of 'next generation' networks as deployed in the utilities space

29 BAPCO 2021 preview
Taking place in Coventry in the UK, this year's annual BAPCO Conference & Exhibition will be a key industry event

SEPTEMBER 2021

Scanning the horizon

Critical Communications Today editor Philip Mason introduces the current issue, a key theme of which is the ongoing development of 5G in terms of both the technology and its acceptance by mission-critical verticals

MISSION STATEMENT

Critical Communications Today provides the global mission-critical community with insight into the latest technology and best practice required to ensure that its members always have access to the instant, one-to-many wireless communications that can make all the difference in moments of crisis.

We are dedicated to providing our readers with the knowledge they need when determining their critical communications strategies and procurements, though delivering up-to-the-minute accurate information on industry trends, developments, and deployments, as well as the latest new products and services. Our journalists are committed to easing out the little details from your peers that will allow you to draw on the industry's collective experience of deploying and implementing new projects and systems.

We work to stimulate and focus debates on the topics that matter most and provide our readers with a means to raise their concerns and speak frankly about their work and the lessons they've learned while delivering the devices and networks that the world's blue light organisations depend on.

Welcome to the latest issue of *CCT*, the leading resource for professionals operating within the critical communications sector.

In this issue, we are spending considerable time focusing on 5G, a technology that could, once it reaches full fruition, conceivably come to be regarded as the most exciting development in the history of mission critical communications.

The reasons for this excitement are numerous, the most obvious examples of which are massively increased bandwidth, and comparatively infinitesimal levels of latency.

Just as exciting as the technology itself, however, is its potential impact on the market, something that will become apparent to anyone reading our exclusive interview with the head of Huawei's European wireless product management team, Ray Williamson. Turn to page 14 to see what he has to say about verticals starting to "believe the hype", as well as progress towards 5G Advanced and eventually 6G.

For further evidence of mission-critical verticals starting to get well and truly onboard with the technology, meanwhile, head to this issue's 'events' feature where we visit the KymiRing motorsport circuit in Finland (page 16). Working in collaboration with Nokia and EDZCOM, KymiRing's owners have recently installed a private 5G network aiming to revolutionise both the sport and monetisation of the circuit.

> **"5G could be the most exciting development in mission critical comms history"**

Finally, turn to page 20 for James Atkinson's report on the anticipated future use of VR/AR in the public safety space, increasingly integral to which will be the leveraging of 5G. According to James, use-cases abound in this arena, not least the potential ability for police officers to "walk around" a virtual crime location, interacting with live images from the scene, beamed back in real time.

It's not all 5G, however, and regarding the rest of the issue, eagle-eyed readers will no doubt have had their attention drawn to the BAPCO Conference & Exhibition 2021 show preview, beginning on page 29. There are two very good reasons to get excited about this event, not least the expected quality of the show itself. More to the point, however, is that it is actually taking place in the real world, marking a key stage in the critical comms sector's long-anticipated emergence from lockdown.

Enjoy the issue.

Philip Mason, editor

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Who, what, where

EUROPE

English ambulance Trusts deploy body worn video

Motorola Solutions is providing the National Health Service in England with its VB400 body-worn video camera.

According to the company, the roll-out is intended to "increase transparency and safety for [NHS] frontline workers and citizens across the country".

Motorola said the country-wide deployment follows successful trials taking place with London and North East ambulance services.

Clinical service manager at North East Ambulance Service, Darren Green, said: "If we are unable to protect our staff, we are unable to provide a service that's fit for purpose for the public we serve. The availability of body-worn cameras is something that we have championed for a long time and we are delighted to have led the trial to help implement them nationally."

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Hungarian emergency comms put to the test

Hytera Mobilfunk (HMF) has tested what it calls a "multi-cell, mission-critical LTE network" on behalf of the Hungarian public safety communications operator, Pro-M.

According to the company, the 700MHz test system was set up in the centre of Budapest, consisting of an LTE core, MCX application server and two SmartOne dispatchers. In addition, says a statement, "a baseband unit and a remote radio unit were installed at three other locations". Products used included Hytera PTC760 multi-mode advanced radios, PNC550 POC devices and VM780 body cams.

Speaking of the test, a spokesperson for the company said: "Held over several weeks, it focused primarily on functional testing. Pro-M is currently evaluating LTE as a successor technology for their latest TETRA network."

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Nokia collaborates on renewable energy deployment

Nokia has entered a framework agreement to provide private 4G/5G to energy company Equinor for its international operations.

According to a statement from the company, the eight-year agreement includes "hardware, software, design, radio planning, implementation and support". The work was scheduled to begin in the summer, with the installation of a private LTE network at Dudgeon and Sheringham Shoal windfarms, located in the UK. Deployment is being carried out in collaboration with systems integrator NetNordic.

Speaking of the solution, Nokia president of cloud and network services, Raghav Sahgal, said: "Equinor is one of the most forward-looking energy companies in the world, with a growing wind and renewables business."

Autonomous community chooses TETRA

The government of Aragon in Spain has awarded a consortium made up of Teltronic and Telefónica the contract to deploy TETRA-based public safety communications across the region. The new network will replace previous disparate analogue-based technologies used by the Aragon emergency services.

Speaking of the roll-out, a spokesperson for the company said: "The new network is configured as a modern and unified communications system that solves current shortcomings. [It will allow] the introduction of more advanced functionalities, guaranteeing service at all times and allowing immediate and efficient interoperability between the different agencies." In the first instance, the network will be used by a variety of organisations, including security and civil protection services.

ASIA

Narrowband systems link major Chinese airports

Airbus has provided a TETRA system to Chengdu Tianfu International Airport in China.

The network – which includes the company's TB3 base stations – has enabled the site to interconnect with Chengdu's Shuangliu International Airport, which has been using its own Airbus TETRA solution since 2013.

Speaking of the roll-out, a spokesperson for the company said: "The 800MHz radio communication interconnection between both airports will allow smoother collaboration between staff.

"It will also allow safer and seamless logistics, while ensuring the safety of passengers, visitors and employees in both premises. This marks another interconnectivity achievement in China."

MIDDLE EAST

Saudi roll-out helps ensure pilgrimage safety

Airbus has provided communications technology to help secure this July's Islamic pilgrimage to Mecca in Saudi Arabia, known as the Hajj. According to a statement, the company provided public safety and security personnel with TETRA technology, as well as its Tactilon Agnet 800.

Describing the latter solution, the statement said: "Tactilon Agnet allows users to leverage solutions to talk, exchange multimedia messages, and record and share videos at the touch of a button [regardless of device]. It enables secure and reliable group communication, one-to-one voice calls, as well as video and picture/text messaging."

Airbus SLC vice-president, Selim Bouri, said: "During unique events such as the Hajj, sturdy and reliable communication is essential."

5G: the technology behind the future of public safety

Broadband wireless services based on 4G/LTE have already had a big impact on public safety services with the deployment of next-generation services in the US (Firstnet), the UK (ESN) and Dubai (Nedaa) and other countries. But public safety authorities are also scrutinizing the arrival of the next generation of private wireless: 5G. What will its high-performance broadband, low latency and other features do to enhance command and control, situational awareness and general communications support for first responders?

One of the principal drivers for broadband wireless services is the ability to share high amounts of data, including video. First responders often have to feel their way without much situational awareness, especially when the scale and rapid shifts on the ground make it difficult for them to keep up with the larger picture. This is where video communications and augmented reality can be invaluable for keeping everyone involved connected and aware of the evolving situation.

It is possible for a very big event to have feeds from tens, if not hundreds, of first responder body cameras, truck-mounted cameras, site-based CCTV cameras and drone cameras, including infrared. The large number of high-quality video feeds requires an enormous amount of bandwidth. For drones and robots, a very low latency connection is a must so that the pilots are able to precisely maneuver them remotely.

Much less bandwidth-intensive, but still demanding for the network, are IoT communications, namely with the many kinds of sensors that now exist: Air quality, heat, chemical, structural sensors and bio-vital monitors, to name a few. Also, modern telemedicine capabilities can deliver top medical expertise, including remote surgery, to the event by connecting paramedics with medical specialists operating from a distance.

Many of these use cases are being tested and, in some cases, already used on a regular basis using 4G/LTE. However, in the longer term, in cases where a high density and variety of applications will be needed in the same area, there can be some limitations to what 4G/LTE can deliver regarding scaling up to the performance needed.

The technology behind the 5G magic

To support this increased need for high bandwidth, 5G New Radio is designed to work across a much broader range of radio spectrum. Many of the bandwidth gains relate to 5G's ability to use higher frequencies, such as millimeter wave (above 20GHz). These very high frequencies provide limited coverage, making them better suited for hot spots in dense urban areas. To efficiently provide large area coverage for rural areas, 5G will also be able to use lower frequencies, but capacity will be reduced compared to higher bands. Between these extremes there are different spectrums that work better. Typically, urban and suburban areas will benefit from the latest radio technology, such as MIMO and beam forming, to deliver enhanced throughput versus 4G, while offering similar coverage. Using these different bands will be important to fully benefit from 5G promises.

There are other ways in which 5G shows its flexibility, such as its ability to geographically distribute core network functions to the edge, thus shortening the distance between essential core functions and end devices. This is what enables 5G to dramatically decrease latency, which is the measure of how long it takes for communications between two devices to take place. This is a key feature for machine-to-machine communications, such as drones and robots using haptic and tactile feedback and is especially useful in applications such as augmented reality or tele-surgery, where the feedback to the user has to be nearly instantaneous.

Last, for operations in remote areas or where the network coverage is bad or even down, public safety authorities will

still have the ability to equip themselves with deployable 5G systems, to benefit from the full performance and capacity of this technology. The massive bandwidth of 5G even enables self-backhauling, where part of the capacity is used to relay communications in between the field and a central mobile command and control center. This self-backhauling is known as integrated access and backhaul (IAB).

A slice of security

More than ever, first responders will be able to rely on public 5G networks and their nation-wide deployment because of a feature called slicing. It allows multiple virtual networks, with agreed quality of service (QoS) criteria, to be created on top of a common, shared physical infrastructure when a service must be used. In the case of 5G, network slices can be put up and taken down almost instantaneously, in this way being implemented only where and when needed and optimizing overall network resources usage.

5G is based on a cloud-based, virtual network architecture, which means that it is possible to duplicate many network functions. Thanks to end-to-end orchestration of all network elements, it is possible to automatically create a virtual network configured precisely to fulfill the needs of the application. A mission-critical application used during an event might, for instance, be a push-to-video application. The virtual 5G network creates the network functions required to support the video transmission, which means a very high quality of service with no delays and top priority level. These virtual network resources are then reserved for this application. This is what we mean by a slice.

In other words, slicing means that the many consumers who also depend on the public mobile network will still have access to it, but their activity won't affect the operation of the public safety mission-critical slice that is passing over the same network infrastructure. Especially important for security is that the traffic on one slice cannot pass to another. This makes a dedicated public safety slice or slices very secure.

When will we have 5G?

We are still in the first phase of 5G deployment. Most of the features we have discussed above will not be available for a few years, as the standards are still being firmed up. Even when the final standards for features like slicing and massive IoT support are finalized, the end device ecosystem will take a while to mature.

This means that for most public safety authorities, if they want to reap the benefits of broadband wireless, they are better off today starting with 4G/LTE. In fact, the majority of new innovations in this area of public safety are occurring today on 4G/LTE networks. Fortunately, 4G/LTE was designed to smoothly evolve to 5G and the two will in many cases co-exist for years. But make no mistake, 5G is coming, and it will be the future of public safety.

For more information about Nokia mobile broadband networking solutions for public safety, visit our web site: **nokia.ly/publicsafety**

ESN London Underground Direct 2 testing

Emergency Services Network testing has taken place on the London Underground, as part of a Transport for London 4G pilot. The tests involved the use of live 'Direct 2' devices, which provide interworking between ESN and the legacy, TETRA-based, Airwave system.

According to the UK Home Office, testing involved ESMCP's operational validation team alongside emergency services personnel. It took place on the Jubilee Line between Westminster and Canning Town across the course of three days.

