JAN/FEB 2024 Vol.11 No.2

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Inside

January/February 2024

Hytera has released its latest intrinsically safe (IS) radios: HP79XEx DMR and PT890Ex TETRA. Engineered to meet stringent IECEX and ATEX requirements for explosion-proof equipment, these cutting-edge devices help empower personnel with confidence in work-place safety, when they efficiently communicate and collaborate with intuitive push-to-talk (PTT) calls, at potentially hazardous worksites where explosive gas, combustible dust and chemical vapour exist.

For professionals working in places with a potential risk of explosion, such as in the oil and gas, mining, chemical and pharmaceutical sectors, the IS performance and reliability of two-way radios are non-negotiable. The HP79XEx and PT890Ex adopt multiple protections — such as explosion-proof material and battery, plus innovative IS circuits — to eliminate electrostatic discharges, prevent sparks from accidental drops and offer stable heat dissipation.

HP79XEx boasts 2 W RF TX power and 0.16 μV receiving sensitivity, while PT890Ex offers Class3L TX power level and -120 dBm receiving sensitivity; their high performance enables robust signal transmission and penetration across wide and complex campuses. Their robust 2 W speakers, augmented by AI-based noise cancellation, automatic gain control (AGC) and howling suppression technology, enable loud and clear voice calls in the bustling industrial environment, even at the edge of coverage.

The versatile connectivity options, such as BT5.3, WLAN and NFC, simplify the management of HP79XEx and PT890Ex. These features facilitate wireless accessory connections, remote programming and rapid user identity recognition. The 20% weight reduction and 10% slimmer design compared to previous series, along with advanced ergonomics, enhance the user experience. Both models excel in extreme work temperatures from -25 to 60°C.

Caelus Wireless
www.caeluswireless.com.au

Do you read me?

Writing this comment in mid-December, I am acutely aware that summer can be an uneasy time for our first responders, who should have the chance to sit back and enjoy the festive period but may instead find themselves facing bushfires, storms and even floods. The good news is that many telco providers are now taking extra measures to support Australians during the so-called disaster season, with Telstra recently launching a range of initiatives including payphone upgrades; portable generators and satellite technology to prevent comms outages; and even a commitment to simulate emergency roaming, in recognition of recent discussions on this topic between industry and government.

Of course, even better than disaster preparedness is disaster prevention — in our article on page 23, we showcase smart sensors that can detect and locate any lightning strikes at the greatest risk of starting a fire, which could be a game changer during an El Niño summer. Other highlights this issue include an explanation of the 'silver lining' behind the forced migration to 4G (page 6); the return of our Next Gen column, with a peek inside the US-based Public Safety Communications Research Division (page 34); and a deep dive into the long journey to class communications systems as 'critical infrastructure' in Australia (page 13).

The government should also be applauded for its recent efforts to bring communications upgrades worth over $170 million to more than 100 communities across rural and regional Australia, through the federal Regional Connectivity Program (RCP) and Mobile Black Spot Program (MBSP). The RCP Round 3 is awarding $115.23 million for 74 connectivity projects across Australia, several of which target First Nations communities, while the MBSP Round 7 is awarding Telstra, OneWiFi and Optus $41.3 million for 43 new mobile base stations across Australia, plus $13.6 million for 19 mobile base stations targeting First Nations communities. The program will also fund 25 new OneWiFi neutral host base stations that support multi-carrier outcomes, with Optus confirmed to offer services from the base stations.

"This major investment in remote and regional connectivity will be a game changer in ensuring more communities can stay connected and safe with essential and reliable phone services," said Assistant Minister for Indigenous Australians Malarndirri McCarthy. And as we've demonstrated, connectivity at any time — but especially during an unpredictable Australian summer — should not be taken for granted.

Lauren Davis, Editor
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Calendar

February

MWC Barcelona 2024
26–29 February 2024
Fira Gran Via, Spain
https://www.mwcbarcelona.com/

March

BAPCO 2024
6–7 March 2024
Coventry Building Society Arena, UK
https://www.bapco-show.co.uk/

ARCIA One-Day Conference and WA State Networking Dinner
14 March 2024
Aloft Perth Hotel
https://arcia.org.au/events/one-day-conference-perth-14-march-2024/

SATELLITE 2024
18–21 March 2024
Walter E. Washington Convention Center, USA
https://www.satshow.com/

IWCE 2024
25–28 March 2024
Orange County Convention Center, Florida, USA
https://iwceexpo.com/

April

EENA Conference & Exhibition 2024
24–26 April 2024
Palacio de Congresos de Valencia, Spain
https://eenaconference.org/

May

Critical Communications World 2024
14–16 May 2024
Dubai World Trade Centre, United Arab Emirates
https://www.critical-communications-world.com/

ARCIA One-Day Conference and NSW State Networking Dinner
30 May 2024
NSW Teachers Federation Conference Centre, Sydney
https://arcia.org.au/events/one-day-conference-sydney-may-2024/

June

Comms Connect New Zealand
26–27 June 2024
Te Pae Christchurch Convention Centre, New Zealand
https://www.comms-connect.co.nz/

For a full list of industry events, see criticalcomms.com.au/events

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Critical communication solutions for rail and metro

– When reliable communication is crucial

With the rapid expansion of urban populations and the persistent growth of road congestion, rail and metro are increasingly becoming the primary choices for comfortable and smooth local and long-distance journeys across all levels of society.

But as the utilisation of rail systems increases, the greater the need for robust and reliable communications becomes. Not just to keep personnel and passengers safe and fully informed at all times, but also to enhance journey speed, punctuality, and the effective utilisation of infrastructure.

With 40 years of expertise in radio communication and a proven track record of collaborating with leading metro and rail providers, we have extensive experience in providing large-scale integrated voice and data solutions. This includes the successful implementation of interoperable TETRA Packet Data to comply with the demands of European Train Control Systems (ETCS) Level 2.

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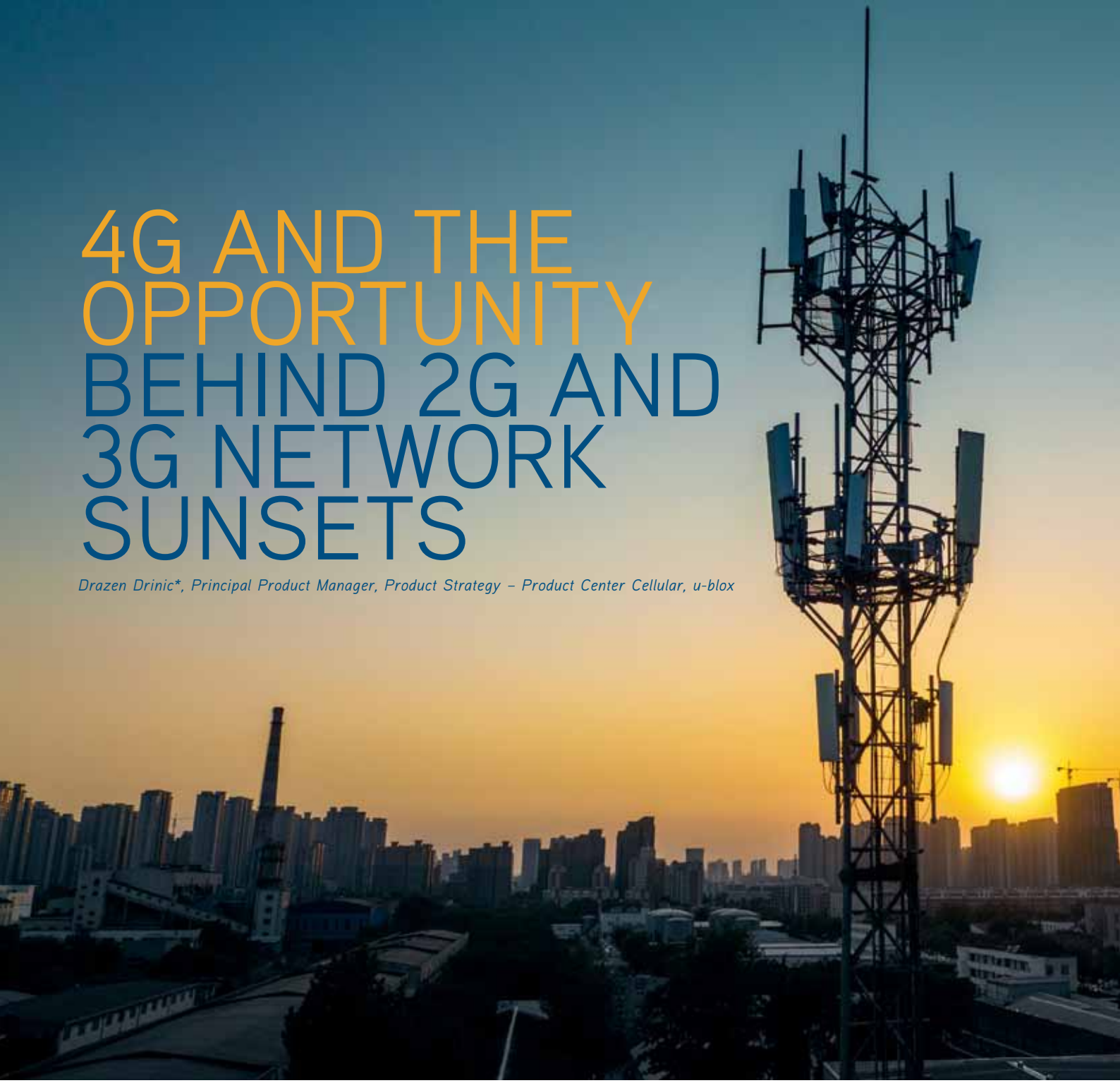


4G AND THE OPPORTUNITY BEHIND 2G AND 3G NETWORK SUNSETS

Drazen Drinic, Principal Product Manager, Product Strategy – Product Center Cellular, u-blox*

While the forced upgrade will disrupt businesses, they and their end users will benefit from more capable connected solutions.

When 2G, the second generation of cellular communication technology, was commercially launched in 1991, its use of digital communication technologies rather than analog ones ushered in a new era of cellular communication with the introduction of data transfers and text messages. 3G followed in its footsteps, stepping up data rates and bringing us the mobile broadband experience we as consumers now take for granted.

But as the sun sets on 2G and 3G, it isn't their initial beneficiaries — mobile phone users — that will be most affected. Over the course of three decades, their low cost of ownership, ubiquitous coverage and widespread roaming agreements have made 2G, and to some extent 3G, essential enablers of the Internet of Things.

Automotive emergency call systems, smart meters, vehicle telematics devices and tracking solutions are just a sampling of use cases that commonly continue to rely on 2G and 3G — and that will need to be upgraded as the technologies wind down.

Fortunately, the immediate inconvenience this will cause businesses and end users comes with a clear silver lining: not only will upgrading legacy solutions keep them from becoming obsolete along with the legacy networks they rely on, it will also allow IoT product developers and solution providers to tap into the value that today's more advanced communication technologies provide, both to their and their customers' benefit.

The sun begins to set

According to a GSMA report focusing on the Asia–Pacific region[1], the main considerations driving mobile network operators to sunset their 2G and 3G networks are cost reductions achievable by reallocating 2G and 3G spectrum to 4G and 5G. At the same time, mobile network operators (MNOs) are rightly wary to abandon 2G and 3G until both their own infrastructure and their customers'

solutions are prepared for the transition.

Because of regional variations of these opposing forces, sunsetting timelines vary from country to country (and even within individual countries, from operator to operator).

In North America, for example, US mobile network operators have been phasing out their 2G networks, and 2022 saw major 3G networks shut down their service, while Canadian MNOs will likely delay the transition to 2025.[2] The timelines are less aggressive in Central and South America, where at least some networks will continue to provide 2G and 3G service until more modern technologies have sufficient coverage to absorb demand.

In EMEA, where the installed base of 2G IoT devices is high, MNOs are pushing out 2G sunsets beyond 2025. Instead, 3G will by and large be the first to go. Enabled by a viable transition path from 3G voice services to newer technologies, many MNOs have already largely decommissioned their 3G services.

Finally, in the Asia–Pacific market, the transition strategy varies broadly from country to country, with markets where legacy 2G IoT devices are prevalent such as India expected to keep 2G networks up and running for longer. Others such as Singapore, New Zealand and Australia have already decommissioned their 2G networks. Generally, the timing of 3G sunsets will depend on the availability of alternative technologies capable of absorbing voice-based applications that are currently enabled by 3G.

4G is ready to pick up the slack...

With 2G and 3G on their way out, a common question will be whether to upgrade IoT devices to 4G LTE or whether to move straight to 5G. After all, 5G technology was specifically specced to meet the needs of a broad spectrum of use cases, including lightning-fast enhanced mobile broadband (eMBB), ultra-reliable low-latency communication (URLLC) and, tailored to the needs of the IoT, massive machine-type communication (mMTC).

But because IoT applications need neither the high data rates offered by eMBB nor the ultra-reliable low-latency performance offered by URLLC, the choice ultimately comes down to four potential candidates — see Table 1.

Considering that LTE-M and NB-IoT are 5G-ready technologies, meaning that they are included in the 5G spec and will continue to work on 5G mMTC networks once they are available, it becomes clear that LTE-M and NB-IoT offer the best of both worlds for use cases requiring low data rates.

The picture is even more clear-cut when it comes to use cases requiring medium data rates. The 5G spec covering these use cases, 5G RedCap, will only be completed later this year, and the first devices supporting the technology won't hit the market until around 2025. Consequently, LTE Cat 1 (and where available, its stripped-down, lower-cost variant LTE Cat 1bis) will become the go-to solution for use cases requiring medium data rates.

...and provide connectivity for the foreseeable future

But first, is it wise to bet on an already 12-year-old technology to offer the longevity expected for professional applications? If past generations of mobile communication technology offer any insights, it is that each generation tends to outlive the devices it connects by a large margin. 2G, which saw its first shutdowns 25 years after it first rolled out, continues to represent 15% of global connections. 3G was intended to replace 2G, in the same way that 4G was to replace 3G.

