CRITICAL COMMUNICATIONS TODAY

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AI for public safety: the benefits, the challenges, the ethics

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NOVEMBER 2024

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Continuing TETRA's constant evolution

Critical Communications Today editor **Philip Mason** introduces the new issue, which focuses – not unlike the sector itself – on the evolving relationship between 'legacy' and 'future' technology

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 work to stimulate and focus debates on the topics that matter most and provide our readers with a means to raise their concerns.

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Welcome to the latest edition of *CCT*, the leading resource for those in the critical communications sector.

As regular readers will know, the key discussion taking place across our industry over recent years has been the anticipated move – primarily on the part of first-responders – from narrowband to broadband. We have seen this reflected in an ever-increasing number of national public safety projects across the globe, from Europe to the Middle East and beyond.

At the same time – and over a decade since the above conversation began – it is now becoming increasingly obvious that reports of TETRA's demise have been greatly exaggerated. There are many reasons for this, not least an initial underestimation of just how complicated rolling out emergency-services-grade voice over broadband was likely to be, coupled with an abiding trust in TETRA among those who use it.

This is reflected in our lead feature, which explores the ways in which the latter standard will likely evolve to meet new challenges in the coming years, with the anticipated timescale for its continued use being measured in decades.
Turn to page 14 for TCCA TETRA Industry Group chair Francesco Pasquali's take on the situation, as well some examples of the products currently moving the technology forward.

Another important topic for the industry is how artificial intelligence might be leveraged in the mission-critical environment, both on the frontline and in the control room. With that in mind, turn to page 18 for an exclusive AI deep dive, examining the implications of the technology from all sides. Our writer includes quotes from a wide variety of sources in the piece, including the European Emergency Number Association, which has recently completed a project exploring potential use-cases for AI in the control room.

Finally, turn to page 22 for an in-depth account of this year's Critical Communications World, which took place in Dubai. The 2024 conference provided so much content, distributed across multiple stages, it would be difficult to do it justice, even if we set aside the entire magazine. We have given it a good go, though.

Our coverage of this year's exhibition floor, meanwhile, focuses exclusively on new launches taking place at the event. This includes several innovative products designed to facilitate interworking between narrowband and broadband, which brings us neatly back to where we came in…

Enjoy the issue.

Philip Mason, editor

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Who, what, where

EUROPE

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BT deploys first sustainable mobile site

BT Group in the UK has rolled out its first self-powering mobile site. Located in the Shropshire Hills, around 70 per cent of its operating power is anticipated to be gathered by on-site solar panels and a wind turbine.

According to a statement, the site was identified through an environmental assessment, calculating its viability for renewable power. Its back-up, should wind and sunlight ever prove insufficient, is a generator powered by hydrotreated vegetable oil.

The latter is described in the statement "as a green fuel, produced from a variety of waste and residual oils".

BT Group anticipates that the site will deliver 17,000kWh of wind and solar energy on an annual basis. This, it says, is the equivalent of 100,000 hot showers.

UK fire service procures new control room

NEC Software Solutions has won the contract to provide Humberside Fire and Rescue Service in the UK with a new command, control and communication system. The initial contract is for seven years.

The DS3000 solution will be hosted in NEC's data centres and accessible from Humberside's "control room locations". It will include a live video-streaming facility, as well as a mobile application for use by firefighters.

Humberside chief fire officer Phil Shillito said: "The commitment and dedication of colleagues has been instrumental in reaching this stage.

"We are excited to see the positive impact these new features – like 999Eye and the mobilising app – will have on both our communities and our staff."

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Vodafone claims nuclear power 5G first

Temelín nuclear power plant in Czechia has rolled out a private 5G network, provided by Vodafone. The company claims that the network is the first of its kind in Europe.

According to Vodafone, the pilot phase of the network covers outdoor space, as well as "selected areas of a production unit". It is intended to enable transition away from two-way radio, as well as to facilitate the use of virtual reality glasses by technicians.

CEO of Vodafone Czechia, Violeta Luca, said: "By being entirely independent from the public network, our private 5G solution ensures that all user data and infrastructure are securely managed within the power plant's own systems.

"This is vital for maintaining the highest standards of safety and reliability."

ASIA

NORTH AMERICA

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Singapore train operator extends TETRA contract

Singapore transport operator SBS Transit has signed a contract with Motorola Solutions to "maintain and support" TETRA across its Downtown Line and Punggol Light Rapid Transit system. According to Motorola, the contract – the duration of which is 15 years – is worth S$14m.

According to a statement, TETRA has been used across the company's daily operations for the past decade.

Services provided by Motorola also include remote network monitoring, as well as local support and "cyber resilience services and system updates". SBS Transit operates a fleet of 8,700 TETRA radios.

A Mototola spokesperson said: "By accessing our solutions as a managed service, SBS can remain focused on its daily operations."

New Nokia research and development facility in India

Nokia has opened what it says is its largest fixed networks lab in Chennai, Tamil Nadu in India.

According to Nokia, the new facility is intended to "help foster new technology innovations that further strengthen [our] fixed networks portfolio across fibre, Wi-Fi and fixed wireless technologies". The move has taken place with the support of the Tamil Nadu government.

A spokesperson for the company said: "As a key hub for fixed networks, this investment will further strengthen Nokia's technology innovations in 10G, 25G, 50G and 100G PON, fixed wireless access, Wi-Fi and MDU solutions, as well as in access network and home controllers. [It] underpins our commitment to developing new technologies."

Change at the top at FirstNet AT&T, following retirement

FirstNet AT&T has announced that Scott Agnew will be its new president, following the retirement of Jim Bugel.

According to a statement, Agnew brings with him "over 25 years of experience in the telecommunications industry.

"He has extensive experience managing mobility and wireline corporate initiatives, supporting the public sector and transforming AT&T operations with a 'public safety first' mindset."

AT&T lists a number of innovations pioneered by Agnew during his time working on the programme.

This includes the integration of broadband mission-critical push-to-talk with land mobile radio, as well as coverage expansion in the form of FirstNet MegaRange.

News round-up

FCC expedites NG911 transition; approves 4.9GHz FirstNet sharing

The Federal Communications Commission (FCC) has adopted rules to hasten US transition to Next Generation 911. According to the organisation, this is to "support the deployment of advanced 911 capabilities including video, text and data that will help first-responders save lives".

This process will involve the FCC's adoption of what it calls nationwide NG911 transition rules, defining responsibilities and deadlines for mobile operators to "implement 911 capabilities". It is anticipated that this will lead to "faster call delivery and improved service reliability".

Going into more detail about the rationale behind the decision, an FCC spokesperson said: "Each year, people in need of emergency assistance make more than 200 million calls to 911 in the United States. The calls travel on dedicated 911 networks to reach a tele-communicator who can dispatch aid."

The spokesperson continued: "State and local 911 authorities are now transitioning to NG911 by replacing legacy 911 technology with IP-based infrastructure that will support new 911 capabilities.

"Completing the NG911 transition requires originating 911 callers' phone companies to format 911 calls to be compatible with NG911. [This will] deliver the calls to new destination points on IP networks, as established by 911 authorities."

In other FCC-related news, the commission has also adopted new rules for the public safety 4.9GHz band, enabling FirstNet to use unassigned spectrum.

4.9GHz is used to support, in the words of APCO International, "localised, bandwidth-intensive applications for mission-critical uses". Eligibility to use it is limited to public safety and must "relate to the protection of life, health or property".

To quote the introduction to the FCC's recently published document outlining the move: "In this Eighth Report and Order, we take another major step towards ensuring that the 4940-4990MHz band [4.9GHz band] is efficiently and intensely utilised in support of public safety missions nationwide. To that end, we bolster the co-ordinated nationwide approach to the band that the Commission established in its Seventh Report and Order, in which it adopted a nationwide 'Band Manager' framework to co-ordinate operations in the 4.9GHz band, optimise public safety use and facilitate the integration of the latest commercially available technologies, including 5G, for the benefit of public safety users."

The report continued: "To further these goals – and ensure that the 4.9GHz band is put to more robust use nationwide in the near term – the 4.9GHz Band Manager, once selected, will be eligible to apply for a nationwide overlay licence and authorised to enter into a sharing agreement with the First Responder Network Authority [FirstNet].

"Pursuant to this sharing agreement, FirstNet may be permitted to use unassigned spectrum in the 4.9GHz band as part of its nationwide public safety broadband network in a manner that protects incumbent operations."

Nokia to lead EC 6G sustainability project

Nokia has been selected by the Smart Networks and Services Joint Undertaking (SNS JU) initiative to co-ordinate its Sustain-6G lighthouse project.

Discussing the project in a statement released at the time, Nokia described its role in the European Commission-funded project as leading "a consortium of innovators that will identify how 6G can play a key role in building a sustainable future. This will [address] not only environmentally sustainable but also economically and societally sustainable technologies."

The company states that one of the key goals of Sustain-6G is to develop new solutions "for meeting sustainability challenges using the toolkit that 6G will offer".

It will therefore "devote considerable time" to considering use-cases in areas drawn from

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the United Nations' Sustainable Development Goals. These include in relation to 'energy smart grid,' 'E-health and telemedicine' and 'agriculture'.

Discussing the first work area in particular, a spokesperson said: "The consortium will explore how 6G could be used to create microgrids that manage electricity demand. Sustain-6G will also investigate the use of AI technologies for real-time control of distribution networks.

"This could lead to more efficient and resilient grids that minimise disruptions while providing the flexibility to draw energy from diverse sources as the world transitions to renewables like solar and wind."

Vice-president of Nokia Standards, Peter Merz, said: "The UN Paris Agreement committed the world to combatting climate change. Every industry must do its part.

"Sustain-6G will show how the communications industry will apply the next generation of networking to creating that sustainable future, overcoming not just environmental challenges but societal and economic challenges as well."

The consortium includes a variety of organisations, including network vendors, comms services providers, industrial equipment manufacturers, European research institutions and universities, as well as SMEs.

The project is scheduled to run from January next year to 2027.

Multi-billion Rakel upgrade proposed

The Swedish government has proposed SEK2.3bn (£166m) in order to upgrade the country's emergency services radio network, Rakel. The proposal was made in its 2025 budget bill.

Discussing the decision in a statement, the Swedish Ministry of Defence said: "[The funding is for] the period 2025 to 2027, for the establishment of Rakel generation two. A modern communication system for [public safety], security, health and total defence, to be able to carry out their tasks effectively."

