critical comms

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DAMM frequency sharing functionality

A cost-efficient solution for achieving coverage in low-density networks

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critical comms

Inside

July/August 2023

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www.criticalcomms.com.au/magazine

ON THE COVER

When building coverage in low-density areas, the DAMM BS422 offers rail operators a powerful solution for reducing costs and complexity in their networks. With its frequency-sharing concept, adjacent base stations can efficiently share frequencies, which leads to significant savings in frequency costs and licence fees. By eliminating the need for excessive frequency allocations and optimising spectrum usage, operators can achieve improved spectrum efficiency. This approach is particularly beneficial in scenarios with few users, where the number of frequencies used is disproportionate to the user count. The DAMM BS422 enables operators to create larger radio cells and re-use frequency pairs more efficiently, resulting in a streamlined and cost-effective network.

In addition to frequency savings, the DAMM BS422 simplifies repeater systems by using a single type of hardware for both base stations and repeaters. This consolidation reduces complexity in the network infrastructure and lowers maintenance and operational expenses. Operators can benefit from streamlined network management by deploying a unified software platform and reducing training requirements, as well as simplifying monitoring and control. The DAMM BS422 also provides built-in redundancy and high RF performance compared to traditional repeaters, for dependable coverage and signal quality. Overall, the DAMM BS422 frequency-sharing functionality offers operators a comprehensive solution to reduce costs, simplify operations and enhance network efficiency when building coverage along a railway line or in a tunnel.

Damm Australia
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Do you read me?

At the time of writing, the Audit Office of New South Wales has just released a report assessing the NSW Telco Authority's effectiveness at managing the state's Critical Communications Enhancement Program, which aims to deliver an enhanced Public Safety Network. The results were definitely mixed, with revelations that the cost of the program has blown out to $1.293 billion (up from $400 million in 2016) and that it will be completed seven years later than scheduled. The good news, at least, is that the enhanced network is so far meeting most of the requirements of ESOs. To read the audit in full, visit www.audit.nsw.gov.au and go to the Reports section.

The report was released the week following Comms Connect Christchurch, where attendees were able to hear updates on New Zealand's own PSN as well as other recent efforts to improve connectivity and resilience — particularly in the wake of Cyclone Gabrielle. You can read some of the highlights from the Christchurch show in our lead story on page 6, as well as a bit of a teaser for our Melbourne event in October. We are also pleased to have an article from Comms Connect NZ speaker Jodi Favaloro, who shares some of the benefits of IoT connectivity in vehicles on page 24.

While in Christchurch, I was privileged to attend an informal meeting featuring representatives from TCCA/ACCF, ARCIA and RFUANZ, who had come together to discuss how to ensure the future of the critical comms industry by nurturing the next generation of talent. One of the outcomes of this meeting was that *Critical Comms* would seek to showcase promising young members of the industry in its forthcoming issues, and I am pleased to say that we begin this issue with 18-year-old Alex Stewart on page 34. I am hopeful that his story will be the first of many to be featured, so if you know any young people who would like to share their experiences in the industry, please send me an email.

Lauren Davis, Editor
cc@wfmedia.com.au

Calendar

July

ARCIA Brisbane Conference
27 July 2023
The Greek Club, South Brisbane
https://arcia.org.au/events/one-day-conference-brisbane-july-2023/

August

APCO 2023
6–9 August 2023
Music City Center, Nashville, USA
https://www.apco2023.org/

AFAC23 Conference & Exhibition
22–25 August 2023
Brisbane Convention & Exhibition Centre
https://www.afacconference.com.au/

October

ETSI Security Conference 2023
16–19 October 2023
Sophia Antipolis, France
https://www.etsi.org/events/2155-etsi-security-conference-2023

Comms Connect Melbourne
18–19 October 2023
Melbourne Convention & Exhibition Centre
https://melbourne.comms-connect.com.au/

November

ITU World Radiocommunication Conference 2023
20 November–15 December 2023
Dubai World Trade Centre, United Arab Emirates
https://www.itu.int/wrc-23/

PMRExpo 2023
28–30 November 2023
Koelnmesse, Germany
https://www.pmrexpo.com/en/

December

ICCRA Congress 2023
5–7 December 2023
Le Louise Hotel, Brussels, Belgium
https://www.iccra-congress.com/

Natural Disasters Expo Asia
6–7 December 2023
Singapore Expo, Singapore
https://www.naturaldisastersshowasia.com/

Intelligent DIN Series

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New Intelligent DIN Series Power Distribution Unit

▶ Space-saving modular design

▶ Easy installation

▶ Six DC load outputs each rated at 15 A max.