Today, 2G, 3G and 4G LTE coexist with 5G, which was launched with the explicit goal of complementing, not replacing, 4G LTE. 4G LTE is still growing its footprint, so it's safe to say that it is not only ready to pick up the slack as 2G and 3G phase out, it will also continue to deliver reliable connectivity well beyond the expected lifetime of IoT devices.

NB-IoT, LTE-M or LTE Cat 1(bis)?

The optimal choice of cellular technology will always be the one that best meets use case-specific requirements in terms of network availability, data throughput, power consumption and latency. Mobile use cases further require seamless handovers from one cell tower to the next, as well as roaming agreements for uninterrupted connectivity across national borders. And device developers targeting global markets with their products might prefer the simplified logistics offered by devices that work out of the box wherever they are deployed.

Figure 3 breaks down the application space according to data rate requirements and geographical coverage.

NB-IoT: Static low-data-rate IoT use cases located in areas with NB-IoT network coverage will benefit from the technology's ultralow-power demand, low cost of ownership and extended range compared to standard 4G LTE technologies. Typical use cases include smart metering, smart buildings and smart cities, as well as agricultural and environmental sensing.

LTE-M: Mobile and static low-data-rate use cases located in areas with the required network coverage will be well served with LTE-M, with its low power requirements,

Low bandwidth (currently served by 2G)	Medium bandwidth (currently served by 3G)
4G LPWA (LTE-M or NB-IoT)	4G LTE Cat 1(bis) or LTE Cat 4
5G mMTC	5G RedCap

Table 1

Figure 1: Countries where at least one MNO has announced a 2G shutdown before 2025.

Figure 2: Countries where at least one MNO has announced a 3G shutdown before 2025.

extended range over standard 4G LTE and seamless handover from one cell tower to the next.

LTE Cat 1: Most mobile and static use cases with low to medium data rate requirements will see their needs met by LTE Cat 1, which today comes closest to offering the robust coverage with seamless handovers and international roaming agreements that many mobile 2G and 3G solutions rely on. In addition to offering the lowest latencies in this cohort, LTE Cat 1, which supports receive diversity via two separate receive pathways, is designed to carry high-quality voice communication and deliver reliable performance in difficult coverage conditions.

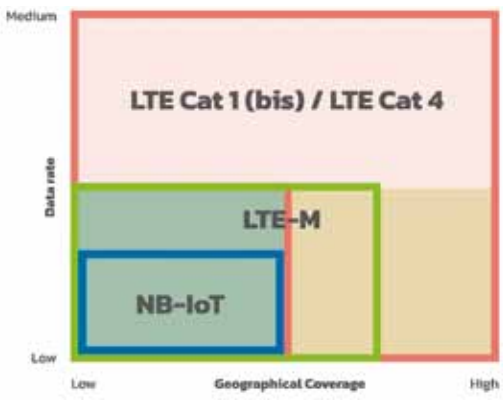


Figure 3

Because LTE Cat 1 is already available on most 4G LTE networks worldwide, with robust international roaming agreements, businesses can simplify their logistics by serving global markets using a single stock-keeping unit (SKU).

Cost-sensitive applications with weaker coverage requirements that do not require highly reliable communication can alternatively use a stripped-down variant of LTE Cat 1, LTE Cat 1bis. Supporting only a single receive antenna, LTE Cat 1bis offers the same data rates and mobility as LTE Cat 1, wherever it is supported by mobile network operators.

Finally, use cases with even higher bandwidth requirements (data speeds above 10 Mbps download, 5 Mbps upload) can migrate solutions to LTE Cat 4 or higher.

More than just a technology upgrade

The forced migration to 4G will push customers to leave technologies that were not developed with the IoT in mind. As a result, it comes with a clear silver lining — generally speaking, it will enable end devices to do more with less:

- The new 4G technologies are, by design, much more power-efficient than the ones they are replacing, enabling up to 10 years of power autonomy. Gains in power autonomy translate directly to reduced maintenance and replacement costs.
- Their increased spectral efficiency allows them to efficiently deliver higher data rates, both for upload and download.
- Deeper in-building penetration allows them to meet the needs of more diverse use cases, in particular in metering applications.
- Finally, 4G provides a robust replacement to the lost global 2G/3G coverage.

As a result, the improvements brought by NB-IoT, LTE-M and LTE Cat 1(bis) and the improved end-device performance they enable will futureproof existing use cases while at the same time increasing customer satisfaction. At the same time, it will enable new applications that were poorly served by 2G and 3G.

Summary

As mobile network operators rationalise their cellular communication infrastructure to free up resources needed to expand their 5G coverage, IoT device developers and IoT service providers are being forced to migrate their 2G- and 3G-based solutions to futureproof alternatives.

NB-IoT, LTE-M and LTE Cat 1(bis) offer the most viable migration paths for existing IoT solutions based on 2G and 3G technology. While the applicability of NB-IoT is limited to static low-data-rate solutions, LTE-M and LTE Cat 1 (and LTE Cat 1 bis) are strong candidates to replace 2G and 3G modems for applications requiring voice communication, seamless handovers and international roaming.

Due to the near-universal availability of LTE networks, LTE Cat 1 paired with an IoT SIM card enabling global roaming is particularly well adapted for devices serving global markets.

The takeaway for everyone whose business is affected by the 2G and 3G network shutdowns is clear: 4G LTE — NB-IoT, LTE-M, and LTE Cat 1(bis) — is ready to pick up the slack and deliver robust connectivity for the foreseeable future, offering businesses new growth opportunities and end customers a better user experience.

1. https://www.gsma.com/spectrum/wp-content/uploads/2020/06/Legacy-mobile-network-rationalisation.pdf
2. https://northernbi.com/3g-sunset-update-for-us-and-canadian-network-carriers/

**Drazen Drinic is an electrical engineer from the Technical University in Dortmund, Germany. He has over 20 years' experience working in various product management roles in telecom infrastructure and energy and automation technology.*

A $25m upgrade for the NSW SES flood rescue fleet

Following record flooding in NSW in 2022, which impacted several communities across the state and resulted in more than 80,000 calls to the State Emergency Service (SES), the state government has announced a $25 million upgrade to the SES's flood rescue fleet.

More than $14.7 million will go towards 142 additional boats, rafts, trucks, cars and trailers in response to recommendations from the independent flood inquiry. Findings from the inquiry highlighted the need for SES volunteers to have upgraded equipment and resources to meet the growing challenges posed by extreme weather events.

All new vehicles are being equipped with vehicle-as-a-node technology, allowing crews to communicate using 4G and satellite networks in addition to regular radio networks. This helps ensure crews can stay connected during emergencies and overcome any dangerous communications blackspots.

A further $10.9 million under the NSW Government's Fleet Replacement Program will fund more than 50 new vessels, storm and rescue vehicles, command vehicles and trailers to replace existing assets for SES units across NSW.

Parts of the state most at risk of flooding are being prioritised during these rollouts, with delivery of the assets set to be completed by the end of this financial year. SES units in the Northern Rivers, Central West and Hawkesbury-Nepean Valley have already received equipment, delivering on recommendations from the independent flood inquiry to improve disaster response capabilities.

"This investment will further equip our volunteers to respond to flooding and other emergencies," said NSW Premier Chris Minns.

"These new boats and vehicles will help save lives and minimise the impact of disasters on communities."

Minister for Emergency Services Jihad Dib added, "This funding recognises the valuable contribution SES volunteers make to the state, particularly when they are on the frontline during floods and storms.

"These resources will enhance our response capabilities across the state and will particularly benefit flood-impacted communities in the Central West and the Northern Rivers."

NSW SES Commissioner Carlene York concluded, "These new assets ensure we can provide swift and effective assistance to those who need it most during times of crisis.

"The additional vessels and equipment will help volunteers save lives and respond to floods as well as many other incidents such as road crashes and land rescues, searches and other emergencies."

Private wireless milestone for MEA energy sector

Technology company Nokia and communications company Ooredoo Qatar have established what is understood to be the Middle East and Africa's (MEA's) first private wireless network for the energy sector, set to provide dedicated voice and customer data services in the most remote and challenging locations. Nokia will supply cutting-edge products tailored to deliver resilient mission-critical connectivity, along with deployment and care services, with its resident engineers providing expert support to ensure the network operates at optimal level.

The deployed solution covers an initial capacity of 20,000 subscribers for the offshore grid and aims to connect offshore and onshore facilities, ensuring seamless voice and data services. By offering dedicated connectivity, the network is expected to empower customers to digitalise and automate operations, marking a significant step towards enhanced efficiency and productivity.

The solution offers a native offshore system designed to deliver services, seamlessly integrating with the existing commercial core, enabling customers to improve operational efficiency and reduce interruptions from onshore connectivity. The integration is claimed to equally enable the efficient handling of interoperability and interservice handovers, making communication between offshore and onshore locations smoother and more reliable than ever before, while managing latency issues through localised data services to improve process efficiency. It will also improve customer experience, by replacing older Wi-Fi and WiMAX technologies.

"This Nokia enterprise solution, specifically designed for offshore locations, coupled with our delivery capabilities and expertise, ensures that the energy sector can now rely on a robust and resilient connectivity solution," said Samar Mittal, VP, Cloud and Network Services (CNS), Global Business Center (GBC) at Nokia MEA.

Günther Ottendorfer, CTIO at Ooredoo Qatar, added, "This significant milestone underlines our commitment to transforming communication solutions for challenging environments. This landmark project provides dedicated voice and data services and paves the way for the oil and gas sector and others to replicate such solutions, marking a new era in connectivity for the industry."

NEW VULNERABILITIES FOUND IN SIERRA WIRELESS ROUTERS

Cybersecurity company Forescout has released a report titled SIERRA:21 – Living on the Edge, an analysis of 21 newly discovered vulnerabilities within OT/IoT routers and open-source software components. Produced by Forescout Research – Vedere Labs, the report emphasises the continued risk to critical infrastructure and sheds light on possible mitigations.

The report features research into Sierra Wireless AirLink cellular routers and some of their open-source components, such as TinyXML and OpenDNS. Among the 21 discovered vulnerabilities, one has critical severity, nine have high severity and 11 have medium severity. These vulnerabilities allow attackers to steal credentials, take control of a router by injecting malicious code, persist on the device and use it as an initial access point into critical networks.

An open database of Wi-Fi networks shows 245,000 networks worldwide running Sierra Wireless routers for a variety of applications, such as for police vehicles connecting to a central network management system or to stream surveillance video; in manufacturing plants for industrial asset monitoring; in healthcare facilities providing temporary connectivity; and to manage electric vehicle charging stations. The new vulnerabilities thus have the potential to stop vital communications that could impact everyday life.

The research found that the attack surface is expansive, with 86,000 vulnerable routers still exposed online. Concerningly, researchers found that Australia is currently third in the world for the number of exposed devices (3853), behind Canada (5580) and the United States (68,605 devices).

The researchers warned that less than 10% of the exposed routers are confirmed to be patched against known vulnerabilities found since 2019, and 90% of devices exposing a specific management interface have reached end of life, meaning they cannot be further patched. The research further noted that open-source software elements continue to go unchecked and increase the attack surface of critical devices, leading to vulnerabilities that may be hard for organisations to track and mitigate.

"Vulnerabilities impacting critical infrastructure are like an open window for bad actors in every community," said Elisa Constante, VP of Research, Forescout Research – Vedere Labs. "State-sponsored actors are developing custom malware to use routers for persistence and espionage. Cybercriminals are also leveraging routers and related infrastructure for residential proxies and to recruit into botnets."

Sierra Wireless and OpenDNS have issued patches for the identified vulnerabilities. TinyXML is an abandoned open-source project, so the upstream vulnerabilities will not be fixed and must be addressed downstream.

TETRA SYSTEM FOR JAKARTA LIGHT RAIL GOES INTO OPERATION

The critical communications solution deployed by Teltronic for Greater Jakarta's new light rail transit (Jabodebek LRT) system has gone into operation, with the inauguration of the transport system set to significantly reduce traffic in the Indonesian capital. This is Teltronic's second project in Indonesia, after the deployment of another TETRA system in the Palembang LRT.

