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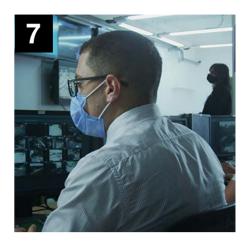The paper used within this publication has been sourced from Chain-of-Custody certified manufacturers, operating within international environmental standards, to ensure sustainable sourcing of the raw materials, sustainable production and to minimise our carbon footprint.

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AUGUST 2022

Long, hot summer

Critical Communications Today editor **Philip Mason** reflects on increasing challenges faced by the emergency services as a result of the steadily worsening climate crisis

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READ MORE ONLINE

Welcome to the latest issue of *CCT*, the premier resource for professionals working in the critical communications sector.

Before beginning the issue, I want to acknowledge the courage of emergency services dealing with such extreme conditions across the course of, what in Europe, has been an abnormally hot summer. In the UK – where *CCT* is published – we have never known temperatures like the ones we saw in late July, resulting in a spate of major fires both in and around the capital, and elsewhere. In mainland Europe itself, meanwhile, even hotter conditions laid the foundations for terrible wildfires across the continent, from Greece to Spain.

Going back to the topic of the emergency services, it is clear that, with the global climate crisis only getting worse, the task of firefighters, ambulance crews and police officers is likely to become even more difficult as we move forward. With that in mind, in this issue we are reporting on several diverse ways in which communications technology can provide increased situational awareness in high-pressure environments such as the fireground.

In the first article focusing on this – which can be found on page 18 – we explore two recently developed products designed to help aggregate real-time, multi-source, mission-critical information for the benefit of fire crews on the frontline. The second feature, meanwhile (page 22), explores the ways in which TETRA technology can be used to monitor personnel and resources across a range of mission-critical verticals using its indoor and outdoor location tracking.

As well as global climate change, another key story of the past – frankly, tiresome – few months has been disruption to air travel, engendered in large part by a lack of staff following the COVID-19 pandemic. At time of writing, one major British operator has announced the advance cancellation of hundreds of flights all the way to October, with airlines occasionally also having to leave passengers stranded at a moment's notice.

This too is reflected in the current issue of *CCT*, via an article starting on page 14 describing current best practice when it comes to the use of critical comms in the airport environment. That of course includes in relation to life critical information, but also technology to keep day-to-day operations (hopefully) running quickly and smoothly.

Enjoy the issue.

Philip Mason, editor

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Who, what, where

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West Midlands Police achieves body-worn video first

West Midlands Police has become the first police force in the United Kingdom to switch on live-streaming on its body-worn video cameras, according to a statement released by its body-worn video provider, Axon.

According to a spokesperson for the latter: "More than 4,000 frontline West Midlands officers and staff have begun to carry the new technology, which will enable anyone with valid operational reasons to livestream footage from incidents they attend."

Speaking of the deployment, chief superintendent Ian Green – who has led the pilot for West Midlands Police – said: "It [streaming] actually really does help.

"We'll be looking at using it in areas where we have people in crisis, so that we can get the right advice and help [to them]."

App enables Interpol database access for UK forces

Police officers from Surrey and Sussex in the UK are using Motorola Solutions' Pronto app to access Interpol's crime database.

According to a statement, the newly added functionality will make the information contained on the database available to around 4,500 officers across the two forces. This includes "millions of international records including warrants, [information relating to] stolen property and threats related to weapons."

Detective chief superintendent Steven Boniface of Sussex Police said: "It takes an average of 1.2 seconds to run a query through the Interpol database using our mobile [devices]. Officers can run a search from any location at any time, leveraging [this] vital source of intelligence to increase safety for themselves and the public."

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Teltronic connects Tavantolgoi coal mine

Spanish telecoms group Teltronic has deployed TETRA to serve a railway corridor linking the Gashuunsukhait Port in Mongolia with Bodi International's Tavantolgoi coal mine, one of the largest untapped coking and thermal coal deposits in the world.

According to a statement, the railway line will run through the most southerly part of Mongolia, along a 250km route. It will support freight transport of up to 30 million tonnes per year.

Teltronic's transport business development director, Felipe Sanjuán, said: "Teltronic has a long history in the development of communication solutions for heavy-haul mining railways. The trust that Bodi International has placed in us only confirms [our] leading position."

SOUTH AMERICA

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Centre of excellence will contribute to economy

Finnish telecoms giant Nokia has announced a partnership with the Indian Institute of Science to create a first-ever Nokia 'centre of excellence' in networked robotics.

The CoE will be based in Bengaluru, and according to Nokia will aim to promote interdisciplinary research involving robotics and 'advanced communication technologies' in 5G and artificial intelligence.

Professor Govindan Rangarajan, director at the Indian Institute of Science, said: "Next-generation communication technologies like 5G and 6G will contribute enormously to the growth of India's economy.

"This collaboration will enable us to explore new frontiers for advanced technology research to benefit society, as well as provide state-of-the-art training to our students."

Airbus collaborates with Indian telecoms provider

Manufacturer Airbus SLC has announced that its Tactilon Agnet 500 device is now "fully operational" in India, in collaboration with telecoms provider Arubaito and Bharat Sanchar Nigam (BSNL).

Speaking of the collaboration, Airbus vice-president for Africa, Asia and the Middle East, Selim Bouri, said: "Airbus is pleased to collaborate with BSNL. Tactilon Agnet 500 is a complete solution, and its deployment in India is a real success thanks to the strength of the BSNL network."

CMD at BSNL, PK Purwar, said: "BSNL is proud to have enabled the deployment of Tactilon Agnet 500 in collaboration with Airbus SLC. This is a real breakthrough for mission-critical communications [being offered to] our professional/enterprise customers."

Argentine police update control room tech

The Santa Fe Ministry of Security in Argentina has contracted Motorola Solutions to deliver its Control, Attention and Dispatch System for Police Emergencies. In a statement, Motorola describes the latter as an "integrated end-to-end emergency management system for multi-agency co-ordination".

Discussing the roll-out, Santa Fe Province governor Omar Perotti said: "Modernising our 911 emergency system is an important step in further reducing our crime rate and achieving our community's goal of building a safer environment."

He added: "Our police officers rely on clear real-time communication to keep people safe, and we are confident that the new deployment will enable faster and more informed decisions."

News round-up

ICCAs reward innovation and service

T he 2022 TCCA International Critical Communications Awards took place at the end of June, at the Kursalon in Vienna. The event was co-located with Critical Communications World, which also took place in the Austrian capital.

Describing the awards, a spokesperson for the organisers said: "As ever, the event celebrated the very best of the sector with awards being given across a wide range of categories. These included recognition for technical excellence as well as for outstanding deployments across a variety of verticals. Awards were also given for individual contributions to the critical communications industry."

TCCA Board chair Mladen Vratonjić said: "There is extraordinary work taking place across the critical communications ecosystem, and it's important that this is appreciated.

"On behalf of TCCA, I thank the ICCAs judges, the winners and those who were shortlisted, and all who entered the Awards this year. I also want to thank everyone who attended the ceremony itself, making it a true meeting place for our global community."

Chair of the ICCAs judging panel, Robin Davis from Actica Consulting, said: "The quality of entries this year was especially high, making the judges' task incredibly difficult. As always, it was an honour to be involved and to help recognise the importance of the achievements taking place within the sector."

In other Critical Communications World-related news, it was announced in Vienna that next year's event will be taking place in the Finnish capital of Helsinki. The location for the event will be the Helsinki Expo and Convention Centre, with the event scheduled for late May.

Discussing the decision to hold the event in Finland, managing director for organiser MA Exhibitions, Tim Willoughby, said: "It is an incredibly important time for the critical communications sector, and there's no more exciting location than Finland.

"Not only are the Finnish authorities one of the frontrunners in the roll-out of national mission-critical broadband, but they also have a strong history of co-operation, both in and outside of the country's borders."

Complete list of 2022 ICCA winners:

- **Best use of critical communications in public safety.** Airbus, for innovative usage during the Dubai Expo.
- **Best use of critical communications in mining oil and gas.** Sepura's SCG22 mobile radios and AutoMate application.
- **Best use of critical communications in transport.** Hytera for its Sri Lanka railway telecommunications project.
- **Best use of critical communications in utilities.** Teltronic for Edesur.
- **Best use of advanced technology.** Telenor ASA's private 5G for search and rescue.
- **Best TETRA device of the year.** Motorola Solutions' mission-critical portable radio, MXP600.
- **Advances in sustainability.** ALDB – CSR, civil protection and innovations.
- **Best MC-X device of the year.** Sepura's SCU3.
- **Best MC-X solutions of the year.** Airbus Tactilon Agnet 500.
- **Best MC-X solutions of the year.** Leonardo Spa's CSP-MCX platform.
- **Champion for equality, diversity and inclusion.** NSW Telco Authority.
- **Control room innovation.** 3020 LifeX by Frequentis AG.
- **Emerging technology.** Ericsson for its mission-critical 5G deployable network solution.
- **Government authority collaboration.** PSBN Innovation Alliance.
- **TCCA young engineer of the year.** Shaunak Patel, NSW Telco Authority.
- **Outstanding contribution to critical communications.** Diana Ball, Sepura.
- **In recognition of outstanding services to TCCA.** Tero Pesonen.

New owners for Sepura

Radio manufacturer Sepura has been acquired by London-based private-equity group Epiris. The group purchased the company from Hytera Communications.

According to a press release, Steve Barber will continue to manage Sepura as CEO. Malcolm Miller – with whom Epiris previously worked as chairman of Audiotonix – will join the company as non-executive chairman.