▶ Each output is GMT fuse-protected

▶ Supports 12-, 24-, and 48-volt DC applications

▶ TCP/IP Ethernet is standard for easy remote monitoring and control

▶ Supports HTTPS, SMTP, TLS1.2 and SNMPv3

▶ Network Watchdog & Automatic Load Shedding feature

▶ Form C alarm contacts

▶ Remote alarm report for each load output

▶ Four alarm inputs for site monitoring sensors

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▶ Easy installation

▶ Adjustable battery charge current

▶ Integrated battery charging with Low Voltage Disconnect

▶ 360 Watt 48- or 24- volt DC Output

▶ Temperature compensated battery charging

▶ Form C alarm contacts

▶ Remote monitoring over Ethernet when used with ICT Intelligent DIN Series Power Distribution Unit

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sales@heliosps.com.au

NZ: www.heliosps.co.nz
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COMMS CONNECT 2023

CHRISTCHURCH HIGHLIGHTS AND MELBOURNE PREVIEW

Lauren Davis

Comms Connect has paid a welcome visit to Christchurch for the second year in a row, with the premier critical communications event setting up shop at Te Pae Christchurch Convention Centre from 13–14 June.

Over 530 attendees visited the two-day conference and exhibition, including government agencies, industry end users, sector experts, dealers and vendors. This was a 20% increase on the 2022 event and the highest attendance for Comms Connect New Zealand ever, in a clear indication of how keen local industry professionals were to support and discuss the future of critical communications. For those who were unable to attend, here we are pleased to share just some of the conference highlights.

Preparing for natural disasters

With New Zealand having suffered more than its fair share of natural disasters in recent years, it was not surprising that the conference featured several presentations on the need for increased preparedness and resiliency. This was made especially apparent during Cyclone Gabrielle, with Don Robertson, CEO of New Zealand's Amateur Radio Emergency Communications (AREC), noting that many citizens were not even aware that radios were still working during the comms outages, and instead just kept trying their mobile phones. He also detailed the long hours worked by AREC volunteers after being activated by Auckland Emergency Management — including their ad-hoc design of a SARTrack-based system to handle incoming messages, because there wasn't one already in place. Richard Hutchinson, an Infrastructure Engineer with the New Zealand Police, added that the police lost their standard dispatch system and other abilities as a result of the various outages, which was compounded by lack of access to cell sites due to the disastrous conditions. Yet in spite of the heavy rainfall and strong

Fire Detection and Environment Monitoring project, created partly in response to the 2017 Port Hills fires. The project is now trialling sensor arrays at Christchurch's Bottle Lake Forest as well as Port Hills, where they will detect the earliest possible signs of fire and provide real-time warnings, enabling citizens to prepare and evacuate before it is too late.

Smart cities and standalone networks

But sensors aren't just useful for monitoring natural disasters — they can also improve our day-to-day life. Matt Schultz, a Partner at Gravelroad Group, suggested that pre-existing public assets could be utilised to create smart cities, with objects like street poles hosting sensors and charging ports. He encouraged public–private partnerships whereby the different players share and rationalise their infrastructure, with public spaces used as hosting sites, in an effort to reach as many communities as possible (regional as well as urban); this will be crucial for closing the digital divide following COVID-19, he said, with the demand for connectivity now higher than ever before. Roy Wittert, Region Sales Director for Australia, New Zealand and Pacific Islands at Cambium Networks, added that 60 GHz networks are a particularly useful tool for smart cities, offering multi-Gbps speeds at a fraction of the cost of fibre. He claimed that 60 GHz networks are a particularly accessible option as they can be installed on regular rooftops as opposed to traditional towers, and have proven applications including CCTV/video surveillance, Wi-Fi backhaul, and connectivity in the oil and gas industry — the latter being a particularly difficult candidate for fibre installation.
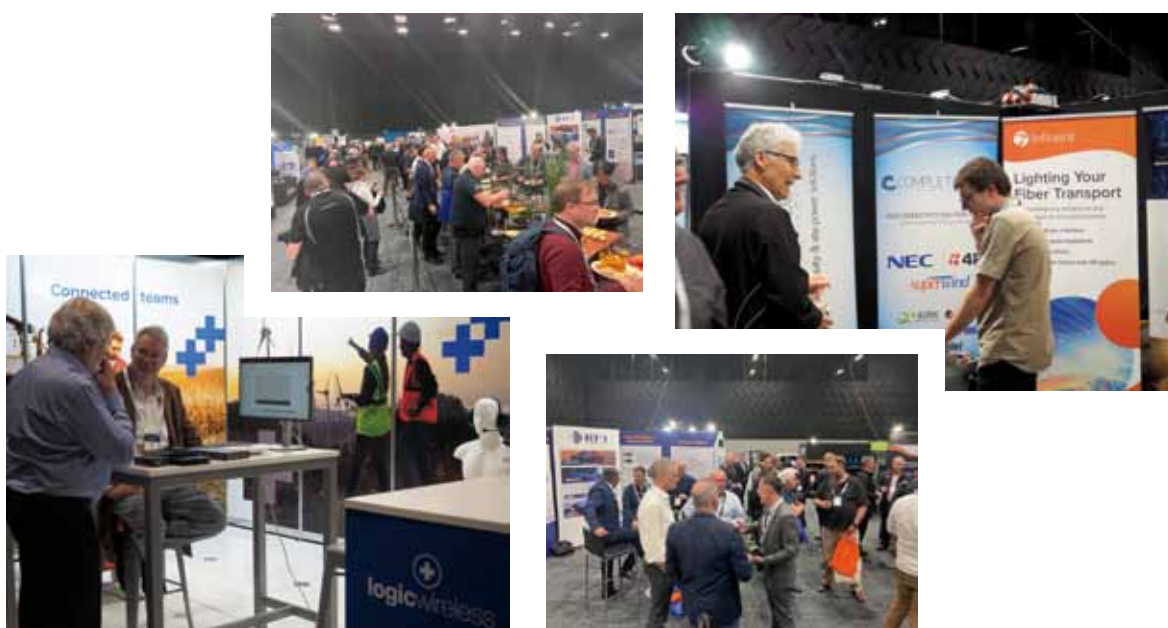
winds, the police's Mimomax voice linking network held firm during the three-day event, providing a useful case study of what to expect from future climate events — see page 14 for more on this.