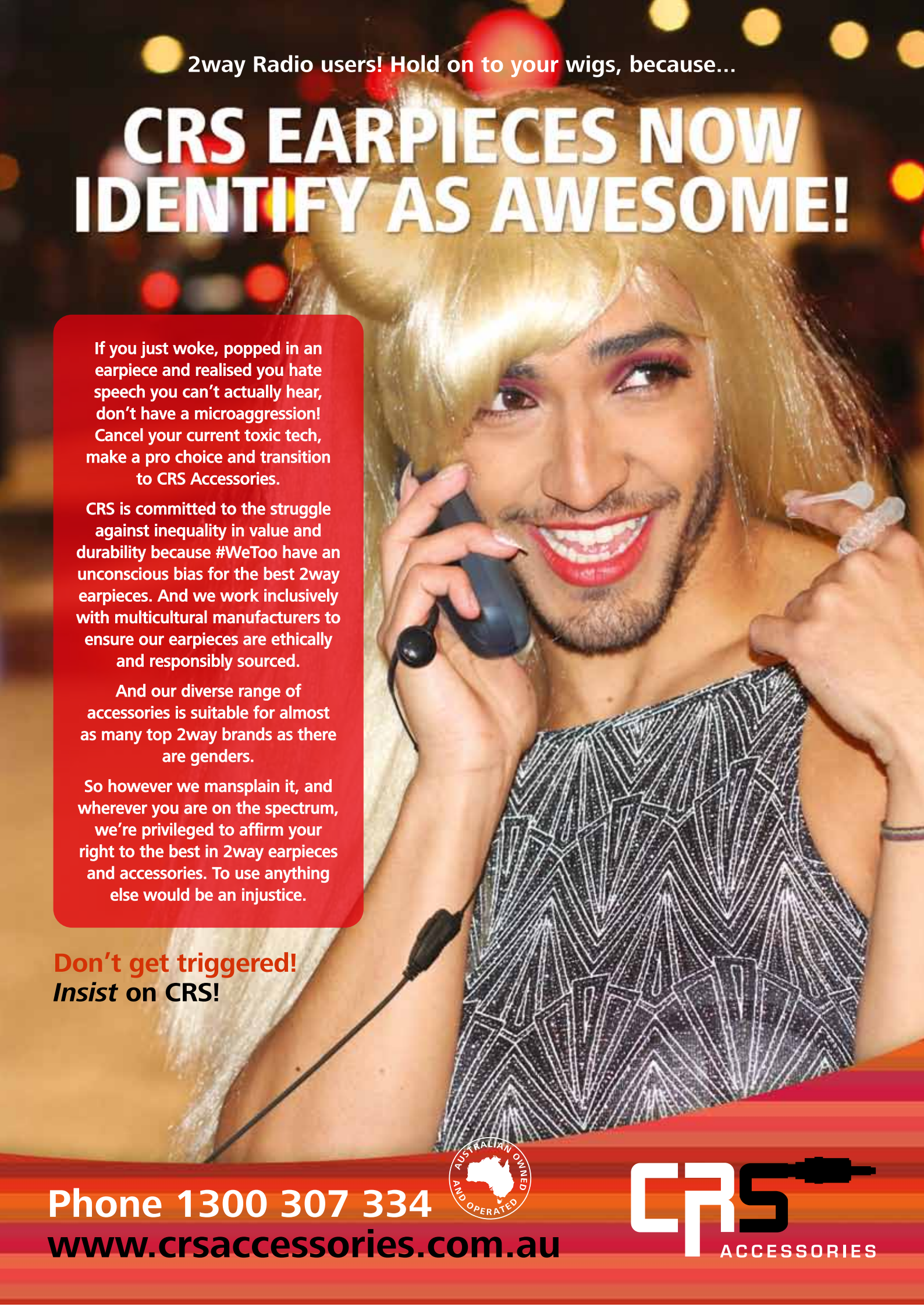
Jabodebek LRT connects different areas of Greater Jakarta, an agglomeration surrounding the capital that is populated by 30 million people, and is being developed in two stages; so far only the first phase has been carried out, with three lines, a total of 18 stations and a route of 44 km. Teltronic was selected to install a TETRA digital radio system that allows not only voice communication but also other important functionalities, as the connection to the Train Control Management System (TCMS) to transmit telecommands.

Teltronic deployed its NEBULA TETRA infrastructure, whose components are designed and manufactured at the company's headquarters in Zaragoza, Spain. This comprises the switching control node, responsible for providing network intelligence, and the base stations required to provide coverage to the network.

The solution also includes the command and control centre CeCoCo, which manages and coordinates all users and has been specifically designed to meet transport sector needs. Furthermore, Teltronic has supplied a total of 76 onboard radios which are installed in the trains, and 199 portable handsets and 20 mobile radios which are used by maintenance and security staff.

Felipe Sanjuán, Teltronic's Business Development Director for Transport, said his company was delighted to take part in a transport project for one of the most populated cities of the world, with Teltronic's solution set to help ease the mobility of millions of people.

"This project means a step forward in our expansion process towards APAC, boosting us as one of the main actors of [the] critical communication sector in a part of the world that offers great growth potential," he said.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UNSEENLABS LAUNCHES NEW SATELLITES TO DETECT SHIPS FROM SPACE

Launch of SpaceX's Falcon 9 rocket.

French space company Unseenlabs, a specialist in radio frequency data and solutions for maritime domain awareness, has announced the successful launch of its two new satellites, BRO-10 and BRO-11 — the 10th and 11th satellites in its pioneering constellation committed to ships detection at sea.

The launch was conducted as part of the Transporter-9 Mission aboard SpaceX's Falcon 9 rocket, taking off from the Vandenberg Space Force Base in California, and signifies another step forward in Unseenlabs' ongoing mission to enhance maritime surveillance through its technology, which is capable of detecting the presence of any ship regardless of its geographical location.

As the global maritime landscape experiences a surge in ship activities, the necessity for reliable, large-scale monitoring is paramount. Unseenlabs provides RF data which is said to be unparalleled, thus enabling comprehensive vessel characterisation and precise geolocation to meet the increasing demands of maritime surveillance worldwide.

With BRO-10 and BRO-11 now in orbit at an altitude of 520 km, Unseenlabs' constellation now comprises 11 satellites, resulting in 11 simultaneous RF data collection points thanks to its monosatellite technology. The extended satellite fleet signifies not merely an enlargement of operational scope, but also an enhanced ability to monitor and characterise vessels globally, underscoring the company's commitment to safeguarding marine assets and environments against illicit activities and threats.

The expansion of the constellation thus offers increased surveillance and vessel characterisation capabilities on a global scale, catering to the needs of government entities, NGOs and private-sector stakeholders, such as insurers, worldwide. This advancement is expected to contribute to improving the global maritime landscape, particularly in a time when maritime activities continue to thrive.

"This milestone not only represents a technological breakthrough for Unseenlabs but also strengthens our position as the global leading provider of data and services for maritime surveillance," said Clément Galic, CEO and co-founder of Unseenlabs. "With each satellite we add to our constellation, we're not just collecting more data; we are expanding the depth and breadth of information we can deliver to the global maritime community.

"With this successful launch, Unseenlabs continues its robust growth trajectory, both in France and internationally, solidifying its position as the global leader in radio frequency signal detection from space."

ARC RESEARCH GRANT TO SAFEGUARD UAV TECHNOLOGIES

Charles Sturt University's Artificial Intelligence and Cyber Futures Institute (AICFI) has received funding from the Australian Research Council (ARC) for a pioneering research project titled 'Robust defences against adversarial machine learning for UAV systems'. The ARC grant is $445,000, with approximately $100,000 apportioned to the university.

The initiative is a collaborative effort between the AICFI, the University of Wollongong and the University of Southern Queensland, and aims to explore resilient cybersecurity measures for unmanned aerial vehicle (UAV) systems to safeguard them against adversarial machine learning attacks. The AICFI lead for the project is Dr Fendy Santoso, who will be responsible for implementing and evaluating countermeasures to implement the defence mechanisms developed and to integrate them with real-world UAV systems using datasets provided by the partner organisations.

"Once deployed on the UAV systems, the defence countermeasures will be evaluated in terms of their effectiveness and real-time performance," Santoso said.

"We intend to assess a wide range of UAVs. For example, fixed-wing UAVs, which are bigger and more sophisticated, will be deployed in remote areas and highways. In comparison, rotorcrafts and quadcopters, which are smaller with limited speeds, can be used in urban areas."

Santoso explained that UAVs play a pivotal role across national industry sectors such as logistics, environmental monitoring, smart farming, and bushfire and disaster management. "However, the susceptibility of machine learning models on UAV systems to adversarial attacks poses a significant barrier to their widespread adoption," he said.

"The project seeks to advance our understanding of cybersecurity by employing innovative approaches to fortify UAV systems against vulnerabilities in machine learning models."

The project's anticipated outcomes encompass refined techniques for developing robust machine learning models and an increased capability to design secure UAV systems. These advancements are expected to significantly enhance the security of UAV technology and foster reliable use in transport and logistics services to support Australian urban and regional communities.

"We look forward to advancing our collective knowledge in cybersecurity and contributing to the secure evolution of critical technologies," Santoso said. The project will commence in 2024.

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CRITICAL INFRASTRUCTURE — IS COMMUNICATIONS REALLY PART OF IT?

*Ian Miller**

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Recent communications failures should cause everyone to stop and think about whether our governments, public safety agencies, industry and the public in general really understand whether our communications systems are being treated as critical infrastructure.

For many years there have been submissions to government at many levels attempting to gain recognition that communications are an essential part of our daily life, and that they must be treated as part of critical infrastructure.

Geoff Spring, an Honorary Fellow and Senior Industry Advisor at the University of Melbourne's Centre for Disaster Management and Public Safety (CDMPS) and a Project Officer for the Australian Radio Communications Industry Association (ARCIA), has been making submissions and representations to multiple government committees of inquiry pointing out the criticality of our public

safety communications networks. In several cases the outcomes from these inquiries endorsed the position and recommended that public safety communication be accepted and treated as 'critical infrastructure', only to see the recommendations ignored or in some cases no follow-up due to changes of government.

In addition to the submissions to the various Public Safety Mobile Broadband (PSMB) inquiries, there were also submissions to bushfire inquiries and smart cities inquiries, all of whom accepted that communications were an essential part of the eco-structure that supports the public safety communications operational capabilities for our first responders, yet there was little or no action towards recognition of them as part of our national critical infrastructure. Perhaps that is because everyone just treats communications systems and platforms as being ubiquitous and like they will always be there? Recent history shows that not to be the case.

Since 2015 Spring has been pushing the case for public safety communications systems to be recognised as being part of Australia's critical infrastructure, something that public expectations would support. When there is an emergency, we all want to feel assured that those saving our lives and protecting our properties have excellent communications systems. That expectation hasn't changed and is still something that must happen; however, the needs and expectations of our public safety agencies have continually increased and will continue to do so, causing all sections of our communications network to become critical.

The recent problems with the public carriers' networks have highlighted the problems, but just consider two examples some years apart:

1. Back in 2012 the Telstra network suffered problems when a fire in a Telstra building in Warrnambool caused interruptions to phone and data networks across much of south-western Victoria. Many businesses suffered some interruption to their businesses but in general many could still operate; it was hardly a business-critical failure on a large scale.
2. Late last year the Optus network had a significant network failure, probably no worse than the Telstra failure of earlier years, yet the outcome was much worse. It became a business-critical failure for many users, both large and small. In fact, news reports showed that businesses including hairdressers and coffee shops had to stop operating during the outage.

So why are these two instances so different? Well, the public expectations of the ways in which we conduct transactions with governments and businesses have substantially changed and will continue to do so at an increasing pace, thanks to the continuing evolution of digital technologies — so not only are we more connected than ever before, we are now also more dependent. In today's modern world, close to 70% of payments are done by credit card or other electronic means, whereas several years ago it would have been around 20% of transactions.

So, for a small business, not having connectivity means electronic payment systems are not available, and in the case of a small coffee shop in a 'bolt hole' location in the CBD of any of our cities, the loss of 90% of the business between 6 am and 10 am on a weekday probably equates to the profit for that week, maybe even that month; a business-critical failure. For bigger businesses, given that most operations are now utilising cloud-based software, losing connectivity means that the business can hardly operate without having access to the cloud.

In a modern world, losing general connectivity is now a business-critical situation for every transaction-oriented industry, from the coffee cart to the cellar door and restaurants. In many ways these businesses rely on their connectivity as much as public safety agencies rely on communications to provide essential services, hence the terms 'mission critical' for these agencies and 'business critical' for the daily requirements. Both of these are of such importance that they should be included in the consideration of what is the critical infrastructure required now and even more importantly being actively planned for 'essential services' in the future.

Historically, the critical communications networks for our public safety agencies were designed, installed and maintained by the radio communications industry, the members of ARCIA. The equipment utilised for primary communications was specifically selected and tested to the five nines level — 99.999% availability of service. This was also extended to cover the ancillary services required for continued operation. System design was built around the availability of support services; within metropolitan areas probably 48 hours' back-up, regional services with 3–5 days' back-up and remote areas much longer.

In the modern world we rely much more on the mobile phone suppliers and their wireless data networks, and these are designed around a consumer-grade network, probably 2–4 hours' back-up in metro areas, maybe

8 hours in regional areas and perhaps 12 hours for key sites, a long way short of the power back-up at mission-critical levels. Why isn't it longer, you ask? Well, the carriers are private companies and need to make a profit so their shareholders can receive dividends on their investment.

As we identify the concerns around the 'always there' public carrier communication networks, we must accept that it just isn't practical to build them to always be there; the network owners and suppliers have to work to a commercial return-on-investment formula as part of their investment philosophy. This is also exacerbated by the ever-faster technology developments that mean that the network infrastructure also needs to be upgraded as technology changes. Most of us have seen the 3G, 4G and 5G technology implemented, and 6G is already being planned; technology leads to constant change.

The second big issue with technology advances in such a speedy fashion is that often the technology hasn't had time to be fully explored and tested before it is installed; think about the updates to programs on your phone and laptop. Imagine the stress for a system engineer as he hits the ‹update› tab on software in a major network, and then watches to make sure that everything he has assured will be alright actually works. In most cases it does, but if it doesn't then often there isn't a 'Plan B' or maybe the Plan B is to forewarn the CEO that the TV stations are on the way for an interview, oops.

So what is the solution? As Spring has been trying to highlight for nearly a decade, a key part of any solution is to acknowledge that there could be a problem and, through well-coordinated planning and review, to highlight where the issues might come from. This planning and review should be done as a part of a regular and peer-reviewed process included in national programs to review the protection of our critical infrastructure. Just as our power and water companies must provide plans for the protection of supply and maintenance of services during incidents, so too should our communications industry be required to be transparent and provide an overview of its plans on how to address as many known (and unknown) risks as possible.

There should be no single point of failure, there should be alternative or parallel pathways to avoid known risks, and perhaps most importantly, our governments should insist on having the powers to permit access to other networks in times of critical incident failures. A business that depends on connectivity for daily operations should have access to other networks to ensure that business doesn't grind to a halt with a network failure, and in some cases maybe the networks need to accept that mission-critical operations should just seamlessly switch to another network to ensure ongoing operations without interruption. How long have we had to wait for a PSMB capability to become available to our first responders? Simply put, too long!

For almost a decade the CDMPS and ARCIA, primarily through the efforts of Spring, have been lobbying for these types of considerations, and during that period the demand has now developed from just being mission critical to now including business critical as well. The wireless data networks that are 'always there' sometimes are not, and as a nation we cannot afford to continue to accept that as an ongoing situation.