Discussing the acquisition, a spokesperson said: "The sale comes as Sepura marks its 20th anniversary, having become market leader in over 20 countries with over two million devices deployed worldwide.

"Its portfolio of TETRA radios and accessories is used globally by public safety users in the police, fire and ambulance services. It has also successfully expanded into the commercial space, supplying transport, mining, oil and gas, and utility companies."
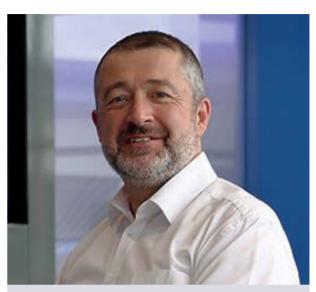
Steve Barber said: "With a growing portfolio of world-class critical communications products and a loyal global customer base, Sepura is well positioned to continue its sustained growth. Epiris's ownership will allow us to increase our investment in new products and technology, as well as expanding our reach into new markets.

"The strengthening of our leading portfolio of TETRA devices, as well as our emerging mission-critical LTE portfolio – all based on our own IP – will spearhead our growth plans. It is a very exciting time for Sepura, our customers and our employees, as we can now compete more effectively worldwide following our return to UK ownership."

Partner at Epiris, Ian Wood, said: "Sepura is in a unique position. It combines extensive public safety knowledge with strong intellectual property and an extensive UK-based R&D capability that consistently delivers best-in-class innovative products. The company's ability to develop new applications and devices that embrace emerging technologies and meet

Steve Barber

customer needs positions it to continue to succeed as a pioneer for many years to come."

Epiris Fund II's current other investments include Appello, Inchcape Shipping Services and The Big Table, the operator of Las Iguanas, Bella Italia and Café Rouge in the UK.

TCCA News

Two international government authorities performing cutting-edge work in the realm of critical communications have joined TCCA.

The first to join, at the beginning of June, was the Canadian Public Safety Broadband Network Innovation Alliance (PIA), which was founded in 2019 by Halton Police, Peel Police and the Greater Toronto Airports Authority.

The alliance established Canada's first dedicated public safety broadband network, with a coverage footprint – according to a statement – of more than 2.5 million residents in Ontario. The PIA also "represents the needs of public safety, first-responders and critical infrastructure operators".

Speaking of the organisation, executive director, deputy chief Anthony Odoardi, said: "We are very excited to join the ranks of our peers in public safety critical communications from around the world. We are looking forward to collaborating with, learning from and sharing our experiences with the dedicated and professional public safety communications operators who are currently members of TCCA.

"In Canada, as in the rest of the world, secure, reliable and high-performance communications for our first-responders and critical infrastructure operators is seen as a critical factor in ensuring the safety and security of our citizens for current and future generations."

The other organisation is New South Wales Telco Authority, whose new membership was announced during Critical Communications World 2022. The organisation manages the state's public safety communications network, which – according to a statement – supports more than 53,000 registered radio handsets averaging 1.33 million calls per month.

A spokesperson for the organisation said: "NSW Telco Authority is a delivery agency responsible for more than $1.5bn in key NSW government projects that connect communities and support emergency services. We lead and co-ordinate the whole-of-government connectivity strategy to bridge the digital divide and help keep people and places safe."

TCCA CEO, Kevin Graham, said: "It is with much pleasure as a fellow Australian to welcome the first Australian government member to TCCA. NSW Telco Authority has significant experience deploying and operating critical communications narrowband networks for government agencies within their state jurisdiction.

"On behalf of all Australian states and territories, the agency is also leading a public safety mobile broadband technical proof of concept trial. We look forward to the insights they can share with our community and between their many global peers who are TCCA members, and also back into the agencies they serve in Australia."

Australian company RFI Technology Solutions has also recently joined TCCA.

Moving with the times

In the year of its 75th anniversary, **Philip Mason** talks to Frequentis's vice-president of public safety, **Robert Nitsch**, about the company's origins, and the fundamental differences between the air traffic and public safety sectors

Frequentis is in the process of celebrating its 75th anniversary. Could you discuss the origins of the company and how it has developed over the years?

The company was founded in Austria in 1947 by two young engineers [Emanuel Strunz and Walther Hamm], during the recovery phase after the end of the Second World War. The two of them built the business according to a particular mantra: we build everything that this young republic needs.

Several years after that, once the occupation had come to an end in 1955, there was a need for communications with air traffic again. I don't think the capacity in the country at that time was huge, but it was still a need, and we decided to help address it as a company. That offering progressed and became more sophisticated going into the 1980s with the arrival at Frequentis of Hannes Bardach.

Could you provide some background on Hannes Bardach for those who don't know?

Mr Bardach became Frequentis MD in 1983, subsequently taking ownership of the company three years later.

He came in initially as a consultant, designing a new system involving a hybrid micro-processor, analogue audio switch and so on, which in turn became the VCS 2020. We were able to use that to capture the Austrian market, as well as becoming increasingly successful in other countries.

For instance, at the same time, a German telecom company got a similar contract to provide air traffic communications technology in Germany. They couldn't get their system up and running within the requisite time frame, so they approached us and we ventured into the German market. That was around 1990.

Has the way in which Frequentis develops technology evolved over the years? What does the strategy look like now compared to 30 or 75 years ago?

We continue to maintain a huge emphasis on research and development. A big part of that is a real appreciation of employees' entrepreneurial spirit, and the opportunity that we give them to come up with new ideas and new technologies. This is an engineering-driven company – it

always has been and it still is. At the same time, mission critical is also a clear part of our DNA, and we test the technology against that criterion the entire time. Going back to our employees, everyone in the company is thinking about what happens if something fails. Is there a back-up? If not, why not?

Honestly, this is not a natural approach for a business, but we live it every day. I had to learn it as well when I was a young programme engineer. My first trip when I joined the company was to Frankfurt airport, and meeting the people who are actually responsible for flight safety at the sharp end, you realise how important the work is.

Given the success that Frequentis already had in the air traffic space, why did the company decide to diversify into public safety?

Over the course of the 1990s and the 2000s, we had one fundamental goal, which was to reach a certain size as a company. We achieved that, primarily because of how successful we were in expanding our air traffic control effort, at which point we started to look at diversification.

We were obviously focused on mission critical, so we started looking into areas where the same mindset was required. That naturally meant any other kind of transportation – public transport, maritime – but also public safety. We pursued success in those adjacent domains, and honestly, it didn't take long.

Is there an element of risk inherent in that kind of diversification?

You naturally want to grow as a company, looking for ways to increase your business, thereby providing a stable future environment for your employees. In my own experience, I was in a similar situation – albeit on a smaller scale – when I took over responsibility for building out our subsidiary in the US. Ultimately, you start the programme, put it into place, bring employees along. And when you've done that, you do it again – that's how you grow your company.

What has been your biggest public safety contract so far?

Our biggest success in relation to public safety so far

took place in 2005, when we won the contract for the Metropolitan Police. That is a huge organisation – more than 30,000 field officers and 500 radio dispatchers, responsible for more than 14 million people. Again, for us, that's not so much a job as a calling.

The Met's requirement was three control centres, networked together and connected to the TETRA infrastructure. We participated in the procurement, which took place in 2002/2003, and weren't selected after the first round. As it turned out, the company that was selected couldn't achieve the requirements, so in 2005 we were asked to jump in.

We were given two years to build the system and bring it into operation, which we did. And the system is still running. We also won the re-compete for tender in 2020, and will replace the Frequentis ICCS 3020 with our newest multi-media platform, LifeX.

What would you say are the key differences between air traffic and public safety?

There are key differences between the two, and they have very different missions. They each have their own domain knowledge, operational concepts and so on, which are very specific to them.

At the same time, both sectors have the same basic requirements when it comes to the communications technology they use. It has to be reliable, redundant and so on.

So, while it was a natural move for us, there was also a lot of learning. There are always new things to learn working in the field of mission-critical communications, which helps keep spirits up. We're not getting bored, I tell you.

Which of the two sectors is more risk averse when it comes to the adoption of new technology?

As a general rule, I'd say that both sectors are quite risk averse. At the same time, public safety moves towards new technologies quicker than air traffic control tends to.

Aversion to risk also seems to be different depending on where in the world the organisation in question is operating. Generally speaking, new innovations tend to be adopted more

Both public safety and aviation are keen to leverage standards-driven technology

quickly by America and the UK, and then – moving around the world – to places such as Australia, and eventually Europe. I think the most risk-averse people are the Europeans.

An illustration of that is the adoption of new trends such as software as a service. SaaS is a massive talking point for everyone at the moment, but it's really in the US and the UK where it is mainly being deployed [in a mission-critical context].

As well as being risk averse, both public safety and aviation are keen to leverage standards-driven technology, and that can take a long time. For instance, from the initial idea of a standard to the point where it's really ready, you're talking between 10 and 20 years.

If you look at NG 911/112, for example, the original meeting for the blueprint architecture took place sometime in 2000. After that, the first finalised documents came out in 2007, after which the NENA Plugtests began, of which there have been around 10 at this point. It's been an extremely long process.

With public safety now increasingly starting to use broadband-based technology, what's the expectation from the user perspective? How has users' experience in their personal lives informed what they now expect at work?

The private use of smartphones and smartphone apps and their use within the mission-critical context are two very different things. For instance, before adopting any new piece of technology, public safety organisations have to follow procedures and take account of operational concepts. You can't just use something [as you would at home] – it has to be thought through.

That includes questions around who is using the technology, when it's being used and so on. Likewise, the information used during communication has to be encrypted, captured, traced and [enabled for] use as proof in front of a judge.