According to the statement, SEK652m has been allocated for 2025, and SEK768m and SEK880m for the two subsequent years. Responsibility for upgrading the current iteration of Rakel, which is based on TETRA, will lie with the Swedish Agency for Community Protection and Preparedness (MSB).

Swedish minister for civil defence Carl-Oskar Bohlin said: "There is a need for a modern system that can handle both voice calls and large amounts of data in real time.

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"In order to get an expedient – and as cost-effective – solution as possible, existing [capability] must be utilised. [These include], among other things, existing infrastructure, and that the capabilities and resources of commercial actors are used through procurement."

The proposal is based on an agreement between the government and the Sweden Democrats party.

TCCA News

TCCA has published a white paper summarising the findings of a survey examining market requirements for high-powered user equipment (HPUE). The survey was undertaken by the association's Critical Communications Broadband Group's mission-critical HPUE task force.

According to a statement issued by the association, respondents represented a "wide variety of critical communications users". Findings related to potential use-cases, deployment timeframes, device requirements, frequency spectrum requirements/possible interference issues and deployment challenges.

Discussing the rationale for the survey, a TCCA spokesperson said: "The key requirement for mission-critical communications users is that their devices are connected to the network. No coverage means no calls.

"Operating at higher transmit powers than standard consumer mobiles, HPUE can extend the reach of the device, helping to ensure that users stay in contact even where network connection is poor. However, this enhancement will only happen if the challenges identified in [the white paper] are addressed without delay."

The spokesperson continued: "Multiple potential use-cases for HPUE solutions were indicated by the survey respondents, with handheld device coverage enhancement being the most popular.

"However, a wide variety of different types of HPUE device and equipment will be necessary to meet different users' requirements. In order to create a diverse device ecosystem, suppliers will need to be convinced of the HPUE business case.

"The objectives of the survey were to understand the market requirements for mission-critical HPUE, identify potential challenges and ultimately to advise user organisations, critical communications operators and equipment suppliers on the successful development, deployment and use of HPUE solutions."

TCCA Board member and leader of the HPUE task force Tim Clark said: "Mission-critical broadband HPUE devices have the potential to deliver significant benefits to the critical communications sector.

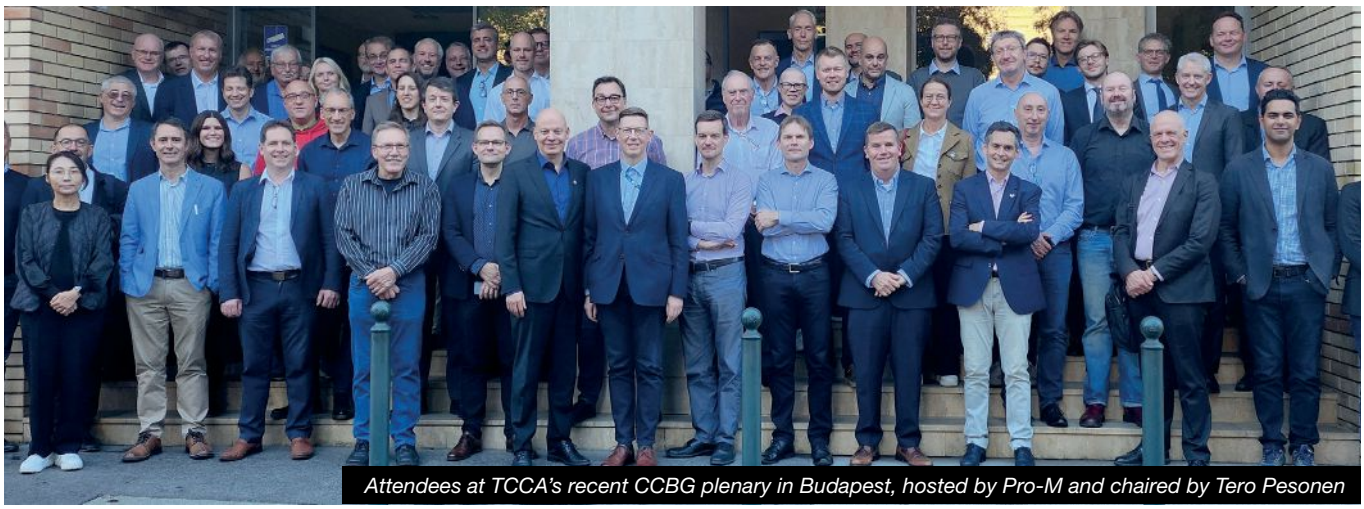
"HPUE can help to ensure that public safety first-responders, coastguards, military and mobile workers within sectors such as utilities, transport and natural resources stay in contact, even while operating in remote locations or inside network coverage blackspots."

TCCA CEO Kevin Graham said: "TCCA strives to bring the global critical communications community together to find potential practical solutions to functional and operational needs of end-users. HPUE is a path to address an identified coverage enhancement requirement."

The organisation says that next steps for the task force are to "quantify the market demand for HPUE solutions and build a compelling business case to share with regulators, operators and suppliers". It will also "work with standards organisations and national bodies to drive availability of additional spectrum for HPUE deployments".

The majority of survey respondents indicated they will be looking to start using HPUE solutions within the next five years. The white paper is called 'Mission-Critical High Power User Equipment Market Survey Results'.

TCCA celebrates 30 years



Attendees at TCCA's recent CCBG plenary in Budapest, hosted by Pro-M and chaired by Tero Pesonen

TCCA is marking its 30-year anniversary in 2024, highlighting what it has achieved during that time.

Discussing the milestone in a statement, a TCCA spokesperson said: "For 30 years, TCCA has been at the forefront of promoting the use of standardised technologies to deliver mission-critical communication systems that are secure, available, resilient, interoperable and, ultimately, trusted.

"In the five years since we marked our 25th anniversary, much has been achieved despite the global pandemic. We would like to thank all our members and partners for their hugely valued support and contributions that combine to deliver the collaborative advancement of critical communications."

Discussing its work in a wide-ranging statement, the organisation highlighted various working groups and task forces operating across a range of core issues for the sector.

Topics for these include "broadband callout, broadband spectrum, cybersecurity, high-power user equipment, massive mission-critical video, mission-critical applications and devices, mission-critical roaming, narrowband-broadband interworking, physical network infrastructure security, non-terrestrial networks, and quality of service and priority and pre-emption".

The spokesperson continued: "Critical broadband is moving forward with projects around the world in various stages.

"Our work as the Market Representation Partner for critical communications in 3GPP is [incorporating] the unique requirements of mission-critical users into the defined features of 3GPP Releases, [forming] the basis for the development of standardised products and services for critical broadband."

Illustrating a recent success in this area, the statement mentions the Global Certification Forum's decision to add 3GPP-based Mission Critical Services to its certification programme. This comes after "several years of work by dedicated individuals".

Moving onto TCCA's ongoing work in relation to the TETRA standard, the spokesperson continued: "Certification and interoperability is essential to ensure a thriving market, as proved by the ongoing growth of TETRA technology, underpinned by our world-leading TETRA Interoperability [IOP] process.

"Regarding enhancing TETRA security – with the support of industry and ETSI – the new additional TETRA Set B security algorithms have been published. Our Technical Forum worked hard to include these into the TETRA interoperability profiles and test plans, meaning products using the new algorithms can now be IOP tested."

Commenting on this aspect of the association's work, TCCA Board chair Mladen Vratonjić said: "During all these years, the market has shown that this kind of association was necessary.

"TETRA is not only a marketing hit, it is a triumph of quality, a careful and smart approach, a joint success of producers and users under the watchful eye of TCCA. And TCCA initiates the same approach when defining broadband solutions for critical communications. The increasing number of members, the better and more comprehensive world congresses, the undeniable desire of all stakeholders to co-operate in the application of high-quality open standards… [These] are a guarantee that TCCA will continue to be a leading player in the field of critical communications in the future."

Alongside its work with technology and the market, meanwhile, TCCA is also highlighting its presence on the global stage, in particular Critical Communications World.

The event, it says, has seen "significant growth" in the five years since the 2019 iteration in Malaysia.

This included in 2020 when an equivalent event – Critical Communications Week – was held online, followed by real-world events in Madrid, Austria, Helsinki and Dubai.

Discussing the show's presence in Finland in 2023, the spokesperson continued: "[It] will always be remembered as a landmark edition, taking place in Helsinki. It was the busiest-ever CCW, with more than 4,800 visitors and five host operators from the Nordic countries supporting the event, truly encompassing its core theme of success in co-operation.

"2024 saw the event taking place in Dubai, with support from host operator Nedaa. The show was a huge success."

CCW 2025 will take place in Brussels, supported by host operator ASTRID, and co-located with the ASTRID User Days. TCCA anticipates this to be its largest-ever edition of the event, with "a record number of visitors and exhibitors".

Foundations of a new era for 911

AT&T director of next-gen 911 product management **Mike Guerra** discusses evolving attitudes around cloud functionality and security among US PSAPs

AT&T has recently publicised what it calls 'end-to-end' architecture, combining a nationwide emergency services IP network (ESInet) with cloud-based PSAP applications. What benefits do you anticipate to control rooms?

The goal of Next Generation [NG] 911 is essentially enabling users to do the same with an emergency call-taker as they can with their family and friends. That is, texting, escalating a voice call to a video call, sending attachments, streaming and so on; what we all do – and take it for granted – every day.

In the States, I would say that public safety is about five to 10 years behind where the consumer industry is in relation to this. What our industry has been working on is changing out the 'plumbing' and building the actual IP network.

We've built an emergency services IP network [ESI net] across the country, operating out of strategically located data centres. That's been our mission for the past three to five years and we're now finally at the point where we're entering the second phase. That's where the cloud really starts to come in.

What is the benefit of moving to the cloud from a PSAP perspective?

It comes back to the NG 911 discussion. The thing that's really exciting to me about the ESInet infrastructure, particularly moving into the second phase, is the ability to bring different applications into the call centre.

That said, only half the puzzle has been completed. While I'm now able to send IP packets, the people answering the phone don't necessarily have the technology to utilise them. That's where the cloud is really critical to us, so we can bring in the applications [they might want to use].

This space is traditionally referred to as call handling, but we call it PSAP solutions now.

Other than providing the public with increasing ways to get in contact with the emergency services, what are the likely benefits of the PSAP solutions from an organisational perspective?

When we bring call handling into the cloud, several things take place. Firstly, implementation time goes down because you're not shipping hardware. There doesn't need to be an on-prem technician to light up the equipment.