Describing the process, a spokesperson for the ESN programme said: "The scripted tests, which took place mid-July, used Direct 2 devices to measure the coverage. [The tests also] assessed the operational experience while exchanging data and voice communications between the Underground, the programme's base in London, and Merseyside FRS.

"Part of the testing involved a coverage assessment. This saw users on the Underground carrying out voice communications across all nine stations.

"Users walked along platforms and ticket halls and carried out ingress and egress tests, from surface level down to platform level and reverse."

Testers included personnel from the Ambulance Radio Programme, London Fire Brigade, the Metropolitan Police Service, British Transport Police, Operational Communications in Policing, and Cornwall Fire and Rescue Service. The Direct 2 devices were on loan from Merseyside Fire and Rescue Service.

NHS Ambulance Radio Programme senior user, Chris Lucas, said: "One of the pleasing things we saw [during testing] was the proof of the network interworking solution that connects Airwave and ESN together, which is really critical for part of the transition piece. I think both myself and my colleague from the ambulance service were really impressed with how it works. The quality of the voice that came through exceeded our expectations."

ESN fire senior user, the National Fire Chiefs Council's Ian Taylor, said: "I've been able to witness the fact you can make calls and send messages and pictures on the Underground into a building built of concrete, so it shows the capability and coverage ESN produces."

According to the programme, the stretch of Underground between Westminster and Canning Town is the first to receive 4G signal, as part of the aforementioned pilot scheme. The signal covers all tunnels, as well as platforms and station areas, other than those at London Bridge and Waterloo. The coverage is also freely accessible to the public and not exclusive to ESN.

TfL recently awarded a 20-year concession to BAI Communications which will expand the pilot to enable mobile coverage across the whole Tube network by the end of 2024. Further ESN testing will take place on the London Underground in the coming months.

4G coverage was introduced on the eastern half of the Jubilee line in March of this year. BAI has claimed that Oxford Circus, Tottenham Court Road, Euston, Bank and Camden Town stations will all go live by the end of 2022.

BAI says that the project will deliver "the most advanced [underground] network of its kind in the world" and be available for use by all mobile operators, as well as being 5G-ready. It has previously set up similar networks in New York, Toronto and Hong Kong.

Swissphone acquires company; appoints new CEO

Swissphone has acquired Swiss company instaSOLUTION AG, which operates a cloud-based critical event management system.

Speaking of the acquisition, a spokesperson for Swissphone said: "As a market leader in the field of secure alerting, we operate various service platforms in the areas of lone-worker protection, threat solutions and critical messaging.

"In the future [with the acquisition of instaSOLUTION], Swissphone will serve customers with a comprehensive, modern and highly available alarm management solution. The entire instaSOLUTION AG team will move to Swissphone to help continue the company's growth."

Along with the new acquisition, Swissphone has also seen the departure of its long-time CEO Angelo Saccoccia, who is handing over management to Pascal Jaggi.

Speaking of the move, chairman of the board of directors, Philipp Schülin, said: "Angelo led Swissphone quickly and very successfully back on the path to success, from 2015.

"We regret his departure and thank him sincerely for his commitment.

"At the same time, we warmly welcome Pascal Jaggi as our new group CEO. He will bring sound and long-standing experience in the telecommunications industry."

Jaggi has held a variety of management positions at telecoms company Swisscom, the most recent of which was as executive VP, operations and engineering.

Discussing the acquisition of instaSOLUTION, Schülin continued: "[The company] fits perfectly into our mission to provide highly available alerting and communication solutions, via standalone networks as well as cloud-based solutions."

ETSI releases testing specifications for industrial IoT

ETSI's committee on methods for testing and specifications (TC MTS) has completed a set of standards addressing "the testing of the IoT MQTT and CoAP protocols, and the foundational security IoT-Profile".

According to the organisation, the ETSI TS 103 596 series provides "an overall test suite structure and catalogue of test purposes for the Constrained Application Protocol (CoAP)". The standards will serve as a reference for both client-side and server-side test campaigns.

The ETSI TS 103 597 series, meanwhile, provides an overall test suite structure and catalogue of test purposes for the MQ Telemetry Transport (MQTT), divided into three different parts for conformance, security and performance testing. Finally, ETSI TS 103 646 specifies testing for "selected security requirements as known in the IEC 6244-4-2 standard".

Speaking of the new developments, chair of the working group, Axel Rennoch, said: "These new standards fill the gaps for the quality assessment of some of the most relevant communication protocols and system requirements of today's industrial IoT systems, using standardised testing techniques from ETSI."

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The organisation describes the working group as developing "studies, guidelines, test catalogues and test specifications for specific ICT technologies that are not already covered by other ETSI groups". Testing can include – but is not limited to – conformance, interoperability, security and performance testing.

Further news from ETSI comes with the publication of the results of its recent Future Railway Mobile Communication System virtual plugtests, in collaboration with a variety of other organisations, including TCCA.

One hundred global participants executed around 350 test cases across 65 sessions during the plugtests, which took place in June. A 95 per cent success rate was reported.

Discussing the event, an ETSI spokesperson said: "The goal of the FRMCS plugtests was to validate the interoperability of a variety of implementations using different test scenarios based on the 3GPP Mission Critical Services framework, with a focus on the rail-specific features.

"The event tested railway-oriented capabilities such as functional aliases, multi-talker, MCData IP connectivity, user regrouping and so on, as defined in 3GPP Release 16. It also focused on over-the-top tests via VPN connections from the vendor labs, using MCX remote lab."

TCCA news

TCCA has announced the opening of registration for this year's Critical Communications World. The event will take place at the IFEMA in Madrid, from 3-5 November, having been previously rescheduled earlier this year.

As in previous years, the event will include a range of conference and masterclass sessions, as well as a large-scale exhibition, featuring critical comms manufacturers from around the world. CCW 2021 will be the first iteration of the show to livestream conference sessions for the benefit of those who cannot travel.

Discussing the event in a statement, the organisers said: "CCW 2021 will feature a wide range of sessions, delivered by some of the most respected global critical communications experts.

"Under the theme of 'Protect, enhance, envision, advance', topics will include ongoing national roll-outs of broadband technology for critical communications, the evolution of the TETRA standard and much more."

The statement continued: "Alongside the online element, two other new additions for 2021 will include the Government Authority Global Village, which will provide an exclusive forum for national critical communications projects from around the world to come together to discuss ideas and best practice. The new VR & AR Zone, meanwhile, will explore how virtual and augmented reality technology is being used across a range of mission-critical verticals."

Speaking of the event, TCCA chief executive Tony Gray said: "The past months have been a difficult period for those operating in our sector, something which has been compounded by the inability to meet colleagues in person. With Critical Communications World now able to take place, that situation will soon be rectified."

In other TCCA-related news, the organisation has recently published a white paper focussing on machine-to-machine network priorities for utilities companies leveraging broadband-based communication networks.

Speaking of the document, TCCA SCADA, Smartgrid and IoT Working Group chair, Nick Smye, said: "There is a perception that moving to a new technology bearer is a necessary upgrade that will deliver a faster service. However, for M2M communications, mission-critical capability isn't simply about speed.

"Risk of obsolescence, resilience, priority and pre-emption are all critical features for mission-critical applications. It will be some time before 5G networks provide the required level of resilience, coverage [and priority/pre-emption]."

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New horizons for TETRA

Critical Communications Today reports on the first iteration of Critical Communications Bitesize, which focused on the use of narrowband from the user perspective

According to its organisers, CC Bitesize is intended to be a series of online events designed to explore the critical communications landscape entirely from the point of view of the user. Its first iteration took place earlier in the summer, focusing specifically on the use of narrowband technology – and especially TETRA – in the mission-critical space.

Broadly speaking, the TETRA-themed event consisted of three main strands when it came to conference content. The first of these was the history of the technology itself, going all the way back to its initial development and roll-out over 20 years ago.

This led directly into the second strand, which explored current use within a variety of different mission-critical contexts. This part of the programme focussed on the strengths of the TETRA standard, while at the same time interrogating instances where improvement has been required.

Finally, there was a discussion on the future use of the technology, and in particular the ways in which the standard might evolve. This was presented in the light of increasing interest in broadband solutions on the part of traditional 'critical communications' verticals.

Setting the standard

The first of these three strands was covered in significant detail by ETSI TC TCCE chair Brian Murgatroyd, during his session entitled 'Evolution or revolution'. This presented an overview of the needs fulfilled by the technology since its earliest iteration, something which, according to him, has been bound up with the standardisation piece.

Discussing the earliest days of the technology, he said: "When digital systems first came in, it was pretty much a nightmare, at least in Europe. There was a big push for standards to come to the rescue, particularly when it came to public safety.

"[At that time] various manufacturers had brought in systems to their own standard. This left users with technology which was not interoperable, and which also may not have had the ability to be developed any further."

Murgatroyd continued the discussion by giving an overview of the benefits of open standards to the industry as a whole, in the light of his previous comments. These include increased user choice, competitive pricing, "encouragement of innovation" and longer product life (alongside the attendant user assurance that "the product will not go out of date").

Use of TETRA is increasing in verticals such as transport and utilities

From there, he discussed the development of the TETRA standard itself from its initial publication in the 1990s. According to him, this covers the air interface, the intersystem interface, the peripheral equipment piece, direct mode, SDS and packet data. "It also describes security in a lot of detail," said Murgatroyd.

Having established the credentials of TETRA as a standardised technology, Murgatroyd then went on to talk about the requirement for those standards to evolve in the context of the aforementioned, most likely widespread, broadband adoption. The three areas he identified in relation to this were packet data enhancements, additional security algorithms and the interworking interface between TETRA and critical LTE.

Discussing the latter, he said that it was necessary to include functionality such as group call, emergency call, short data and encrypted communications. "We want to be able to replicate on a 3GPP system everything you get on TETRA, and we want them to be able to talk to each other," he said. ▸

Choices to be made

A more operationally focused take on the current use and requirements of TETRA came from critical communications industry analyst Ken Rehbehn during his joint presentation with TCCA SCADA group chair Nick Smye. The presentation was titled 'Future directions for narrowband communications'.

Having established his credentials as a firefighter (albeit using P25) in the United States, Rehbehn discussed the context of current TETRA use within the emergency services environment, and why the standard "excels" in the way which it does.

"This is a technology that absolutely excels with group voice, short data and scale," he said. "It also excels because of security."

He continued: "The care and attention that went into the design of the TETRA architecture allows public safety organisations to have control over encryption, and how they use these capabilities with the assurance of confidentiality.

"I think that this is a huge aspect of TETRA's importance and reason to be. [The standard] has been around for years, a maturity which allows for a level of stability and reliability."

Rehbehn followed this with a discussion of how the use of TETRA is still growing, both in terms of the different sectors and territories in which it is being rolled out. In terms of 'new' verticals, he specifically identified transport and utilities, while also commenting on the way in which TETRA is expanding out of its original, primarily European, base.

"Choices are going to be made by the end-user agencies as to what their ageing analogue systems should be replaced with," he said. "That could be DMR or POC; however, in many of these markets, TETRA may continue to be a superior choice going forward."

This was further illustrated by a number of other presentations discussing particular roll-outs around the world in specific detail. These included the use of the technology by Highways England, Brussels public transport, and by the Australian 'resource' sector.

> **"I am sceptical that 5G will satisfactorily communicate from inside a structure, below grade, to an external user"**

Other global market studies, meanwhile, were delivered by the Norwegian Directorate for Civil Protection, discussing its Nodnett system, alongside a panel focusing on the opportunities for TETRA in the US. The latter consisted of a range of organisations, including PowerTrunk, Collins Aerospace, NJ Transit and Bay Electronics.

Think about the future

As indicated by the title of Smye and Rehbehn's session, much of it was occupied with the future direction of the standard. Discussing this in the second half of his presentation, the latter introduced the idea of "mixing and matching" TETRA and LTE-based systems, with potential scope for the development of a standard interface.