In terms of user expectation itself, that is certainly higher in relation to broadband, because – as you say – they already have experience of what they can do with it in their non-professional life. The first stakeholder which has to overcome that is the user organisation itself, which has to

Adobe Stock/Ian

explain the safety-critical context when it comes to the use of technology.

At the same time, we as manufacturers are also challenged because of the need to differentiate between what the app is and what you use it for. Is it used as mission-critical or just a supporting application for the mission in question?

Frequentis has been heavily involved in BroadWay, the pan-European project to provide cross-border communications for the emergency services. What part have you personally played in that?

It's been an extremely important project as far as I'm concerned, both from the 'public' side of contacting the emergency services, and from the dispatching side.

We started looking at the [integration of broadband into emergency operations] around 2015, at the time of the initial development of ESN. At that point it was a general interest in how the technology was going to develop, and what the general requirements were going to be, compared to TETRA. That included infrastructure, applications, devices and, of course, the control room.

As part of that process of looking at how the radio side was changing, we also engaged with the standardisation bodies, as well as participating in the MCX Plugtests. There was a lot of learning from other companies to come out of that, and we also started to build a relationship with Nemergent, which was one of the companies we partnered with during our work on BroadWay.

Our involvement in that project was a natural progression following our experience with the emergency services, and with our background in TETRA.

Frequentis's largest public safety contract is with the Metropolitan Police

Has your involvement in the BroadWay project given you any particular insight into the needs of users that you wouldn't necessarily have had before? The initial stage of the project involved surveying operational need across the continent, after all…

We did, and that absolutely helped us with the development of our products going forward. Seeking out cross-connections between domains is also a really fruitful approach. There are certain elements in air traffic which in public safety you would never think about. But when you engage a little, you see that it has merit.

How do you see Frequentis progressing from here? What are the immediate ambitions for the company?

Going forward, we have high aspirations of expanding our product portfolio even further, to better serve the air traffic, public safety and defence communities.

We took the company public [in 2019], and last year acquired elements of L3Harris Technologies, specifically around voice communication product lines. As a result of the latter, we now offer a much broader, more consolidated solution.

Specifically on the public safety side, we became a majority shareholder for [computer aided dispatch specialist] Regola, at the beginning of 2022. In terms of the market, currently our main focus is in Europe, the Middle East, and a little bit of Asia.

We want to expand more globally, however, specifically in instances where we're very much in the country already, such as our presence in Australia. ◉

Reaching for the sky

In the middle of a time of flight disruption, **James Atkinson** gives an overview of the critical communications technology used by airports to function safely and effectively, and respond to emergency situations

Airports typically have very similar, if not quite the same, critical communication requirements depending on their available budget, according to Joseph Ferri, business development manager with systems integrator Affini, which owns and operates networks at 22 UK airports.

"The one area where the importance and focus is unified is in the critical communications area," says Ferri. "If there is an incident at the airport, regardless of whether it is a cash-rich or cash-poor airport, they need to respond to those critical incidents with the same priority, because human lives are at stake."

Airports currently deploy a mix of radio standards and technologies to support their communications needs, but voice services are still dominated by dedicated two-way radio networks such as TETRA or DMR, although Ferri says PoC devices are also used.

"The beauty of private TETRA or DMR networks is that if there is an incident then that could result in a massive use of bandwidth. Therefore, airport operators want robust and proven technologies to ensure they do not have an issue while they are using their radio devices," he says.

"5G will emerge into that space and things will progress in that area, but certainly for the foreseeable future I think we will see a mixture of technologies," says Ferri, "but what is non-negotiable across all of them is the fact that they must be robust."

Instant PTT voice and messaging services are essential for co-ordinating a fast response to any kind of incident at the airport, as well as enabling tight flight schedules to be met. Ensuring the security of the airport is paramount, as any kind of intrusion is likely to force closures, causing loss of revenue and huge disruption to passengers and cargo.

Unauthorised drone intrusion

Security is provided by perimeter fences, video cameras, access control systems, geofencing, audible alarms, and so on. Touch or motion detection sensors on perimeter fences complement human patrols by sending automated alerts. CCTV and – in the near future – live video streaming from 5G-enabled cameras will provide much greater situational awareness across the airport. But the vertical space also needs monitoring to detect unauthorised drone intrusion.

For the time being, geofencing using PMR or LTE networks, along with people and asset tracking, are a major help in enhancing both daily operations and for aiding emergency response. Ferri continues: "We are looking to understand the topography and topology of the airport and track people within that, because if there is

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"At present, most airports deploy multiple networks to support different radio standards"

enables monitoring, not just of vehicle performance, but also driver behaviour. If the driver is driving, accelerating, breaking or cornering too fast or enters a restricted area, an alert is sent to both the driver and to dispatchers.

Affini has developed a security application based on vehicle telemetry and the driver's airport access security card. "Each vehicle has different driver qualifications," explains Ferri. "For example, a pushback tug for an Airbus A380 requires different qualifications to a pushback tug for a Boeing 737.

"So, we developed a solution whereby the driver swipes onto the vehicle with his security card, but in doing so it checks his driver qualifications. If he does not have the right qualifications for that type of vehicle, it won't start. That provides a first-level preventative type of security."

Achieving aircraft turnaround targets is fundamental to airport operations. If an aircraft misses its turnaround slot, whoever is deemed responsible, either the airline or the ground crew, is fined.

But geolocation with timestamping of recorded voice – or video – traffic will reveal whether the ground crew fulfilled all its specified tasks on target. The technology records the evidence and provides the proof, which has a direct impact on financial considerations for airlines and operators.

The role of 5G

At present, most airports deploy multiple networks to support different radio standards, so it is not hard to see why some argue that the migration to 4G/5G networks will make operations easier.
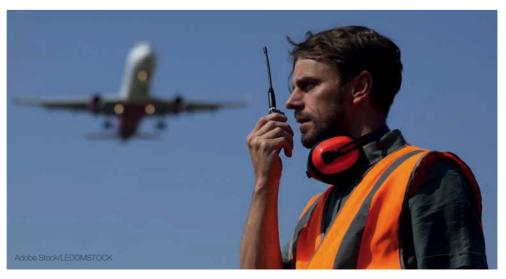
Stefan Krinjen, industry and ecosystem manager at Ericsson, says: "To really improve productivity, optimise operations, support autonomous operations, and really innovate on the customer experience side so they have a seamless experience, there really is no other way than to digitalise processes."

Krinjen continues: "An airport needs to provide stellar infrastructure to airlines, to maximise capacity and be as efficient as possible. But when you start to digitalise processes, you need to have connectivity that supports that.

"You need to put sensors on all types of assets. You need to ensure you have process optimisation capabilities, and you really need to be able to collect large amounts of data to give you the insights that allow you to utilise real-time information. We think you can only do this with industrial network connectivity."

Krinjen says that existing 4G networks can support a lot of individual applications, but airports are a good example of where multiple applications need supporting at the same time. To really scale up, airports will need the increased bandwidth, low latency and support for massive IoT provided by 5G.

Ericsson's 'Connected Aviation' report from July 2022 identifies ▸

an emergency it is important to know where assets and people are in relation to that emergency. Who can help? Who can aid first-responders and so on."

Geofencing allows the airport operator to set different speed limits in different areas or restrict access to some parts of the airport to authorised staff only, which can be monitored in real time by tracking personal radios or via vehicle geolocation and telemetry. "Drones are enabling the emergence of 3D geofencing. We can start to understand 3D space by seeing what is approaching at height, so we can monitor not just on the ground but in the air," adds Ferri.

The ability to create a dynamic geofence via the radio dispatching system is a crucial asset in dealing with incidents. "The dispatcher may be talking to baggage handlers on one channel and bus drivers on another and there is an incident at Stand 10. The dispatcher can draw a circle around Stand 10 on his touchscreen and create a dynamic talk group. Being able to broadcast to everyone in that area is a very powerful feature," observes Ferri.

Harnessing vehicle telematics data

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aircraft turnaround delays as the most significant barrier to growth and efficient operations. For Krinjen, the "sweet spot" of airside operations offers operators the best return on investment in a private 4G/5G network. Ericsson's vision for 'Aviation 4.0' is based on improving productivity, driving economies of scale, innovating to improve the passenger experience, and enhancing safety and security.

An airport comprises many different but interdependent organisations, and aircraft turnaround is where many of them come together. To enable them to all work more efficiently, what is required is connected assets to make real-time, dynamic scheduling possible, as well as maximising asset utilisation by ensuring only what is needed is deployed.

Integrated real-time communications increase operational efficiency, reduce delays and operational costs. More efficient digital load control enables faster aircraft maintenance, resupply, baggage and passenger on/offload. Transferring flight data (anything from 500Gb to 1Tb) is a slow process at the moment, but 5G with edge computing will allow fast bulk data download and upload.

"If you look two or three years ahead, we also see AGVs running around the airport as opposed to manned vehicles," says Krinjen. "Baggage handling systems will become much more flexible. The baggage installations they have now are fixed and massive, but they could be replaced with automatic baggage runners that just hand over the baggage to where they need to go."

Private 4G/5G networks at airports are still rare, but Groupe ADP is installing one at the three Paris airports it owns: Charles de Gaulle (CDG), Orly and Paris–Le Bourget. The network will connect more than 120,000 people and around 1,000 tenanted companies.

Project manager Hub One Digital Technologies, a Groupe ADP subsidiary, is developing the private network using Ericsson radio equipment, Athonet cores at CDG and Orly, Streamwide's MCPTT application, with Italtel as systems integrator.