Another unwelcome event from recent history was the 2011 Christchurch earthquake, which required most of the city to be completely rebuilt; an undertaking which is still ongoing today. Michael Healy, from Christchurch City Council, revealed how the Smart Christchurch Programme has been setting up a network of seismic sensors to monitor public and private assets around the city; in the event of a quake, these sensors will help to determine if an individual building has sustained any damage (either immediate or cumulative), which will allow for a more targeted approach to recovery efforts. Another initiative of the program is the Early

One thing that will be vital to the growth of smart cities — as well as other advanced use cases such as VR/AR, remote surgery and autonomous vehicles — is 5G. Speaking in a keynote and accompanying panel, Michael Molony, Head of Mobile Core Networks (Technology Strategy and Architecture Tribe) at Spark, said 5G is set to offer massive drops in latency compared to 4G, enabling more data to be transmitted over the airwaves in less time. The problem is that non-standalone 5G networks, which enable quick entry to market, rely on existing 4G infrastructure and so do not offer the enhanced security, reliability and scalability of standalone (SA) networks, which are 'cloud native', or software-based.

In an effort to move forward, Spark has been conducting 5G SA trials in recent months with partners including Red Hat, AWS

and Mavenir. Their latest trial, delivered within a short three-month timeframe, demonstrated how 5G SA technology can deliver the low latency, high bandwidth and reliability that are required for high-performance use cases, such as real-time video analytics. It also showcased the benefits of network slicing, which means taking a 'chunk' out of a network and tailoring it to meet the specs of a private customer (in terms of latency, reliability, data allowance, etc). This customisation ability and other benefits mean that 5G SA is, according to Molony, "a solution looking for a problem".

Cybersecurity

Of course, none of this new technology should be implemented without a robust cybersecurity policy in place. Vanessa Leite, Principal Strategy & Risk at CyberCX, noted that telcos are an attractive target for cybercriminals as a result of their critical role and the sensitive information they hold — and they can also be difficult to protect, due to their large-scale infrastructure with multiple net-

work entry points, as well as legacy systems including outdated technology or software. Indeed, Martin Rampl, Managing Director of Frequentis Australasia, said that many legacy control rooms are not secured against cyber attacks as they provide limited adaptability to change, which is a problem as systems should really be updated every 3–6 months in order to be up-to-date with security.

Stressing that all organisations should have baseline security measures such as backup, asset inventories and security training, Leite said cybersecurity is a shared responsibility, and suggested collaboration between multiple parties (eg, research and IP sharing) as a way to tackle it. It is also something that affects communications at every level — from New Zealand's upcoming Public Safety Network (which is set to feature encrypted LMR, said Next Generation Critical Communications Relationship Manager Paul Smith), to Radio Spectrum Management's Register of Radio Frequencies (which was recently updated to improve its cybersecurity, said RSM Acting National Manager Nathan Schaffer), to Schultz's smart cities concept (which will need regulations to manage data privacy, Schultz acknowledged). It will thus require organisations to have a multilayered strategy encompassing prevention, detection, response and recovery — all of which the critical comms community should be well versed in.
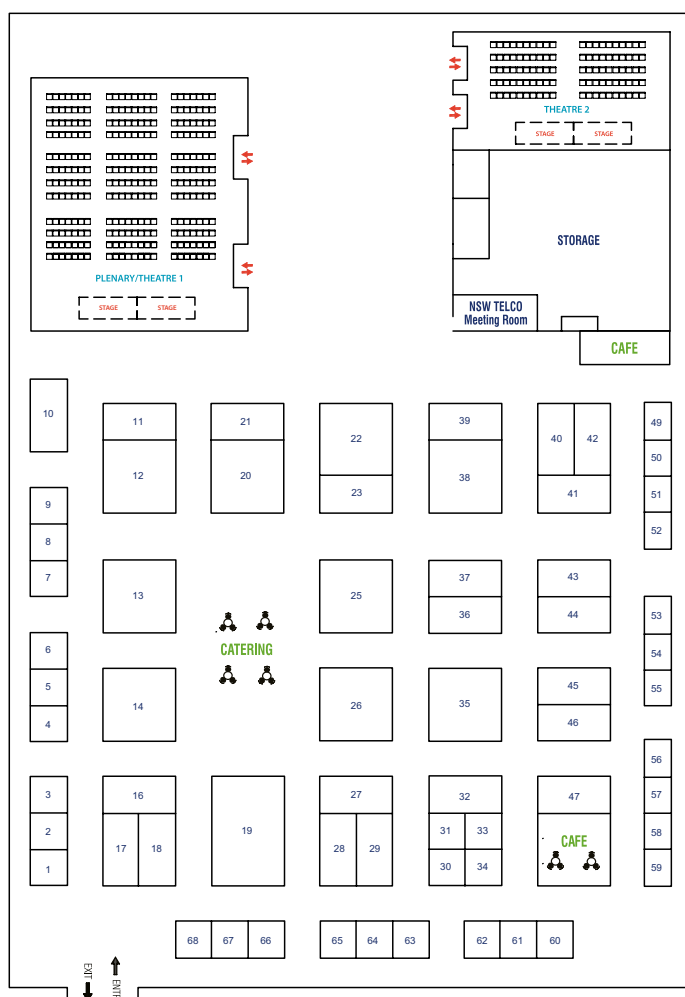
Melbourne event coming up