The ongoing review of our nation's critical infrastructure must include our public safety communications networks and the formal recognition of the ecosystem in which they reside; inherent and evolving risks should be identified and effectively managed to minimise their impact. These processes must be done in a transparent fashion so that concerns are not just accepted as being part of system or commercial design by our public carriers. It is in our national interest to make sure our systems are robust and, given the changes in our society, they remain 'fit for purpose'.

On 13 November 2023 the Minister for Home Affairs announced that telecommunications will be recognised as critical infrastructure, with the Minister saying, "These rules, frankly, should have been in place years ago." This is a very welcome small first step, but the remainder of the journey cannot be allowed to take another decade, and maybe the next step is to recognise the need for planning and transparency of the planning process. We should also recognise the efforts of people like Spring, the CDMPS and ARCIA for continuing to raise awareness of the need for recognition and protection of communications as part of our critical infrastructure.

Ian Miller is the Spectrum & Technical Coordinator for the Australian Radio Communications Industry Association (ARCIA), and has over six decades of experience in the radio/wireless communications industry.

Digital radio gateway

The Omnitronics **DRG**100 Digital Radio Gateway is a powerful device that can be programmed with a wide variety of digital protocols. By using a gateway infrastructure, one can connect operators on PC dispatch consoles to radios of multiple types — analog or digital, conventional or trunked, open-standard or proprietary — for true interoperability.

The gateway is used all over the world for applications such as public safety, transport, oil and gas, mining and more.

Omnitronics Pty Ltd
www.omnitronicsworld.com

Body-worn camera

The Axon Body 4 is a next-generation body-worn camera that provides high-quality footage with additional perspectives, streamlined operations and real-time communications support, making it more than just a camera. It was specifically built for the needs of public safety and security, empowering users to capture and preserve footage and data exactly as situations unfold.

The product introduces bidirectional communications between officers and their support teams, by enabling multiple viewers who have access to the livestream to communicate in real time with the camera wearer. A Watch Me button empowers officers to signal for additional support, with location and critical alerts displayed on Axon Respond.

The device offers the option to easily connect an additional point-of-view (POV) camera module. This camera can attach to an officer's head or shoulder, be handheld or be affixed to the brim of a hat or sunglasses to allow to for alternative perspectives that more closely mirror the officer's own point of view.

Sharper images, improved visibility, a larger field of view (160°) and better camera capabilities compared to previous versions enable the wearer to capture more of every moment. With streamlined operations, the product improves the officer user experience and enables agency administrators to more easily manage their body camera programs.

With a battery life of over 13 h, the camera can be used over a full shift, even with real-time services running. It also provides rapid charge capabilities with magnetic quick-disconnect. The device is able to add over 20% battery charge in under 30 min, making it simpler for the user to recharge in the car while on duty.

Axon Public Safety Australia
au.axon.com

4x4 MiMo 4G/5G BAT antenna range

Panorama Antennas' BAT[X]M4 range is a discreet or covert 4x4 MiMo antenna solution for 4G/5G with the option of GPS/GNSS, and 2x2, 3x3 or 4x4 dual band 2.4/5 to 7.2 GHz Wi-Fi 6e. It is a high-performance, futureproof antenna that has been designed to meet the needs of today and the future, while remaining a low-profile solution.

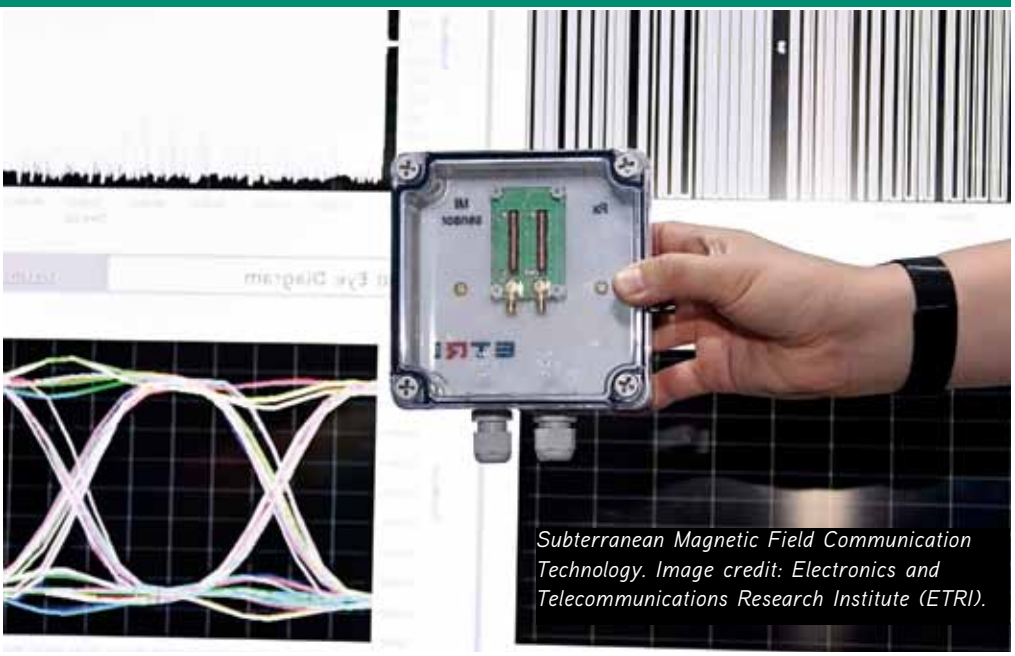
The efficient 4G/5G antenna elements cover 617–960/1427–6000 MHz to provide a robust communications link, for high data rates even in challenging network coverage areas. The product can include a GPS/GNSS module with advanced filtering for either L1/E1/G1/B1 only or dual band L1/E1/G1/B1 with L5/E5a.

The dash mount antenna is IP55 rated and designed to be mounted on or under a vehicle dashboard or parcel shelf but can be mounted on any non-conductive surface, due to its easy adhesive, suction or screw mounting. Versions without GPS can be mounted vertically to a wall or panel.

The BAT range is supplied with integrated, low-loss flame-retardant cables that meet the requirements of UN ECE R118 and EN45545-2. Applications include use in police vehicles, ambulances, fire engines, public buses and coaches, mass transit, fleets and trucks, utilities, EMS covert requirements and enterprise.

Panorama Antennas Pty Ltd
www.panorama-antennas.com

WIRELESS COMMUNICATION ENABLED 40 M UNDERGROUND



Subterranean Magnetic Field Communication Technology. Image credit: Electronics and Telecommunications Research Institute (ETRI).

Researchers from South Korea's Electronics and Telecommunications Research Institute (ETRI) have found a way to enable wireless communication below the Earth's surface, in a significant departure from their traditional focus on terrestrial communication systems.

The team managed to send and receive voice signal-level capacity up to 40 metres below the Earth's surface, opening new avenues for confirming the survival of individuals trapped due to accidents such as mine collapses. Their work was presented at the 20th Annual IEEE International Conference on Sensing, Communication, and Networking (SECON 2023), held in September.

Conventional wisdom held that wireless communication in the complex underground environments of mines was virtually impossible due to signal attenuation. However, ETRI overcame these obstacles by developing a new communication system, dubbed Subterranean Magnetic Field Communication Core Technology, which leverages the unique boundary conditions of magnetic fields within the medium.

The research team miniaturised the size of their transmitting antenna to one metre, contrasting with the tens-of-metres scale antennas used in previous international research. The system also features small receiving sensors based on magnetic induction, with dimensions in the order of centimetres.

According to the researchers, the newly developed transmitting and receiving antennas function akin to an access point (AP), essentially serving as a base station linking the surface and the underground. Therefore, it is expected that once transmitting devices on the surface and receiving devices underground are installed, individuals awaiting rescue could communicate through personal devices like mobile phones, connected to these antennas.

The successful communication test was conducted over a distance of 40 metres inside a mine composed of limestone bedrock, where stable communication was previously unfeasible. The team used a very narrow low-frequency band of 20 kHz, rather than the MHz or GHz range commonly used in general wireless communication; this frequency band was chosen to minimise material loss in the subterranean environment, and to suit the size of the antennas. The data transmission rate for voice signals was maintained at around 4 Kbps, sufficient for basic two-way communication.

According to the researchers, this successful application of magnetic field communication promises to bring substantial changes to the underground mining industry; notably, the technology is expected to offer a reliable mode of communication during emergencies such as mine collapses, underground fires and other disaster scenarios that typically disrupt conventional communication systems. This is because magnetic field communication systems should maintain connections between miners and rescue teams during accidents, thereby facilitating better-coordinated rescue efforts. The technology is also seen as a means to reduce response time in emergencies and to enhance safety measures.

"We have conducted successful communication trials between the first and second layers of underground mines using magnetic field communication systems," said ETRI's In-kui Cho, Director of the EM Wave Basic Technology Research Section. "This greatly reduces the likelihood of communication network disruptions caused by mine collapses."

Beyond mining, magnetic field communication is expected to offer effective communication solutions in other underground structures like gas and oil pipelines, contributing to increased safety measures during various emergencies. As noted by Seung-keun Park, Assistant Vice President of Radio Research Division at ETRI, "This technology is anticipated to be a groundbreaking mode of reliable communication in complex and unpredictable environments like underground construction, tunnelling and ocean excavation."

ETRI is currently concentrating its research on overcoming the limitations of propagating material in extreme conditions like underwater and subterranean environments, having previously executed underwater communications up to a depth of 40 metres in freshwater regions such as rivers and streams. Collaborating with industry partners, the researchers aim to further develop their technology for long-distance and miniaturised systems exceeding 100 metres.

Industry Talking

Welcome to 2024 — we hope all our members have managed to recharge their batteries for another year ahead.

ARCIA has an extensive event plan for 2024, including one-day conferences and networking dinner events. Key events are 14 March (Perth), 30 May (Sydney), 25 July (Brisbane), 11 September (Adelaide), and the big one in Melbourne on 16 October. Make sure you check out https://arcia.org.au/events/ for all the events and training sessions.

To make the most of these events, ARCIA is working on new content and subjects that many in our industry will find interesting. We would encourage you read the details of your local event to see if there are topics of interest to you or your team. Of course, we are always on the lookout for new and interesting content about the people, places and projects that our industry works on every day.

A consistent theme from ARCIA and likeminded associations around the world, such as RFUANZ and the FCS, is hiring and training technical staff for our industry. The challenge has only been exacerbated by COVID as every industry is struggling to find staff. On the ARCIA website you will find planned training sessions for 2024, and the association will continue to expand training content and courses through the year. Make sure you check this out and take full advantage of what is available.

In this edition of *Critical Comms* there is an article concerning the federal government's work on considering communications systems as part of the nation's critical infrastructure. This is a long overdue decision and something ARCIA has been advocating for. However, we need to also acknowledge the huge effort that Geoff Spring and The University of Melbourne have put into this work.

Given all the new technology options coming to the public safety market with hybrid devices, new satellite connectivity options and MCPTT services, it is pleasing to hear about the considerable investment that state governments are making in critical communications around the country. Over 2023 we had many user presentations on this theme and we expect to see more in 2024. It's amazing to see how far communications technology has advanced in the last 10 years. While we all know the basics of LMR have not changed, all these new options are providing great solutions to extend the effectiveness of communications for many important user groups.

As always, our Industry Gala Dinner in Melbourne is a significant event, and last year it gave me great pleasure to confer life membership on two individuals who have been committed supporters of ARCIA for many years. David Cox was one of the founding members of ARCIA and a driving force in raising the profile of the industry dinner; serving as Treasurer for ARCIA for several years, he has been a tireless worker for our association and our industry for many years. The second life membership was awarded to Steve Jacques, who recently retired from RFI. Steve has been a strong supporter and mentor for the ARCIA committee for many years; his wise words and experience in many markets helped ARCIA develop to the powerful organisation it is today. Life membership is the highest accolade that ARCIA can offer, and these two gentlemen are very worthy recipients; we thank them for their ongoing support.

Finally, the first committee will be gathering in Melbourne for our annual planning day in February to set the agenda for the year. We are very fortunate that committee members can make time available to participate in this important day.

Hamish Duff
President
Australian Radio Communications Industry Association

Hearing protection headsets

Savox Communications has announced the latest addition to its Noise-Com (NC) 500 series — the Savox NC-520XP hearing protection headsets, designed to meet the needs of professionals working in demanding environments.

In noisy work environments, protecting one's hearing is paramount, but it should never come at the cost of situational awareness and effective communication. The hearing protection headsets incorporate Savox Dual Bluetooth, allowing users to connect two devices — in most cases a radio and a mobile phone — simultaneously. This enables hands-free communication and allows users to listen to radio transmissions and still be reachable.

The noise-cancelling push-to-talk (PTT) boom microphone offers crystal-clear speech even in loud environments. The headsets also feature a user-friendly answer button and rotary switch for convenient control of ambient sound volume and incoming communication. With a rechargeable power unit designed for maximum durability, the headsets provide reachability, usability and onsite safety.

Other features include: ambient sound, enabling the user to stay aware of their surroundings while protecting their hearing; ambient audio profiles, for personalised audio settings; a voice-prompted menu with a user-friendly interface for easy navigation; professional two-way radio PTT compatibility, for seamless integration with existing communication systems; and a low battery warning with automatic switch-off.

Savox Communications
www.savox.com

FLEET MANAGEMENT
DRIVES SURGE IN GPS TRACKER MARKET

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The global GPS tracker market is on the brink of a substantial valuation, projected to reach US$3.1 billion by 2024, according to a new report by Future Market Insights. This significant growth can be attributed to burgeoning interest in the market, driven by the increased adoption of fleet- and asset-tracking solutions for both commercial and passenger vehicles.

GPS tracking technology, relying on satellite signals for real-time location accuracy, is widely used by vehicle owners and fleet managers; its applications range from optimising routing to improving customer service and enhancing cargo security. Businesses of all scales, from small enterprises to large corporations, increasingly leverage GPS technology to manage and monitor expanding vehicle fleets.

Fleet-tracking solutions, enabled by GPS technology, offer numerous advantages. These include increased productivity, enhanced return on investment (ROI), theft recovery, and improved employee and asset safety. The accuracy of GPS technology is particularly useful in challenging situations such as vehicle breakdowns, fleet-related crimes and unauthorised stops.