At the same time, we're able to layer different solutions on top of each other, which makes it more integrated for the customer. The thing I love is that we can bring it through this public-safety-grade, high-security network that the customer has already bought.

What is the anticipated impact on public safety operations themselves?

I think the real excitement from an operational perspective is this layering of innovative applications. For example, we're looking forward to seeing how much more situational awareness we can provide to the call-taker. Obviously, there's the basic call-taking information, such as location, but there's also potential additional data that can be provided.

Developments taking place in the automotive industry are a good example of that. Launching a 911 call from your car, which in turn also sends information about the vehicle itself. How many seatbelts were buckled? Did the airbags go off?

From that, you begin to get an idea of how serious the incident is, and what resources need to be mobilised to it. Then there's information about the highway itself, providing the best way to approach a scene and so on.

Other applications include home security. Traditionally, if your home alarm went off, it would call the security company who would have to turn up and validate it, and call 911. The 911 call-taker would then have to transcribe everything.

What we're seeing now are applications that can launch a 911 call straight from the event. That information comes in like a voice call, as well as text [which doesn't have to be transcribed]. We anticipate it will take a three- or four-minute dispatch event down to about 30 seconds.

Going back to ESInet, it's obviously intended to exist and function in parallel with FirstNet…

It is in parallel, yes. When a member of the public, for instance in Dallas, makes a 911 call, it hits their carrier and is then passed to AT&T ESInet. It then goes to the 911 agent, who determines what emergency service is required and then dispatches the first-responder. That begins the use of FirstNet.

At the same time, we're also trying to bring FirstNet into the '911' part of the process, providing wireless backup in order to ensure diversity and continuity. An agent could

> **I don't want to sound like I'm being super-positive here, but there's an element where the cloud is actually even more secure**

AT&T's director of next-gen 911 product management, ***Mike Guerra***

theoretically operate a laptop with a FirstNet SIM, leveraging the cloud service, and answer that 911 call from anywhere.

The concept of teleworkers for 911 is not really acceptable, but in the case of an emergency where they can't actually be in the control room, it's absolutely a viable option. Better that than not getting the call answered. If that takes place over FirstNet, it's secure and prioritised.

Can user organisations pick and choose their IP network/cloud provider? I assume – as with emergency services radio comms in the US – it's still based around a competition model.

Our traditional networks would have been very regional-based, which meant you didn't really have an option regarding who was your 911 provider. By contrast, with this generation, it truly is a competition, and states are buying in.

It's nationwide, but we still have to go and win the business in South Carolina or wherever. All the states have their own timeline, based on funding and so on.

What I can now do is go to them and say, look, I can bring in this COTS [commercial off-the-shelf] application, so you can better utilise the investment you made. It makes managing the infrastructure easier for whoever is doing the administration inside that PSAP.

When you have a cloud type of environment, people are more willing to adopt it because they're not having to integrate hardware on prem, and they're not patching it together. 'I went with vendor A and bought this product, so now I need to make sure that it fits in with the router from vendor B…' That's not an issue with the cloud.

Is security still a concern when it comes to emergency services' adoption of the cloud? Organisations have been reticent, for instance because of the potential server location.

Some organisations are still reticent about using the cloud, absolutely. Everyone has been talking about the cloud in public safety for the last five years, but no-one trusted it.

From our perspective, we're now seeing potential early adopters actually starting to ask for it. States will send out RFPs [requests for proposals] now, and these bids are actively mentioning the cloud for the first time ever.

> "The last three or four bids I've seen have shown openness to the cloud"

It really doesn't have to be prem-based any more. They're open to a cloud solution. The last three or four bids I've seen have contained that openness to the cloud.

One thing that has helped us is companies such as AWS, with their government portal located in the cloud. That's starting to be understood by everyone as an 'extra secure' cloud offering. Having said that, it's still early in the adoption, and you can't expect this to just spike in the next 12 months.

I don't want to sound like I'm just being super-positive, but there is an element where the cloud is actually more secure. If I have 2,000 customers [on prem], those are 2,000 endpoints that I have to keep secure, versus two instances of AT&T cloud. I'm absolutely going to be able to safeguard that.

Going back to the 'physical' aspects of on-prem, there are updates where I would need to roll a technician out, which is something that could take months. In the cloud, that's done across the universe within seconds, and it hits everybody.

There are things that I would argue are actually more secure. But it's a mentality that you have to get people comfortable with.

The AT&T network outage from February of this year was the result of an update. While it's not quite the same context, what impact has that event had on the confidence of your customers?

We had a very prem-based solution for many years, and then it became this hybrid. And that slowly got people used to the concept of not all their equipment being on premise.

So, we have those early adopters, and that's helping us because they're getting comfortable with it. And because a lot of the extra functionality – the feature set that they want – is only available in the cloud, that's going to help them get over any reluctancy.

Regarding the outage in February, honestly, the wireless side is not my expertise. But I will say that I'm absolutely expecting my customers to try to draw that linkage. And we absolutely have to be prepared to have that conversation.

Ultimately, we have to try and explain what occurred, which certainly adds [complexity] to the conversation. But I honestly haven't seen an overwhelming influx of calls about it. The silver lining with something like that is that it's an opportunity to learn.

New era, trusted tech

Philip Mason talks to industry experts about the future of the TETRA standard, as well as its ongoing evolution going into the mission-critical broadband age

Over recent years, much of the discussion among the mission-critical comms community has revolved around an anticipated, imminent, embrace of broadband technology.

There are many reasons for this, not least the number of high-profile national projects – particularly in the public safety sector – now focused on rolling out LTE. As is well known, this included the UK, South Korea and the US in the early going, followed in turn by France, Finland and so on.

While that is, of course, hugely exciting, the other side of the discussion has inevitably focused on what broadband might be replacing, particularly when it comes to mission-critical voice. And as longtime readers of *CCT* will know, in Europe (and elsewhere around the world) this invariably means TETRA.

Referring back to some of the original programmes mentioned above, this is probably no surprise given that a key driver for those such as the UK was – and still is – the desire to turn off the TETRA-based Airwave network. This continues to be a massively high-profile project after all, not just for what it has set out to achieve but also the difficulties that have been encountered in achieving it.

Having said all that, however, over a decade after the original 'broadband for public safety' discussions began, it is apparent that an immediate swop from TETRA to LTE might be more difficult than first envisioned. We shall explore this more as the piece progresses.

With that in mind, there are several countries taking a more hybrid-based approach to MCX roll-out. Furthermore, there are also countries that have not fully completed their TETRA roll-out yet.

Taking all that into account, the question then becomes how does the sector, and indeed public safety organisations, proceed in the intervening years prior to MCX being fully adopted across the globe? More to the point, how does the TETRA standard itself need to evolve in the coming decades, during which it will likely remain the go-to technology for mission-critical voice?

These are the questions which this article sets out to answer.

The need to evolve

Francesco Pasquali is a TCCA Board member, as well as chair of the association's TETRA Industry Group. Discussing the necessary evolution of the technology, he believes that this will take place across two broad areas – the security piece, and 'hybridisation' to enable simultaneous working with broadband.

Beginning with security in the first instance, he says: "In my opinion, TETRA will remain the optimal [voice] technology solution for many years. In the meantime, however, the cyber threat is growing.

"For instance, freely available computational power is increasing, making it easier to crack encryption systems through brute force attacks. It's clear, therefore, that TETRA needed to evolve and be upgraded in this regard."

Illustrating this, he highlights the recent introduction of a new set of TETRA security algorithms, developed in conjunction with ETSI. These, he says, have been designed to resist even brute force attacks, as well as taking into account any future threat potential from quantum computing. TCCA is already working on the TETRA interoperability certification needed for this.

Readers will also recall that ETSI recently made the decision to publish the TETRA security algorithms in the public domain. The rationale for this was to demonstrate their quality as well as make them available for peer review, following the Midnight Blue 'TETRA:Burst' findings published in the summer of 2023.

Discussing this, a statement released by ETSI at the time said: "Keeping cryptographic algorithms a secret was common practice in the early 1990s when the original TETRA algorithms were designed.

"[However], public domain algorithms are now widely used to protect government and critical infrastructure networks, for example AES [Advanced Encryption Standard], standardised by the US government. Effective scrutiny of public domain algorithms allows for any flaws to be uncovered and mitigated before widespread deployment occurs."

According to Pasquali, meanwhile, alongside efforts by ETSI and its partners such as TCCA, the industry itself is also busy evolving the security piece on its own behalf. "Far beyond what the standards provide," he says, "all the TETRA industries have been making efforts to strengthen and protect their own solutions against cyber threats. That could mean both intentional [threats] and unintentional, like any other ICT infrastructure."

> **"The interworking function is a crucial part of TETRA's evolution"**

Moving onto hybridisation, meanwhile, Pasquali believes that interoperability between broadband and TETRA will be necessary for the foreseeable future, particularly when it comes to the public safety space. He cites many reasons for this, including questions around network resilience, availability of spectrum, as well as aspects of the functionality and standardisation piece, which is still very much a work in progress.

Discussing functionality in particular, he continues: "It is important to highlight that TETRA and broadband are not competing technologies. Rather, they complement each other, and it can be expected that both will be used together to provide mission-critical services.

"With the prospect of TETRA and MCX operating in parallel for many years, it's clear that the interworking function is a crucial part of TETRA's evolution. This is why ETSI's TETRA interworking function has been conceived and published.

"The industry itself will continue to incorporate interfacing, interworking and gateway functionality into its products."

The work on the TETRA Interworking Function (IWF) started in a TCCA Critical Communications Broadband Group (CCBG) task force, and has gained momentum with the aim of facilitating the transition from narrowband TETRA to broadband MCX. TCCA has now created a formal IWF working group to continue the work.

Asked how he believes that interworking will work from an operational perspective, Pasquali goes into more detail about functionality itself, including the ability to have "mixed technology talk groups" in the field.

"It will be a different story, however," he continues, "for all the other features which are not covered by the standards but are still important. For instance, management and administrative stuff, around things like user privilege.

"If a unique management platform is desired by a specific user organisation, that would fall to individual industries to provide a propriety interface."

Disruptive technology

Winner of the best TETRA solution category at this year's International Critical Communications Awards, Teltronic's MCBS base station is a product which is indeed helping to evolve the standard.

The device offers multi-TETRA carrier capacity as well as RF power of up to 40 watts, thereby – according to the company's website – "matching the performance of cabinet format base stations in a compact unit of reduced weight and size".