The next edition of Comms Connect is not that far away, with the show returning to its 'home ground' at the Melbourne Convention and Exhibition Centre on 18–19 October. Strong expressions of interest from Finland, the USA and Canada will add a broader international flavour to the event this year, with delegations from each country looking to attend the conference, present papers and/or exhibit.

The exhibition is already over 85% booked at the time of going to press, and an extended floorplan is being explored to allow for exhibitor demand. If you are interested in exhibiting, contact Liz Wilson at lwilson@wfmedia.com.au or Tim Thompson at tthompson@wfmedia.com.au for a prospectus and the latest floorplan availability.

Event Director Geoff Hird is also in the process of building another world-class conference program, so if you have a case study or technology paper you'd like to present, please email a topic, brief abstract and speaker bio to events@wfmedia.com.au. Further requirements and suggested topic areas can be found at https://melbourne.comms-connect.com.au/call-for-papers/.

Telstra will once again headline the event sponsors, as Innovation Partner, while the Platinum Sponsors are Hypha, L3Harris, Simoco Wireless Solutions and Tait Communications. The ARCIA Gala Dinner & Awards evening will again take part in conjunction with Comms Connect, on the night of 18 October, and pre-conference workshops are planned for 17 October with the support of ARCIA and the ACCF/TCCA teams.

The latest exhibitor and sponsor lists, along with other up-to-date event details, can be found at https://melbourne.comms-connect.com.au.

Comms Connect (WFevents)
www.comms-connect.com.au

COMMS CONNECT

OCTOBER 18-19 2023
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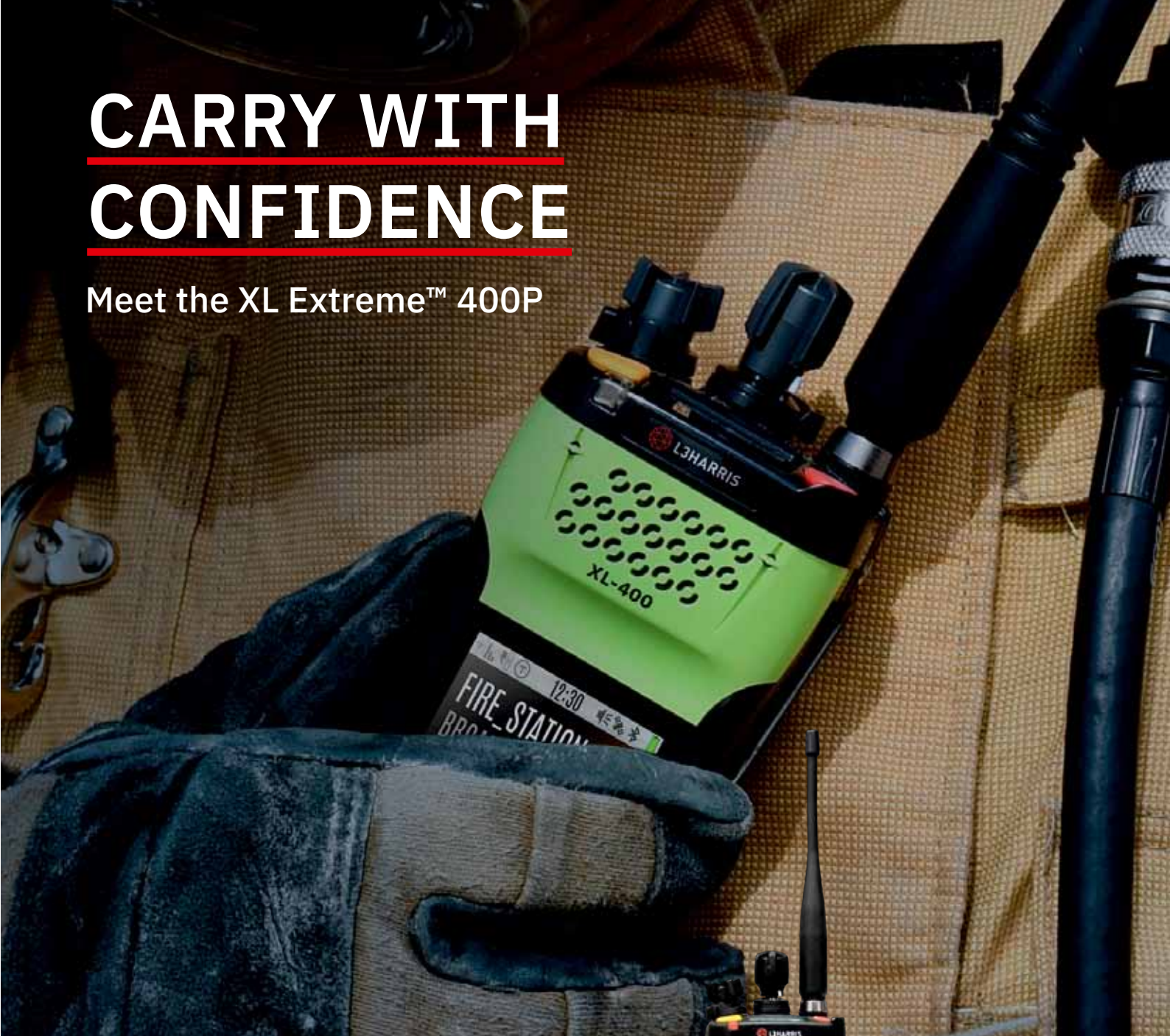
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AST SPACEMOBILE EXCEEDS 10 MBPS IN SAT-TO-PHONE DOWNLINK