"GPS tracking technology allows fleet managers to optimise routing, monitor vehicle locations and improve overall fleet efficiency," said Sudip Saha, Managing Director at Future Market Insights. "This leads to cost savings, increased productivity and better resource utilisation, and is considered one of the major drivers of the GPS tracker market."

GPS tracking is also pivotal in critical situations involving potential threats to human lives, such as search and rescue operations, as this technology allows rescue teams to monitor search areas effectively and gather information from lost smartphones or GPS devices carried by individuals. GPS trackers in search and rescue operations provide essential functions, including tracking rescue teams, locating missing individuals, surveying hazardous areas, monitoring vehicles and equipment used in rescue missions, and ensuring situational awareness.

Manufacturers actively contribute to market expansion through initiatives focused on developing advanced and portable GPS trackers. Notably, integrating dash cameras into GPS trackers adds a layer of comprehensive tracking capability, providing real-time video features alongside location data.

A competitive landscape

The GPS tracker industry boasts a substantial array of market participants. Research and development play a pivotal role among these players, primarily focusing on introducing eco-friendly product lines as a core aspect of their manufacturing endeavours. Furthermore, they employ various expansion strategies, including collaborations, mergers and acquisitions, and diligent exploration of regulatory approvals to bolster their market presence.

In one recent development, Sierra Wireless has introduced the Acculink Cargo, a managed IoT asset tracking solution. This offering is designed to streamline the implementation of tracking systems, allowing companies to efficiently monitor the location and condition of high-value and sensitive assets in real time. Meanwhile CalAmp, a connected intelligence firm focused on enhancing work processes for individuals and organisations, has unveiled its latest innovation — the SC1302 single-use smart tracking gadget.

According to Future Market Insights, the GPS tracker market expanded at 7.6% CAGR between 2019 and 2023, and is valued at US$2887.6 million as of 2023. Standalone trackers are expected to dominate at a market share of 38.9% in 2024, while fleet management applications will register at a market share of 45.8%. The market has a projected CAGR of 8.7% from 2024 to 2034, by which time is it poised to soar to an estimated total valuation of around US$7.2 billion.

All that said, certain challenges remain which could hinder market growth, with concerns related to privacy and data security associated with GPS tracking systems posing as significant restraints. Addressing these issues while ensuring consumer data protection will be crucial for market players to maintain trust and sustain long-term growth.

Future Market Insights' report offers an unbiased analysis of the global GPS tracker market — segmented by type, by application, by industry and by region — providing historical data for 2019 to 2023 and forecast statistics from 2024 to 2034. To view the report in full, visit https://www.futuremarketinsights.com/reports/gps-tracker-market.

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10 PREDICTIONS FOR MISSION-CRITICAL COMMS IN 2024

Anatoli Levine, Director, Products and Standards at Softil Innovative Communications

Softil, a leading mission-critical communications (MCX) enabler, has issued its annual outlook for the disruptive MCX industry covering the 2024 period and highlighted 10 probable advances in group communications that the coming year will bring.

"The past decade has brought seismic change in the way that first responders communicate," said Pierre Hagendorf, Softil's CEO. "The year 2024 will see life-changing technology continue to broaden its outreach in public safety agencies and extend its functionality and usage in MCX and FRMCS deployments."

1. 5G private networks

When it comes to MCX deployments, the most typical scenario is deployment in service provider networks such as AT&T FirstNet, KT SafeNet, Southern Linc's Critical Linc, etc… At the same time, as MCX technology is already mature, it is a perfect candidate for deployment outside a major service provider's reach — especially when it comes to, for example, utilities or oil, gas and mining. Utility companies often operate their own private communication networks, and considering the level of maturity of MCX, group communications technology is perfectly suitable for private network deployments — which align very well with the increased proliferation of 5G private networks. We should expect to see more and more deployments of MCX within private 5G networks in 2024.

2. 5G-Sidelink, V2X and device-to-device

For many verticals, it is imperative that devices be able to discover each other and then communicate with each other anywhere in the world. Most importantly, device-to-device (D2D) communications should work when no network is available.

D2D communications without using the network (whether the network is available or not), often called Direct Mode, is a critical success element in a variety of applications, but of all the use cases, the ones that clearly stand out are communication between cars and infrastructure (V2X) and communication between first responders, or any public safety users for that matter. Implementation of such D2D solutions for broadband devices was attempted before, but only now, with the advancements in 5G, real solutions are starting to appear in the form of the 5G-Sidelink standard.

The year 2023 has already seen serious advancements in this space with Qualcomm, the major mobile chipset supplier, bringing 5G-Sidelink implementations for the MCX interoperability testing event (ETSI MCX Plugtest #8); Softil was delighted to be a part of the D2D interoperability demonstration in front of observers at the Plugtest. 5G-Sidelink with its groundbreaking technology can provide at least 1.2 km line-of-sight communication capabilities on standard cellular handheld devices, solving the important challenge of enabling forces on the ground to communicate with each other no matter what. All in all, this is an important step in the right direction, and we expect more advances in this space in 2024.

3. Internet of Life Saving Things

One of the key goals of 5G technology is efficient machine-to-machine (M2M) communications. As 5G is advancing along the Plateau of Productivity (see the Gartner hype cycle), it enables better and more efficient communication for the myriad of devices comprising the Internet of Things (IoT) universe. Many verticals are set to benefit from advancements in the IoT space, including public safety and first responders. For example, think about the great number of sensors that can be placed on a first responder's uniform — body vitals, temperature, barometric pressure, shot detection and so on — and all of this data available in real time in the decision centre, all thanks to ubiquitous 5G connectivity. We expect to see more and more solutions in IoLST (Internet of Life Saving Things) this year, and every year after that.

4. Machine learning for MCX

It is well known that ubiquitous broadband enables the opportunity for a data flood. With billions of devices connected to the broadband network, the amount of data available for processing is simply immeasurable. Specifically in MCX, the amount of data that is available and needs to be processed in real time is huge — sensors, audio streams, video streams from multiple sources (body-worn cameras, street cameras, traffic cameras), location data, images and lots more. Considering this 'data ocean', machine learning (ML) comes to the rescue: computers can take on processing and analysing the data and make recommendations to a dispatcher — learning in the process and improving its algorithms to be able to help better next time. We predict significant advances in ML applications for MCX use cases in 2024 and beyond.

5. MCX in the cloud

In simple terms, MCX is just a standards-based group communications technology. While public safety was the primary beneficiary of new open-standards-based broadband group communications technologies, it was also clear that many other user types, from utilities to transportation to mining to even retail, can also take advantage of the same standard. At this point in time, MCX communication solutions have already reached an advanced stage, where core technology is stable and can now extend its reach to the 5G Cloud, offering the same group communications benefits to enterprise users. As 5G Cloud deployments grow, we expect to see more MCX cloud deployments in the years to come.

6. FRMCS

FRMCS (Future Railway Mobile Communications System) is a critical technology for high-speed railways and an essential part of the European Green Deal. Today's high-speed train communications are based on the GSM-R, an old 2G technology that is rapidly sunsetting; thus FRMCS, a 5G-based technology, needs to become fully operational during the next decade. FRMCS, actively being developed by the UIC with the assistance of 3GPP, ETSI, UNIFE and many other organisations, will enter the second phase of trials this year and we expect that further development of FRMCS technology and FRMCS products and services will accelerate in 2024 and beyond.

7. MCX applications

Being an open global standard supported by mobile operators around the world, MCX offers an opportunity for application developers to enrich broadband group communications solutions for public safety, utilities, transportation and other verticals benefiting from group communication capabilities. For example, mission-critical push-to-talk (MCPTT) functionality can be easily added to situational awareness solutions for public safety, reaching a group of first responders with the push of a button, or mission-critical video (MCVideo) sent directly to first responders from a video analytics application when certain criteria is met. The possibilities are endless, and we expect to see more MCX applications helping public safety, utilities and transportation users to be more effective in their daily work in 2024.

8. CAD + MCX

CAD (computer-aided dispatch) is an integral part of first responder operations. Today, CAD is still all about 'secret sauce' — all CAD vendors operate on their own proprietary datasets, and literally every delivery requires specific integration. MCX offers common operational paradigms of CAD, such as resources, their locations, group chats and more. As MCX solutions are increasingly deployed, there is a greater need for CAD to be integrated with MCX systems for both interoperability and operational efficiency. We expect the first CAD/MCX integrations to come to life in 2024, and to steadily increase from there on.

9. MCX and NG911 integration

The emergency communications available to the general public, commonly known as 911 in the USA and Canada, 112 in Europe and 999 in the UK, are increasing being upgraded to broadband SIP-based architecture, officially known as NENA i3 in the US, but commonly referred to as NG911/NG112 (NG stands for Next Generation). MCX technologies were developed especially for and deployed on broadband networks and it makes perfect sense that both MCX and NG911 technologies can be tightly integrated. When needed, audio, live video, text messages, images and more can be delivered directly from a citizen's mobile phone to first responders equipped with MCX devices. As both MCX and NG911 technologies become more widespread, we expect to see an increased number of deployed MCX/NG911 integrations in 2024 and beyond.

10. More MCPTT traffic, more MCPTT minutes

This might be the easiest prediction… we expect to see more MCPTT calls on service providers' networks and that will lead to better uptake among public safety users, more devices and applications supporting MCPTT, more use cases, more verticals, more traffic and more MCPTT minutes. While revolutionary in nature, MCX technology is akin all other 'revolutionary technologies' that came before and will come after. The path is simply an evolution; thus we simply expect 'more'.

Real-time fronthaul analyser

VIAVI has expanded its NITRO Wireless portfolio with the addition of XhaulAdvisor, a scalable software solution offering real-time data for fronthaul verification, analysis, emulation and channel utilisation. Featuring real-time analytics, it enables Open RAN vendors, operators and OTIC labs to accelerate interoperability testing and end-to-end testing and troubleshooting.

Unlike conventional tools that require lengthy waiting periods for capture, post-processing and visualisation, the product enables a realistic testing and validation environment in real time. Vendors and operators rapidly correlate test anomalies to network events and troubleshoot fronthaul and transport timing, packet flows and channel utilisation, as well as analyse M-plane, S-plane and C/U-plane sessions.

Various operation modes are available to fit different application needs, from set-up in passive or through mode to analysis in live or post-capture environments. Synchronisation can be achieved from open fronthaul or an external timing source.

Providing operational flexibility, the product can be deployed on commercial off-the-shelf hardware. It can also be integrated with other VIAVI tools already present in the testbed — such as TM500 and TeraVM — to speed up troubleshooting and root cause analysis, as well as flagging and isolation of issues caused by RAN, transport or synchronisation functions.

VIAVI Solutions Inc
www.viavisolutions.com.au

DMR multiband portable radio

Tait Communications' 9700 two-way radio series has been designed to expand the capabilities of the digital mobile radio (DMR) standard with a large range of frequencies and network standards in one compact, rugged unit.

The Tait TP9700 DMR multiband portable radio offers the flexibility to adapt to a wide variety of scenarios. Users can easily talk to people from other organisations, roam across multiple radio networks and have the option to expand their network in the face of spectrum shortages. It is also a useful preliminary investment for organisations planning a phased migration to a new radio network with an entirely new frequency band.

The multiband DMR portable radio series has the ability to operate in conventional FM analog, MPT1327, DMR Tier 2 conventional digital and DMR Tier 3 digital trunking modes. It can be configured to operate across one or more frequency bands, including VHF, UHF, 7/800 MHz and 900 MHz, plus single-band operation across the UHF radio spectrum from 378–520 MHz (normally two bands). It enables direct-mode calling between radios, inter-network roaming, expandability and rebanding.

Tait Electronics (Aust) Pty Ltd
www.taitcommunications.com

Processors

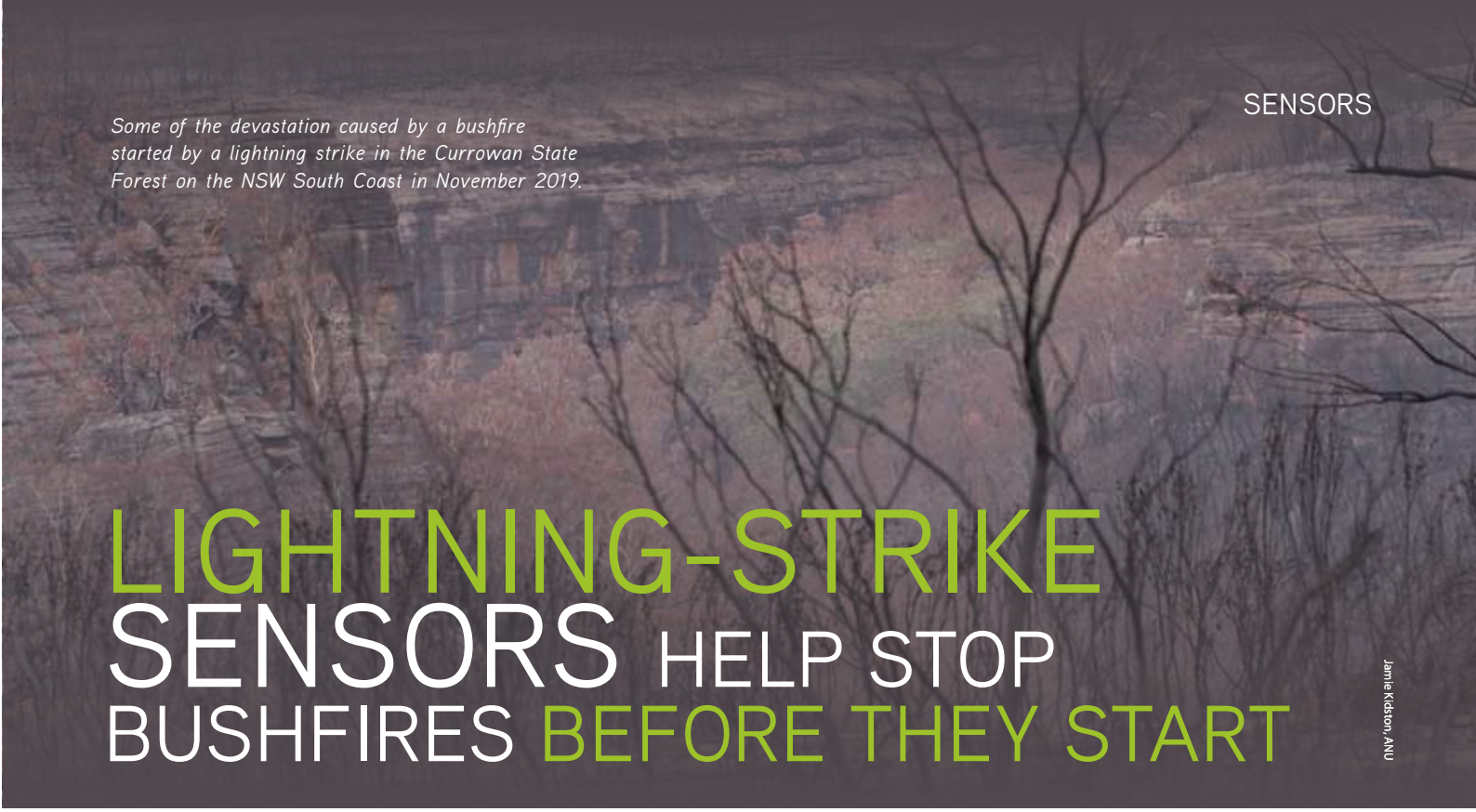
The latest generation of processors in the Ericsson RAN Compute portfolio have been designed to help communications service providers (CSPs) get the most out of current and future radio access technology evolutions. The portfolio includes processors with high- and standard-capacity variants, and with both enclosure and outdoor formats, to cater to varying site needs. The products are also hardware prepared for Open RAN deployments.