TETRA will continue to be an important part of the critical communications ecosystem, said Rehbehn, citing, among other things, critical LTE's inability to provide direct mode functionality. "I am very sceptical that 5G will solve – to the satisfaction of FRS personnel – the ability to communicate from inside a structure, below grade, to an external user or vehicle. I just don't think that the physics support the power transmissions which are required."

Another presentation discussing future use of TETRA was delivered by Omdia research director Thomas Lynch, alongside ex-Mid and West Wales firefighter Steve McLinden. This was titled 'Narrowband in the time of change: the perspective of the end user'.

McLinden began by outlining his experience of using TETRA in the UK Fire and Rescue Service, primarily for the provision of voice comms. This communication, he said, took place between firefighters and control rooms, with the solution "working well".

Moving on to the topic of where the standard goes from here, he echoed Rehbehn's sentiments about the deployment of the technology in a 'joined up' way, also taking other solutions into account. Discussing this, he said: "In the programmes which I've been involved in, we're looking for something where everything's connected, so you're not just relying on one thing.

"It's about making sure that the TETRA capability matches up to what the end-user needs. It's a very complex question, and I wish I had an easy answer.

"The key critical objective is to make sure that first-responders have reliable access to what they need through the [communications] infrastructure. TETRA shouldn't be looked at in isolation, but as part of a wider network."

As readers of *CCT* will already be aware, the option to incorporate TETRA into UK emergency services operations will dwindle considerably once ESN is fully rolled out and the Airwave network finally switched off. According to McLinden, this is something which Mid and West Wales has already incorporated into its planning process, with broadband-enabled technology rapidly becoming ubiquitous across a variety of operational areas.

Talking about this in greater detail, he said: "We've been increasing our use of data over the past 10 to 15 years, with the use of mobile data terminals. We [still] haven't made a huge amount of progress in this area, however, mainly because affordable technology wasn't necessarily there.

"By contrast, what we're seeing now is a real rise in emergent technologies, something which has taken place over the course of the past four or five years. This includes things like drones and bodyworn video, both of which provide an unprecedented level of situational awareness [to firefighters on the ground].

"TETRA has served us well, but we're now at the tipping point. [As a service], we're probably where smartphones and apps were five or six years ago." Their use, he suggested, is only going to increase, certainly among UK first-responders.

As the first iteration of Critical Communications Bitesize illustrated, predicting the development of the TETRA standard is by no means a straightforward task.

On the one hand, its ongoing use is likely to be absolutely secure, particularly given the extraordinary value offered by the technology in sectors such as transport and utilities. On the other hand, it is difficult not to wonder what the impact of broadband might be, at least when it comes to public safety. If 'mixing and matching' solutions really is the way forward, that is where the conversation could get really interesting.

Do believe the hype

Philip Mason talks to the head of Huawei's European wireless product management team, **Ray Williamson**, about the ongoing development of mission-critical 5G and the eventual road to 6G

Could you tell me a bit more about your role, and how the wireless product management team helps to drive the rest of the business?

I'm part of the wireless product line, focusing on the development of broadband technology. We look at everything from 2G, to 5G Advanced and eventually 6G.

Our main customers are the mobile network operators, and it's our job to consult with them, as well as with industry and the end-users. We're in the process of talking to the verticals about what products they need – and therefore we need to develop – in the next three to five years.

At the same time, we're also involved in the initial business engagement process, again, working with verticals to help them understand the use-cases for 5G. Seeding and developing the market, basically.

Again, we primarily work with some of the leading mobile network operators in Europe, who themselves are becoming increasingly interested in the verticals market. I need to be able to help the MNOs understand the requirements of these potential customers.

What part are the MNOs likely to play in the critical comms ecosystem going forward, particularly in comparison to private network providers?

Mobile network operators are always going to want to leverage the networks that they have built, which is where the slicing conversation comes in. As mentioned, however, operators are increasingly seeing the importance of verticals, to the point where they are predicting a considerable increase in revenue in the 2B [to business] segment as opposed to the traditional consumer piece.

There are certain use-cases where use of the consumer network is completely appropriate. At the same time, it's increasingly being seen that private networks have got an important role to play as well.

What is that going to look like in practical terms? What do you anticipate the preferred models of roll-out are going to be?

Honestly, that's something which we'll just have to wait and see. The deciding factor might be down to region, one example being the heavy industry and mining-related networks that are currently being deployed in China. Those are using public spectrum in many cases, but in reality they are actually private networks because the sites in question are so inaccessible. It is almost like a ring-fenced environment.

At the same time, there will be other use-cases where the business in question is purely interested in having its own 5G system. The larger car manufacturers are a good example of that, particularly given the urgent requirement for them to manage their own data. They are looking to use dedicated spectrum to deploy their own campus networks.

That being the case – and staying on the subject of spectrum – is more now being made available for use by private networks?

We're now seeing dedicated spectrum being made increasingly available in the industrial space, particularly in Europe. For instance, Germany recently allocated some of the C Band – 3.4 to 3.8GHz – for verticals. At the same time, in the Netherlands, they are looking at a different part of the C Band, while in the UK, we have taken spectrum in the 3.8 to 4.2GHz range.

While this is undoubtedly positive from the verticals' point of view, we are also now starting to see a certain amount of fragmentation in terms of the use of different spectrum across those different countries. That could possibly create some challenges when it comes to mass adoption, something which would ultimately affect things when it comes to driving the cost down. The more standardised the approach, the better the return.

Another challenge related to this is the number of different potential types of infrastructure and models of roll-out, all of which will be dictated by the needs of the organisations themselves. In some cases, they will just be using public networks, while some will be using dedicated on-premise, and some will be using a mixture of both.

Are verticals in the industrial space becoming more convinced about the value of 5G?

I would say that the level of interest is increasing all the time, starting around 18 months ago. The vertical industry has moved from listening to the hype around the potential of 5G to understanding the business benefits of it.

Huawei's Ray Williamson

That being the case, what they want to know now is that the technology is ready to go to market. That means they need to be shown that the ecosystems exist, both in terms of the networks and the devices.

I think real evidence of that progress can be seen in the fact that there are now around 100 5G modems available, specifically for use in industrial type applications. As of last year, I think they were about 150 dollars each on average, and now they are less than a hundred. By 2023, we predict they will be as low as 20 dollars.

Honestly, we're now seeing 5G scaling to a similar price point as Wi-Fi, at least from a device perspective.

Many critical use-cases require considerable network resiliency and reliability. Are verticals becoming more reassured in relation to that?

I would say that there are still some question marks from the verticals over reliability, as well as security. But, again, we have ongoing reference cases which are starting to convince the market that the technology addresses these areas.

What needs to happen now is that we need to embed testing in order to prove that these networks are as reliable as they are needed to be in terms of coverage and redundancy. At the same time, these organisations have to absolutely avoid the possibility of outages, which is another thing they need to be reassured about. We work with a manufacturing company in the automotive space, and their expected downtime is literally minutes per year.

In terms of security, 5G has a lot of features which come through the 3GPP standards applications. To use Wi-Fi as the comparison again, there has always been a reluctance to use it for critical communications, specifically because of concerns over security and reliability. A lot of improvements have been made to 5G within 3GPP, however, on both the radio side and the core side.

The other thing with 5G is that if you want to, you can virtualis the core and bring everything on-premise.

You mentioned earlier that you are looking at developing products for roll-out in two or three years' time. What does the medium and long term look like, and where do 5G Advanced and ultimately 6G fit into that narrative?

As with previous technologies, we can't just have 5G and then jump straight to 6G 10 years later. The concept of 5G Advanced therefore marks the next phase in that continual evolution, gravitating around Release 18, which is probably no more than two or three years away.

There are a few areas in the current standards which require enhancement to satisfy the wide variety of 5G use cases, for instance in relation to uplink data throughput. There will therefore be a big focus on uplink performance going forward, something which is absolutely crucial for industry.

Regarding 6G, at the moment it is being talked about as less focused on the technology and more on what it does for the planet and the people who inhabit it. I've seen a lot of very socially conscious and environmental-driven use-cases, looking at the broader impact on people's lives.

Release 18 is scheduled for 2024 – maybe in the market by 2025 – with speculation being that 6G will be somewhere around 2030.

Finally, how has the British government's banning of your network components affected business in Europe, and what do you predict will be the long-term effects on the 5G landscape in the UK?

Starting with the impact on the UK, I think it's a pity because the UK was making really good progress in terms of rolling out 5G.

We had enabled all four of the major operators to offer the service, which I think was a first in Europe. Since then, the change of supplier, alongside the restrictions, have meant a delay of about two years.

In terms of Huawei – and what I do in particular – we have only seen those restrictions in a small number of markets in Europe. Even in the UK, we still have regular discussions with organisations about how their business is going and what they require. We continue to have vision strategy meetings about what will be happening in five or 10 years, and we are still involved in standardisation.

Ultimately, it has not made a huge impact in terms of what I do. That said, I'd obviously still love to be talking about the work we do in the UK.

Adobe Stock/3D motion

Getting ready for life in the fast lane

Philip Mason explores how the use of critical communications technology in motor racing is transforming both the sport and the circuits

Critical communications technology is currently deployed across a variety of 'vertical' environments, ranging from public safety to utilities, industry and mining.

Needless to say, CCT attempts to cover all these sectors in our ongoing mission to provide readers with the very latest case studies from around the world.

One area that doesn't necessarily get the attention it probably deserves, however, is large-scale events, and in particular those involving sport.

There could be any number of reasons for this, not least that there is, by definition, something seemingly frivolous about locations that are places of enjoyment as much as they are places of work. It is also probably fair to say that there is an (often perfectly reasonable) perceived lack of peril when it comes to these environments, at least when compared with an airport runway or a crime scene.

That being the case, in this issue we are redressing the balance by focussing on motor racing, a sport where efficiently designed and deployed critical communications are absolutely integral to the safety of both participants and spectators.

In the first instance, the focus will be on Airbus's ongoing work providing TETRA to the Bahrain Grand Prix, via a system that has been constantly evolving since it was first deployed in 2005. Next, we look at Nokia's roll-out of 5G at the KymiRing in Finland, a project which offers major insight not only into the direction of the technology but also the future of the sport itself.

Continual progress

Taking place at the end of March, this year's Bahrain Grand Prix marked the start of the 2021 Formula One Season. The venue for it was the 70,000-spectator-capacity Bahrain International Circuit in Sakhir in the west of the country.

Airbus provided narrowband communications technology for the race, leveraging – as in previous years – the country's pre-existing TETRA infrastructure, as owned by the government. The F1 deployment also included extra network capacity to the site itself, as well as the provision of handsets, in order to, according to a statement released at the time, "secure the safety of the competitors and everyone on the premises".

Going into greater detail about the roll-out and its history, Airbus head of Middle East, Africa and Asia Pacific, Selim Bouri, says: "We've been providing TETRA to the Bahrain International Circuit Organisation almost from the beginning, connected to the core network already rolled

out for local authorities. That enables communications at the circuit to integrate with external security and emergency services organisations, which is obviously vital."

He continues: "In terms of the Grand Prix, we provide additional capacity and infrastructure based on specific race-day needs, for instance in relation to security, and the organisation of the event itself. Those using the network include marshals and the race organising committee, as well as dispatchers located in an onsite control room."

That extra capacity is provided by base stations located across the 5,412-metre circuit (the number of which Bouri cannot disclose for security reasons). The system operates on the 380-410MHz frequency, corresponding, naturally enough, with the spectrum set aside for Bahrain's emergency services.

User equipment includes the company's THR880i TETRA handsets, as carried by the aforementioned race personnel. Dispatch is carried out via the company's Tactilon suite, which – in the words of the Airbus website – "combines the capabilities of TETRA/Tetrapol networks and [as yet unleveraged] broadband communications".

Describing use of the network on race day, Bouri continues: "If there's an issue in one part of the circuit, a marshal can immediately activate a dedicated talk group in order to connect with other marshals located in that area, as well as security and emergency services officials. With one click, everyone who needs to be on a particular call will be involved.