Grégoire de la Crouée, business line director at Hub One, explains that

network roll-out has been prioritised at CDG and Orly.

"We now have full outdoor coverage at CDG and Orly. The indoor coverage at Orly is done, but we still have work to do at CDG, as it is a big airport. It will be finished by the end of 2023," he says.

A number of applications have been migrated, including the geolocation system used by all airside vehicles. "This localisation is managed by the control tower and is very important for the safety and security of the airport, as it enables drivers to pass on information about any problems they can see on the aprons and taxiways, such as a broken light," explains de la Crouée.

The baggage reconciliation system is also now running on LTE. Scans of baggage and passenger ticket barcodes ensure that both the passenger and their luggage are on the same flight. If the passenger hasn't boarded the aircraft, it

might indicate a possible terrorist bomb in the baggage.

MCPTT, MCVideo and MCData are critical, both for day-to-day operations and to deal with emergencies. The Streamwide PTT services operate on specific QoS criteria to ensure that MC data is always transmitted at a higher priority than any other traffic on the private network.

"Thanks to that, all the field agents can communicate immediately," says de la Crouée.

He adds: "Thanks to the LTE network we can now very easily download all the documentation relating to the aircraft's performance. This is a quick win, but we are also working on remote maintenance and we would like to introduce AR glasses to allow engineers to be guided by remote experts."

Efficient aircraft turnaround times are at the heart of a properly functioning airport. A short-haul flight has a turnaround target of less than 40 minutes. Hub One has directed outdoor LTE base station coverage around the nose of the aircraft to ensure both sides

Some airports have faced huge disruption in recent months

"Efficient aircraft turnaround times are always at the heart of any properly functioning airport"

Adobe Stock/06photo

Drone detection and counter-drone measures

Drone incursions have become one of the most disruptive problems facing the aviation industry. On 19 December 2018, two drones appeared over Gatwick Airport in the UK. The airport suspended all flights and ended up being closed until 21 December, which affected 1,000 flights and disrupted 140,000 passengers. Since then, airports have been scrambling to improve drone detection solutions and develop effective countermeasures.

The Airports Council International's Counter Drones Knowledge Centre highlights a number of detection and mitigation options. Airports are adopting layered options that may combine radar, RF, audio, acoustic, cameras and artificial intelligence (AI) for detection with a variety of mitigation options.

The main detection options include:
- Radar. The primary means of detecting an unauthorised drone at distance, but it requires a skilled operator and does not help with finding the drone pilot
- RF scanners. A cost-effective solution for detecting, tracking and identifying a drone over an average detection range of 1-3km
- Optics/infrared (IR). Electro-optical sensors use a visual signature to detect drones, while infrared sensors use a heat signature
- Acoustic detection. Uses acoustics to detect the sound of drone motors.

The main counter-drone measures include:
- Electronic jamming to disrupt both RF and GNSS links
- Manipulation of a drone by remotely impersonating its remote control
- Kinetic mitigations – intercepting drones by physical means, including live fire; attack nets (carried by another drone); autonomous kinetic interception methods; lasers; birds of prey
- Geofencing.

Adobe Stock/Richard Johnson

are covered as well as the inside of the aircraft, which is not easy as it acts like a Faraday Cage. "This is providing a much better performance than we could achieve before using outdoor Wi-Fi," says de la Crouée. "The feedback from crews has been really positive and it is completely changing what we had before."

Checks conducted by ground-handling crews and airline crews used to be done using pen and paper, but this has now all been digitised with personnel using PDAs to validate and conduct checks. This is faster and leads to lower error rates, which is boosting operational efficiency.

Ensuring perimeter security is a major task, meanwhile. At present, CDG detects intruders using sensors, which trigger an alert if they touch the perimeter fence. "In the future, we will add video as well to provide a 360-degree view around the airport," says de la Crouée.

Another major safety concern is foreign object detection (FOD) – small objects on runways that can cause major accidents. For example, the

terrible Concorde crash at CDG in 2000 was caused by a metal object on the runway that punctured a tyre, which then caused a fuel tank to rupture.

Currently, a vehicle has to go out several times a day to inspect the runways to try and spot FODs just using the human eye, which is likely to prove both difficult and time-consuming. "The idea now is to add some high-definition cameras with AI to recognise small objects on the airfield, geolocate them, send an alert, and then someone can go out to pick it up before the next aircraft takes off. It is the automatisation of FOD,"

explains de la Crouée. He concludes: "We are really seeing a shift happening, and that is very promising." That said, the Paris airports have not phased out their TETRA radios, Wi-Fi or DECT phones. "There is a lot of migration to proceed yet," he says, "but we hope to switch off the TETRA equipment, for example, by 2024."

The Paris airports are clearly looking like a good indicator of how airports are likely to evolve their critical communications and emergency response in the future. ⦿

Unblurred vision

Philip Mason speaks to an innovative manufacturer of solutions to facilitate fireground situational awareness, developed in light of the Grenfell Tower disaster

Earlier this year, *Critical Communications Today* published an interview with radio manufacturer Tait Communications regarding a newly developed piece of technology, designed to provide continuity of radio communication to the fireground.

As those who read the article will remember, production of the solution was – at least in part – informed by recommendations following the Grenfell Tower fire, specifically around firefighters talking to commanders on the ground.

Another piece of learning to emerge after that horrendous day, meanwhile, centred around the need for increased situational awareness, as well as the ability to share known risks in real time.

This has been the driver behind another newly developed piece of technology, in the shape of IRIS by Unblur.

Discussing its IRIS Core, and IRIS Tactics products, the company describes them like this: "IRIS is a software that centralises all data tools in one single place, allowing incident commanders to obtain real-time situational awareness.

"[Designed to be used on Android smart devices], IRIS Tactics bridges tactical and operational commanders. It is a communication bridge between resources deployed in the field, and advanced commander centres and strategic teams."

The Unblur story is interesting for a variety of reasons, and not just because of the technology itself. For *CCT*'s purposes, one primary point of interest is just how closely the company has worked in conjunction with user organisations to get its product over the line.

Indeed, one of its executives is a former lead technology officer for Mid and West Wales Fire and Rescue Service.

Also compelling is the way in which Unblur is attempting to build 'agility' into how it supplies its clients. While certainly not the only company to leverage an 'as a service' model, it is calibrated – at least according to its CEO – to provide the model of a 'set and forget' solution.

Risk critical intelligence

Steve McLinden is account executive for Unblur. He is perhaps most well known for his work leading the Mid and West Wales FRS Transformation2020 project.

Going into greater depth about the Unblur products' functionality, he says: "IRIS comes in two parts. Firstly, there's IRIS Core, which is a desktop, Google browser-based application. IRIS is essentially an information bucket, with all the data collected into one place, updated in real time and distributed out so that everyone [attending an incident] can see the same thing.

"Alongside that, we have the IRIS Tactics app which goes on an Android device. This turns the phone or tablet into a real-time GPS tracker, as well as a body-worn streaming camera, while also carrying out mapping."

He continues: "The idea is to enable incident commanders to start capturing risk-critical information on the fly as they move around an incident. It also allows them to see the location of other resources that are available and being tracked. For instance, incoming appliances.

"The platform is designed to be used from the very first decision to the very last. It's designed to have an open infrastructure, allowing information to be ingested from multiple sources. So, for instance, if a GPS location can be

shared, it can be shown. If video can be streamed, we can incorporate it and then service it within our platform."

According to McLinden, as well as 'information sources' derived straight from the scene, IRIS users also have access to pre-integrated data, such as fire survival guidance, as per the recommendations post-Grenfell. The JESIP (Joint Emergency Services Interoperability Programme) dashboard is included as well.

Perhaps most importantly – at least according to McLinden – is the inclusion of a "fully embedded analytic risk assessment capture form", linked to the UK's national operational guidance scenarios.

Elaborating on this, he says: "When you look at the Grenfell Tower report, one of the things that came out of it was the need to share risk information in real time. We want to help firefighters on the ground carry out a much more informed ARA [analytical risk assessment], rather than just handing a clipboard to someone who looks like they haven't got anything else to do. This makes the whole thing more meaningful."

One organisation which has clearly been impressed with the technology is London Fire Brigade, which, as no-one will need reminding, was the FRS in attendance at Grenfell. It has recently signed a commercial agreement with the company to provide the brigade with IRIS Core for 10 years.

The UK Fire Service College has also recently chosen the incident command software to incorporate into its teaching programme. Discussing this, McLinden says: "We're incredibly proud to have been chosen by the college. If you attend their incident command school now, the backbone of that course is IRIS.

"We continue to work very closely with them to make sure that we draw out all the learning from their experience. We want to keep one step ahead of the game at all times."

Information-based functionality

Unblur's technology is designed to provide a variety of information-based functionalities, both for those occupying command positions and on the fireground itself.

Just as interesting, however, is how the company has deliberately attempted to build the ability to be

> The company wants to be seen as being on the same page as users themselves

The Grenfell Tower disaster

The Grenfell Tower fire took place on 14 June 2017 in North Kensington, west London. According to figures released following the disaster, it took the lives of 72 people, with many more also suffering from injuries.

Fire officials believe that the fire started on the fourth floor of the 24-storey tower at around 1am, with the initial cause of the blaze being a faulty fridge freezer. Subsequent information released about the tragedy indicates that the flames caused by the burning appliance escaped the kitchen window, subsequently spreading up to the 11th floor via the building's exterior cladding. By dawn, Grenfell Tower was completely in flames.