It accomplishes this through the use of software defined radio (SDR) technology.

The website continues: "The great strength of the MCBS lie in the use of SDR technology, [enabling] the components that have been typically implemented in hardware [to be] implemented by means of software.

"Thanks to these SDR techniques, the MCBS is capable of incorporating up to four TETRA carriers, presenting itself in different configurations to be able to adapt to the characteristics of each deployment." SDR also enables the unit to be configured and monitored remotely, via the use of the company's IP infrastructure, Nebula.

Discussing the development of the product, Teltronic director of research and development, Alfredo Calderón, says: "The development of the MCBS started around 2018, and a little less than two years later we were presenting it at Critical Communications World 2020."

He continues: "It is a truly disruptive product. Our goal was to match the performance of a fixed indoor base station in a single compact device that was ready to operate outdoors in the most extreme environmental conditions without requiring civil works for installation. This unit has changed the way TETRA deployments are made."

Elaborating on the deployment piece, Calderón states that the ability to mount the unit on a mast or wall due to its size has simplified installation considerably. At the same time, "being able to operate with [both] batteries and solar panels" means that the MCBS doesn't need to be situated in an environment with what he calls a conventional power supply.

"Moreover," he continues, "as fewer units are required to cover the same coverage area, its use significantly reduces the cost of TETRA infrastructure. [It also] shortens deployment, maintenance and upgrade times, and reduces the carbon footprint.

"Also, in terms of energy, MCBS consumes much less power than a base station in a cabinet, to deliver the same number of carriers and RF power. This reduces the OPEX cost of operating the TETRA infrastructure.

"The MCBS has contributed significantly to the evolution of TETRA by driving innovation, optimising processes and creating new market demands.

"TETRA still has a long way to go, and we believe that its evolution will involve improving the efficiency of the systems and – in a global context of great awareness of environmental issues – improving energy consumption and reducing the carbon footprint of the systems."

Coming back to our earlier discussions with Pasquali around the industry's efforts in relation to security, meanwhile, Calderón also touches on the aforementioned Nebula infrastructure.

This, he says, is already certified according to the IEC 62443 security standard.

Another product paving the way for TETRA evolution is Sepura's SCL3, which is a TETRA and 4G/5G handset, launched earlier this year. The company's website describes the product as being "carefully designed to meet the needs of users at every stage of the journey to mission critical services [MCX]."

"It delivers," the website adds, "everything you would expect from a rugged body-worn device, along with Android OS, a 5 inch display, an optional TETRA module, and extensive portfolio of accessories."

While discussing the development of the SCL3, Sepura's chief technology officer, Peter Hudson, makes explicit that technological evolution is always intimately bound up with user need.

He says: "The device concept came out of a market requirements research exercise spanning several years, involving discussions with end-user groups and staging workshops across our customer base worldwide.

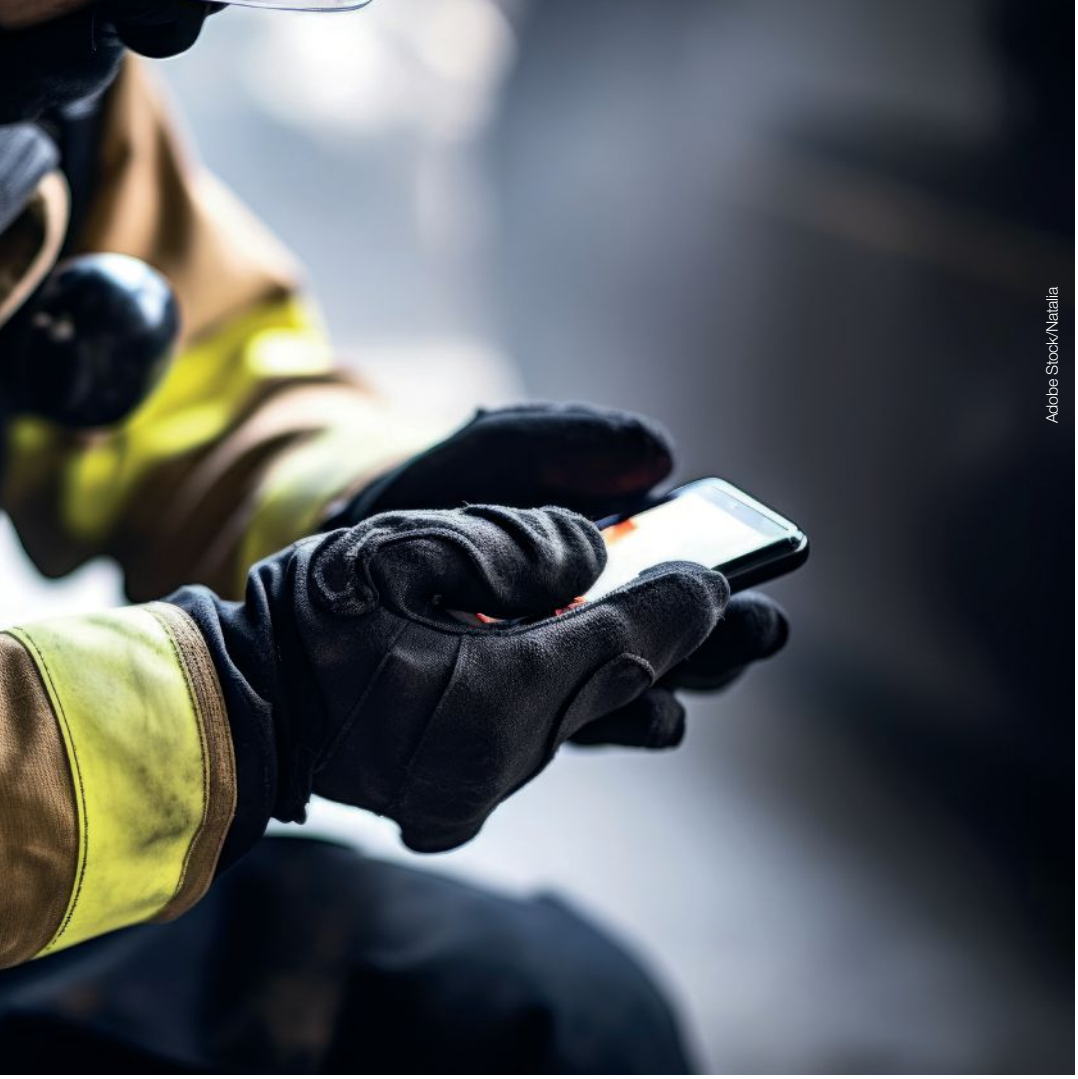
"The results of this process enabled us to better understand the use-cases, how the devices will be deployed and what accessories and support services will be required to support the device when in use."

He adds: "Introducing a new product with new technology and capabilities obviously offers new benefits and opportunities. However, the end-user also has to be able to seamlessly continue their day job while adopting the device and any new benefits or features it brings.

"That can take time, particularly given that [onboarding new kit] is not normally top of the priority list when it comes to the day job. Therefore, the design of the product needs to facilitate that transition in as easy manner as possible."

Hudson illustrates this further by hinting at a certain amount of back and forth taking place during the market research activities mentioned above, claiming that "we have seen requirements go full circle several times as our users develop understanding of their future device needs".

> **"The end-user has to be able to seamlessly continue their day job while adopting the device and any new benefits or features it brings"**



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One key outcome of these discussions, naturally, was the need for broadband-enabled functionality, such as data transfer, video and so on. At the same time, it was also clear that users wanted to undergo little or no disruption when it came to 'business as usual' working.

Hudson elaborates on this via a discussion of the SCL3's push-to-talk functionality, with the device including a large button positioned similarly to the company's other TETRA solutions.

"The devices also still have physical keys, so users can operate them 'eyes free'," he says. "This enables them to accept or reject a call without having to look at the screen. The keys are likewise programmed to do everything from sending a message to taking a photo with the camera."

All this leads neatly onto a discussion of the transition to broadband in and of itself, which in the UK, of course, means the Emergency Services Network.

Discussing how the SCL3 might fit in with organisations' procurement strategies, Hudson says: "From our point of view, we're now getting close enough to broadband transition that this is about the right time [to launch the product].

Emergency services are increasingly leveraging broadband

"People are starting to understand what they're going to buy, and how they're going to use it."

The foreseeable future

Earlier in the piece, TCCA's Pasquali spoke of his belief that TETRA would remain the optimal mission-critical voice technology for many years to come.

This was due to lingering questions around leveraging commercial broadband networks for mission-critical use, as well as the different needs and requirements of each country.

That being the case, how does he see this ultimately playing out a decade or even more down the line?

Can he envisage a situation where some nations will simply refuse altogether to give up TETRA, choosing to run both technologies in parallel, in perpetuity?

Giving a background to this, he says: "It has become quite clear in the last few years that the replacement of TETRA is a much more complex task than [was originally] expected. There are many technical and operation considerations to address to make sure that any new network delivers the same mission-critical quality of service.

"For instance, all the elements of the end-to-end system must be made resilient, as well as being able to deliver high-density and robust communication even in the event of a crisis. This is particularly crucial, because in most cases, the user organisation and national administration are going to be using a commercial [broadband] network, which has been designed for a completely different purpose."

He continues: "There are also many commercial factors to be considered. For example, all suppliers in the mission-critical ecosystem must clearly understand their responsibilities, dependencies and deliverables. And not all have the same expertise from that point of view.

"Once again, commercial operators don't usually have any expertise of what the mission-critical service is. Therefore, the deployment and running of a mission-critical broadband service must be treated as any other ICT project, integral to which will be high-quality programme management. This is a very complex and long task."

Last but by no means least, meanwhile, is that public safety users themselves invariably demonstrate – quite understandably – extreme reluctance to give up any frontline technology which they already trust. (This was certainly the case early on in the ESN project, for instance, as anyone who attended the British APCO event Home Office Q&A sessions at the time will remember).

Answering the questions posed above, Pasquali says these decisions will be entirely for public safety user organisations and their respective "national administrations" to make.

He is less circumspect when it comes to other mission-critical verticals, however.

He says: "The big push for the move to broadband has come from the public safety sector, particularly in relation to national public safety networks. By contrast, many other market sectors will probably decide to remain on narrowband, at least in the next decade.

"Voice services still represent the main operational needs for non-public-safety operations, after all. And TETRA is still the optimal solution for that."