Built for the network demands of 5G Advanced and enhanced artificial AI algorithms, the processors are powered by Ericsson Silicon, the company's system-on-a-chip, which is built on a custom-made, flexible and modular architecture. This is what enables the existing RAN Compute portfolio to consume 30–60% less power compared to industry benchmarks, the company says.

The company's two high-capacity processors, RAN Processor 6672 and Radio Processor 6372, offer four times the capacity compared to the previous generation and can support up to six 4G and 5G modes in a single unit; advanced 5G markets typically utilise three to four modes in basebands at present. The additional modes will allow CSPs to run more technologies simultaneously on one RAN Compute board, including 5G time division duplex (TDD) Massive MIMO, 4G and 5G frequency division duplex (FDD) and more, with modes to spare for future needs.

The two standard-capacity options are the RAN Processor 6655 and Radio Processor 6355, both of which offer higher capacity and energy efficiency than their predecessors.

Ericsson Australia Pty Ltd
www.ericsson.com/au



Some of the devastation caused by a bushfire started by a lightning strike in the Currowan State Forest on the NSW South Coast in November 2019.

Jamie Kidston, ANU

LIGHTNING-STRIKE SENSORS HELP STOP BUSHFIRES BEFORE THEY START

A US-developed smart sensing system that detects the lightning strikes most likely to start a fire is being fine-tuned to Australian conditions, as part of a collaborative NSW Smart Sensing Network (NSSN) Grand Challenge project. Sensors in the system can detect the component of lightning responsible for ignition; when combined with satellite data on forest fuel load and vegetation moisture levels across Australia, the system can predict if a bushfire is likely to start.

The aim of the project is to provide the earliest possible warning and accurate location of lightning strikes at the greatest risk of starting a fire. The work followed the devastating Australian bushfires in the summer of 2019–20, as a large proportion of these fires were ignited by lightning strikes and extensive areas were burnt largely because of an inability to detect and extinguish ignitions in remote areas before the fires spread and became uncontrollable.

The project is being led by the ANU-Optus Bushfire Research Centre of Excellence — directed by Associate Professor Marta Yebra — in collaboration with Western Sydney University's Hawkesbury Institute for the Environment, government partners, and Florida-based company Fire Neural Network (FNN). FNN's goal as a company is to identify the small portion of lightning strikes (less than 10%) that are actually capable of starting a fire, and to do so quickly and accurately.

FNN has developed its onsite lightning detectors to allow for real-time fire ignition tracking with an accuracy of 40 metres within just 40 seconds. Information about the lightning strike and environmental data are fed into the company's proprietary neural network to determine if the strike was a high-risk lightning strike or not, which firefighting services can rely on to efficiently allocate their resources for containment. The detectors use multiple bands to differentiate between regions of cloud and no-cloud to allow for higher accuracy.

Jamie Kidston, ANU

The high-risk lightning detector is fully autonomous and uses solar power and Starlink internet technology, meaning it can be deployed in remote locations.

As explained by FNN co-founder and CEO Dr Istvan Kereszy, the NSSN project enabled FNN to develop a fully autonomous high-risk-lightning detector that has its own power supply and internet. He noted, "This approach uses solar power and Starlink internet technology, and it means that the detectors can be quickly deployed anywhere in Australia."

Yebra said the FNN-developed High-Risk-Lightning Precision Detection System was found to show promise, having successfully identified high-risk lightning strikes near fires ignited by lightning in the Canberra region in February 2023. "While there's room for refinement, our findings suggest potential for more accurate risk assessment in the future," Yebra said.

The project has also developed a model that can predict the probability of lightning-caused fire occurrence based on identified key drivers. As explained by ANU's Dr Colleen Bryant, "Ultimately, the risk of lightning ignition is related to how much moisture is in the system — in the atmosphere and in the fuels.

"Decreasing humidity, soil and fuel moisture, and increasing daily maximum temperatures in the lead-up to thunderstorm activity, are important predictors of lightning fires."

NSSN Natural Hazards Theme Leader Peter Runcie said the work has been an excellent example of a project funded by the NSSN's Grand Challenge program, with the project partners now applying for funding to demonstrate the system in a longer bushfire season.

"It has enabled collaborators from government, academia and business to work together to progress the development of new technology solutions for detecting bushfires," Runcie said.

"Combining lightning detection with the analysis of lightning characteristics and fuel conditions will provide authorities with an improved ability to identify potential bushfire ignitions as they occur."

CASE STUDY

Uninterrupted connectivity for UNSW's solar race car

Wireless network edge solutions vendor Cradlepoint was selected to provide connectivity for the UNSW Sunswift 7 solar race car last year, supporting the car as it competed in October's Bridgestone World Solar Challenge.

The Bridgestone World Solar Challenge is a competition for solar electric cars that takes place every two years, commencing in Darwin and finishing 3600 km later in Adelaide. The eight-day challenge not only tests the cars' technology but also the teams that come from all over the world to try and win this prestigious and gruelling event.

Cradlepoint's in-vehicle Wireless WAN (WWAN) solutions were used to connect the Sunswift 7 race car to the internet, as well as auxiliary vehicles that supported the UNSW race team during the competition. Connectivity ran over Optus 4G/5G cellular networks or, where there was no cellular coverage available, Cradlepoint's routers redirected traffic to a LEO satellite for uninterrupted connectivity.

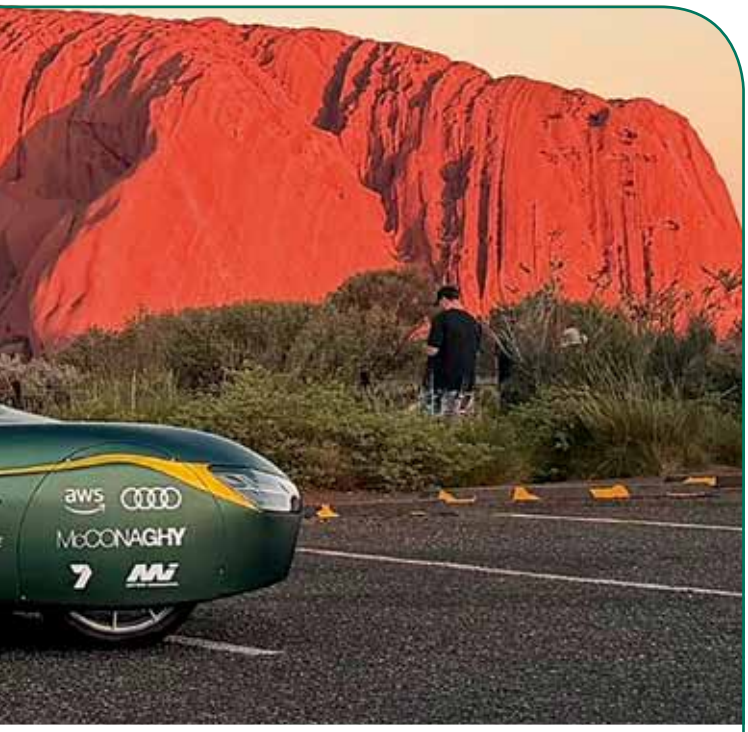
The Sunswift 7 team selected Cradlepoint to provide connectivity for their vehicles during the race based on the WWAN solutions' ability to seamlessly connect to all devices used for the race, such as laptops, dash cameras, sensors and tablets. A key component of the solution provided was the ability to monitor connectivity of devices in the convoy remotely, enabled by Cradlepoint NetCloud Manager. APIs were used for GPS tracking, showing remote teams the live location of vehicles, and used to ensure the safety of race team members and provide vehicle telemetry data for insights and reporting. Cradlepoint routers also had built-in security firewalls to protect devices in vehicles from external attacks.

"Cradlepoint is providing the Sunswift team with crucial uninterrupted internet connectivity in and across the vehicles in our convoy, enabling us to access race car telemetry and send that data to the cloud," said Professor Richard Hopkins, Sunswift Racing Team Principal, ahead of the race. "This means that our wider team can monitor the performance of the race car — things like vehicle speed, solar battery status, temperature — from the outback to wherever they are located. We're also able to broadcast live and students are using it as a way to get messages around sustainability and climate change out to the public."

The Sunswift 7 convoy was equipped with multiple Cradlepoint routers, including the Cradlepoint R1900 Ruggedised 5G Edge Router, optimised for in-vehicle networks and offering high levels of ruggedness, performance, security, connectivity and utility in a purpose-built, compact design. The R1900 delivers full 5G performance and enterprise-class security and can connect to LEO satellite technology.

"Cradlepoint is a critical piece in this race for us because telemetry is the key ingredient for success in car racing," Hopkins said. "Cradlepoint is enabling constant connectivity to and in our vehicles either via cellular or satellite networks, which means that the health of our race car is constantly monitored and ensures the highest level of performance throughout the race."

Ultimately the race had a bittersweet result, when strong winds put such a toll on all the cars' batteries that none of the entrants were able to reach the day-four checkpoint at Coober Pedy before the 5 pm deadline. Race organisers announced that the final results for the Cruiser Class would be based on the standings from the previous checkpoint at Tennant Creek, where the points classification — which considers factors such as energy usage, the number of passengers and the time taken to complete each stage — placed Sunswift well ahead of its rivals. Marks were also issued by the judges based on criteria such as design innovation,



occupant space and comfort, ease of operation, versatility, and style and desirability.

Following all calculations, Sunswift finished at the top of the rankings with a total score of 91.1 points to claim the trophy, well ahead of the University of Minnesota in second place on 22.4. This is the first time an Australian car has won the Cruiser Class category in the World Solar Challenge since it was first introduced back in 2015.

"I could not be more proud of this team for what they have achieved," Hopkins said.

"We were the fastest car in the pre-race time trial, we were ahead on the road, we were ahead on points and we travelled further than any other team.

"After seeing what Cradlepoint can help us successfully do, Sunswift hopes to have a continuous partnership with Cradlepoint beyond this event."

Cradlepoint Australia Pty Ltd
www.cradlepoint.com/au

Bluetooth LE 5.4 modules with LE Audio

u-blox's MAYA-W3 family is a series of compact dual-mode Bluetooth LE 5.4 modules with LE Audio. The modules also support Wi-Fi 6/E and are designed for demanding industrial applications, including health care, industrial automation and monitoring, asset tracking and management, and smart homes.

The module is available in several variants, offering Wi-Fi 6, Wi-Fi 6/E, tri-band, dual-band and single-band configurations. It can be combined with various antennas, such as antenna pin(s) or U.FL connectors, and comes equipped with an LTE filter to coexist with other technologies. The choice of variant depends on the desired performance.

The series brings the benefits of Wi-Fi 6 and the 6 GHz band to a wealth of industrial applications. It is designed to alleviate network congestion and enhance power efficiency, and can operate in temperatures ranging from -40 to +85°C. It also includes Bluetooth LE Audio for point-to-point voice communication and voice broadcasting.

The module supports designers' efforts to scale solutions for current and future market trends. Maintaining the same compact dimensions as its predecessors (10 x 14 x 1.9 mm) simplifies migration across generations.

The module variants hold global certifications for both Wi-Fi and Bluetooth. Its versatility makes it an asset for applications including assisted living, power tools, container tracking and solar inverters. The u-blox technical support team can assist with fast implementation.

u-blox Singapore Pte Ltd
www.u-blox.com

Radio Matters

iStock.com/Chonlatee Sangsawang

The Radio Frequency Users Association of New Zealand (RFUANZ) celebrated its 25th year running recently, and we owe a big thanks to our members, partners and sponsors, plus everyone who has supported the radio frequency industry of New Zealand. We have come such a long way in such a short amount of time but there are still a few hurdles to jump.

For some time now we have identified that the telecommunications industry is rapidly moving towards a crisis in the availability of skilled radio technicians. What RFUANZ wants to see is a formal career pathway for new people entering the workforce and a foundation course for existing staff who have no formal training but want to gain their qualification.

With this in mind we have been supporting industry training provider E-tec for the past few years in their development of a Level 4 qualification that's suitable for training radio technicians for the radio industry. We are thrilled to welcome all personnel into this course, and with rolling enrolments open as of October 2023 you can join any time!