London Fire Brigade's preliminary report into the fire – as quoted on the Big Issue website – described it as being "of a scale and rapidity that was exceptional".

agile into its business model. It clearly also wants to be seen as very much on the same page as users themselves, as demonstrated by the company's product development process.

Discussing the latter, Unblur CEO and co-founder Alfonso Zamarro says: "We've spoken to a lot of chief fire officers, and we always have to bear in mind it's not just a matter of their taking the technology and using it.

"We have to take their internal processes into account, while also making them aware that those will need to evolve as well. One example of that is that with our solution, officers will no longer need to ask for multiple forms because there is a single feature in IRIS that can do all of that.

"It's important that user organisations can evolve their way of working, but also that the supplier can do this internal work. It's operating according to a particular mindset."

Continuing on the same theme, McLinden says: "This solution has ultimately been designed by firefighters for firefighters. In the first instance, Alfonso and myself drew up the original specification, working with Mid and West Wales.

"More recently, we've been working with Shropshire, and Hereford and Worcester FRSs. The way in which the Fire and Rescue Service operates is changing all the time, and we want to bring digital technology that allows them to operate in a different and more effective way.

"There's a lot of firefighters in the brigades that we've worked with who can look at the platform and say 'You see that button? I asked for that.'"

According to both McLinden and Zamarro, a key part of the design process is to build in the ability for the technology to evolve, in something like real time. This, likewise, speaks of empathy with the user, not just from an operational perspective but also from the point of view of obtaining efficiencies.

"When our customers buy our system, they're not buying a licence, they're subscribing to what we provide," says Zamarro. "The idea is to provide ongoing tech support. Plus, we have a team whose job is to spend time with the end-users themselves, finding out what their specific needs are, and what they're likely to need going forward."

He continues: "We take feedback and ideas, create prototypes, test it with our end-users, and develop features around those ideas.

"All that is included in the platform that they will use, available after a few months.

"Our job as manufacturers is to make sure that the technology is as relevant after 10 years as it is when it was first developed. That's another area where we try and take the burden off the user, so they don't have to keep up with the latest developments in the field themselves."

Unblur is an interesting company, with its products intended to fulfil the crucial need for increased situational awareness at various different levels of incident command and response. Its business model also gives a strong indication of the increasingly user-focused direction likely to be taken by manufacturers and developers going into the future.

Building resilience

In an exclusive interview, CCT gets an update on the UK emergency services coverage piece from EE/BT's MD for ESN, **Richard Harrap**

Richard Harrap

Has being an ESN core contractor changed the way that EE operates as a business/provider of broadband coverage?

Our involvement in the Emergency Services Network has really forced us to consider how we run our network. At this point, it's not simply a question of providing more masts, but how we engineer the entire thing. This isn't just a commercial network, it's critical national infrastructure.

What does that shift mean in real terms?

Essentially, it means being ruthless, driving out every fault in the network as quickly as we can. That includes being super-proactive about sites, engaging in preventative maintenance, and continually looking at places where we can improve. Again, this is critical infrastructure, so we have to look at everything through the lens of someone's life depending on it.

One way of doing that is preparation for any potential equipment failure, for instance looking at how to locate spares in a more agile and diverse way.

Following the initial signing of the ESN contracts back in 2015, one of the key areas of concern for users was signal availability across what, at the time, was considered to be 'just' a commercial network. Given the progress that's been made on coverage, to what degree have they been reassured?

I would say that they have been reassured. We continue to do a lot of work with users in the background – as does the Home Office – with the primary aim of providing exactly that kind of reassurance. The whole operation has matured considerably since 2015/2016.

Regarding coverage, we have the ability for enhancements to be much more data-driven now because of how much information has become available in recent years. In large part, that has to do with the ESN coverage testing programme, Assure, which has put devices in users' hands and enabled them to feed back any concerns.

What specific user concerns have there been since the beginning of testing?

In the vast majority of cases, we've been able to ascertain that

> From an ESN point of view, the upgrade programme is nearly finished

any problems raised within contracted areas were not related to the coverage itself but something else. For instance, maybe a site was down for maintenance at a particular time, or the handset being used for testing wasn't configured correctly. However, we're not complacent and will continue to work with users to improve coverage for their critical operations.

What does EE still need to accomplish in terms of the coverage responsibilities?

From an ESN point of view, the upgrade programme is nearly finished, although we will continue to upgrade sites to provide overlapping coverage. Geographically, we've got something like 80 miles of road left to cover across the entire country, which will be covered by new sites we have built but are not yet live.

Would you say that users are satisfied with the priority and pre-emption functionality which has been put in place?

We're certainly confident in the priority and pre-emption measures which have been included in the system. We want to continue to test that at mass events, something which obviously hasn't been possible over the last couple of years. Again, it's a matter of giving the users confidence, rather than necessarily evolving the technology.

The difficult bit is getting the end-to-end service working with the right software, which will enable really accurate testing. Could you make a PTT call from where you thought you should be able to? Was the voice quality up to the correct standard?

Resilience has been another key area of concern, particularly given perceived difficulties when it comes to 'hardening' a commercial network. What work has been carried out in that area?

In terms of the radio network itself, there's a natural resilience which comes with overlapping coverage. Regarding the core, ESN is completely separate from our commercial offering, so if there's an issue with the latter, it won't touch emergency services users.

At the same time, if we lost the ESN core for any reason, we could then flip it onto the commercial core. There are multiple layers built in – a response to each 'if'. ◉

Right place, right time

Continuing this issue's theme of situational awareness, TCCA's TETRA Applications Group – led by Portalify's **Hannu Aronsson** – offers a deep dive into TETRA's ability to provide both indoor and outdoor location tracking

Real-time situational awareness is important for increasing operational efficiency and helping to ensure the safety of first-responders and mobile workers. Knowing everyone's location continuously is a critical part of situational awareness for public safety and business-critical users.

Location tracking is often called AVL (Automatic Vehicle Location) or APL (Automatic Person Location). Typically, locations are displayed and updated on a dynamic map within the control room, along with other important data such as activity status and incident information.

Real-time location tracking for enhanced situational awareness

TETRA has the most advanced data features in the land mobile radio (LMR) space, including support for location tracking of TETRA radios with a standardised protocol. This makes location tracking practical on all sizes of TETRA networks, right up to large national public safety networks, with many different user organisations using different equipment.

TETRA location tracking has been designed from the outset specifically for mission-critical users. The direct benefits of accurate, up-to-date location tracking include:
- Quicker response to incidents by being able to dispatch the nearest suitable unit or person
- Worker safety is enhanced by knowing where staff are when an emergency happens
- Ensuring that staff are covering every part of the operational area
- Quickly selecting and viewing the nearest CCTV camera for visual monitoring.

There are also many indirect benefits. These include:
- Being able to assess the efficiency of mobile staff and analyse incident response activities for continual improvement of operations
- Archive audit trails to confirm that patrol routes have been completed
- Raise operational performance by being able to work more efficiently
- Reduce risks and insurance premiums with effective lone-worker safety.

Outdoor location

The most common location tracking solution is the Global Positioning System (GPS), as well as other satellite-based systems. Satellite location works best outdoors. Most TETRA radios available on the market today support satellite-based location tracking.

Many TETRA radios support other navigation satellite constellations such as Galileo or Beidou, in addition to GPS, providing additional outdoor satellite location capability and serving users in different regions of the world.

Some location applications support reverse geocoding, which converts GPS co-ordinates into more convenient street addresses.

Indoor location

Indoor location tracking solutions enable staff locations to be available when they are working in, for example, airports, tunnels, museums, metro systems or factories. There are several indoor location solutions available for TETRA radios, including:
- GPS repeating solutions which enable the TETRA radio to keep receiving satellite location signals when indoors (possibly with less accuracy). This requires installing the GPS repeating solution inside the building
- GPS repeating solutions can also ensure satellite (for instance, GPS) signal lock for vehicles in garages,

Adobe Stock/Kadmy

"Geofencing can be done in the control room, or even the TETRA radio itself, depending on the model"

Indoor tracking solutions may be combined with satellite-based systems to enable location of personnel and vehicles wherever they are working.

Location-enabled radio features
Other TETRA radio data features also work with location information, for example the 'man down' alarm or an emergency call being configured to automatically send the location to the control room when initiated. This means up-to-date location information along with the alarm will be delivered, enabling help to be sent more rapidly.

For vehicle use, TETRA radios allow other devices to read GPS location using the TETRA standard PEI (peripheral equipment interface) serial port interface. This reduces the number of devices that need to be installed in a vehicle.

If pooled TETRA radios are used, rather than personal issue radios, users can log on to the radio with their employee or police ID number. The location tracking can then track the user and not just the radio, and show the current user's name on the map. Tracking people, not only radios.

Location-based actions
Geofencing is a powerful tool to manage TETRA radio features based on the users' location. Geofencing can be done in the control room or even on the TETRA radio itself depending on the model.
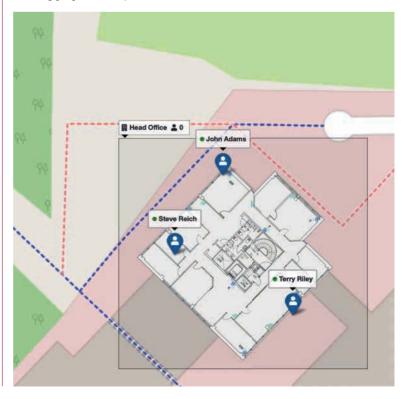
Examples of geofence functionality include:
- Changing talk group when the user enters or leaves a location
- Showing a reminder message if the user enters a hard-hat area
- Reminding users to select the incident-specific talk group when leaving their home region to support larger incidents
- Open gates when authorised vehicles or users approach the location
- Alert if buses leave their planned route.