AST SpaceMobile, the company building a space-based cellular broadband network accessible directly by standard mobile phones, has announced it has achieved repeated successful download speeds above 10 Mbps during testing of its BlueWalker 3 satellite.

The milestone of space-based cellular communications at 4G speeds comes less than two months after the company stated it had completed the first-ever space-based voice calls using everyday unmodified smartphones, and only nine months after the launch of BlueWalker 3. Designed to communicate directly with cellular devices via 3GPP standard frequencies at 5G speeds, the satellite spans 64.38 m^2 in size — a design feature that is critical to supporting a space-based cellular broadband network — which is understood to make it the largest ever commercial communications array deployed in low Earth orbit.

Engineers conducted download speed tests in Hawaii in June 2023 using multiple off-the-shelf smartphones. The 4G LTE download speed testing, which used AT&T spectrum and Nokia RAN technology, reached initial speeds up to 10.3 Mbps, with further testing of voice calls to AT&T employees. Evaluation of BlueWalker 3's capabilities continues, with enablement of 5G cellular broadband as the next major test activity.

"AST SpaceMobile's space-based cellular capabilities are designed to be a critical extension for cellular communications," said Abel Avellan, Chairman and CEO of AST SpaceMobile. "In addition to supporting basic voice and text that we expect from phones, it would also enable users to browse the internet, download files, use messaging apps or stream video.

"Achieving this milestone from an unmodified, standard cell phone on the ground connecting through our low Earth orbit satellite is another groundbreaking moment in telecommunications history and an important step toward AST SpaceMobile's goal of bringing broadband services to parts of the world where cellular coverage is either unreliable or simply does not exist today."

3D-rendered illustration of AST SpaceMobile's BlueWalker 3 test satellite, currently in low Earth orbit.
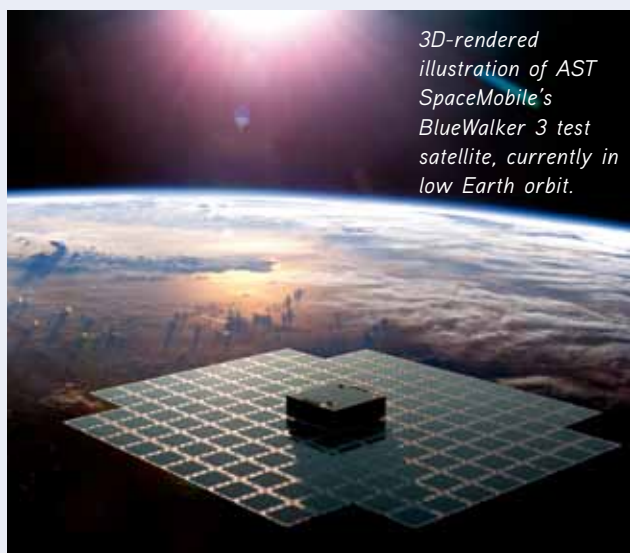
GOVT ANNOUNCES ENHANCED COMMS FOR EMERGENCY MESSAGING

The Australian Government is rolling out a new cell broadcast National Messaging System (NMS) that will use state-of-the-art technology to significantly enhance how the Commonwealth delivers emergency messages. It will also improve how states and territories issue alerts and warnings to mobile phones and devices during a crisis or emergency event, in near real time.

Drawing on technology currently used overseas, the speed and effectiveness of the NMS is expected to substantially improve Australia's ability to send prioritised warnings from trusted sources, to prevent the loss of life, injury and damage to property, and to mitigate the spread of misinformation during disasters. The technology will also allow governments to send messages in English and a second language, in order to provide official information to multicultural communities, helping them to understand the risks and make appropriate decisions about their personal safety.