In our eyes the availability of a suitable training course is paramount for the future of our industry, and while that was a major milestone for our 2023, we remained busy in other sectors as well.

Engaging with our membership has been a big point of focus. We introduced a photo competition to increase engagement online (keep an eye out for this year's entries and winners!) — this also allowed a personalised RFUANZ calendar to be sent out at Christmas. We are also working on new initiatives to bring our members and industry leaders together (currently this only happens at our AGM).

And of course, there was a lot of admin... The new Incorporated Society rules are changing and so we too must adapt. This is a meticulous process, but we will have an update and changes to our rules ready for discussion at this year's AGM.

Last year saw the implementation of a few things and the maintenance of others, but our sights are set on an engaging 2024! We aim to see and hear from our membership more often, creating scenarios where this can happen. We hope to improve our industry relationships to better support those without a voice of their own, and most importantly, we strive to protect, promote and preserve the radio frequency industry of New Zealand for years to come.

We wish you a happy 2024 full of success and look forward to seeing you at our Annual Gala Dinner and Awards Night in June.

Ngā mihi Nui.

Justin Wonderlick
Chairman — ARE182
Radio Frequency Users Association of New Zealand.

5G FWA outdoor receiver and indoor gateway

Nokia has expanded its FastMile 5G Fixed Wireless Access (FWA) portfolio with an outdoor receiver and indoor gateway with Wi-Fi 7 based on the latest available technology. The devices are designed to enable operators to conserve radio capacity and improve coverage of their FWA service, with studies indicating that operators can save as much as 60% of potentially wasted network capacity simply by placing the right device in the right location of the customer premise. This means using outdoor receivers where signals are weaker and indoor gateways where signals are strong.

The FastMile 5G receiver is suitable for locations that require optimum use of the weak signals that are available. It features high gain antennas (up to 10 dBi) in a compact, outdoor design that can be self-installed by the consumer in a window, wall or pole. With 4-carrier aggregation of up to 300 MHz of bandwidth, the 5G receiver makes the most of the signals that are available. It includes a simple, user-friendly mobile app that helps users identify the optimal location to install the receiver.

The FastMile 5G Gateway 7 utilises high gain antennas with up to 8 dBi of gain, carrier aggregation and 200 MHz of spectrum support to enable high-speed broadband access over the 5G network. The gateway utilises dual-band Wi-Fi 7 to extend 5G speeds throughout the home. It is powered by Nokia's Corteca software, which supports value-added applications embedded in the device, cloud-based Wi-Fi optimisation and Wi-Fi device management based on open industry standards and EasyMesh.

Nokia Solutions and Networks Australia Pty Ltd
www.nokia.com

CASE STUDY

IoT fall detection solution protects lone workers

Wearin', a startup of the Swiss-headquartered Conextivity Group, has developed an IoT solution that connects lone workers with the control centre in the event of an accident. The product was commissioned by Geneva-based concrete producer PRO BETON, in order to ensure the safety of its machine operators and cleaners working on production sites on days, nights and weekends.

Based on IoT technology and powered by AI, the Wearin' solution comprises two platforms, one physical and the other digital, communicating with each other in real time. A device attached to the worker's vest, called the Wearin' Brain, embeds three safety alert and detection systems: one to alert the control centre via the Wearin' SOS button that can be activated manually in the event of an accident; an inertial sensor that can automatically detect a fall (in case the alert cannot be raised manually); and GPS to pinpoint the precise location of the worker. Data and alerts are sent and collected via the cloud to the Wearin' dashboard integrated into the central monitoring system, allowing the control centre to take appropriate emergency and rescue measures according to the alerts they have received.

"The reliability of the solution, in particular its advanced automatic fall detection system, makes the difference in securing lone working time and meeting the comfort and safety needs of our employees," said Éric Guillot, Director of PRO BETON. "As they work alone in a noisy, high-risk environment, it's crucial for them to be able to rely on cutting-edge technology that incorporates all the necessary safety features so that the safety control centre can intervene in a timely and appropriate manner in the event of an accident."

As its name suggests, the Wearin' Brain attached to the worker's vest is the brain of the hardware and software systems in the IoT solution. Alvaro Goncalves, Technical Director at Wearin', explained, "The Brain contains the SOS button, the fall detection sensor, the GPS system, a 10-hour battery enabling it to last an entire shift of PRO BETON employees without additional charging, as well as the LTE module for secure data transmission to the alarm centre."

The fall detection sensor designed by Wearin' has been designed to minimise the risk of false positives that might be experienced with other products. Aurélie Balsa, Embedded Software Manager at Wearin', explained, "The detection provided by other products less advanced than ours is sometimes so unreliable that users, annoyed by repeated false alarms, end up disconnecting the system altogether. Wearin's solution comprises hardware, firmware and embedded algorithms. Based on data from our accelerometer and gyroscope, our algorithms reduce false positives to less than 1%, to the great satisfaction of users, who find it all the easier to adhere to this security system."

Jonathan Brossard, CEO of Conextivity Group, said the IoT platform perfectly meets the needs of the lone worker market, stating, "The trend we're seeing in this sector is a strong and genuine concern on the part of companies for the health and safety of their employees. These companies no longer want to limit themselves to ticking the boxes on safety checklists provided by regulatory authorities. They demand real solutions to the real-life issues specific to their operations.

"In this respect, Wearin' provides an end-to-end connectivity solution that is not only ultra-reliable, but also modular and scalable, capable of adapting to the specific security typologies and requirements of each client organisation."

Wearin'
https://wearin.tech/

5G enterprise router

Cradlepoint's E100 5G Enterprise Router has been designed to support retail and small office applications, including POS, video surveillance, inventory applications and IoT. The router combines the performance of 5G with modern security through Cradlepoint NetCloud Exchange. Integrated SD-WAN and zero trust deliver 5G SASE capabilities and enable IT teams to provision and manage networks and security at scale with fewer staff.

As more retailers turn to creative pop-ups and experiential stores, IT teams need to support applications and security policies even in small spaces where higher performance, lower latency and minimised downtime are imperative. The router meets this demand in the retail and small office markets by enabling connectivity while protecting the network and its users from external threats. IT teams can gain further confidence in deploying communications, IoT and POS devices in small and temporary sites just as they would in flagship locations.

The router secures the WAN by enabling enterprises to replace complex VPNs with a secure zero trust network. Integrated and easy-to-configure failover for hybrid WAN or dual cellular locations provides IT teams with the confidence of connectivity during unpredictable conditions. With the ability to access high-performance 5G and futureproof network connectivity with an integrated 5G modem, the router can be used to support thousands of small offices and temporary sites — allowing global management with limited-to-no incremental staff.

Cradlepoint Australia Pty Ltd
www.cradlepoint.com/au

E-band solid-state power amplifier

Filtronic has announced the Cerus 32 E-band solid-state power amplifier (SSPA) for terrestrial and non-terrestrial communication. Based on the company's Cerus power-combining technology, it is a highly configurable product designed to offer an improved user interface and seamless integration.

With the expansion of satellite networks and an increasing number of people worldwide being connected to the internet via LEO satellite, the demand for data is expected to grow exponentially. This growth in user terminal capacity will require a significant increase in bandwidth to boost capacity. E-band provides the necessary wide bandwidth pipe to support the increase in user terminal capacity, and the Cerus 32 enables this through its high power.

The amplifier can be easily customised to enhance integration and is available as a standalone SSPA with WR12 input on top and output on the bottom, or with both input and output on the bottom. Moreover, it can be supplied with a powerful integrated Morpheus transceiver and high-power diplexer, providing an integrated high power transceiver module suitable for low Earth orbit applications.

The product has been designed to be compact and is useful for E-band ground station applications where performance is critical. It features a simple interface with a single 48 V input and has onboard regulation and bias control, making it easy to integrate. Additionally, it has a large surface area heat sink, enabling optimal thermal efficiency. Both high band (81–86 GHz) and low band (71–76 GHz) variants are available.

Each device consists of 32 E-band GaAs MMICs that are performance-matched and power-combined in waveguide, allowing for maximum linear power delivery. With up to 43 dBm of transmit power, the product can be applied in a range of applications and is specifically suitable for commercial, military and satcom applications.

Filtronic Pty Ltd
www.filtronic.com

GNSS smart antenna for machine automation

Septentrio has announced the AntaRx smart antenna, suitable for machine automation and control in construction, precision agriculture and logistics. Combining a high-performance GPS/GNSS receiver and an antenna in a single ruggedised housing, the device is easy to install and offers multiple communications options.

Built on Septentrio's longstanding GNSS experience, the multi-frequency receiver delivers RTK positioning down to the centimetre level. The receiver technology integrates Septentrio's GNSS+ algorithms, including advanced multipath mitigation, which allows uninterrupted operation in challenging conditions such as near high structures or machinery. The high update rate and low latency are particularly useful during fast movement or rotation.

Robust enough to handle high levels of shock and vibration, the unit is ready for operation in harsh industrial environments. Equipment manufacturers and system integrators can benefit from a versatile offering including INS (inertial navigation system) integration, dual antenna mode and 4G cellular communication.

The product targets industrial applications such as construction and mining, offering a high degree of robustness validated through extensive testing against industry standards. It is available in several configurations, either as a GNSS smart antenna or as a GNSS/INS smart antenna system, integrating a high-performance IMU (inertial measurement unit).

Septentrio
www.septentrio.com/en

CASE STUDY

Emergency comms vital to Gansu earthquake rescue efforts

On 18 December 2023, an Ms6.2 magnitude earthquake struck in the Chinese province of Gansu, about 5 km from the border with Qinghai in the country's north-west. At least 151 deaths and 982 injuries were reported, making the disaster China's deadliest earthquake since the 2014 Ludian quake. Caltta Technologies, a provider of integrated professional PMR communications solutions, found itself playing a pivotal role in supporting relief efforts through its contributions to crucial emergency rescue communications.

In the immediate aftermath of the earthquake, Caltta swiftly mobilised a dedicated emergency support team equipped with cutting-edge communications technology. Upon arrival at the disaster site, the technical support team encountered damaged infrastructure, including water supply, power supply, transportation and communication networks.

Aware that the stability and availability of an emergency communication network is paramount for disaster relief, Caltta's technical team deployed portable base stations to achieve coverage of blind spots. They also conducted rapid and comprehensive network testing and optimisation to ensure smooth audio/video communications and facilitate efficient command and dispatch for rescue teams and various departments.

Emergency communication plays a critical role during rescue activities, but the Gansu Security Bureau was faced with the challenge of insufficient communication channel capacity in disaster areas. Caltta managed to collaborate with the Security Bureau to swiftly expand the base station's capacity in a short time.

"Onsite, our team collaborated closely with local public security bureaus and emergency management departments, prioritising the establishment of a robust emergency private network," a company spokesperson said.

"Concurrently, Caltta's technical experts maintained round-the-clock remote duty, promptly addressing and resolving network issues reported from the field. This unwavering commitment ensured the seamless operation of the communication network; a critical lifeline during the crisis."

As frontline rescue efforts persisted in the days following the quake, Caltta remained committed to ongoing operations within the disaster-stricken area. The company's continued collaboration with local departments is understood to have ensured the seamless operation of emergency communication, providing a vital lifeline during this critical period, while its efforts safeguarding connectivity at the rescue site contributed to the effective coordination of rescue operations and enhanced the overall disaster response capabilities.

Caltta Technologies Co., Ltd
https://en.caltta.com/

eFuse reference design

The electronic fuse (eFuse) concept is designed to protect both the user and the hardware in high-power applications. With the steady increase in 48 V eMobility applications, semiconductor-based resettable fuses are suitable for replacing mechanical relays, contactors and non-resettable fuses.

Vishay's EFUSE-48V100A reference design features TrenchFET MOSFETs and is designed to handle continuous current up to 100 A. It can operate continuously at maximum current with less than 14 W of losses without requiring active cooling. The eFuse also features a pre-charge function, continuous current monitoring and overcurrent protection.

In addition to safely connecting and disconnecting to 48 V power sources like high-energy battery packs, the product also features fast disconnect of loads in under 2 μs, a resettable fuse and an adjustable current limit. It is designed to work in battery management systems, EV test environments, solar installations, industry and home automation, industrial and server computing, networking, telecom and base station power supplies.

Digi-Key Electronics

www.digikey.com

Mission-critical communication and collaboration solution

Airbus has formed a partnership with Vertel, an Australian-based critical network solutions provider, to introduce the Airbus Agnet MCx mission-critical communication and collaboration solution to the Australian market. The solution is expected to help to improve the country's ability to manage emergencies, risks and threats, thereby contributing to the mission-critical management of national and local companies and security forces.

The Airbus Agnet MCx is a standardised, flexible and futureproof solution-as-a-service-based platform for meeting all critical communication needs by leveraging the benefits of cloud technology, mobile or private broadband (4G/5G technology) and satellite communication. The platform can acquire and transmit secure data, video and voice to all relevant stakeholders at once in a secure way. It allows two-way radio device, smartphone, tablet and laptop users to communicate individually or in a group.

The solution will be cloud hosted within Australian territory and expands Vertel's mission-critical communications offering to its government and enterprise customers. They will now have flexibility to start using mission-critical services on a subscription basis, with only a small upfront investment and without the need to wait for heavy infrastructure deployment. This is expected to open the door to an array of possibilities in public safety, defence, utilities and transport verticals.

Vertel

www.vertel.com.au

3G/4G/5G repeater and antenna pack

RFI's ROAM Connect Pack is a 3G/4G/5G repeater and antenna pack designed to extend mobile cellular coverage into any vehicle. The pack includes 1x CEL-FI ROAM R41 plug-and-play cellular coverage solution; 1x RFI external CD/CDR/CDQ8195 series antenna (user's choice); 1x RFI T5-4M-SMA internal antenna; and 1x DC power lead.

The pack has all the essentials required to help users extend their mobile coverage to any vehicle, all in the one box. To optimise the performance of the CEL-FI R41, it has been paired with the RFI 8195 series antenna. Along with covering the entire frequency range of the CEL-FI R41, the antenna includes three variants to suit the user's requirements on the road: the CD series (a lightweight durable antenna with fixed whip); the CDR series (a lightweight durable antenna with a removable whip); and the CDQ series (a heavy-duty antenna with a removable whip).