"Obviously, the Formula One teams have their own systems to communicate between themselves as well. Those are all based on different technologies, operating in other frequencies, so there's never any issue with interference with the TETRA system. Ours is the only onsite network classified as mission-critical, which guarantees reliability and redundancy in terms of the core system, base stations and so on."

As mentioned, Airbus SLC has been providing TETRA-based communications to the Bahrain Grand Prix since the middle of the 2000s. Throughout that time, at least according to Bouri, the network has been constantly evolving, culminating this year with the creation of 'virtual' talk groups, leveraging the Ministry of Health's parallel TETRA solution.

> **"We provide additional capacity based on specific race day needs"**

This was necessary, with a tedious inevitability, to help maintain onsite safety measures prompted by COVID-19. These included additional screening requirements, as well as potential isolation and evacuation of those suspected of having the virus. "There were also multiple additional logistical and tactical procedures associated with COVID-19," says Bouri. "The F1 event had a specific sanitary 'bubble', which increased the requirements of communication, control and co-ordination."

The ability to create what might be regarded as 'external' talk groups has clearly added a vital element to the system, enabling it to become increasingly agile and adaptive. According to Bouri, however, there is also likely going to be further evolution on the way, with the increasing integration of broadband now integral to the organising committee's plans going into the future.

Discussing this, he says: "The handsets currently being used at the circuit are dedicated TETRA devices. However, going into the future, we're looking at bringing additional capacity to the network, moving from purely narrowband to a hybrid approach.

"We anticipate that TETRA will continue to be the most reliable solution for voice, for at least the next 10 years. At the same time, by putting in a 4G layer over the top, we can include other functionalities such as real-time video monitoring and additional sensor information.

"That would also give us the opportunity to introduce our next generation of handsets such as the Dabat, which is both TETRA and LTE. Use of the Tactilon Agnet, meanwhile, will provide a secure virtual gateway for smartphones to link into the communications network. That would give the opportunity for volunteers to perhaps become involved.

"In terms of the type of broadband network we plan to leverage – private, commercial and so on – that depends entirely on the potential users, as well as in-country regulations and priorities. Generally, the first implementations of hybrid start with private TETRA/commercial MNO via a roaming agreement. However, the option of a private dedicated broadband network may also be relevant, either as a second step or if specific additional requirements arise."

Race for the prize

Bouri says TETRA is likely to remain the most reliable solution for voice for the foreseeable future, and so it is. It is also obvious, however, that, at the Bahrain International Circuit alongside everywhere else, broadband is coming.

Further, and even more conclusive, proof of this can be found in the work currently being carried out by Nokia and private wireless network provider EDZCOM, which have been contracted to deploy private 5G to the 4.5km KymiRing in Finland. Situated in the southern village of Kausala, the site includes the main racetrack as well as driver training facilities located next door, and space for what a well-known online encyclopaedia calls "fairs, festivals and other mass events".

According to a statement released earlier this year, the new network will support both the "testing environment" as well as enabling "unprecedented televising techniques for motorsport". At the same time, the increased bandwidth and drastically reduced latency provided by 5G will likely also revolutionise the actual racing itself.

The CEO of KymiRing is Markku Pietilä. Discussing the reason for commissioning the network, and the impact he believes it will make, he says: "It's clear that a significant part of what we do going forward will have a digital element, which is the same in every facet of the events industry. In terms of the sport itself, if we look forward five years, the races are probably going to look completely different from the way they do now."

For Pietilä, the primary driver (no pun intended) for the installation of the new network revolves around expenditure and income. As he says, for instance, he had already installed fibre as early as possible ("in the starting phase") because of the expense of leaving it until after the circuit was built.

At the same time, he is also confident of finding ways of successfully monetising the new network, particularly in relation to the televising techniques mentioned above.

This could include, for instance, enabling fans to watch an entire race in real time from the point of view of their favourite driver. He is also excited about the potential for 'interactive' advertising, ▸

with content catered specifically for each individual viewer.

As intriguing as this is, however, probably more compelling for CCT is the likely impact that the new technology will have on the racing piece, for instance from a safety perspective. At the same time, 5G will also likely have profound implications for the car manufacturers that use the KymiRing as a testing ground.

Going into greater detail about this, Pietilä says: "We've been consulting with Aki Ajo, who is the founder of Grand Prix motorcycle racing team Ajo Motorsport. He is massively respected in the industry and believes that teams will undoubtedly find ways to exploit the 5G technology.

"One example of that is the potential use of onboard cameras, which will be able to send uninterrupted information back to the teams at all times. They will also be able to analyse mechanical – and biometric – data, all of which will again be available in real time. We can only imagine what they're going to be able to do with all this information, provided by what is essentially an unlimited number of sensors."

He continues: "It's the same principle with the testing environment, with commercial cars now providing their own data from a variety of onboard sensors. Again, car manufacturers have to receive testing information in real time, with a very high level of security, which is one of the reasons that we've decided to opt for a private network."

This last comment brings us neatly onto the technology/infrastructure itself which is being provided by Nokia alongside private wireless network specialist EDZCOM.

Describing the deployment, EDZCOM CTO and co-founder Kari Lehtinen says: "KymiRing is designed as a private network, which includes an on-premise core, radio access and enough spectrum to deliver the value proposition and use-cases. It's been built to support both 4G and 5G, enabling potentially massive expansion once millimetre wave becomes available.

"The advantage of this kind of private network – other than the owner having complete control – is that you can add capacity very flexibly and quickly, for instance if you need to change the location of a camera.

"Depending on the size of the network and the required number of base stations, you can build something like this in a day and scale it up incredibly easily."

Lehtinen continues: "We have a very good partnership with Nokia. They were willing to invest in us in the first instance, and also willing to let us test and try new things that are not necessarily in wider usage yet. We've been rolling out about 30 private networks, mostly in Finland, including deep mines, ports, airports, manufacturing."

Formula 1 communications needs are constantly evolving

Going back to the variety of use-cases mentioned earlier, what is likely to be the priority in terms of how the network is used? Given the unique nature of the environment, meanwhile, what has been the situation in regard to spectrum?

"In terms of usage," says Lehtinen, "uplink is critical. There's going to be a huge amount of data coming from moving elements as well as from the track itself. That's the case with a lot of private networks in any space where the technology is being deployed in order to gather information. The top speed of the circuit is 350KPH, and 5G can easily cope with the handover between the base stations.

"Spectrum was not an issue, because of our history as a company. We have spectrum in two bands which we acquired early on, almost by chance. Five years ago, comparatively small companies such as us were not necessarily even thinking about these kinds of roll-outs. Now there is an increasing need for these local, high-performance environments."

Sporting event locations are increasingly at the cutting edge of critical communications deployment. With its need for safety and efficiency at all costs, the motorsport space is a perfect example of that.

Photo courtesy of Airbus

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Embracing the new reality

James Atkinson reports on a variety of current uses of virtual/augmented reality by public safety organisations, while also exploring the revolutionary potential of 5G in the VR space

Virtual reality (VR) and augmented reality (AR) have been around for years as concepts, but it is only relatively recently that applications have been developed for use by public safety agencies.

Arnaud Legrand, lead marketing strategist for Nokia's worldwide public sector business, observes: "We are still in a phase where public safety needs to learn what they can do with data using 4G even though some 5G is now available. But you can do a lot of very interesting VR public safety applications already using 4G, as the throughputs enabled by it sustain some pretty high-quality video."

Nokia recently undertook a VR/AR proof-of-concept trial in Dubai with network operator Nedaa. The trial involved installing a 360° camera inside an ambulance and equipping a paramedic with a specialised short-distance-focus camera, headset and microphone. Equipment in the ambulance was also connected to a hospital over the 4G network.

A doctor in the hospital was issued with VR goggles, so he could see what the cameras were showing in the ambulance and get an overlay of the patient's medical records. "We were also able to display the bio-vital signs of the patient from the equipment in the ambulance as an overlay in real time on the doctor's VR goggles," says Legrand.

The 360° video and short-range-focus cameras enabled the doctor to make a remote diagnosis and provide some recommendations for immediate treatment. "The third benefit was that by having all this information, the doctor was able to prepare the hospital ahead of the patient arriving," says Legrand.

Where VR is really making itself felt right now is in offering immersive training opportunities for first-responders. In the US, the Public Safety Communications Research (PSCR) division of NIST (National Institute of Standards & Technology) has been supporting research into VR and AR for public safety since 2017, working with academia and industry.

Scott Ledgerwood, who works on PSCR's user interfaces/user experiences research portfolio, says: "With VR, you can immerse someone in [the experience of] a burning building, a hazardous materials spill, or recreate a mass-casualty incident by the side of a highway without presenting a significant risk to the users. We can do this at a fairly low cost and in a repeatable way. We ascertain the key takeaways, measure what is going on with the users, and assess how well the technology helped them carry out various tasks."

One example where PSCR has helped is a VR training tool for advanced cardiac life support (ACLS) developed by Health Scholars. Paramedics and firefighters need to have ACLS training every year, but to get 20 paramedics into the same room with several instructors is expensive and time-consuming. The Health Scholars VR training offers 14 different scenarios enabling trainees to measure different heart rhythms, administer different medications and to perform cardiopulmonary resuscitation (CPR). Health Scholars has

since extended the application to paediatric critical care.

Ledgerwood says PSCR and its collaborators are looking at intelligent user interfaces to leverage AI and human computer interaction, to identify what the immediate goal of a first-responder might be, working out what information should be displayed to them to help them achieve particular tasks.

PSCR is also measuring the cognitive load on the first-responders. "We are trying to balance it, so first-responders are not getting too much information, but they are getting the right information at the right time without overburdening them," explains Ledgerwood.

The most common use of VR right now is for classroom training. For example, a UK-based company, RiVR, has developed RiVR Link, a mobile 'Classroom in a Box' VR solution for training up to 30 people in a classroom simultaneously. The instructor controls a number of synchronised headsets with various functions.

"They can play existing footage on the screen or go straight to 360° video and be at the Fire Service College doing some training," says Alex Harvey, director at RiVR. "The tutor can draw on the screen to highlight things, pause things, interact with the video for talking points or to call out hazards and so on."

At the same time, VR also enables users to recreate specific environments that a crime scene/fire investigator or paramedic might experience on the job. For instance, RiVR Investigate is designed as a fully immersive VR fire investigation training solution, which has been implemented by West Midlands Fire Service (WMFS), again in the UK.

Luke Beckett, fire investigation officer at WMFS, says: "The solution enables us to run fire investigation training for Watch and Crew commanders. The training is designed to help their understanding and skills in conducting an investigation into a fire, which could be accidental or deliberately done. It will help them assess heat damage, fire spread and spot possible criminal activity. Ultimately, it will highlight the area of origin of the fire and the potential cause."

RiVR Investigate offers six training scenarios including different domestic and commercial fire scenes such as a lounge, kitchen and office. Real burn scenes are captured using 360° video and photogrammetry. Wearing a VR headset and holding two controllers, the firefighter can enter and walk around rooms, pick up objects, take notes digitally, take photos and transfer items to a reconstruction area or a laboratory for tests and further examination.

"It also allows the wearer to utilise a tool belt of equipment including a flashlight, a camera to capture the scene, a dictaphone to take contemporaneous notes, scene lights to illuminate certain areas, and evidence markers. All of these tools are ones we would utilise at a real fire scene," says Beckett.

Using the solution, investigators from the WMFS Fire Investigation and Prevention Section (FIPS) guide trainees through these scenarios, viewing their progress in real time on a computer screen. "At the end of the session they can watch a video of the real fire and see how it actually started and developed, and how accurate their hypothesis was," says Beckett.

VR has some other benefits. Beckett points out that these fire scenes can be reset an unlimited amount of times within just a few minutes. "But you can only put a certain number of people through a real training burn scene before it is unusable," he says.

> **"The most common current use of VR is for classroom training"**

Scaling up

These fully immersive VR applications are available now using Wi-Fi and 4G. However, 5G will be the transformational technology required for supporting real-time AR applications for public safety personnel in the field.