The government has also committed $10.1 million to establish a central taskforce to drive the delivery of a Public Safety Mobile Broadband (PSMB) capability which would deliver a mobile broadband service that provides public safety agencies and first responders with fast and secure voice, video and data communications.

Near-instant access to data, images and information in critical situations would be enabled by PSMB along with real-time, data-rich analytics, situational awareness and cross-border communications between, for example, ground crews, aerial assets and incident control centres. This would support the coordination of responses across organisational and geographic boundaries, and enhance Australia's ability to manage emergencies, hazards and threats.

The PSMB was a key recommendation of the 2020 Royal Commission into National Natural Disaster Arrangements. The taskforce will take forward the recommendations of the review and drive the delivery of this important capability.

It is anticipated that the NMS will be designed, built and tested over the next 18 months, becoming operational by late 2024. In parallel, a national public awareness campaign will be developed and rolled out ahead of implementation, prior to future high-risk weather seasons.

Both measures will be jointly developed and implemented by the Minister for Communications Michelle Rowland and the Minister for Emergency Management Murray Watt.

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N5 SMART SERIES

The Talkpod N5 Smart series is exactly what the Australian PoC radio / Network market has been screaming out for: well-engineered, fast, great looking Android devices that look and feel like traditional two-way radios and function in a way that more than meets consumer expectation. Talkpod devices are extremely well engineered, deliver a great 'in hand' feel and provide a durability level that assures user confidence.

The Talkpod N5 Smart Series include Android 9.0, Open API, Google Play, Dual SIM, Man Down/Gyro, Vibration Feedback, Bluetooth 4.0/BLE, Wi-Fi 802.11 B/G/N, GPS, front & rear camera (N59 only), crystal clear audio, all Australian 3G/4G bands including Band 28, and an IP66/67 waterproof rating.

One of the many qualities that separate Talkpod devices from their competitors is their ability to roam between different cellular sites, bands and technologies for the best signal with the greatest bandwidth to rapidly deliver an optimal level of service. The speed at which this roaming occurs leaves competitors in their wake setting new standards in the Australian PoC market.

News

ACMA UPDATES FORM FOR COMPLIANCE STATEMENTS FOLLOWING RULES CHANGES

For radio equipment to be legally supplied and used on the electromagnetic spectrum in Australia, the supplier must ensure that the items comply with the relevant equipment standards. These requirements are now contained within 'equipment rules'.

The actual testing of equipment is the responsibility of the organisation intending to import or supply the items, and they are legally required to provide a 'Statement of Compliance' to the ACMA. Organisations are also required to maintain a folder of the evidence or test results for those items to show they have been certified by an approved testing laboratory to meet the equipment rules.

This is an important part of making sure that the electromagnetic spectrum remains 'fit for purpose' and that equipment will not cause harmful interference to other legitimate communications systems. The ACMA has the power under legislation to request any equipment user, or their supplier, to provide evidence supporting equipment compliance and can request that the equipment use be discontinued until clarification is supplied. Under the recent changes to the legislation, the ACMA can also order an equipment supplier to recall equipment supplied without correct certification and compliance, at the supplier's cost.

The ACMA update information and the new compliance form are available at https://acma.createsend1.com/t/d-e-vltbld-l-r/.

A/NZ SIGNS $187.4M CONTRACT FOR SOUTHPAN SATELLITE SERVICE

Every major industry across Australia and New Zealand, from transport and construction to resources and agriculture, is set to gain positioning and navigation benefits from the Southern Positioning Augmentation Network's (SouthPAN) new satellite service.

With the signing of a 20-year, AU$187.4 million contract with Inmarsat Australia for the new SouthPAN satellite service on one of Inmarsat's three new I-8 satellites, SouthPAN partners Geoscience Australia and Toit Te Whenua Land Information New Zealand are now one step closer to a world-class satellite positioning service for the Southern Hemisphere.

The Inmarsat I-8 satellite.

SouthPAN provides instant positioning services across all of Australia and New Zealand's land and maritime zones without the need for mobile phone or internet coverage, and should improve positioning accuracy to as little as 10 centimetres. Early Open Services have been available since September 2022.

Signals will begin broadcasting services from the Inmarsat-8 satellite, which will cover the Asia–Pacific region commencing from 2027. The satellites will provide redundancy and resilience in SouthPAN to ensure continuous broadcast of signals, enabling the development and use of critical applications relying on its positioning. An additional satellite service will also be procured.

The satellites will also be a critical part of a safety-of-life-certified SouthPAN for aviation and other applications, scheduled for 2028. These services will be accessed or used by end users engaged in operations where life could be at risk, like landing an aircraft.

Alison Rose, Chief of Space Division at Geoscience Australia, said SouthPAN is a major commitment between the Australian and New Zealand governments to provide essential satellite positioning services and will bring many benefits to industry.