TCCA's webinar 'Talking TETRA – the continuing rise of the TETRA standard' will take place 21st November at 10am CET. Visit the events section of the TCCA website to register.

A gradual process

Artificial intelligence tools have the potential to help hard-pressed emergency services organisations in many operational areas. But this is a relatively young technology, and there are many caveats along the way, as **James Atkinson** reports

The use of artificial intelligence (AI) and machine learning (ML) seems to be permeating almost every aspect of society. Given the cost and time pressures on emergency services generally, it is no surprise then that AIs are being looked at to help relieve some of the burden. But as with any new technology, the emergency services are taking a cautious approach.

Robert Hogg, CEO of Black Marble, a UK software and AI developer, is all in favour of this caution. "For now, AI should only be thought of as a force multiplier; an AI tool that takes out the mundane parts of work tasks and automates them.

"It's about producing 20 per cent more in the day job by reducing admin, automating tasks and accelerating the speed of results. That's where AI will have a massive impact for the emergency services.

"Where AI won't have a massive impact is when people are looking for 'solve everything' AIs, because they are very complex and very expensive. One day they will work very well, but they need a lot of effort to create in terms of quality of data, training, security and so on. They are not a quick solution."

He points to the recent EENA AI Special Project as a good example of the kind of deterministic, rather than probabilistic, types of AI he is referring to. "EENA has picked exactly the right kind of AI projects for now, which will have an impact, but not a negative one."

The EENA project brought together four AI technology companies: Gladia, Cestel, Augmented Hearing and LiveReader; and PSAPs from seven European countries, undertaking nine pilot programmes.

"The current generation of AIs for PSAPs are about improving quality and removing barriers in the emergency communications chain," explains Peter Lonergan, policy officer at EENA. "The next step, which is about aiding decision-making and making suggestions, that's a bit further down the line for PSAPs."

"Our special AI project mainly looked at possible uses of AI in three areas," he continues. "The first was language detection, translation and transcription. The second was noise isolation or cancellation to improve call quality. The third was triage to prioritise emergency calls effectively."

The objective of the project was to explore the use of AI tools to see if they can be effectively implemented into PSAPs and how they can contribute to increased efficiency and, as a result, a better emergency service for citizens across Europe.

The results of the trials will be presented in December 2024, but Lonergan says one general observation he can share is that there are certain emergency communications where the audio quality is not the same as audio in general conversation: "Also, people are stressed, crying, anxious, maybe not speaking in their first language, so it is not typical conversation data that the AI might be used to working with, so that might also be a complication for AI working with PSAPs."

Identifying risk

In September 2024, the UK's National Police Chiefs' Council shared findings from various AI trial projects, which illustrate Hogg's point about how AI can save time, reduce errors and improve efficiency through automation of processes.

For example, West Midlands Police has introduced the Andi-Esra voice recognition and AI system to support answering 101 calls such as reporting lost property, requesting an investigation update and prioritising calls with a vulnerability element through identification of key words and phrases. The AI was able to deal with more than 30 per cent of all 101 calls, which freed up agents to prioritise those with more threat risk and harm.

Humberside Police deployed a control room AI assistant for calls relating to domestic abuse (DA) in order to help identify the risks to the caller and whether they have called police before. The software also transcribes the call and updates the incident record as fully as possible. The tool was found to save 29 per cent of the total call time (seven minutes and 50 seconds saved on each DA call).

To put this in context, the police recorded almost 1.5 million domestic-

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abuse-related incidents and crimes in England and Wales (excluding Devon & Cornwall Police) in the year ended March 2023. This could therefore potentially realise productivity savings of almost 190,000 hours per year. If applied to more crime types, there is the potential to increase time savings further.

Avon and Somerset Police is trialling an investigation tool originally developed in Australia called Söze. This uses technology such as computer vision, face search, speech-to-text and language translation to surface evidence, which it might not have been possible to find using manual methods.

Söze was able to review the evidential material in 27 complex cases in just 30 hours. It is estimated this would have taken up to 81 years for a human to review.

Bedfordshire Police, meanwhile, is using AI to connect to multiple systems to enable the AI-supported creation of subject profiles, directed surveillance authorities and communication applications and mobile phone analytics.

This is driving productivity by saving significant amounts of time with high-level regional operations. The AI has the capability of summarising multiple intelligence reports and mobile phone data in seconds, which would normally take hours or entire shifts to do manually.

> Predictive AI is the next level up from current 'deterministic' tools

Beds Police has also developed an AI-based tool for automatic redaction of sensitive information from documents as part of the criminal justice disclosure process. It is estimated that it takes four hours to redact a simple domestic abuse case and up to 26 hours for a complex child abuse case.

In total, the annual average time taken to redact these case files per force, per annum, was approximately 133,400 hours. If scaled nationally, there are potential savings of up to 7.5 million police hours from redaction. This, of course, now has to apply to audio and visual multimedia redaction as well.

AI and ML are essential for retrospective and live image analysis, including the controversial use of live facial recognition. It is also key to Robotic Process Automation (RPA). Avon and Somerset Police used an RPA function to process 2.1 million cases in 2023 and added around 80FTE (full-time equivalent) of capacity to the force since deployment. Its RPA function now covers a total of 50 repetitive tasks.

Proof of value

AI tools that aid decision-making and provide predictive AI are the next level up from the deterministic AI tools currently being trialled or introduced into the emergency services. "As soon as you start to get onto predictive AI, there are different grades," says Hogg. "We need to look at how we can build frameworks to deliver AI into critical services that are explainable, auditable and can prove their value. Proof of value is absolutely key."

The concept of predictive policing or ambulance deployment based on analysis of historical crime data, geography, social strata, weather, social media and emergency calls, CCTV, mobile video footage and so on is not new. What is relatively new is the sheer power of AI computing today and its ability to gather all that disparate data, crunch it so much faster and then extract insights in near-real or real time.

"AI could help you determine new ▸

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incidents happening or predict events sooner than is possible now," says Hogg. "That is probably the 'bright star' AI tool for all the emergency services.

"It's about using AI to enhance situational readiness by putting resources closer to where they might be needed, because there is a growing confidence that something is going to happen."

Of course, an AI tool's effectiveness comes down to the quality of the data it learns from. Data can be biased based on gender, ethnicity, religion and social standing. Crime hotspots tend to be in inner urban areas often populated by low-income and minority ethnic groups, and that kind of data can skew the AI's learning model. "Police do have a massive problem training AIs for that reason," observes Hogg.

Bart van Leeuwen, situational awareness expert at Netage who is also an active firefighter in the Amsterdam Fire Service with 30 years of experience, has studied how humans make decisions, especially in very stressful situations. "My tagline is: if we think we can improve human decision-making with AI, shouldn't we understand human decision-making first?" he says.

"What I try to explain to people is that this is a lot harder than we think. We are far less rational as humans than we dare to acknowledge." He cites a study in The Netherlands where the fire service tried to understand how decisions are made by getting 120 fire incident commanders to run an incident in a VR scenario.

One-third of the commanders ran the incident singly, as they normally would, relying on their training and experience. The second group ran the incident in tandem with a similarly ranking incident commander from outside; they ran the incident jointly. The third group also had a second commander involved, but they would step in, discuss an issue, and then step away again.

"What blew my mind is that the person running the incident alone was more effective and more situationally aware than the two-person commands," says van Leeuwen. "What was also effective was the third option where somebody was not interfering with the incident but just stepping in and making points."

This is similar to what van Leeuwen refers to as 'adjunct AI'. "The AI is not telling you what to do. It is just giving you thought-provoking information. That is where I see the role of AI.

"Something that monitors the process and asks questions, but where an incident commander can say: 'I understand why you say that, but you haven't seen this and that, so I am not changing my position.'"

But if these more advanced, more complex advisory-type AI tools are to be effective, they need to be better structured and helpful, van Leeuwen believes. "The road to AI goes through IA (information architecture). What should the data nerds know about the fire service that will enable them to provide a better structured and helpful AI tool?" he asks.

For van Leeuwen, the big stumbling block to devising a well-structured AI is terminology. "We don't have taxonomies, we have folksonomies. Enabling people to really understand exactly what you mean by certain terms is really difficult.

"How can you train an AI with data if even within the fire service people disagree about what a certain term means?"

Another major issue van Leeuwen points to is that firefighters and police are facing more 'outlier' or one-off-type incidents, where situations escalate because the incident was not what the firefighters or police expected. The Grenfell Tower fire in the UK is a good example of this.

"These AI systems try to be really accurate. But if you look at outliers, that is actually impossible. I'd rather have a system that says 'This is not what you think it might be', instead of telling you exactly what it thinks it is." It is about providing an operational perspective; using the AI for outlier detection, not an attempt at accurate description.

> The are many potential use-cases when it comes to AI and law enforcement

To this end, van Leeuwen created an AI for the Amsterdam Fire Department that looks at the data to see if it could signal that a dwelling is above a certain threshold.

The reason for this is that a fire in a 70 square metre apartment can behave very differently from one in a 250 square metre apartment. If the incident commander at least knows it is the latter, they can consider changing their default approach.

He is also a keen advocate for asking uncomfortable questions about AI tools. As he points out, the tech bro enthusiasts who create these AIs have no skin in the game. They are not confronted with the results of poor outcomes.

"We seem to think only of the potential maximum positive outcome, but neglect the maximum negative outcome. That means asking the question: what if it goes horribly wrong?" he says.

It is essential, therefore, that if AIs are deployed in the emergency services that they conform to strict ethical and legal standards to remove bias, preserve privacy, are tailored to the specific use-case, are transparent and explainable and keep a human in the loop making the final determination.

EENA's Lonergan says it is very important that the emergency services comply with the EU AI Act. "This is particularly the case with PSAPs, as call-takers work with people in vulnerable situations, and wrong decisions can have very considerable consequences.

"It is very important that PSAPs trial technology: consider it deeply; make sure it is being used ethically; that the data is being protected; but make sure it works, that it suits them."

Hogg is a big advocate of AI, but he sounds a note of caution. "AI is going to genuinely change how society works and how the emergency services work, but we have got to take control of it really tightly.

"It is better to go just a little bit slower to get guaranteed quality results and keep building on that quality, and then ultimately you will get everything. The failure will come from people rushing AI."

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Going from strength to strength

CCT reports on this year's TCCA Critical Communications World, discussing major themes from the conference as well as some of the new products launched on the exhibition floor

As befitting the location of this year's Critical Communications World (Dubai), the conference focused heavily on work taking place in the Middle East.