RFI Technology Solutions

www.rfi.com.au

ITU ADVANCES
THE DEVELOPMENT OF 6G

The International Telecommunication Union (ITU) has published the framework for the development of standards and radio interface technologies for the sixth generation of International Mobile Telecommunications (IMT), following the Radiocommunication Assembly 2023 (RA-23) held in Dubai from 13–17 November. The ITU Radiocommunication Sector (ITU-R) will now focus on defining technical requirements, the submission process and the evaluation criteria for potential sixth-generation (6G) radio interface technologies.

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The Assembly agreed on 'IMT-2030' as the technical reference for the sixth generation of mobile systems, with details of the framework contained in Recommendation ITU-R M.2160 on the 'IMT-2030 Framework'. The Assembly also updated the principles of Resolution ITU-R 65, paving the way for studies on the compatibility of current regulations with potential sixth-generation mobile system radio interface technologies for 2030 and beyond.

The ITU-R Recommendation represents significant progress in the development and implementation of globally accepted standards for mobile systems using 6G. All the previous mobile telecommunication generations — analog cellular (1G), digital cellular (2G), IMT-2000 (3G), IMT-Advanced (4G) and IMT-2020 (5G) — were also standardised through the ITU.

"Terrestrial wireless systems to be developed under IMT-2030 are expected to drive the next wave of innovative radiocommunication systems, promote digital equity and advance universal connectivity," said Mario Maniewicz, Director of the ITU Radiocommunication Bureau. "The publication of the Recommendation on future 6G mobile technologies is a testament to ITU's longstanding multi-stakeholder approach which ensures the development of globally accepted technical and regulatory solutions."

For the next phase of 6G development, companies and industry associations will submit proposals for the IMT-2030 Radio Interface Technology (RIT) for ITU-R consideration in early 2027. These submissions will then be evaluated against the agreed minimum requirements prepared by ITU's expert group on IMT systems (Working Party 5D), with the prospect of getting a final set of 6G technology standards approved by 2030.

The IMT-2030 Framework Recommendation identifies 15 capabilities for 6G technology, nine of which are derived from existing 5G systems. IMT-2030 is expected to help address the need for increased environmental, social and economic sustainability, with expected 6G usage scenarios including the following:

- Immersive communication to provide a rich and interactive video experience for users.
- Hyper-reliable and low-latency communication to enable the scale-up of intelligent industrial applications including telemedicine and management of energy and power grids.
- Enhanced ubiquitous connectivity, especially in rural, remote and sparsely populated areas with the aim of bridging the digital divide.
- Massive communication to include expanded use of Internet of Things (IoT) devices and applications in smart cities, intelligent transport systems and sectors such as health, agriculture, energy and environmental monitoring.
- Artificial intelligence (AI) and communications to support AI-powered applications.
- Integrated multi-dimensional sensing to improve assisted navigation, and high-precision positioning including object and presence detection, localisation, imaging and mapping.

"Mobile communications are central to our efforts to ensure that everyone is meaningfully connected," said Doreen Bogdan-Martin, ITU Secretary-General. "By agreeing on a way forward on 6G, ITU Member States have taken an important step toward ensuring that technical progress is synonymous with affordability, security and resilience — supporting sustainable development and digital transformation everywhere."

Other discussion highlights during RA-23 included the following:

- The adoption of a new resolution on the use of IMT technologies for fixed wireless broadband.
- In accordance with Resolution 219 (Bucharest, 2022), the adoption of a new resolution on space sustainability to facilitate the long-term sustainable use of radio-frequency spectrum and associated satellite orbit resources used by space services. This will be supportive of further cooperation with other United Nations organisations and beneficial to the satellite industry.
- The conclusion of a new ITU-R Recommendation on the protection of the radio navigation-satellite service and amateur satellite services.
- The adoption of a new resolution on gender equality to strengthen, accelerate and widen the active involvement of women in the work of the ITU-R.

"The work of the Radiocommunication Assembly helps us shape how we live together in our interconnected world," Bogdan-Martin said. "The outcomes of this meeting ensure a promising future for ITU's Radiocommunication Sector and, through the groundbreaking resolution on gender equality, for women in the radiocommunications field."

"This Radiocommunication Assembly has achieved significant accomplishments, and the outcomes will establish the framework for the activities of the ITU Radiocommunication Study Groups in the upcoming four-year study period," Maniewicz added.

"We have set the stage for the development of new technologies with the potential to deliver better capacity and coverage everywhere, bridging the digital divide, as well as providing possible solutions to the challenges and impacts they will have on our lives."

SUPERCARS TEAM FINDS SUCCESS WITH D2N

Erebus Motorsport came into existence in 2011, with team owner Betty Klimenko setting her sights on succeeding in the fast world of motorsport. Fast forward to 2023 and the Supercars team has had a number of podium finishes, thanks in part to its technology partnership with D2N – Technology Solutions.

"We were using D2N previously as a supplier and purchasing smaller items from them, such as radio adapter looms and rooftop antennas, as they were one of the only suppliers in Australia who were producing radio parts with specific applications in motorsport and Supercars," said Erebus Race Engineer Tom Moore.

"The radio applications which are used in Supercars are very specific and therefore it is very difficult to find suppliers with equipment that exactly suits our needs. I knew that D2N were also suppliers of higher-end intercom equipment and Riedel was of particular interest to us, so when we were looking into upgrading our garage communications to incorporate those systems, it was a natural progression to seek out D2N and enquire about how they could fulfil our requirements."

One of the main reasons Erebus wanted to invest in a D2N wireless intercom system was the duplex interaction it allows between engineers, car controller, and crew and team managers all simultaneously. Moore explained, "We had one or two issues occur during a pit stop where the information provided by the engineer to the car controller needed to be updated after the pit stop had begun, and with standard digital RF radios, communicating a change once the car controller has keyed up the car in the pit lane is virtually impossible.

"In this sport, one preventable issue is one too many, so it was clear we needed to invest in the latest technology to ensure we were equipped to achieve the best results possible at all times. For that we needed D2N, their experience and their solutions."

Amongst many other smaller consumable items, D2N supplied Erebus with a Riedel Bolero standalone belt pack system, consisting of 15 belt packs, three charging bays, one Network Stream Adapter (NSA) and two Bolero antennas. More recently, the company has also built custom Riedel MAX headsets for Erebus with individualised ports to suit the team's needs.

"The equipment supplied by D2N fulfilled and fulfils our needs perfectly and we utilise the features of the system on a regular basis," Moore said. "We are able to communicate throughout the garage to multiple people and/or groups of people concurrently and essentially hands-free."

In addition to the equipment being much more user-friendly for the engineers and car controller, the pit crew — who are now listening to the radio messages via a wireless intercom rather than an RF radio — are particularly impressed by the stark difference and improvement in audio quality. According to Moore, "The crew couldn't believe that the

communication within the garage could be so clear. Every person in the garage uses at least one Bolero belt pack.

"The engineers, team principal and crew chief use theirs to communicate to each other individually or specified groups and they use them to communicate to the pit crew for each car during all sessions, including live pit stops. We use the NSA to bring in radio transmissions from the car to the Bolero system to be heard by any and all members of the team and similarly the race control transmissions are brought into the system via the NSA."

While the race engineers still communicate directly to the car with an RF radio, these transmissions are brought into the Bolero network via a Riedel NSA, and the pit crew, car controller and team principal then listen to these transmissions on their belt packs. Race engineers communicate with their respective car crews via a Bolero belt pack and the car crews receive the messages from the race engineers on their own belt packs.

"Our car controller uses his belt pack to communicate with the entire crew as well as the two cars, and in some circumstances — a double stack pit stop, for example — the car controller is communicating to both drivers, both race engineers, a data engineer, team principal and up to 10 crew members all at the same time and all hands-free whilst conducting a pit stop," Moore said.

"The obvious wow factor with the D2N solution is the difference in audio quality between an internal wireless intercom transmission and a standard RF radio transmission. They are not even comparable in terms of audio quality. However, the features and additional functions the system allows to all users are quite astounding; duplex communication is something which is very hard to go without after getting used to the freedom it allows."

The Erebus team are now essentially operating with Formula 1-level radio communications within their garage, with the Bolero belt pack system considered to be at the very forefront of technology for wireless intercom systems. In addition, Moore praised D2N for its support packages that have helped the team use the equipment to its full potential.

"D2N is more than accommodating in helping to expand our solution whenever we require it and then cannot help enough to assist us implement that solution," he said. "Whether it be visiting the team workshop prior to events or a last-minute installation at the circuit, they will do anything and everything possible to ensure we get the most from our communication equipment. They are happy to offer advice on all matters communication related and always happy to help us win races."

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Bluetooth module and evaluation board

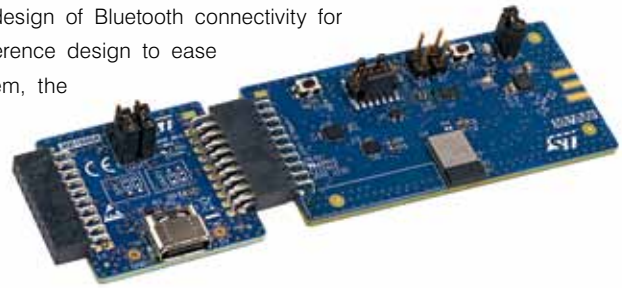
STMicroelectronics' STM32WB1MMC wireless module has been designed to make wireless connectivity simple. It contains a certified wireless microcontroller pre-integrated with external components needed for the radio system, as well as the Bluetooth software, and so bypasses many of the engineering challenges encountered when designing with chips.

The module helps product developers reduce project risks and build high-performing wireless products with only basic radio-frequency engineering skills. By doing so, users can focus on developing their own firmware to add value as the wireless functionality will be easy to use.

Built around the STM32WB15 MCU with 320 KB flash and 48 KB RAM, the all-in-one module is claimed to alleviate supply-chain headaches and lead-time issues and to help avoid certification delays. Bluetooth Low Energy 5.4 certified and with worldwide radio-equipment approvals, it provides a full reference design in an LGA package.

To make the module even easier to use, ST's B-WB1M-WPAN1 evaluation board is ready to power up and start development. The board contains movement, temperature and barometric-pressure sensors that can be incorporated into the system, and other convenient features like an industry-standard connector for attaching an external antenna.

For application development, the evaluation board accelerates the design of Bluetooth connectivity for integration with other system components and can be used as a reference design to ease hardware engineering workload. Leveraging the STM32Cube ecosystem, the board eases both power-consumption testing using the STM32CubeMX calculator and RF testing with the STM32CubeMonRF software tool.



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From novice to NIST: a non-technical journey into public safety communications

My first day working on the National Institute of Standards and Technology (NIST) campus fell on the anniversary of 9/11 — a day, annually, that carries with it the heavy-hearted reminder of tragedy in American history. Though purely coincidental, my happenstance start date was an underscore of the important mission I was joining. The Public Safety Communications Research Division (PSCR) within NIST came about in direct response to the first responder fatalities on that horrific day in 2001 and still today serves as the primary US federal laboratory conducting research and development to advance future public safety communications technology.

I came to PSCR with a background in program management and my initial role was to provide contract support to the division as a management consultant. I managed a team responsible for general program support, strategic communications and stakeholder engagement. Though I had little to no technical acumen at the time, the significance of the research I was supporting was palpable.

To do this job well, I wanted to speak the same language as the scientists I engaged with and truly comprehend their specific research goals. I became committed to learning the technical subject matter behind communications technology through independent study, observation and conversation with the experts. I asked as many questions as I could and paid close attention to the challenges they were encountering. I knew I wasn't going to *become* an engineer or data scientist, but if I could *understand* the rudimentary concepts behind each project, I could bring something equally as powerful to this program — an ability to translate. At PSCR, we work with stakeholders across sectors, and it's crucial that we can deliver updates and exchange information with non-scientific audiences — from the general public to policymakers to the commercial industry and, most importantly, to boots-on-the-ground first responders.

The more I learned, the more I was hooked, so when an opportunity arose to join PSCR's federal team, I applied without hesitation. Now, as the Strategy and Operations Lead at PSCR, I bring the skillsets I honed as a consultant to apply strategic thinking, partner engagement, process development and organisation to the setting of a government research laboratory.

One of my favourite efforts from this past year has been developing an international engagement strategy. Advancing communications for first responders is a worldwide challenge, so it's essential that we partner to exchange knowledge and demonstrate the critical mass of the global public safety market. At PSCR, we've developed strong relationships throughout North America, Europe and Australasia and have already begun collaborating with international governments on research efforts, engagement opportunities and programmatic resources. I'm grateful for the opportunity to bear witness to various approaches and advancements in public safety technology around the globe and to connect with a diverse group of leaders all passionate about the same cause I am.

PSCR brings together pioneering innovation with government standards and exacting science. I could not have found a career path more perfect for my creative but punctilious personality. I hope more people with a non-technical background consider a career in research and development because so much more than the technical research itself makes a laboratory successful. Moreover, we need a diversity of opinions engaged in this industry, people of all backgrounds with all sorts of experiences, because that's who public safety is for: it impacts all of us.

As for me, I imagine a future where the technology we are researching today — augmented reality heads-up displays, indoor location tracking, device-to-device communications on LTE, 3D mapping drones and everything else — feels as obvious as oxygen. Someday it will be difficult to remember a time before our first responders had these capabilities, and that's a promise that keeps me showing up.

Brianna Huettel is the Strategy and Operations Lead for the Public Safety Communications (PSCR) Division at the National Institute of Standards and Technology (NIST) in the United States, having been with PSCR since 2017. Utilising her subject matter expertise in current public safety technology challenges and the horizon of broadband technology, Brianna implements programmatic strategic planning and stakeholder and partner engagement to augment PSCR's mission of advancing communications technology capabilities for first responders.

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