TETRA's standard LIP location protocol
TETRA has been designed specifically for mission-critical operational use, including location tracking support.

Location information protocol (LIP) is a TETRA standard protocol between radios and control rooms

ensuring immediate location updates the moment they leave to attend an incident
- Device tracking solutions using Bluetooth, which can be used to track TETRA radios with Bluetooth support. These systems will require installing active tracking stations in the relevant locations
- Some TETRA radios supporting indoor location tracking, using industry standard Bluetooth beacons and/or Wi-Fi access points. Existing Bluetooth beacons and Wi-Fi access points can be used in-building. Or, low-cost battery-powered Bluetooth beacons added – with five-plus years of battery life – for quick and easy deployment
- Examples of TETRA radios that support indoor location tracking with Bluetooth beacons include Sepura's SC20, SC21 and SCG22 series, and Motorola's MXP600, ST7000, MTP3000 and MTP8000Ex series. This is also a great example of how the interoperable-but-competitive TETRA market can provide advanced features and capabilities to TETRA users, based on their specific needs.

Right: View showing indoor location on a building plan map (portalify.com)

> ## The standardised LIP allows radios from any TETRA vendor to be tracked from a control room

intended for location tracking. LIP has been designed to provide best-quality location data on a narrowband radio network for public safety operational needs.

The standardised LIP allows radios from any TETRA vendor to be tracked from a control room. This enables centrally managed location services for large TETRA networks with multiple organisations who may use different TETRA radios.

LIP allows the control room to control remotely when the radio will report location, based on parameters such as unit status or task priority. LIP supports both time- and distance-travelled-based triggers for location updates, which allows both moving and stationary units to be tracked efficiently.

LIP provides more data than just latitude and longitude. LIP location reports include speed and direction and the reason why the location was sent. This could include distance trigger, emergency call, or I/O connection state change on a vehicle radio from an external integration.
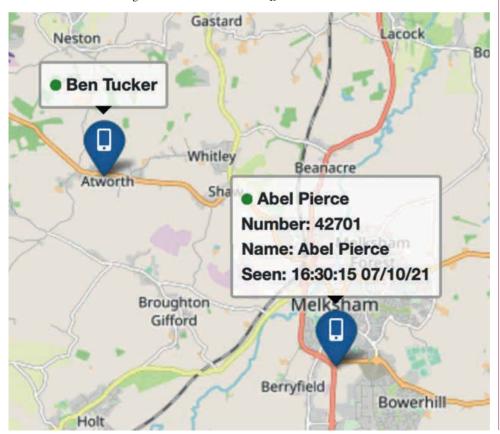
LIP also supports out-of-coverage location history buffering. This means that the TETRA radio can collect location data while out of network coverage, and the radio will send the location trail data to the control room when it comes back into coverage.

The LIP protocol is designed to be efficient over a narrowband TETRA network, using small data packets to enable many radios to send their location over the network. This allows the tracking of large numbers of radios or vehicles, for example in public transport where location data can be used to provide up-to-date information to the public in addition to the control room.

TETRA location summary

TETRA enables mission-critical indoor and outdoor location tracking of staff and assets in order to increase effectiveness, efficiency and safety of mobile operations. Standardised location tracking means maximum use of users' investment in TETRA. ◉

Below: View showing outdoor locations on a map (portalify.com)

TETRA location tracking supports multiple verticals

Examples of how TETRA location capability can serve many different verticals:

Public safety
- Provide quicker response by choosing the nearest suitable resource
- Location information always available over the secure mission-critical network, even during incidents or natural disasters
- Know where all officers are, to prepare better, and provide higher job safety.

Transport
- TETRA can track every bus, tram and ferry location for up-to-date travel information
- Identify traffic delay issues based on comprehensive location information
- Provide real-time traffic information to station and bus-stop displays.

Utilities
- Quicker response to incidents based on unit location
- Follow in the control room how soon a unit will arrive on location
- Provide better job safety with location-enabled man-down and emergency call features on radios.

Energy
- Lone-worker protection on power stations, oil refineries and wind farms.

Mining
- Ensure people are in the correct talk group when they move around the site
- Enforce vehicle speed limits with geofences for safety.

Industrial
- 'Alarm' people based on their location in case of emergency evacuation
- Provide quicker response in emergency, based on up-to-date location information
- Track location and status of autonomous mobile machinery.

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On the world stage

Critical Communications Today reports from Hytera's Middle East and Africa PMR summit, which took place in Istanbul in June

Hytera's PMR summit was interesting for several reasons. Firstly, it gave a deep insight into the company's progress and ambition, both within the region in question, as well as from a global perspective. Secondly – and probably more compelling – it provided a snapshot of one of the industry's major players as it negotiates a time of both great technological and cultural change.

The event began with an introduction from TCCA CEO Kevin Graham, who gave an overview of the global mission-critical communications landscape, taking in everything from standardisation to the state of the market. Graham's presence at the event was important for any number of reasons, not least in light of his recently stated intentions to actively give the organisation a much more 'global' presence.

Beginning his presentation, he said: "We are now entering into the fourth generation of critical communications. The driver is now data – the ability to utilise information. This requires broadband spectrum as well as much more complex technology across the entire ecosystem.

"These data-centric services are largely already available via commercial networks on standardised 3GPP technologies. Thus, all over the world they have adapted to complement mission-critical narrowband voice and messaging services with commercial grade, broadband data delivery. The big step now is to find a way to mission-critical LTE and 5G."

Graham continued by identifying three primary areas which he said need to be addressed in order to enable 'mission critical' verticals to transition in the direction of broadband. These included the 'technology' itself, 'the environment' (for instance, the legal and regulatory landscape) and lastly 'the users'. Discussing the latter, he said that users had trusted LMR systems for years and that, consequently, "we need to ensure that the same trust [exists] in any critical broadband deployment".

Finishing his presentation, Graham touched on TCCA's global role going forward, bringing together mission-critical stakeholders from around the world. "It's important that our industry understands some of the factors which are important in achieving convergence and product innovation to achieve end-user requirements.

"What we're trying to do is aggregate all those requirements, and look at what are the common factors that we need to fight for, whether it's spectrum, functionality or prioritisation and efforts in the standards. That's why it's important we all get together across all of the regions."

With Graham having provided his introduction to

Stanley Song, pictured below, speaking at Hytera's Middle East and Africa PMR summit

the conference, the tone of the content across the rest of the day shifted to become much more Hytera-specific. Subsequent sessions included insights into the company's overall strategy, its technology, its regional partnership building, as well as its ongoing marketing effort. There was also input from regional users, and break-out workshops focusing on specific verticals.

Following on immediately from Graham, director of Hytera MENA, Stanley Song, delivered a keynote speech titled 'Always leading, always innovating'. He began this by noting the ongoing changes in the mission-critical sector, with users first going from "legacy PMR technology" to digital technology, before ultimately – as indicated by Graham – incorporating broadband.

Song illustrated the company's place in the market via a slide stating that its revenue has grown markedly in the last 10 years. One of the reasons for this, he said, was Hytera's emphasis on research and development. "[We have] 10 innovative R&D centres worldwide, with five in China and five located overseas. Each year we invest heavily into R&D to keep our products and solutions innovative and have almost 3,000 international patents."

Moving on to the next part of his presentation, Song offered delegates an insight into the potential future of the company, involving, he said, an overwhelming emphasis on the needs of users. Echoing Graham's comments about the increasing popularity of broadband in both the mission- and business-critical domains, he stated: "The world is unpredictable. [Users'] jobs are becoming increasingly complicated, so they need more information to make decisions to improve situational awareness.

"We are investing in LTE technology, helping our users [access] high-speed data services. We're also providing intelligent assistance through AI and big data, as well as more efficient management through IoT sensors."

Following a number of presentations from Hytera itself taking place across the course of the morning, the latter part of the day included sessions dedicated to users of the company's technology situated primarily in Africa and the Middle East. This included organisations such as IGA Istanbul Airport and Zener Marine Technology from Qatar.

The Middle East and Africa PMR summit gave a useful insight into the way Hytera aims to conduct its business going into the future. It also provided a decent warm-up for Critical Communications World, taking place as it did four days prior to that event, situated just two hours away in Vienna.

Greetings from Vienna

Philip Mason reports from the Critical
Communications World 2022 conference

Speaking as someone who has been attending Critical Communications World for a number of years, this year's iteration – taking place in Vienna – was as good as any I can remember, certainly from a content perspective.

This included not only the quality of the sessions, many of which were excellent, but also the sheer volume of them, with several conference theatres running simultaneously across the course of the whole event. The usual masterclasses (rebranded this year as Focus Forums), meanwhile, also took place across all three days, rather than just at the start as has recently been the case.

The conference sessions kicked off on the first day with two big names, speaking on behalf of 3GPP. The first of these was the organisation's CTO, Adrian Scrase, who delivered a keynote on how to standardise 5G, while his colleague, 3GPP SA Georg Mayer, led a session titled 'Developments in 3GPP standardisation for mission-critical communications'.

The latter was particularly compelling, containing as it did not only an insight into the standardisation process itself, but also the way the landscape has started to shift thanks to the increasing involvement of 'mission critical' verticals.

Opening his presentation, Mayer said that the organisation is currently working on three broadband releases in parallel.

The first of these is Release 17, which he said is practically completed, then R18, the work items for which are now decided, and R19, which is still very much in its early stages.

Focusing in particular on Release 18, Mayer said: "We know pretty well what we want to do [in that release]. The content is fixed and the technical work is ongoing."