The was apparent from the very first keynote sessions on the first day. These were delivered by Dubai Civil Defence's head of command and control rooms, Suhail Mohammad Abualmaleh, and head of Nedaa, Mansoor Buosaiba. Their respective presentation titles were 'Critical communication in the Middle East' and 'Critical communications outlook, Nedaa'.

The first day also witnessed another compelling session, during which Dubai Police's head of operational communications, Abdulla Ahmed Saif Alafkham Alhammoudi, delivered a case study focusing on its use of mission-critical communications technology.

He began his presentation by saying that he wanted to share his organisation's "transformation journey", which has seen it augment TETRA with broadband. Discussing this, he said: "As technology advanced, we started facing limitations such as bandwidth constraint and the [TETRA] system's inability to support modern, data-intensive applications."

He continued: "Our journey to [mission critical] over LTE began in 2017. This transition involved extensive infrastructure upgrades, training and significant testing to ensure seamless integration with our existing systems. The outcome has proven its worth."

Going on to discuss mission-critical push-to-talk (MCPTT) in particular, he stated that it has been necessary to roll out hybrid devices to personnel. This ensured "no loss of our service during the transition".

"With MCPTT over LTE," he said, "we have unified various platforms within Dubai Police into one integrated system. The unification has enhanced our operational efficiency, allowing for better co-ordination across different units and providing commanders with real-time updated [information] from the field."

For those who watch the mission-critical comms sector closely, it probably won't be a surprise that Alhammoudi's presentation not only provided an overview of Dubai Police's efforts, but also a kind of stating of themes for much of the rest of the CCW 2024 conference. These included the changing nature of public safety operations, the use of hybrid devices, the adoption of mission-critical broadband and more.

Standardisation update

Focusing on the latter in particular, another compelling presentation from the first day was delivered by ETSI's new chief technology officer, Issam Toufik. The title of the session was '3GPP and ETSI standardisation update'.

Outlining the current situation in relation to 3GPP releases and how this relates to the mission-critical (and also commercial) sector, he said: "Release 15 and Release 16 have been submitted to the ITU [International Telecommunication Union] as the 3GPP 5G solution of the IMT 2020, and these two releases are the basis of the 5G commercial deployments that we are seeing today.

"According to the GSA there have been 308 commercial deployments so far and the majority of these are non-standalone [5G]. So, we are still to see the full potential and the promise of 5G."

He continued by saying that Release 17 has also now been completed, with 3GPP working on Release 18, which is the first release representing what is known as 5G Advanced. Drilling down into R18 in particular, he said: "Release 18 has been functionally 'frozen'. In terms of contents [it] continued to expand and brought a new wave of innovations."

This includes improvements to mobile broadband, while at the same time bringing more "expansion and

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The Middle East is at the cutting edge of critical comms technology

extension" to vertical use-cases. Projects, he said, are now also being considered from an 'end-to-end' point of view, meaning not just the "UE [user experience] side, but also the network side". That includes initiatives advancing uplink and downlink MIMO, as well as studies on new technologies.

Referring specifically to the mission-critical piece, meanwhile, he mentioned the importance of drone and satellite in both Release 17 and Release 18, as well as the expansion of Sidelink, and Multicast.

Moving onto Release 19, he said the expectation is that the "functional" side will be finalised by September of next year, with an additional three months to "finalise the code". Elaborating, he continued: "We are continuing on what Release 18 is bringing in terms of realising the full potential of 5G. But as well, starting to create a bridge… to work on some early studies [for] 6G."

Key areas mentioned in relation to R19 included the evolution of satellite work, as well as artificial intelligence and machine learning. The latter, he said, is a "major project" in relation to Release 19.

Another speaker representing ETSI was Brian Murgatroyd, who is the chair of its Technical Committee TETRA and Critical Communications Evolution. He spoke on the key topic of TETRA and critical broadband interworking, focusing in particular of the development of the interworking function standard.

This function, he said, was proving to be crucial in terms of the transition between narrowband and broadband. In his words, this could prove to be an "awful long period, with decades of interworking".

Discussing the burgeoning standard itself, Murgatroyd said that it has been in development for seven and a half years and was just about to be published. He continued: "It's now been recognised in the past few years that switching over to a broadband solution isn't quite as straightforward as it might have appeared five or seven years ago. It now seems clear that major operators will want to ensure that everything is very safe to go onto these new systems.

"Can you do a switchover just like that? Possibly, but probably not. Because it's not safe to do so."

Going into the interworking standard in more detail – particularly in relation to the use-cases – he continued: "There's the obvious one – short-term usage – where the user community ▸

TCCA Board chair, Mladen Vratonjić

is transitioning from TETRA to use MCPTT. [The] part of MC data where you've got the requirement to be able to talk between the two systems.

"The other scenario is long-term, where it's intended that TETRA and broadband live side by side for a lengthy period, or maybe always. There may be difference in the solutions for security between a short-term and a long-term use of interworking.

"However, a user organisation may be willing to accept an increased level of risk in the shorter term. This specification describes security in an awful lot of detail."

Murgatroyd then went on to list key facilities decided upon during the standardisation discussions. These include group attachment, with group calls controlled by either TETRA or MCPTT systems. There is also the need for private/individual calls to go across the two systems, and likewise emergency calls.

"And finally," he said, "we want encrypted communications. So if you've got security at one end of your system, you want the same degree of security at the other.

"Both TETRA and broadband have their own methodology of providing more than adequate security. We've got to somehow make them meet in the middle."

The ever-increasing importance of the hybrid communications was also demonstrated across the exhibition floor, which we will look at more closely later in the article. This included offerings such as Airbus's Tactilon Dabat, Sepura's recently launched SCL3 and Motorola's MXP660, which was revealed on the first day of CCW 2024.

The journey to MCX

Another key theme of the conference, it will surprise no-one to learn given the above, was the ongoing move from narrowband to broadband. A large amount of content related to this took the form of national project updates, delivered by representatives from the countries in question.

One of the first of these was delivered by John Black, programme director of the UK's Emergency Services Network programme. Discussing the development process (post-Motorola Solutions leaving the project in 2022), as well as timelines, he said: "A key issue for us is coverage… [and] our coverage journey is coming towards the end.

"When we started, EE had to build – to meet our contracted coverage requirements – around 650-700 new masts. Those masts are all built.

"There's an additional 300 or so, which we call extended area services. We're building those in conjunction with a separate strategic rural network programme, with the dual benefit of providing emergency services coverage, but also providing commercial coverage for the populations of those areas."

Moving on from the coverage piece, Black continued by discussing what he called "testing at scale". He said the programme had taken advantage of the extra support given to it by Motorola post-2022, enabling it to focus on the EE network, RAN and backhaul solutions.

"What we've done over the last 18 months," he said, "is go out to a whole range of the more 'stressed' situations [for testing]. Football stadiums are really good because you get a large number of people on a regular basis. Festivals, transport hubs and other pressured situations as well.

"We've even done some simulations of previous terrorist activity, to see how the convergence of emergency services into a location has affected the network. That work has been hugely valuable, and we've learnt an awful lot about how a 3GPP standards-conforming MCX solution works under that kind of stress."

The good news – in his words – is that it works. And also that the programme has found nothing to suggest "this technology won't perform in the way we want it to with priority and pre-emption being effective".

As well as Black's presentation, day one also witnessed an update from a nation state at an earlier stage of its transition, delivered by the Swedish Civil Contingencies Agency (MSB).

Discussing network planning progress (as of this May), director of Rakel and command operating systems at MSB, Ronny Harpe, said: "Our final proposal for this project is not approved yet by the Swedish government [see the news section for an update on this]. The key fact from the proposal is that we have to build a next-generation mission-critical network that provides the same services as today's TETRA network.

"In Sweden, the network is supposed to support development of civil defence and total defence, and the need for secure and robust infrastructure is vital. Aiming to support end-users in all different scenarios, from day-to-day business to crisis management, and even to the state of high alert."

'High alert' in this context, he said, would be a state where Sweden "in some ways [is involved] in an armed conflict".

He continued in his description of the aforementioned proposal, in particular that the Swedish state will have ownership of the core network and MCX platforms; and that it would build a dedicated radio access network to combine with commercial RANs.

"For this," he said, "we propose that we have dedicated frequencies. When it comes to [being equal to] the existing TETRA network in terms ▸

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of robustness, today's network has seven days' backup for 80 per cent of the infrastructure. The rest of the infrastructure has battery-powered backups for about 36 to 48 hours."

Moving onto timescale and the programme's relationship with the Swedish government, he said: "The budget decisions have been reduced since last year. So, 36 million Swedish krona this year, just to maintain the project that we have started, so we don't have to close it all down and start over when the decision comes."

Procurement for the core network has already taken place (Ericsson), as well as SIM card manufacturing.

"Though the bill states that the government sees the [urgency] for doing this technology shift, they know that if we don't do it this time, we have to do re-investments for the existing TETRA network, for about two billion Swedish krona."

Harpe continued by mentioning an alternative proposal for the network from Terracom, which is a Swedish state-owned company. This was investigated by a task force, in comparison to MSB's proposal outlined above. "We foresee that this might be the year that we actually get a final decision from the government," said Harpe.

Other national network updates came from FirstNet in the United States, Astrid in Belgium, SafeNet in South Korea and many more.

The 'national roll-out' sessions described above were focused almost entirely on the future, with some of the plans being outlined measured out in decades. At the same time, meanwhile, the conference also focused on what might be referred to as 'future' technology, in the form of AI, satellite and 6G.

The latter two topics were dealt with in one go by VTT research professor Marko Höyhtyä, in his session looking at 6G-enabled satellite connectivity for remote regions. This was based on his organisation's project work, as well as work with "state-of-the-art satellite devices in Northern locations".

Introducing the use of satellite in more general terms, he said: "[It's] a technology which enables connections anywhere; whether you are sailing far from the shore, flying high in the air and, of course, in remote areas.

"Typically, satellite systems are proprietary. So, in order to connect to the Starlink system, you need to have a Starlink terminal. If you want to connect to OneWeb system, you need to have a OneWeb terminal. And so on.

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This year's show featured numerous exhibitors, and several product launches

"The big disruption that is coming is from 3GPP standardisation, which provides interoperability between the systems. Another big disruption is LEO [low Earth orbit satellite] constellations, meaning hundreds or even thousands [of satellites] in the same system."