Nokia's Arnaud Legrand says the first phase of 5G will bring additional capacity. "5G will be useful when you need to scale up for a big event where you have to support high densities of police and firefighters in the field with cameras." But 5G Phase 2 will be needed to deliver the ultra-reliable low-latency communications (URLLC) required to support real-time VR and AR applications for frontline first-responders.

"Before, it was about bringing real-time information back to the control centre," says Legrand. "But the next step is to transmit the information from the incident that has been analysed back to the field. For that, it will be very important to have extremely low latency, because the guys in the field need to react instantly. 5G will bring some very significant improvement in AR applications."

Mobile edge computing (MEC) will also be equally important in supporting URLLC VR and AR applications as it removes the need for heavy processing power in the AR headsets and deploys it at or near 4G and 5G base stations. Legrand adds that the big difference 5G Phase 2 will bring is that it will be dynamic, as the entire network is virtualised. "End-users can dynamically get what they need automatically from the network, when they need it," he says. "Capacity and service on demand."

This kind of service will support applications such as thermal imaging cameras, toxicity sensors and edge detection on firefighter helmets in order to provide an outline of objects on AR-enabled visors, aiding navigation in the smoke. Low latency will also be required to control and stream video back from remote vehicles, robots and drones in real time.

PSCR is investigating 'gesture interaction' where a device strapped to a person's forearm will interact with movement, using AR to carry out a task normally performed using fingers (for instance, to toggle a screen or interact with a display). "Similarly, if you are interacting with drones and want to issue a command for them to fly in a particular direction, you can do that with a basic gesture," says Ledgerwood.

RiVR's Alex Harvey, meanwhile, says the company is developing a 360° live-streaming 5G camera. "You could go into a crime scene, fire scene or major incident and stream back images to command centres. We are also looking at the rapid capture of crime scenes if we can get the upload speed and processing of the data in the cloud fast enough. We could turn up to a crime scene and take 6,000 photos and upload them. Then an expert on the other side of the world could walk around that crime scene almost in real time."

With 5G networks in their infancy – and 5G Phase 2 yet to be implemented – most frontline public safety AR applications depending on ultra-low latency tend to be in ▸

West Midlands Fire Service has invested in virtual reality technology

the trial stage. However, a cutting-edge EU-funded, three-year AR trial called Project DARLENE (Deep AR Law Enforcement Ecosystem) illustrates the kinds of applications that will be possible.

DARLENE will combine AR smart glass technology and computer vision algorithms with 5G network architectures to allow the agile processing of real-time data by LEAs, even in high-pressure situations. The aim is to enable first-responders to make more informed and faster decisions.

"The way to do that is through AR and AI," says Nikolaos Dimitriou of CERTH (Centre for Research & Technology Hellas) in Greece. "What we are developing in the project is an AR/AI ecosystem where officers in the field will have AR glasses. They will carry a very small computational unit that will be able to process video in real time from the AR glasses camera, and also pick up information from IoT devices like surveillance cameras."

The AR glasses will also be connected to the cloud and to the command centre, which can conduct further analysis on the data and then transmit relevant results and advice back to the field. The two critical requirements are the ability to process data in real time and to display information on the AR glasses with minimal latency, so officers get the information they need when they need it. The second is to ensure the information being presented to field officers and HQ is accurate. "The margin for error is really small here," says Dimitriou.

DARLENE is addressing two representative law enforcement use-cases. The first involves using AR glasses with real-time AI capabilities for rapid visual scene analysis for anomaly detection. The idea is to prevent or respond to crisis situations such as a terrorist attack in a public place and to deliver assistance to the public.

The combination of AR and AI using rapid algorithms will detect anomalous movements in crowded areas such as those made by an armed suspect or an injured civilian on the ground. It will also detect unattended suspicious objects, quickly rendering them on the AR glasses in a way that is easy for the police officer to take in. The same data is also fed back to the command centre for additional analysis and guidance.

The second use study involves 'the tactical neutralisation of human adversaries in the presence of friendlies'. For example, in the event of a hostage situation, the police can utilise an array of sensors pre-installed in the building, such as CCTV, and beacons to create a 3D model of the area or each individual floor and the whereabouts of people in it. A way to see through walls, in other words.

An additional aim is to provide rapid identification of friend or foe for officers in the field by developing a 2D map of the space and displaying that status in an easily apprehendable way on the AR glasses. With this knowledge, police could theoretically plan a better co-ordinated response and tactical approach in active shooting situations.

The use of this technology does raise privacy concerns, however. So, DARLENE will also carry out an integrated ethical, data protection and social impact assessment to ensure compliance with ethics requirements and build public trust.

There are many other areas where VR and AR applications can be used for public safety, including, for example, information overlays on heads-up display units in vehicles. While the technology is already useful as a training tool, it seems clear that we are only just at the beginning of what VR, AR and AI can bring to public safety with the arrival of 5G.

DEFENCE AND SPACE

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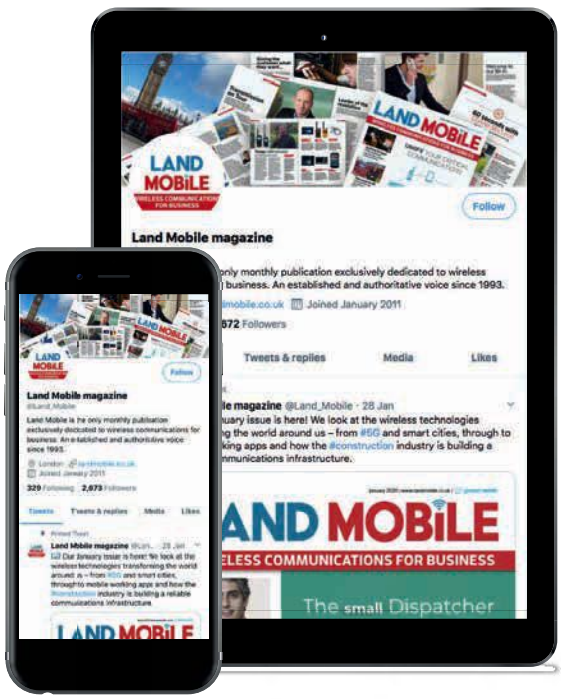

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In for the long haul

Richard Martin talks to the Red Cross about the challenges of setting up emergency comms in global disaster locations

The Red Cross is one of the world's leading public safety agencies, standing ready to work in disaster zones across the globe.

Communications is one of its critical tools, used to manage precious resources and helping it to operate effectively. These are set up by the organisation's specialist communications Emergency Response Unit (ERU).

You improvise, you adapt

Founded in 1863, the Red Cross has brought medical aid to millions. It is currently made up of 192 national Red Cross-branded organisations across the world, made up of 12 million volunteers. Umbrella organisation the International Federation of the Red Cross and Red Crescent acts as a secretariat and co-ordinator of these efforts, including those involving disaster situations.

When a disaster such as an earthquake or armed conflict arrives, the first step taken by the organisation is to deploy an assessment team on the ground. This will determine if local medical and other recovery resources are overwhelmed and therefore in need of outside help. If so, ERUs will be dispatched for a maximum of 30 days to support the local teams. The organisation has ten such ERUs whose range of tasks includes setting up mobile hospitals, taking care of logistics and – of particular interest to CCT – arranging IT and telecoms.

Noe Hatchuel is the senior international emergency field operations officer in the US-based IT and Telecoms Red Cross ERU. Offering an example of a typical deployment, he discusses the work carried out in Mozambique in 2019 following cyclone Idai.

He notes that in order to deploy quickly, the team must be ready. This state of readiness is informed by information provided by local Red Cross teams on the ground, which identify both what needs to be provided, and what personnel may expect to find once they get there.

Elaborating on this, he says: "We go with everything we anticipate we're going to need for 30 days, including food, shelter, as well as things such as mosquito nets. One of the basic principles of the operation is that we must not be a burden, and that we do no harm."

He continues: "In terms of the communications piece, we could be installing equipment such as antennas, but also repairing our or other agencies' kit. Our equipment is transportable on a commercial aircraft, and we would typically have 30 hard travel boxes alongside soft luggage."

The Red Cross attends disaster situations across the world, such as earthquakes, hurricanes and wildfires

According to Hatchuel, his team needed to take three flights taking around 30 hours in order to reach Mozambique, leaving from the US before going via London and South Africa. As might be imagined, the team was exhausted, arriving with "hundreds of other aid workers into a confusing and chaotic situation".

"In Mozambique, the Red Cross deployed other ERUs such as water/sanitation teams, with the airport becoming the first centre of operations," he says. "The key from our point of view is the ability to be flexible, with teams having to adapt immediately to what could be extremely basic conditions, including a lack of contact with home."

Many needs, many solutions

Going back to emergency communications specifically, Hatchuel says this ability to improvise is also vitally important when it comes to connecting those on the ground. He says staff have to be "problem-solvers and innovators", something which could include finding (or indeed making) a ladder, duct-taping cables to

walls, and so on. "In one case, our team spotted a civilian technician fixing fibre lines, so we used his skills to lay fibre to our main system."

He continues: "There could be a variety of communications needs on the disaster site. For instance, providing a suitable broadband link to regional or overseas centres is needed to send back publicity footage. The Red Cross needs to tell its story in order to maintain interest and raise funds.

"With that in mind, satellite communications using commercially available VSAT or BGAN terminals are one of our key tools. These can send both data and images for analysis, for example to a specialist surgeon or consultant.

"For instance, during the Nepal earthquake in 2015 we were sending x-ray images of injuries back to Germany and Tokyo over satellite links."

The video links over satellite have multiple uses in these situations, as well as letting the outside world know the urgent need for assistance.

He continues: "In terms of communication within the team itself we also use VHF and even HF radios. In Mozambique, for instance, the local team had access to one VHF channel, which was also used by other agencies. We subsequently worked with those agencies in order to get access to other channels. The VHF radios were provided by Motorola Solutions and Kenwood.

"Other equipment included an IP network, routers, switches, wireless access points, as well as cabling. We had three Ku-band VSAT, and several BGAN, terminals, alongside Iridium satellite phones."

As might be imagined, there were a variety of challenges in relation to the Mozambique deployment. One of the main ones was not knowing what the local capabilities were in advance, meaning extra equipment was taken along that was ultimately not needed. In some cases, meanwhile, the Red Cross in-country offices were damaged and needed to be restored.

In terms of coverage issues meanwhile, the existing commercial cellular network was also damaged, and as such only able to offer low bandwidth. This required the training of incoming responders on the dos and don'ts of comms on the ground. In Mozambique, the poorly maintained local generator proved an inconsistent

> **"During the Nepal earthquake of 2015, we were sending x-ray images of injuries using satellite links"**

source of power, which meant another repair job for the team.

According to Hatchuel, following the initial 30 days' deployment, ERU equipment could remain on-site for up to four months, at which point its operation is taken over by replacement personnel. Any equipment left behind for the local team therefore needs to be usable and maintainable.

As discussed, the Red Cross uses a variety of different solutions for a variety of different purposes. With that in mind – according to Hatchuel – it is always on the lookout for new and innovative technology. Discussing this, he says: "We are a great sandbox for trying out new gear, but when it comes to a real deployment, there are obviously some key things to consider.

"Firstly, there's the environment itself. In Nepal, for instance, the equipment had to withstand weeks of continuous rain, falling during the monsoon. The equipment also needs to be easy to set up and fix if it goes wrong.

"At the same time, we often also have to rely on our own generators, so electrical power is at a premium. That being the case, we always have to look for increased efficiency when it comes to power usage. We are looking at newer types of remote power, including solar and wind power, as well as more efficient batteries."

The promise of new technologies

While the Red Cross is currently using a combination of mature and current communications technologies, Hatchuel is clearly open to evaluating new innovations.

One such new innovation could – at least in theory – be provided by Rajant Corporation, which produces what it refers to as 'Kinetic Mesh wireless networks'. According to the company, the technology provides "fully mobile broadband connectivity that is simple, instantaneous and fail-proof in any application, giving [users] a resilient mesh network solution that moves and evolves with your connectivity demands".