This content, he said, is represented by a number of "new buzzwords" such as AI, energy efficiency, IoT, extended reality and so on.

Where things got really interesting, however, was the list of stakeholders now contributing to the standardisation process, which included an increasing number of 'critical' verticals.

"The mission-critical community is the first among equals," said Mayer, "because the mission-critical community was the first one coming to 3GPP and starting the idea of 3GPP taking care of vertical requirements."

He continued: "[However], what we achieved when we agreed on the R18 content is that we showed everybody in the room that they're welcome and that they can work with us on the future of 5G."

Going into greater detail about the evolving role of the mission-critical community in the process, Mayer showed the audience some figures stretching back to Release 12. "There is an increasing amount of interest in SA6. That was specifically created for the mission-critical community," he said.

"We also see that your interest increases in SA2, our main architecture group.

"That is the signal which shows to me that [the mission-critical community] is not only interested in specific mission-critical issues, but also in the much broader sense of what 5G is. You have understood that 5G technology is a general enabler."

Another interesting session, also focusing in part on the standardisation piece, was delivered later in the day by the chair of the TCCA Technical Forum, Harald Ludwig, who discussed interworking between broadband and narrowband.

He began his presentation by offering an overview of the need for ►

interworking in the first place, such as in situations where the transition between narrowband and broadband is taking place on a piecemeal basis.

Discussing this, he said: "Fortunately, this was taken up by standardisation, so we have a standard for this connection. Part of the 3GPP mission-critical standards [addresses] this interworking function, while the other [ie, narrowband] side of the interface [is being looked at] by other organisations. In the case of TETRA and GSMR, this is ETSI."

Delving deeper into the interworking function (IWF), Ludwig said that three interfaces exist within the standardisation, specifically for MC voice, MC data and group management information. For the TETRA interworking standard, he said, it is considered that the functionality sits in the system itself, whereas for P25 it is connected via the ISI (inter-system interface).

He continued: "For a TETRA radio, the broadband system looks like another TETRA system connected by ISI. It's not really connected by ISI, but it looks like it is."

According to Ludwig, while the standardisation is now in place, there are still major questions which need to be answered around development and implementation of the technology itself. Expanding on this, he said: "There is one issue, which I call the chicken/egg

problem. We need to know what will be first. Will we have a product, which customers then buy? Or will we have customers who place an order and then you start developing this product?"

He continued: "This could result in a very long, endless situation. For instance, if you look back at the TETRA ISI, it took almost 10 years from being standard-ready to realising implementation. We may face a similar issue with the IWF because no-one wants to make the first move. The big issue is that we don't have the time to wait, because it will be used only for a limited time."

Briefly moving from the regulatory/standardisation side to more user-based content, another fascinating day-one presentation came from digital

NSW Telco Authority's Kylie De Courteney

engagement manager at the Police Digital Service in the UK, David Bailey. His topic was 'Managing demand and contact on social media to the same standard as telephony'.

According to Bailey, UK policing has made a concerted effort over the past few years to provide a viable form of engagement with the public via the use of social media. This is following the realisation that "perhaps [its use] is more than just footage of officers helping ducks across the road on Twitter".

He continued: "Social media has become the communications channel of preference for many members of our community, and they expect the emergency services to be able to respond to their needs on social media just as effectively as they do by ringing 999. In many UK forces, 50 per cent of our demand comes in with no telephony."

There are many different 'channels' of interaction now available to the public, he said, and "they will judge the quality of your organisation based on the interaction they have on the channel that they've chosen to use.

"They don't say Ah, I've used Facebook, so I won't get as good a level of service as I would face-to-face. That's why we have to think about the digital channels in a different way."

Challenges for the sector
The second day of the conference began with two of what could eventually

come to be seen as the most important keynote presentations in the recent history of the event.

Working with the title of 'What will the future look like in 10 to 20 years, and what should we do about it now?', the first presentation came from permanent secretary of the Finnish Ministry of Interior, Kirsi Pimia. Her presence at the conference was important, not just because of the ongoing development of Virve 2.0 in Finland, but also due to Critical Communications World taking place in Helsinki in 2023.

Pimia began by outlining some of the major challenges facing both nation states and the emergency services which keep their citizens safe. This included issues around climate change, increasing urbanisation and an ageing population.

She also said that much of the challenge is manmade, "for example, ideological extremism in more-or-less organised forms", which has "produced acts of violence".

Having provided context in terms of the likely challenges facing the world in the next decade, Pimia began to outline what the mission-critical communications community "can do to make a difference in these challenging times".

Elaborating on this, she said: "We're moving to an era where technology is not the primary limiting factor, [so much as] the culture bound with heritage. I invite all of you to contribute and to support common actions to enable us to harvest the benefits of what the technology has to offer.

"The transition needs to be user-centric. The users need to trust in new technology, new tools and the new way of working. Winning the trust at end-user level requires co-operation and the involvement of all stakeholders. Standardisation in 3GPP and other fora is the technological foundation for the future, an enabler of technical interoperability."

She finished her presentation by reiterating Finland's commitment to contributing to the missions of both 3GPP and TCCA. She also said that Finland was proud to be hosting CCW next year.

The second presentation in the 'preparing for the future' session came from the managing director of the NSW Telco Authority, Kylie De Courteney.

She began by providing some background on her organisation and its responsibilities. She also reiterated

CCW 2022 conference sessions were well attended

the challenges currently faced by both the emergency services and society as a whole, transposing them specifically to Australia.

"We have responsibility for the whole of government connectivity, strategy and programme delivery," she said. "We're also responsible for operation of the public safety network in New South Wales, and have an emergency management function where we are the key interface between private sector carriers and emergency services.

"It is correct to say the last few years have been quite a challenge, with bushfires, then COVID, then floods. It's very clear what the impacts of climate change are, and we are feeling them very strongly in Australia. The future is hitting us right now."

Like Pimia, De Courteney then moved on to the role of technology in improving society, as well as addressing the audience directly around how she believes the critical communications community needs to conduct itself going into the future.

She said: "We're going to have access to huge amounts of data, which is going to allow us to undertake huge amounts of analysis. Machine learning and AI will be used to make better and faster decisions, and – in our industry in particular – that is going to make a huge difference.

"Users of critical communications

will have better situational awareness, giving them actionable data but not overwhelming them at moments of greatest stress. Vehicles will be autonomous, spatial digital twins; the metaverse… all of these things will be ubiquitous, allowing better training and better public safety outcomes."

Before we get to that future, however – according to De Courteney – the community has some work to do in terms of increasing its political and global influence.

"I am personally appalled that the average 10-year old with a smartphone has better access to data, video streaming than the people we support in the emergency services. That's not ok," she said.

"So my challenge to all of us is why are we accepting this slow pace of change? Why are we not advocating more directly and more broadly for faster broadband solutions in critical communications?

"Organisations like mine are small. We're niche, and most of the organisations here are in the same position.

"We need to be co-ordinated, we need to be aligned, and we need to be influential outside of our little vertical. Those things don't play to how we have operated in the past.

"We need to deliberately and strategically influence digital ▶

" We need to be co-ordinated, we need to be aligned and we need to be influential outside of our little vertical "

connectivity for citizens so that first-responders can leverage those investments. We need to drive changes in legislation and regulation if those are needed, not assume that the environment is fixed. The time for us to determine what the next 10 years is going to look like is right now."

Continuing with the theme of user requirements, another day-two presentation was delivered by Motorola Solutions' senior vice-president of technology Paul Steinberg, who discussed 'The future mission of public protection and disaster relief communications'.

Steinberg began his presentation by giving an overview of the current technological landscape, taking in the exponential increase in data, the implications of 5G, the ongoing move towards virtualisation, and so on.

Moving onto what the future may look like, he said: "The first thing is the convergence of the network, which is largely supported by standards. My advice to anyone consuming technology at this level is to follow the standards. They will give them choice, flexibility and openness.

"So, you'll get a paradigm where country A may be able to communicate with country B on a dynamic basis. It may be broadband PTT in country A and it may be TETRA in country B, communicating with each other. What you need is that core interworking and the interconnection fabric at the centre.

"As a colleague of mine likes to say, this is the stepping-stone for a pan-regional – pan-European, if you will – basic standardised intercommunication service where countries can collaborate as a service. This is the fundamental fabric, bringing the networks together in a transparent way, whether it is cross-country, cross-discipline or cross-agency."

Satellites and security

Day three kicked off with a keynote harking back to some of the sentiments expressed by the Finnish minister at the beginning of the second day, namely the increasing sophistication of cyber criminals as a major challenge for the sector. This session was delivered by chief of the technology branch at NATO CCDCOE Urmas Ruuto and was titled 'Critical infrastructure cybersecurity: what to expect'.

After going into detail about the organisation and its origins, he described some of its activities, such as

exercises carried out with its partners. Ruuto then moved on to describing some of the key issues currently facing nation states, communicating "recent incidents, exploits and vulnerabilities which have been discovered lately, over just three days".

He continued: "We are constantly finding new problems, and patching them. What has been changing is that normally, the hackers are mostly interested in money. But everything becomes much more serious if it's politically motivated, and it will be really destructive attacks."

He said that this was the "new reality" in that as soon as critical infrastructure gets 'connected', it is likely to become vulnerable. "[We saw this] when Finland said that they wanted to join NATO, and they got attacked and most likely are attacked more than normal."

Following the initial keynote, cybersecurity continued to be a theme running throughout the rest of the day. This included two panel discussions titled 'What can we do to best protect ourselves against cyber security threats' and 'Updates from SFPG. Security measures in critical communications.'