TRANSITION TO TASMANIAN GOVERNMENT RADIO NETWORK BEGINS

Tasmanian Minister for Police, Fire and Emergency Management Felix Ellis has announced that eight of the state's public safety agencies are transitioning to the Tasmanian Government Radio Network (TasGRN), provided by Telstra and Motorola Solutions, commencing in July.

The network was announced in 2020 and has been built on a feature-rich platform providing a range of capabilities, including greater interoperability; increased coverage; secure, encrypted communications for emergency service workers; and a modern user interface.

"The Rockliff Liberal government has listened to the community and with partner agencies we've invested a total of $763 million to establish TasGRN." Ellis said.

"We're doing this because when our firefighters or police officers are responding to emergency incidents they deserve to have high-performing communications equipment to support their safety and the safety of the community."

Ellis said the transition to the new network will see Hydro Tasmania, TasNetworks, Parks and Wildlife, and Sustainable Timber Tasmania move across by August. The police, fire and emergency services will then follow.

"The TasGRN project has created up to 50 jobs during the three-year construction phase, with additional positions to be recruited to help run and oversee the network once it is fully operational later this year," Ellis said.

"As an added bonus, the TasGRN will deliver improved mobile phone coverage for Telstra users in Tasmania at no cost to the state, particularly in regional Tasmania."

NZ Police's radio network withstands cyclone-strength winds and rain

The New Zealand Police's Mimomax voice linking network on the East Coast of the North Island was put to the test (and emerged unscathed) in February when Cyclone Gabrielle struck, causing the most expensive clean-up on record from a Southern Hemisphere storm.

With at least three links operational in the region where the heaviest rains from the cyclone made landfall, and another three links in areas of extremely high winds, the Mimomax network was subject to extreme weather that downed trees, created landslides and washed out roads and bridges. Both the power and the communications networks were severely impacted across the whole region.

Deployed alongside roads, the fibre network was severed in multiple locations and, with the cyclone knocking out the power network, cell sites which can only typically run on battery power for a matter of hours were also taken out. Furthermore, those cell sites which did still have power lost connectivity when the fibre backhaul was wiped out.

"These failures with phone connectivity, data circuits and the cellular networks meant that communications-wise, the Eastern Districts were entirely cut off," said Richard Hutchinson, Infrastructure Engineer, NZ Police. "In terms of NZ Police operations, the Gisborne and Hawke's Bay areas had to fall back to regionalised dispatch."

At the peak of the communications blackout, there were 272 cell sites down and the NZ Police radio repeater sites were running on backup battery and generator power. With roads destroyed in places, some sites could only be accessed by helicopter — a challenging prospect with cyclone-force winds blowing during the three-day event.

With some areas of Hawke's Bay receiving 600% of their normal February rainfall over the course of 55 hours, the Mimomax radio network was rigorously stress-tested for rain-induced fading. Hutchinson noted, "The radio standards organisations, ITU and TIA, both indicate that links below 1 GHz can reasonably ignore rain events unless the links are very long or the rain is extremely heavy. NZ Police now have some local practical experience to back those standards up."

Communications backhaul was established after approximately 60 hours using Starlink, enabling a limited form of centralised dispatch to be resumed. Hutchinson said, "The limited data bandwidth over Starlink prevented the collection of the Mimomax performance data at the time, but when full connectivity was restored the status pages showed that the Mimomax links had operated as designed with few, if any, errors."

Despite winds registering 140–150 km/h in some locations, the antennas in the Mimomax network held firm. This was the result, according to Hutchinson, of a reasonable degree of effort going into the bracing during antenna installation with an aim to "design for the worst". Furthermore, with power out for a number of days, the Mimomax radios were also used as a window into the status of the grid in that locality.

"The radio supply voltage indication on the status page for each radio helpfully allowed us to ascertain whether the mains supply was functional at these sites," Hutchinson said.

Providing an excellent case study of what to expect from climate events, the impact of Cyclone Gabrielle on communications connectivity has highlighted three clear lessons:

1. The main issue for NZ Police communications sites was loss of mains power. All the sites were designed for outage periods based on typical restoration times; however, lack of site access made restoration much slower.
2. Robust installation techniques for antennas are crucial to promote resilience.
3. Where possible, have some level of connectivity available in frequency bands that perform well under precipitation events.

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"We are beyond pleased with the performance and more importantly the coverage of the XV2-2T. For an 'outdoor' AP, it should be called a 'go through anything AP' as it is breaking down barriers in tough to reach locations to solve tough installation challenges."