Elaborating on the potential for the technology's use in the disaster management space, Don Gilbreath, Rajant VP for systems, says: "Our Kinetic Mesh solution was born from our history of providing systems for military users. Rajant networking has evolved to suit an array of industrial and public safety applications.

"The network consists of radio nodes known as Rajant BreadCrumbs that can communicate with any Wi-Fi or Ethernet-connected device to deliver low-latency, high-throughput data, voice and video applications. They can be easily deployed on vehicles, robots, drones, as well as people, to effectively create an interconnected network of devices communicating seamlessly in real time without infrastructure."

According to Gilbreath, no base stations are needed, with the Rajant devices able to "dynamically determine" the optimum routing path and frequency using the company's InstaMesh protocol. Video, location information, images and voice can all be transported in this way.

Regarding the technology's potential use in the public safety/disaster management space, Gilbreath discusses a demonstration that took place in Santa Barbara, California, in October 2019. This involved representatives from Rajant, its strategic partner Dejero, as well as the Department of Homeland Security and the Santa Barbara Fire Department.

According to Gilbreath, the Kinetic Mesh radios, alongside 'bonded' cellular and satellite technologies, were used to show how they could provide comms in challenging locations. As it turned out, a major brush fire broke out in the El Capitán Canyon, and the demo turned into a live exercise involving 200 firefighters.

During this, the Rajant BreadCrumbs and camera technology were deployed on vehicles to provide live video feeds and voice comms. Vehicles involved included 30-ton bulldozers used to create what are known as 'Cat lines' to slow/stop the fire's spread. Three Rajant ME4 radios were installed on the bulldozers to provide communications to the nearby Microsoft Azure mobile tactical vehicle, which acted as the control centre.

Dejero's Smart Blending Technology

(SBT), meanwhile, further utilised LTE and satellite technology to ensure connectivity in all locations around the fireground. It filled any gaps in the Wide Area Network, eliminating drops by blending any available LTE with SAT communications. Having begun on a Thursday evening, the fire was completely contained by Monday, with no structural damage and no casualties.

Returning to the subject of the Red Cross, another area of interest to the organisation is robotics and UAVs. Speaking of Rajant's offer in this specific area, Gilbreath continues: "We have shown the capability of our solution to track and connect vehicles spread over a wide area, using a long-endurance UAV, able to remain airborne for up to eight hours.

"Hovering UAVs can carry spotlights, cameras, payloads with release mechanisms, and sensors. To give another example of a real emergency, in Western Australia we supported a team searching for missing people using drones."

As well as UAVs, meanwhile, Rajant is also connecting ground-based robots of a variety of different sizes. Discussing this, Gilbreath says: "Robots can now be effectively deployed by public safety organisations to not only reduce the level of human risk, but also to carry hazardous chemicals. They can also carry sensors and cameras, locate casualties or identify sources of combustion and leaks."

Redline Communications is another provider of robust broadband networks that can be used in disaster recovery situations. Its 'virtual fibre' solutions also meet many of the requirements mentioned by the Red Cross, including the need to be compact, as well as low-consumption when it comes to power. According to the company, units can typically be installed and connected in a maximum of 90 minutes.

Waqas Ansar of the Redline Middle East team says: "We were used during hurricane Katrina in New Orleans back in 2005, in order to provide point-to-point and multipoint communications. Much of the local communications had been compromised, and it was an effort for which we won two awards.

"Since then, we have further developed our systems to include private industrial 4G LTE-based solutions, typically using more than 80 watts. These can be solar powered, as can our virtual fibre terminals, which typically only use 18 watts."

Red Cross ERUs bring everything they need for a 30 day period of operation

Redline is also working with NetHope, which connects non-governmental organisations providing critical resources during disasters. This has included disaster response training sessions, during which 40 personnel were sent to a remote area in California to hone their skills.

Several lessons emerge from the experiences of the Red Cross in disaster zones. The first of these is around planning and preparation when it comes to comms. At the same time, equipment has to work under extreme conditions, as well as being easy to set up and maintain in the tightest of timeframes.

Disaster communications is a truly fascinating, not to say multi-faceted, area of work. Keep reading CCT for the latest developments in the field.

For more information on the Red Cross and to donate, go to www.icrc.org/en or your national Red Cross/Red Crescent agency.

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New world

Following publication of TCCA's new white paper discussing utility companies' increasing adoption of broadband, the chair of its SCADA, Smartgrid and IoT Working Group, Nick Smye, discusses the benefits and challenges of 'next generation' networks

Nick Smye, principal consultant, Mason Advisory

What were the origins of the white paper? Was it prompted by a specific event or development?

TCCA's board requested the development of a white paper that would look at end-to-end transition considerations between narrowband and broadband bearers. That is a wide-ranging topic, so discussion within our SCADA, Smartgrid and IoT Working Group resulted in a focus on a utility-sector view. The white paper also resulted from increased collaboration between TCCA and EUTC [the European Utilities Telecom Council].

There is a formal MoU between the two organisations, recognising the similarities and parallels of the transition in the emergency services sector with those in the utilities space as they move away from multiple, proprietary narrowband solutions towards standardised, interoperable solutions.

What will be the main benefits of 'next generation' networks for utilities companies beyond what they already have?

Utilities are having to grapple with migrating their networks where, in place of hundreds or a few thousand points of connectivity, they will have potentially millions of monitoring and control points, with increased demands for reliability and resilience. Previous generations of telecommunications technology cannot facilitate this transition, so embracing new technology concepts is not an option – it's a necessity.

The availability of a huge global ecosystem and multi-vendor support will also massively reduce the possibility of vendor lock-in and obsolescence. These are always challenges for the utility sector's relatively slow technology refresh rate.

How developed is the use-case from the point of view of the utilities companies themselves? Are they starting to factor broadband into their business planning, or is it still just a 'nice to have'?

The case is very well developed already – switch gear, RTUs, IEDs and electrical plant from global leading manufacturers offer a vast array of performance measurements. These were not available with previous generations of hardware, which often only indicated a simple 'on' or 'off' status.

It is essential to have a secure and robust means of transporting this critical data from physical locations in the field to the control centres [SCADA front-end processors] for optimisation and control of the networks. Broadband is essential for enhanced management of utility networks, especially to improve operating efficiency, flexibility, maintenance and latency. Reliability and resilience are critical.

What will be the timescale when it comes to take-up of the new technology? Will it get to a point where narrowband solutions such as TETRA are no longer in the conversation?

It is likely that narrowband solutions will exist in parallel for some considerable time, due to the length of time required to transition from one solution to another. However, it is possible that some regulatory requirements – especially surrounding cyber-security obligations and minimum levels of encryption – could force this change to accelerate.

Narrowband may have a continuing role indefinitely in areas which do not justify the dense telecommunications infrastructure required to deliver broadband. In particular, new VHF technological solutions are being trialled for applications where the propagation characteristics of lower frequencies are essential but the data bandwidth available is more limited.

What are the main challenges for utilities companies regarding the new technology? What conclusions does the white paper come to?

Utility companies have a long refresh cycle of several decades, compared to typical telco cycles of just five to seven years. Additionally, utilities are very heavily regulated throughout the world, especially within the EU. This creates major challenges when justifying investment in new telecoms solutions which are not part of the utility's core business. Ongoing support for legacy hardware can be difficult, particularly while simultaneously meeting critical national infrastructure obligations around reliability and cyber security.

All these issues point to a need for standardised, long-term solutions with support from a large ecosystem. Many utilities are now becoming increasingly involved in the discussion around infrastructure sharing, where utility infrastructure can be used to facilitate further expansion of 5G, 6G and fibre broadband networks.

The white paper can be read here: https://tcca.info/about-tcca/tcca-resources/whitepapers/

BAPCO

The Annual Event 2021

SHOW PREVIEW

12 - 13 OCTOBER 2021

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A warm welcome from BAPCO President John Anthony

It gives me great pleasure to introduce this preview for the 2021 BAPCO Conference & Exhibition, taking place at the Coventry Building Society Arena (formally known as the Ricoh), in October.

The event will give many of us the first opportunity to network with friends and colleagues since we last all met in Coventry, in March of last year. Much of the conversation at that time was about the emerging threat of COVID-19, and little did we know of the impact that it would have for us all.

With that in mind, we're doing things a little differently this time around, with BAPCO 2021 being the first year that the show is fully supported online. This follows on from the highly successful virtual event that we ran in the early spring, which brought together a whole new audience from around the world.

In order to continue building on these new foundations, BAPCO 2021 will combine the best of both worlds. It will allow people to come together in the traditional fashion, in the way that we've known and enjoyed for many years. At the same time, it will enable those who are unable to travel to attend the event in a virtual capacity.

As ever, BAPCO continues to be the premier event in the public safety technology sector, with our conference providing a crucial forum for professionals in the field to exchange ideas and experiences, and to keep up to date with the latest developments.

On the exhibition floor meanwhile, you will find some of the biggest public safety communications manufacturers in the world, waiting and ready to discuss and demonstrate their products for you. Some of these are long-time supporters, but we are also very pleased to be welcoming a number of first-time exhibitors.

The conference sessions will once again feature a diverse range of speakers from home and abroad, allowing you to hear first-hand about the global trends in public safety technology and collaboration. I know from experience that it is easy to miss a session you wish to attend, so be sure to use this preview to help schedule your time at the show. (That said, we will be making as much content as possible available to attendees once the event has finished).

At the end of the first day, we will of course, be hosting our networking dinner. We anticipate that this will be a momentous and important occasion, giving those in attendance the opportunity to renew acquaintances in a relaxed and informal atmosphere. It will also give the opportunity to hear from and support our charity partner, the British Heart Foundation. We have chosen them in memory of our former Chief Executive Ian Thompson, who sadly passed away last year.

The BAPCO 2021 team has worked hard in a difficult and ever-changing environment to bring you what I believe will be a superb event. Our mission, as always, is to continue to meet visitor requirements and benefit the public safety communications sector, at no cost to end users.

Have a great event, and I look forward to meeting you at the show.

John Anthony, MBE
President, British APCO

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Join us for free at BAPCO 2021!

Why attend?

We are proud to help reunite the UK public safety communications sector after such a challenging time. The annual BAPCO Conference & Exhibition is an invaluable forum for knowledge exchange, networking and collaboration.

In a rapidly changing sector, BAPCO 2021 is the ideal setting to discuss challenges, solutions and to expand your knowledge. It will help visitors stay aware of the technological developments affecting organisations, from the latest Emergency Services Network progress to lessons learned from recent public safety incidents. Attending BAPCO 2021 will give you the inside track on the latest cutting-edge communications solutions and best practice.

COVID-19 safety

As organisers, we regard the health and safety of everyone participating in the show to be of paramount importance. We are therefore operating in line with UK government COVID-19 guidance, and will also incorporate appropriate measures from the events sector's All Secure Standard.

To ensure BAPCO is as safe and accessible as possible, we will also be implementing COVID-19 status checks. On arrival at the event, all attendees (including visitors, exhibitors, contractors, venue and staff) must be able to demonstrate proof of COVID-19 status to gain entry.

This will be via proof of a full course of vaccination two weeks prior to arrival, and a negative lateral flow test result taken within 48 hours of arrival/proof of natural immunity. Full details can be found on our website:
www.bapco-show.co.uk/event-safety-measures

Where?

We are pleased to be returning to the Coventry Building Society Arena, previously known as the Ricoh Arena. The venue is a major UK location for business and entertainment, and is also home to Wasps Rugby, Wasps Netball and Coventry City Football Club. The venue attracts over one-and-a-half million visitors each year.

Situated in the heart of the UK, the Arena is within a two-hour drive of 75 per cent of the UK population. It is easily accessible by train, and situated close to Birmingham Airport.

Fully supported online

2021 will be the first year that the BAPCO annual Conference & Exhibition is fully supported online. You can find out more about this on page 32.

When?

Tuesday 12th October, 09:00–16:30
Wednesday 13th October, 09:00–16:00

How much does it cost to attend?