The latter included contributions from Trevor Evans of TCCA's Security and Fraud Prevention Group, David Frith of the UK's National Cyber Security Centre, ETSI's Brian Murgatroyd and Motorola's fellow of the technical staff, Dave Chater-Lea.

As well as cybersecurity, another core topic for the third day was connectivity, with a particular highlight being a panel session focusing on non-terrestrial networks for critical communications.

This consisted of Nokia's Marc Balliet who chaired the session, as well as the company's CTO, Giampaolo Panariello. It also included head of strategic marketing and technology at Airbus, Ali Helenius, and Renaud Mellies from the French Ministry of Interior.

Balliet opened the session by giving an introduction to non-terrestrial infrastructure and its increasing relevance in relation to 5G. He said: "We usually talk a lot about terrestrial networks, but now there's more and more discussions ongoing, mainly in the 5G domain. Non-terrestrial networks are a complete new chapter that 5G is addressing."

Helenius spoke next, giving in the first instance an overview of the general criteria for something to be regarded as critical communications, such as availability, usability and

TCCA board member and director, Tero Pesonen

resilience. He continued: "When we think about satellite communication, it is contributing particularly when it comes to the criteria of high availability. Because the satellite signal is basically available everywhere, at least when we talk about open ground."

He continued by listing what he called "use-case classes" for critical comms, and where satellite fits into that. This included 'permanent coverage', which satellite can provide "mostly in relation to areas where it's too difficult or expensive to build terrestrial coverage. Mountain areas, coastal areas and so on."

The second case, he said, was 'temporary coverage extension', "which from a technical point was exactly the same as the previous one". The difference with that, he said, was that "we're now talking about areas where there is no need to plan permanent coverage at all [such as in a desert]". The third use-case is as a back-up to the terrestrial network.

The conversation then turned to different kinds of satellites, broken down into three categories. The first of these was 'geostationary', which sit at around 35,000km above the Earth. According to Helenius, you only need a few of these for global coverage, "but

the latency is high".

The next two were medium Earth orbit and low Earth orbit satellites, the latter of which have been developed recently. "They are very different," he said. "Their orbit is only around 1,000km, meaning the latency is in practice also very low.

"We have carried out tests running MCX over one web link, and what we have found is that the quality of service is good, and comparable to [what is the case with] ordinary 4G. The latency is the big thing here from the critical communications point of view – geostationary and MEO are not really suitable for the critical comms voice service."

Continuing to move through the third day, another interesting session was delivered by Erillisverkot programme director Ari Toivonen, who compared the different experiences of his organisation and Nedaa in Dubai.

The purpose of his presentation, he said, was to talk about how to build a mission-critical broadband service. As he said, there is not a single template being used across the world, particularly taking into account different geographies, political environments and so on.

He continued his presentation by comparing different projects across the globe, taking in not just Nedaa and Erillisverkot but also the Emergency Services Network in the UK and FirstNet in the United States. Other potential differences highlighted by Toivonen included the use – or not – of dedicated frequencies, compared with sharing frequencies with a mobile network operator and building off the back of a pre-existing commercial offering.
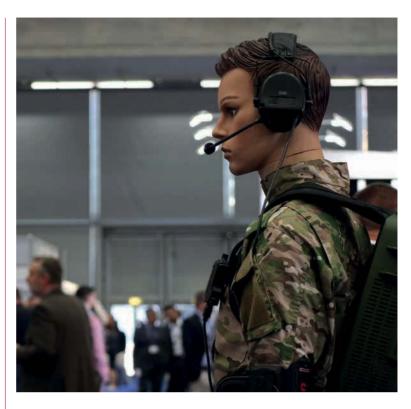
"Maybe the ideal thing is," he said, "to have a bit of both. Have some dedicated frequencies as your backbone, and then get the big benefits of lots of frequencies at a reasonable price by joining forces with an MNO. Only in one country – Finland – we rely only on shared frequencies, and only in one country, in the case of Nedaa, they rely on dedicated."

Moving from the radio network to the core network – "the brains of your mission-critical broadband service" – he said that it was crucial to trust whatever

The event exhibition featured a variety of manufacturers and products

operator is tasked with providing it. This is because they "hold the keys to the kingdom".

He continued: "Then, there's the question of whether you should just use government people or outsource it to the private sector, which has the reputation for doing things more efficiently than sometimes governments can do.

"This is a crucial strategic decision for each country, and depends on the way the project is going, the political direction and so on. There's no right or wrong here – every country decides for themselves.

"In the UK and the US they decided to trust the commercial side, with the core network being outsourced. The other ones, it's in government hands."

The third day finished by looping back to the topic of cybersecurity, looking specifically at 5G via a panel session entitled 'Security challenges with 5G'. This included WithSecure's Laura Kankaala, Nils Ahrlich from Nokia and Aleksander Gorkowienko of Spirent Communications.

Discussing whether 5G service providers are properly prepared to secure their systems, Kankaala said: "5G is a little bit different [from what's gone before], because it will bring cloud technology, more coding and development.

"It will shift the landscape into more agile working in terms of the providers,

then of course there's the innovation that it drives. I still think that there's a long way to go to make sure that internet-connected devices are secured in such a manner that our societies can thrive."

Asked about the role of larger vendors in securing networks, Ahrlich said: "I believe every vendor can contribute. Especially around 5G, we speak about ecosystems, and these ecosystems are the foundation of whole companies' economies.
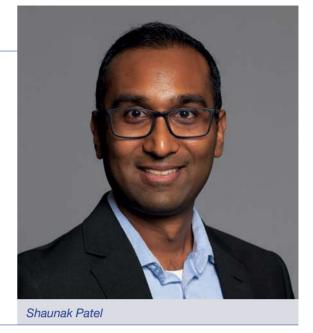
"Of course, large vendors might have a special role, because companies like Nokia are working years – decades – on standardisation, so they lay the foundation in regard to what might be possible.

"It's a multilayer approach. The standards help us lay the foundations in terms of the network functions. You have the features and products, which need to be brought into a whole network and secured."

The conference sessions at Critical Communications World 2022 contained far more content than could be adequately described in an article twice this length. That being the case, the sheer variety of sessions on offer augers well, not only for the show but also for the future of the sector as it continues to grapple with any number of new and diverse technologies, opportunities, challenges and ways of working. ◉

"Ecosystems are the foundations of a company's whole economy"

The next generation

Winner of TCCA's Young Engineer of the Year award at the 2022 ICCAs, NSW Telco Authority's **Shaunak Patel,** discusses the importance of recognising young professionals within the industry

Shaunak Patel

Could you talk about your professional background? How and why did you get into the critical communications industry?

From a young age, I have been interested in telecommunications and the important role it plays in critical communications and security. Inspired by my grandfather who was an engineer, I completed my Bachelor of Engineering, majoring in ICT (telecommunications) at the University of Technology, Sydney. After completing several internships, I kickstarted my career in the private sector at Kordia Solutions Australia and have since worked across a diverse range of large telecommunications projects.

What's your role at NSW Telco Authority? What specific projects are you working on?

I joined NSW Telco Authority in 2020 as a spectrum engineer within the Spectrum Management Office [SMO]. Our organisation is responsible for delivering critical radio communications to first-responders and essential services to keep people and places in NSW safe.

In my role with the SMO, I am responsible for ensuring spectrum is managed efficiently across our NSW government agencies and customers. I also provide technical support related to spectrum for our stakeholders.

Our team supports the delivery of the Critical Communications Enhancement Program [CCEP], which is a $1.4bn investment by the NSW government to expand and enhance the Public Safety Network [PSN]. The PSN provides emergency service organisations access to a common interoperable crisis communications network.

What engages you most about the work? What makes you most enthusiastic?

I enjoy being able to work with a range of professionals – both internally and externally – who come from either a technical or a non-technical background. Before starting my engineering career, I worked in customer service, which has given me a strong foundation and understanding of customer engagement and the important role collaboration and consultation play in successful project delivery.

At Telco, we place customers at the heart of everything we do, and this resonates strongly with my values and beliefs. I also

enjoy troubleshooting and problem-solving. Knowing that I am playing a part in keeping our people safe truly drives me.

How would you like your career to progress?

Working for an organisation that has a vision to be the connectivity leader for the NSW government is very inspiring. I am excited to be part of a team that is driving the future of the critical communications industry through technology innovations and solutions. Ultimately, I would love to lead a team of young engineers, guiding them through their careers and supporting them to become successful.

Why is it important to recognise the contribution of young engineers within the sector?

I feel recognition is extremely important on all levels, particularly for younger employees as it helps build confidence in their work. It also celebrates their contribution and empowers them in knowing they are making a difference.

Engineers may be known for their introverted tendencies, and I can proudly say I am one of them! But, I am lucky enough to be surrounded by amazing, supportive peers and extraordinary managers who go above and beyond to notice the intricacies and specifics of my work. It has helped me grow as a person both professionally and individually.

How can the critical communications industry attract more of the best young engineering talent?

Graduate programmes are a fantastic head start for young professionals in their careers. I would love to see increased availability for engineering graduates to access opportunities across the sector. One of the benefits for graduates is their access to rotations across a business to really get a holistic understanding of what the business does.

NSW Telco Authority has introduced an initiative that enables employees to shadow colleagues and teams from other parts of the organisation to gain an insight into the work they deliver.

Within their roles, I strongly support the need to empower young team members as decision-makers and influencers. This not only benefits the individual but the business as a whole. It ensures they look at their contribution and work and how it supports and impacts others.

> Recognition is important for younger employees as it builds confidence