Moving on to talk about 6G, he stated that while previous broadband generations have been "optimised horizontally", the latter will also have the "vertical aspect included". Or to put it another way – following on from 3GPP's current work – satellite and aerial platforms will be integral to the 6G network architecture, alongside terrestrial.

"This is a very dynamic network," he said. "You have moving satellites, temporary drone formations… in order to have good connections, you need to have dynamic resource management capabilities in place."

Europe, he said, is planning to have its own multi-layer satellite/terrestrial system called Iris Square. The estimated cost for this – again, according to Höyhtyä – is about six billion euros.

Moving onto AI, one particularly interesting presentation, taking place on the second day, looked at the technology in relation to TETRA. Delivered by HMF Smart Solutions' Dr Amina Ayadi-Miessen, the session was titled 'Running AI driven TETRA networks – from fiction to reality'.

Ayadi-Miessen discussed potential uses of artificial intelligence in relation to TETRA, focusing in particular on

security, operations, testing and service.

Starting with the security piece, she said: "AI can be used to detect anomalies [in] user behaviour. For instance, we have a network where most of the time users are making group calls with a short duration. And suddenly [when] we see duplex calls with a long duration, the AI is able to detect this as an anomaly and raise an alarm."

Moving onto operations, Ayadi-Miessen continued: "Learning from 'big data' which are available in the TETRA system, the AI is able to recognise changes, for instance in the base station, antenna, hardware and coverage. The advantage of using AI is that it is able to distinguish what component the changes are coming from."

> **"If you've got security at one end of your system, you want the same degree of security at the other"**

New products

As indicated above, new products unveiled on the show floor reflected in very large part the core themes of the show.

With that in mind, one of the most high-profile launches was Motorola Solutions' Dimetra Connect, as well as a new TETRA radio (the MXP660), designed to enable users to switch automatically between LMR and broadband.

Discussing the MXP660 in particular, the company said that it "carries all the hallmarks of a Motorola Solutions mission-critical TETRA radio", but with the addition of LTE, "AI-trained background noise suppression and high-power transmission".

While not strictly speaking launched at CCW, another new product present on the show floor was Sepura's SCL3, which is designed to be deployed either as LTE only or as a hybrid TETRA 4G/5G handset.

The statement accompanying its launch two months previously said: "Created with mission-critical users in mind, the SCL3 is a 4G/5G rugged handheld device that addresses the requirements published by NCCOM Nordic operators.

"PPDR users are accustomed to rugged TETRA devices, with physical buttons for PTT and emergency calls. These requirements are carried forward into the SCL3."

CCW also saw another major industry player – Hytera – demonstrating not just one but three new products on the exhibition floor. These included a dual-mode rugged radio, 5G body-worn camera and cloud-native digital evidence platform.

Discussing the SC880 camera, a spokesperson for the company described it as a "state-of-the-art intelligent device" possessing "ultra-high definition [UHD] video recording and live streaming".

"Equipped with electronic image stabilisation technology and a high-power infrared LED light," the spokesperson continued, "the SC880 ensures stable and clear footage capture, whether in day or night conditions."

Another company having a busy Critical Communications World was Consort Digital, which likewise brought several new products to the show floor.

The first of these was an upgrade of its PRO ONE managed services solution, aimed at "facilitating the transition from narrowband to broadband connectivity for professional users".

Also in Dubai was the latest iteration of its MCX ONE product. This was described by Consort as a "3GPP-based open standard mission-critical communication platform", supporting PTT, data and video over broadband, as well as integrating narrowband.

Finally, the company launched a mobile device management solution, intended to give organisations "comprehensive control over their mobile devices and data security for private networks".

One particularly interesting solution introduced at CCW 2024 was Rohill's Rapid Deployment Solution with Starlink Satellite. The product – the company said – is a response to the "increasing need for robust communication networks during natural disasters, major incidents and large-scale events".

It leverages low Earth orbit satellite, requiring only a power source to "establish a fully fledged, mission-critical broadband solution, utilisation standard equipment used by first-responders".

Drawing our round-up to a close, meanwhile, is Eviden, which launched the latest iteration of its Lifelink Hoox security solution, known as the T40. The company described this as being designed to "protect high-level confidentiality and prevent inappropriate behaviours such as malware, virus, rootkit or unwanted connections to servers".

Features include the securing of the phone itself, full encryption, as well as a secure app store.

Crit comms on the Rhine

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A preview of this month's PMR Expo in Cologne, as well as a brief look back at its 2023 conference

Glancing through the programme for PMR Expo 2024, it is clear that the event is aiming to build on last year's show, which as ever focused on communications technology for public safety and industry.

Discussing this year's conference content, the organisers describe it as featuring "prominent industry experts, presenting the latest technologies, security aspects and business chances".

Focusing on the themes within the summit, meanwhile, the statement continues: "[Particularly] topical is interconnectivity of narrowband and broadband networks, as well as the setting up of private broadband networks, which are mostly operated independently by users.

"These have considerably increased in importance with LTE and particularly with the 5G standards."

Focused in large part on Germany and central Europe, the aforementioned summit programme takes place across all three days of the event, split broadly into three themes/areas of interest. The first of these centres on what the organisers call 5G 'campus networks', looking in particular at security and implementation.

The potentially most interesting presentation of the first day of the summit is the final one, addressing as it does "technological innovations and future developments". This includes the potential impact of 6G, as well as virtualisation.

Day two, meanwhile, returns squarely to the topic of communication for mission-critical organisations. Areas for discussion include mission-critical radio, the use of satellite to provide coverage, data centres, legislation and cybersecurity. One of the most potentially interesting presentations on the second day is likely to be 'The Evolution of AI TETRA Networks,' delivered by Dr Nils Grupe.

The third day moves onto what might be referred to as 'future' technologies, with an emphasis on drones and, of course, the use of artificial intelligence. Sessions include 'The use of AI in the control centre – innovations 2024', delivered by Eric Rietzke, and '5G rescue citizen – practical use of drones in the BOS area'.

Other features across the three days include a trade fair, '5G hub for private networks', as well as a hackathon.

Going back to the topic of emergency services communications, several of the key presentations from last year focused on questions around the provision of technology for European public safety.

For instance, on the second day there was a presentation with representatives from Romania, discussing that country's Special Telecommunications Service (STS). They said: "STS is a public institution that provides special telecommunication and information technology services, including cybersecurity, to the public sector in Romania.

"Among the beneficiaries of this are the president of Romania, the government, and the central and local public authorities. With the aim of providing critical communications services, STS uses an infrastructure consisting of more than 8,000 kilometres of optical fibre. Also, we are using a microwave radio relay network."

The speaker then moved on to discuss STS's function as facilitator and administrator of the country's 112 service. The Single National Emergency Call System, as it is known, consists of single emergency call centres, as well as integrated emergency dispatch centres.

Another country discussing its mission-critical communications effort at the show was Finland, particularly in relation to its Virve system and the introduction of mission-critical broadband.

"What we are doing," said the speaker in question, "is a gradual introduction. We have a nationwide TETRA service, which has been there for over 20 years and people are very happy using it.

"Obviously, the introduction is a major change for all our users. It's a major change for us as well."

PMR Expo 2024 takes place from 26-28 November at the Messe in Cologne.

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Product news

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Hytera launches new PoC for security and logistics

Hytera has unveiled the P5 Series, its new PTT over Cellular devices.

According to a spokesperson for the company, the range – which consists of the P50 and P50 Pro – "delivers an unrivalled combination of durability, intuitiveness, and performance". It is intended for use in sectors including security, logistics and transportation.

The spokesperson continued: "The P5 Series PoC radios, equipped with professional monopole antennas, deliver excellent signal performance, ensuring reliable push-to-talk calls even in challenging environments.

"For instance, in the Band 5, the P5 Series achieves a TRP of 18.5dBm and a TIS of -93.5dBm, enabling connectivity in areas with weak signals.

"With a 3-watt output power and advanced noise cancellation algorithms, the radios provide crystal-clear audio, even in noisy environments."

The spokesperson continued: "Using wideband audio processing with a 16kHz sampling rate and a frequency range of 20Hz to 8kHz, the P5 Series reproduces audio with remarkable clarity, ensuring that voice calls are delivered accurately.

"IP68-rated, these radios are built for users who need dependable tools in extreme environments, from construction sites to remote industrial facilities."

According to the company, the device is designed to be user-friendly, featuring quick group switching and audio notification. The 'quick group' function enables users to create or join talk groups instantly, meanwhile.

Covert comms accessories from Juma

Juma has officially launched a new range of "covert and tactical" communications products, after initial introduction of the technologies last year to a BETA group.

The products include an "inductive flat pack with wireless key fob for PTT and tones" and an inductive loop with wireless key fob, also for PTT and tones. Other products include an inductive flatpack with barrel PTT, and inductive loop with barrel PTT and a covert earpiece.

Discussing the products in more detail, a spokesperson for the company said: "Depending on the user type, the PTT options are available in either a remote car key-style package or a weapon-mountable Picatinny push-to-talk."

The spokesperson continued: "Both packages feature two buttons, with one dedicated to standard PTT and the other for initiating tones. Many specialised users rely on tones to respond to incoming messages discreetly. The system operates on the 2.4GHz band, with a simple pairing process managed via a tri-coloured LED on the push-to-talk device."

JUMA managing director Andrew McLachlan said: "Before designing these products, we carefully analysed customer feedback and conducted research to understand the specific needs of end-users for covert accessories.

"Each item [included in the range] has been crafted with utmost precision to offer discreet, crystal-clear and instantaneous communication."

Industry 4.0 apps to improve safety and security

Nokia has announced several new applications aimed at "improving worker safety, site security, [to] enhance operational efficiency and secure 'OT environments'" across mission-critical verticals.

Offered as a service, the products are known as Ascom Ofelia, Fogsphere, innovaphone PBX & myApps, Nokia Real-time eXtended Reality Multimedia (RXRM), OneLayer and Redinent.

The applications are deployed via the company's MX Industrial Edge solution. According to a spokesperson, MXIE "supports ecosystem neutrality, enabling the deployment of applications to help support growing diverse Industry 4.0 needs".

Discussing functionality of the apps, the spokesperson continued: "The new applications enable digitalisation to increase situational awareness, better deal with incidents, and increase the use of real-time data and knowledge which are key to improving worker safety and site security.

"Ascom Ofelia helps enterprises shift from separate alarm systems to one unified alarm solution.