The exhibition and conference are completely free to attend in-person. There will be a small fee for online access. Additionally, you can also buy tickets to the BAPCO Annual Dinner, taking place on Tuesday 12th October. Find out more on page 32.

By road

The Coventry Building Society Arena is just metres from Junction 3 of the M6. Its address is Judds Lane, Longford, Coventry CV6 6AQ (Sat nav code CV6 6GE).

By rail

Coventry Arena station is situated next to the venue.

By air

The Arena is around 20 minutes by road from Birmingham International Airport.

Visitors to BAPCO 2021 will have access to FREE PARKING and FREE WIFI.

Exhibition

BAPCO 2021 will bring together the entire UK public safety communications sector to source the latest equipment and systems, develop important business relationships and generate new opportunities. As ever, the biggest critical communications companies in the world will be in attendance, congregating on the exhibition floor. Get hands-on with new equipment and speak to experts on how to transform your organisation and reach your goals.

On the conference floor, visitors will have the opportunity to network with Platinum Sponsor, Motorola Solutions; Gold Sponsor, NEC Corporation; Networking and Gold Sponsor, Hytera; as well as Silver Sponsors Audax, Content Guru, Airbus and NetMotion Software, and of course our Charity Partner, British Heart Foundation.

Conference

Taking place across the course of the event's two days, the BAPCO 2021 conference sessions offer a huge range of cutting-edge presentations, delivered by some of the most respected thought leaders in UK public safety comms.

As always, a massive draw will be the annual Emergency Services Network updates, with presentations delivered by Home Office representatives including Simon Parr, Becca Jones, John Black and Dan Crawley. Another key topic will be Multi Agency Incident Transfer (MAIT), with the Welsh government's Tony Bracey and Atos' Colin Stonelake talking about the technology from the users' perspective.

Attending the BAPCO 2021 conference will enable visitors to learn about the most important developments in public safety communications, all for free.

New for 2021: fully supported online

2021 marks the first year that the BAPCO Event will be fully supported online, meaning that those with restricted travel don't have to miss out. This follows the success of BAPCO: The Online Event, which took place in March of this year, attracting a whole new audience.

Visitors who cannot attend the free physical show will have the opportunity to buy a £150 online ticket to access an interactive virtual platform.

On demand recordings of the sessions will be available both to those attending in person, as well as online attendees. Those attending in person for free will also have access to the online platform during the event.

Don't miss:

- Live-streamed seminar talks with interactive chat and Q&As
- On-demand access to seminar recordings
- Online exhibitor booths with product information and a direct line to knowledgeable reps
- The ability to direct message exhibitors, chat with peers and host video calls with experts around the globe.

Networking Lounge

The BAPCO Conference & Exhibition is increasingly focused on the visitor experience, something which has been the case with every passing year. With that in mind, 2021 will see the return of the Networking Lounge – a purpose-built space enabling attendees to take time out to catch up with valued colleagues and contacts.

The BAPCO Annual Dinner

The BAPCO Annual Dinner is the must-attend event for all those working within UK public safety critical communications, providing a unique opportunity for the sector to come together after a challenging year.

Attendees will be able to enjoy fantastic food and drink as well as top-class entertainment as they relax in an informal setting, following the conclusion of the conference and exhibition's first day. We look forward to raising a glass with you!

Tony Bracey, Head of Programmes, Welsh Government

A user's perspective now the MAIT Hub is live

Tony has been instrumental in the establishment of the Multi-Agency Incident Transfer (MAIT) concept in the UK. He has challenged thinking around information sharing, in particular the identification of vulnerable people in the planning and response to major incidents. After over six years on secondment to the Joint Emergency Services Group (JESG) Wales, he has returned to the Welsh Government as Head of Programmes within the Community Safety Division.

October 12th, 12:00-12:30
Conference room A

Jessica Reed, Vice President of Strategy and Global Partners, RapidSOS

Panel discussion: the future of control rooms and cloud-based working

Jessica manages RapidSOS's go-to-market strategy and relationships with international partners. She has a background of investing in, and operating, high growth companies. Prior to joining RapidSOS, she was a principal at Solera Capital where she managed several of the fund's portfolio companies. Jessica advised on company strategy and led strategic partnership discussions, as well as managing financing processes and leading legal negotiations.

October 12th, 12:00-12:45
Conference room B

Eleanor Rice, Security Lead, Defence and Security Accelerator

Funding for innovations in public safety

Ellie has worked across the security sector for the last 15 years, joining DASA in 2018. She is responsible for supporting suppliers to understand and access the marketplace, turning innovative technology into usable capability for defence and security. She started her career within the intelligence community, deploying to Afghanistan with the first military intelligence element in Helmand province. After this, she joined the police, specialising in various crime areas.

October 12th, 14:00-14:30
Conference room A

John Black, ESN Programme Director

Delivery of ESN

John has over 30 years of experience in IT, leading major projects in both the applications and infrastructure domains. Most of his career was with IBM - which he joined in 1985 -, where he trained as an IT architect.

He joined the Home Office in July 2020 as Chief Technology Officer for the Emergency Services Mobile Communications Programme. He was appointed Programme Director for ESMCP in August of the same year.

October 13th, 9:45-10:15
Conference room A

Becca Jones, ESN Director of Deployment and User Insight

Delivery of ESN

Becca joined the ESN programme in March of 2013. She is responsible for working with the network's user community, planning and supporting their transition from narrowband to broadband. She has worked in support of the public safety sector for the majority of her career, beginning as a clinical biochemist for the NHS. She also spent 14 years in the Forensic Science Service in both operational and programme management roles.

October 13th, 9:45-10:15
Conference room A

Richard Harrap, Managing Director ESN unit, EE

You won't lose your stakes in the race for the Gs

Richard leads a team building ESN and Coverage as a Service offerings at EE. Prior to this, he worked in the realms of fixed networks, business to business and new business development for the company. He also undertook a range of special advisory roles and managed the team responsible for roaming and international M2M.

Richard began his career as a solicitor, rising to senior associate level before moving into the telecommunications sector.

October 13th, 12:15-12:45
Conference room A

CONFERENCE PROGRAMME - TUESDAY 12TH OCTOBER

Conference Theatre A

09:30-09:45
Welcome to the BAPCO annual Conference & Exhibition

09:45-10:15
Keynote address: ESN updates and future roadmap
Simon Parr, Senior Responsible Officer, Emergency Services Mobile Communications Programme, UK Home Office

10:30-11:00
The UK telephony network: Switch from analogue to digital
John Livermore, Industry Engagement Manager, Openreach

11:00-11:45
Panel discussion: NG999/911/112 and the switch to digital
John Livermore, Industry Engagement Manager, Openreach;
Brandon Abley, Director of Technology, NENA: The 9-1-1 Association;
Gerard Donohue, CTO, Telent

12:00-12:30
Multi-Agency Incident Transfer (MAIT): A users perspective now the MAIT Hub is live
Tony Bracey, Head of Programmes, Welsh Government;
Colin Stonelake, Client Consulting Partner, Atos Public Sector & Defence UK

12:45-13:15
Delivering the National Police Digital Data and Technology Strategy
Ian Bell, CEO, Police Digital Service;
Wayne Parkes, Chief Data Officer, Police Digital Service

14:00-14:30
Keynote address: funding for innovations in public safety
Eleanor Rice, Security Lead, Defence and Security Accelerator

14:45-15:15
If it ain't broke… break it: new solutions for emergency services
Joseph Ferri, Leader – Emergency Services, Affini Technology Limited

15:30-16:00
Mapping for emergencies: mapping & data during the pandemic response
Dominic Cuthbert, National Security and Resilience Sector Manager, Ordnance Survey;
Rick Crowhurst, Senior Public Sector Manager, Landmark Information Group Limited

Conference Theatre B

10:30-11:00
User needs and expectations: A non-technical reality check
John Drewnicki, Head of Products - Accessories, Sepura

11:15-11:45
The changing role of PMR due to climate change - Session sponsored by Hytera
Christine Cant, Head of Product Management, Hytera Communications

12:00-12:45
Panel discussion: The future of control rooms and cloud-based working
Jessica Reed, Vice President of Strategy and Global Partners, RapidSOS;
Terry Miller, Head of Product and Pre-Sales, Northgate Public Services;
Justin Day, CEO, Cloud Gateway

12:45-13:15
Cloud-first policing: Why 360-degree communications integration is the Key to ESN readiness - Session sponsored by Content Guru
Colum Gorman, Business Development Director, ContentGuru

13:30-14:15
Eye in the sky – How drones are revolutionising police, fire & security operations
Sam Denniff, Business Development Manager for Public Safety & Defence, COPTRZ;
Nick Strelzcuk, Team Leader, Lowland Rescue

14:30-16:00
Focus on AI
Gerard Donohue, CTO, Telent;
Ryan Poltermann, Wireless Communications Research Engineer, Pacific Northwest National Laboratory;
Brad Beck, VP of Operations Public Safety, beamLive;
Jan Thompson, Senior Director EMEA: Defence, Justice and Public Safety, Oracle;
Bhagvan Kommadi, Director of Product Engineering, ValueMomentum

Conference Theatre C

10:45-11:15
The lifecycle of an incident from a user's perspective
Dave Hannan, Chief Inspector, Lancashire Police;
Ian Williams, Software Consultant for Europe, Motorola Solutions

11:30-12:30
Unchaining the control room through the cloud to provide operational resilience and flexibility - Session sponsored by Motorola Solutions
Mark Swift, Solution Manager, CommandCentral CRS, Motorola Solutions;
Dave Smith, Fire Control Room Manager, Bedfordshire Fire & Rescue Service;
David Dawe, Project Manager, Bedfordshire Fire and Rescue Service

12:15-12:45
Beyond the blue lights: Reimagine collaboration with partner agencies for a truly joined-up response
Nick Chorley, Director EMEA Public Safety & Security, Hexagon;
Karl Price, Business Development Consultant, Hexagon

14:15-15:00
Saving careers and lives through peer support
April Heinze, 911 PSAP and Operations Director, NENA: the 911 Association

15:15-15:45
The transition to ESN: What do fleet managers need to consider when planning for the transition to ensure an efficient move to ESN for their organisation?
Barry Zielinski, Operations & Services Director, Telent

Conference Theatre A

09:30-09:45
Chair's introduction

09:45-10:15
Keynote address: Delivery of ESN
John Black, ESN Programme Director, Emergency Services Mobile Communications Programme;
Becca Jones, ESN Director of Deployment and User Insight, Emergency Services Mobile Communications Programme

10:15-11:00
ESN Discussion Session

11:00-11:30
Expansion of Australia's government radio networks
Kevin Graham, Director, Australasian Critical Communications Forum

11:45-12:15
ESN coverage: The grid of everything
Dan Crawley, ESN Network Design, Validation & Assurance, ESMCP - Home Office

12:15-12:45
You won't lose your stakes in the race for the Gs
Richard Harrap, Managing Director, Emergency Services Network, EE Limited (part of the BT Group)

14:15-14:45
New broadband multimedia MCx and IoT solutions empowering public safety through interoperabiliy and interworking: Session sponsored by Airbus
Samuel Gustaffsson, Head of Sales North, Central & Eastern Europe;
Marja van der Kruk, Key Accounts Manager UK, Airbus Secure Land Communications

15:00-15:30
How situational awareness tools have been helping Police, Ambulance, Fire, Coastguard and Local Authorities to share information during the pandemic
William Moore, CEO & Founder, Airbox Systems

Conference Theatre B

10:30-11:00
Legacy procedures vs new innovative communications. Is a reluctance to adopt new kit, costing lives?
Richard Russell, Business Development Manager - UK & Ireland, Tait Communications;
Mike Wattam, Project Manager, East & West Sussex Fire & Rescue Service

11:15-11:45
Imagining 2030 … How will control rooms be affected? Session sponsored by APD Communications
Paul Roberts, Head of Product Strategy and Innovation, NEC Software Solutions

12:00-12:30
Robust LPWAN for the most demanding IoT applications
Graeme Hull, Head of International Sales, Swissphone Wireless AG

13:00-13:30
Getting the people thing right
Doug Dacre, Director, TechR Limited

13:30-14:15
Panel discussion: How can organisations improve their EDI strategies and why this is important
Doug Dacre, Director, TechR Limited
Monica Million, Immediate Past President, NENA: the 911 Association

14:30-15:00
Save minutes, save lives, save costs - Session sponsored by Motorola Solutions
Ian Williams, Software Consultant for Europe, Motorola Solutions;
Ian Drummond-Smith, Chief Superintendent, Head of Contact & Resolution, Devon & Cornwall Police

15:15-15:45
Improving the safety of emergency workers and the public in underground tunnels
Christian Farrow, Technical Manager, Chronos Technology

Conference Theatre C

10:15-10:45
One for all, all for one. Update on TCCA Critical Communications Broadband Group's recent task force activities and a view of coming work
Tero Pesonen, Chair, Critical Communications Broadband Group, TCCA

11:45-12:15
Achieving maximum advantage from existing critical communications networks
Peter Hudson, Chief Technology Officer, Sepura

13:00-13:30
Panel discussion: Enabling the frontline through digital evolution - Session sponsored by Net Motion
Erik Helms, SVP International Sales, NetMotion by Absolute

14:00-14:30
Digital Ethics: Building and sustaining trust in policing - Session sponsored by Sopra Steria

14:45-15:15
Future of 999/112: Data-driven emergency response
Jeremy Habberley, Director of Global Accounts, Rapid SOS

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Stand C1
Motorola Solutions is a global leader in public safety and enterprise security. Its solutions in land mobile radio mission-critical communications, video security, and access control and command centre software create the most integrated technology ecosystem, making communities safer and helping businesses stay productive and secure. This is bolstered by managed and support services. Motorola Solutions is ushering in a new era in public safety and security.

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Stand D30
Hytera Communications is a leading global provider of professional and private communications equipment and solutions. Visit Hytera's stand at BAPCO 2021 to discover a range of innovative solutions for emergency responders. These are aimed at providing professional communications which delivers on voice, video and data for optimum situational awareness and increased safety.

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Stand E10
Working together, NEC's technologies enable the instant transfer of data from an emergency call in the control room into the hands of a police officer on the street. When that data is combined with known historical information about the caller or the address, officers have the potential to determine the threat, risk and harm of each incident and respond exactly as needed. The company is proud of the impact its technologies are having on the emergency services and the public.

GOLD SPONSOR

Stand H10
Sopra Steria, a European leader in consulting, digital services and software development, helps its clients drive their digital transformation. With 46,000 employees in 30 countries, the Group places people at the heart of everything it does to build a positive future.

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Stand F26
Cradlepoint provides solutions that unlock the power of 4G LTE and 5G cellular, enabling emergency services to deliver mission-critical connectivity that keeps frontline responders safe and productive. Whatever the need for mission-critical cellular connectivity, Cradlepoint has a tailored solution, with cloud-managed software plans and wireless routers/adapters that are engineered to withstand the daily rigors of the frontline.

SILVER SPONSOR

Stand E32
A global leader in cloud communications solutions, Content Guru delivers off-the-shelf and bespoke cloud contact centre services through its multi award-winning 'storm' solution. The first cloud contact centre solution to be selected for blue light 999 services, storm brings together intelligent automation, third party systems integration, and on-demand scalability to enhance all communication functions.

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Stand B25
Airbus offers an unprecedented portfolio for its public safety, government and defence partners. The company has over 25 years of commercial and customer experience. Its situational awareness, multi-agency data sharing, Earth observation and secure mission critical voice and high-speed communications solutions provide reliable and industry leading functionality to customers.

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Stand C20
Audax is a worldwide pioneer in the development of body worn video (BWV) technology. They company led the world in 2006, producing the first ever BWV standards in a joint project with the UK Home Office. Audax is an approved member of Made in Britain. All its product design, development and final manufacture assembly - alongside testing and quality control - are undertaken in Plymouth. The Audax team is predominantly composed of service veterans, all of whom are accredited to the Guild of Security Industry Professionals.

SILVER SPONSOR

Stand F50
NetMotion was recently acquired by Absolute Software, bringing together the power of self-healing devices and applications with a resilient network connection. This delivers the next generation of Endpoint Resilience. The two companies' alliance enables organisations to prioritise a secure user experience while also minimising the strain on IT and security teams. This maximises functionality and strengthens overall security posture.

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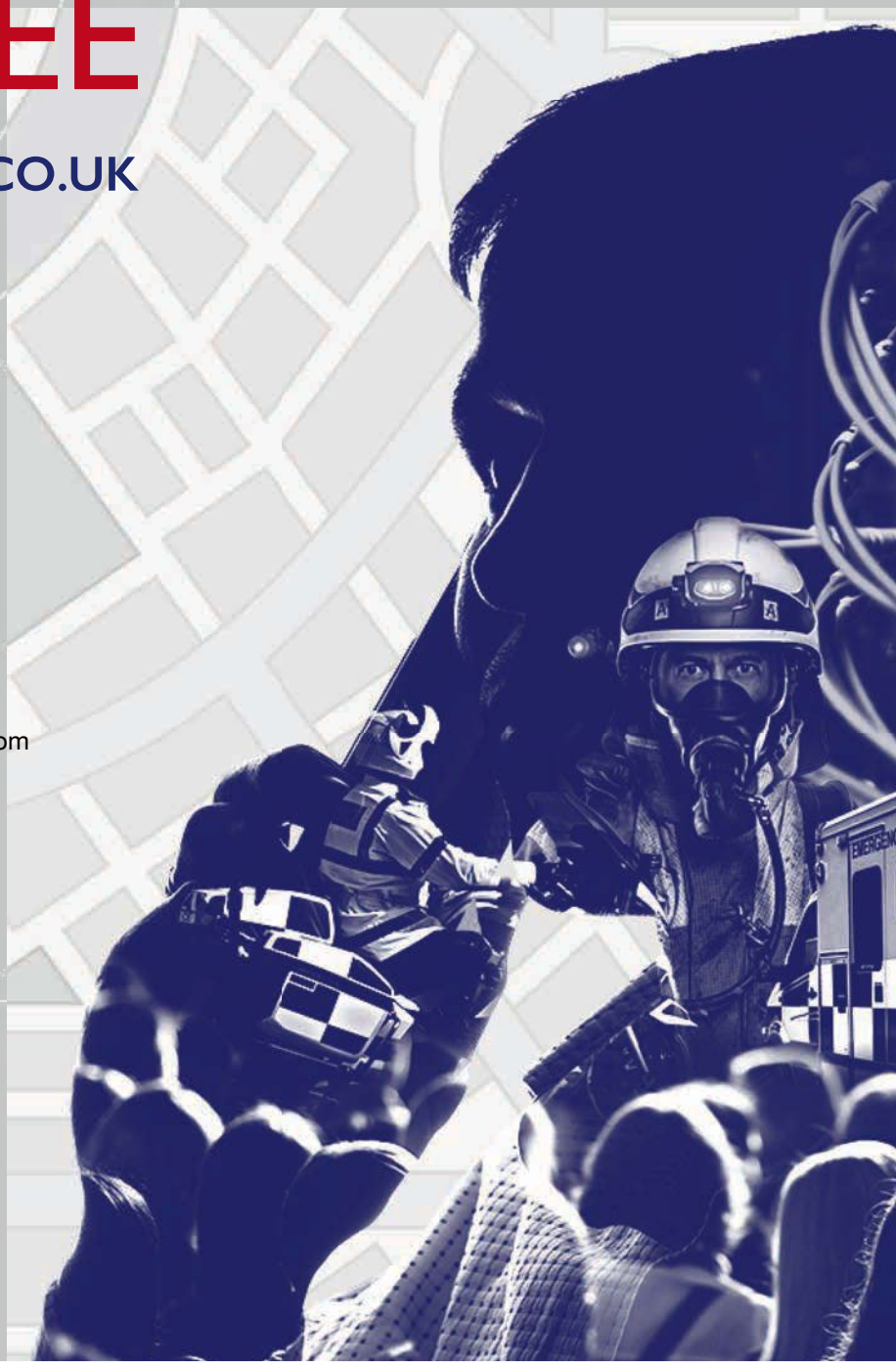

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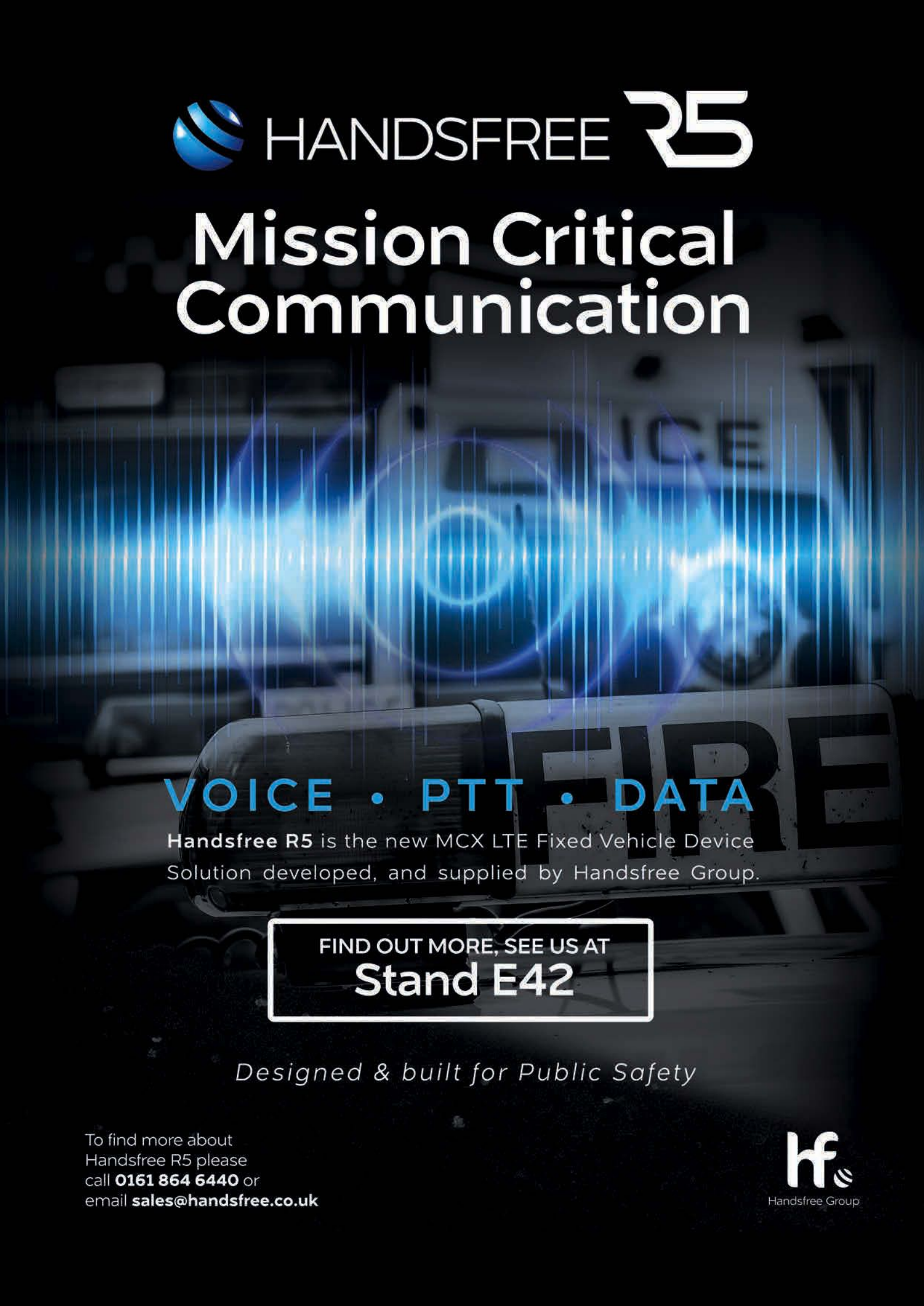
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