"Fogsphere, meanwhile, is a comprehensive, multi-modal artificial intelligence platform to enhance workplace safety, security and operational intelligence."

According to figures quoted by the company, global enterprises using private LTE/5G are projected to spend around $6bn "on industrial applications enabling new use-cases and enhancing existing ones" by the end of the decade.


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H700 hotspot is a world first, claims Sonim

Sonim has launched what it calls "the world's first rugged rel 17 5G + Wi-Fi 7 mobile hotspot", the H700.

Built around the Snapdragon X75 Modem-RF system, the solution "offers advanced and reliable connectivity, ideal for professionals, first-responders and consumers needing high-speed internet in demanding conditions".

Discussing the product, a spokesperson for the company said: "The Sonim H700 combines 5G and Wi-Fi 7 for gigabit speeds and low latency. With support for 5G, 4G and 3G networks, and external antenna ports, it ensures reliable connections even in low-coverage areas."

The spokesperson continued that the solution also supports "up to 34 devices, features a 2.5Gbps Ethernet port, USB 3.1 for tethering, and integrates seamlessly with existing routers, making it perfect for streaming 8K, gaming and conferencing".

The unit also includes an "intuitive touchscreen," as well as an 6000mAh battery, which is designed to both provide extended use and double as a power bank.

Sonim CEO Peter Liu said: "We're thrilled to join forces with Telstra to introduce the Sonim H700 5G mobile hotspot, the industry's first ultra-rugged device featuring both 5G and Wi-Fi 7 technologies. [It also includes] other features not found on competing devices in its class.

"This launch signifies a major leap forward in durability and connectivity, making our exceptional brand experience more accessible than ever before."


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T-Mobile offers 5G slice for first-responders

T-Mobile has launched T-Priority, which it claims features "the world's first network slice for first-responders". The latter enables "lower latency and faster 5G speeds [and] more consistency".

It also – again, according to T-Mobile – "gives [emergency services] the highest priority across every single 5G band, even in times of extreme congestion".

According to the company, the product is built on T-Mobile's 5G Standalone Core, with users also having access to a constantly on-call emergency support team.

"Enhanced security", meanwhile, will include emergency services personnel having access to a security slice from the company's SASE offering.

Discussing the offering, T-Mobile CEO Mike Sievert said: "First-responders put their lives on the line every day to protect our communities, and they deserve nothing less than the most advanced connectivity solutions to do their critical work.

"With T-Priority, we're more committed than ever to serving those who serve us all by delivering a dedicated 5G solution to agencies of all sizes across the country.

"At T-Mobile, our job is to make sure first-responders can count on a consistent 5G experience that will evolve to meet the changing needs of the first-responder mission, backed by a dedicated, award-winning support system, to be ready when it matters most."

T-Mobile has also announced that the "anchor customer" for the product will be the City of New York.


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Viavi launches NITRO mission-critical monitoring

Viavi has launched an "integrated, real-time asset monitoring and analytics solution" for critical infrastructure, such as oil pipelines and perimeter security.

The solution includes 'distributed temperature' sensing, 'simultaneous temperature and strain' sensing and 'distributed acoustic sensing'. It uses remote fibre test heads – commonly known as 'interrogators' – to monitor fibre-optic cable/fibre-enabled infrastructure.

According to the company, alerts are generated by the detection of a range of threats. These include "human interference", "vehicle movement", "digging operations" and "fishing nets or ship anchors encroaching on valuable assets".

Discussing the rationale for the product – known as NITRO – a spokesperson for the company said: "Operators face challenges in protecting and optimising their critical infrastructure. The costs associated with damage to critical assets often dwarf initial investment.

"Hence, swift detection, localisation and prevention of external threats help minimise damage and outages, leading to lower total cost of ownership. Optimising operation helps ensure that production targets are met."

Viavi VP Kevin Oliver said: "As a leader in fibre monitoring, Viavi is trusted to monitor millions of miles of fibre, with thousands of test heads around the world. As the use of fibre-optic cables increases to enable accurate, resilient monitoring, our broad portfolio serves each customer's unique needs."

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Looking to the future

TCCA Young Engineer of the Year 2024 winner, Leonardo's **Veronica Pecchioli**, discusses why it is crucial to recognise new voices within the sector

Veronica Pecchioli

What did receiving the award mean to you?

TCCA's Young Engineer of the Year award represents significant recognition for a young professional like me, who is beginning their career or has recently started in the critical communications sector. It also provides a wonderful opportunity to connect with people who share the same interests and passions.

Winning this prize boosts my confidence in my knowledge and reassures me that the path I have chosen is the right one. I understand that this is not an endpoint but rather a starting point in my professional journey. There will always be new challenges to tackle and new things to learn.

Why is the young engineer award important?

Recognising younger people in the industry for their contributions is crucial for several reasons. First and foremost, it encourages future generations to dive into careers in our sector, bringing in fresh talent and new ideas.

When young professionals are acknowledged for their work, it highlights the value of their fresh ideas and innovative perspectives, which can lead to significant advancements and improvements within the industry.

Moreover, this recognition serves as a powerful motivator for young professionals. Knowing that their efforts are valued and appreciated can inspire them to continue striving for excellence and pushing the boundaries of what is possible. It fosters a sense of pride and accomplishment, which can enhance their commitment to their work and their field.

Additionally, by recognising the contributions of younger professionals, the industry demonstrates a willingness to embrace a diverse range of ideas and knowledge. This inclusive approach can lead to more dynamic and effective problem-solving, as it combines the insights of both experienced and newer members of the industry.

What happens to the industry if we don't do this?

Failing to recognise the value and contributions of younger generations poses a significant risk to the industry's future. When young professionals bring fresh ideas and innovative perspectives, but these contributions go unrecognised, it can lead to feelings of insecurity and diminished motivation.

This lack of acknowledgment can stifle creativity and hinder the introduction of new approaches that are crucial for progress. For companies it's crucial to appreciate and actively seek out the insights that new professionals offer.

Their fresh ideas are often the driving force behind groundbreaking innovations and advancements in the sector. If these new voices are ignored or undervalued, the industry risks becoming stagnant and falling behind in a rapidly evolving landscape.

How do you plan to build on the award?

One of my primary goals is to use this recognition to help create a strong community of young professionals within our industry. I plan to collaborate with fellow award-winners and other emerging talent to build a supportive network.

This collective effort will help us share our passion, exchange ideas and drive innovation together. By creating and participating in this network, we can support each other's growth and contribute to the industry's advancement.

Although the future is always a bit uncertain, my approach will be to remain open to new experiences and opportunities.

Could you describe your work with Leonardo?

Working at Leonardo has been a fantastic opportunity for my career, allowing me to be part of a major technological innovation process across various areas and discover new things every day.

Two years ago, I began my career at Leonardo – Cyber & Security Solutions in the software development field, focusing on multi-technology hybrid mission-critical communications networks. Specifically, I designed and implemented a decision-making algorithm to automatically choose the best mobile radio carrier among those available in hybrid technology networks.

This ensures reliable communication between users at an operational centre and those in the field. This project was particularly exciting because it involved optimising critical communication protocols to guarantee reliable and efficient performance in various situations.

Currently, I am working on a project within the Data Intelligence & Monitoring platforms, fully integrated with critical communications solutions. I dedicate my daily activities to integrating different parts of the software and verifying that the entire system operates correctly. This role is very stimulating as it allows me to have a 360-degree view of the entire project. Looking ahead, I am eager to continue contributing to Leonardo's innovative projects and further developing my skills within such a dynamic and forward-thinking company.

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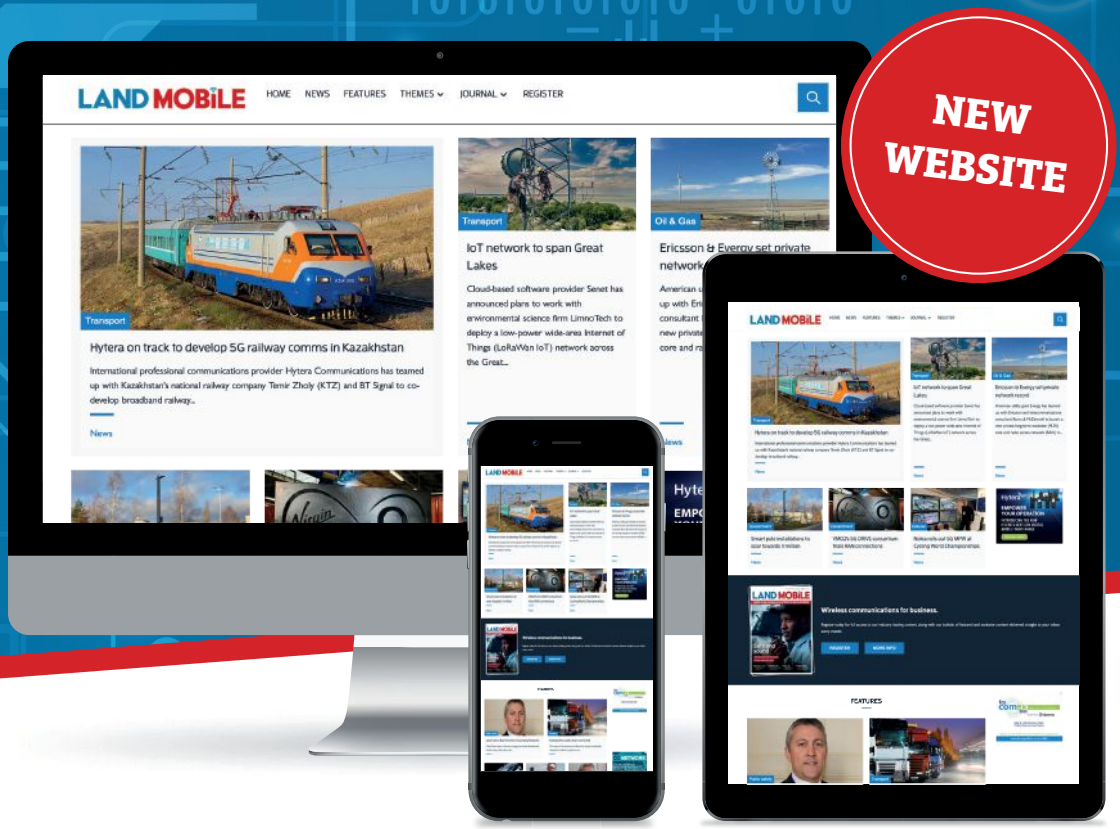

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