Chaz Hager, President, North River IT
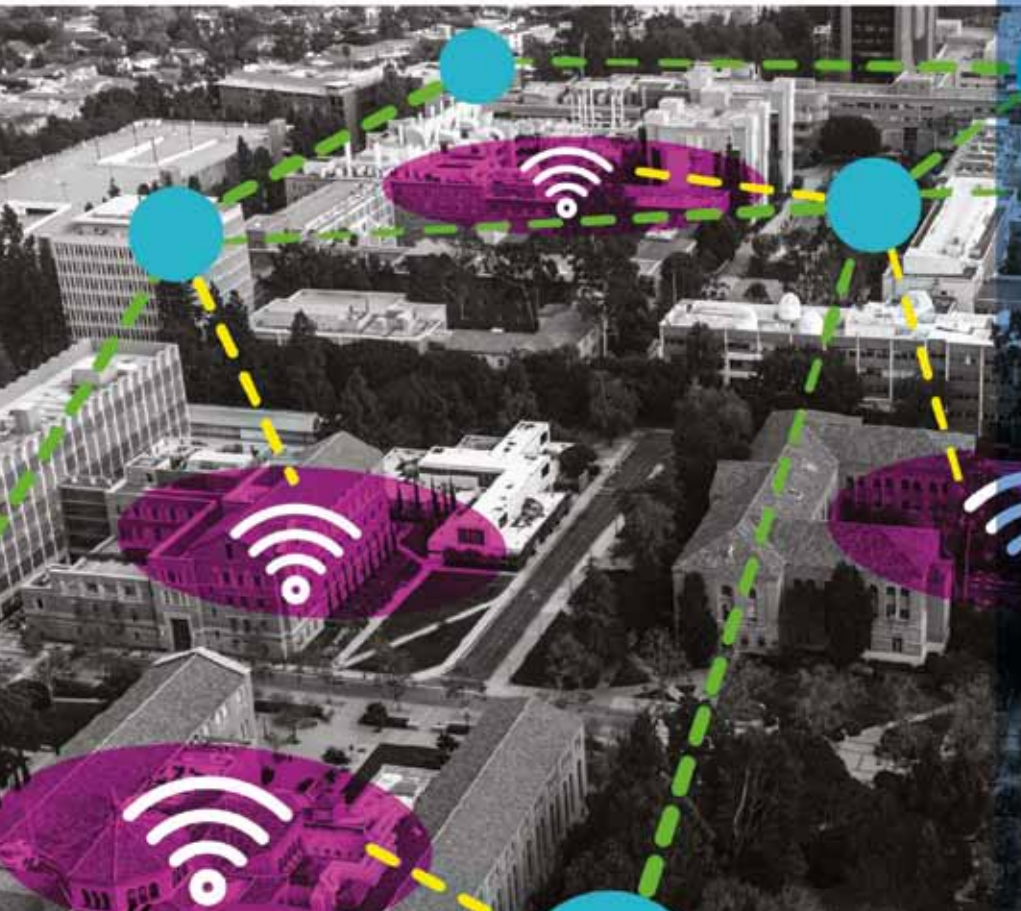
Deliver Outstanding Coverage and Performance

Satellite module

Quectel Wireless Solutions has announced the CC200A-LB satellite module for IoT industries, which utilises satellite IoT connectivity provided by ORBCOMM. The module is designed to provide global coverage and connectivity with ultralow latency, making it suitable for a wide range of applications including maritime, transportation, heavy equipment, agriculture, mining, and oil and gas monitoring.

The module is designed to enable communications in remote areas without cellular network coverage. ORBCOMM provides global connectivity over the IsatData Pro (IDP) satellite service, using the Inmarsat GEO constellation and L band, and features two-way communication, low latency and near-real-time reporting capabilities. ORBCOMM's satellite IoT connectivity can be blended with cellular bandwidth to create dual-mode IoT applications with redundancy and ubiquitous coverage. The satellite module is designed with a compact LCC+LGA form factor, with dimensions of 37 x 38 x 3.35 mm. The module also supports multi-constellation GNSS and supports intuitive AT command set.

With a message size of up to 6.4 KB for transmission and up to 10 KB for reception, the module has ultralow latency. Typical transmission latency is 20 s at 100 B and 40 s at 1 KB, and its typical reception latency is 12 s at 100 B and 70 s at 1 KB. The satellite module will be backwards compatible with ORBCOMM's future OGx services to be launched in Q4 2023, which expand both speed and size of message.

Quectel

www.quectel.com

Radio test system

The VIAVI CX700 ComXpert radio test system is suitable for radio manufacturers as well as depot-based and field-deployed military personnel, as it delivers all-in-one, high-performance synthetic instrumentation for production, depot-level and field test of current and future radios and waveforms.

Engineers, manufacturers and technicians responsible for designing or maintaining RF systems and radios often have to use multiple pieces of test and measurement equipment for accurate test and verification. The system is designed to address this challenge by providing a comprehensive, versatile, all-in-one communications test system that includes 100 MHz of instantaneous bandwidth, good phase noise performance from 9 kHz to 6 GHz, fast data transport mechanisms and a built-in power supply for the devices under test.

For simple maintainability and upgradeability, the system meets MIL-PRF-28800 Class 3 environmental requirements and has a GNSS-enabled 'no-cal' chassis time base, user-replaceable modules and an integrated ruggedised keyboard, touchscreen and trackpad to enable comprehensive system testing in remote-deployed environments.

The product leverages the intuitive GUI first introduced on the CX300 ComXpert, supports native on-box Python scripting as well as remote commands over Ethernet and interfaces with VIAVI StrataSync and Smart Access Anywhere to deliver an integrated user experience.

VIAVI Solutions Inc

www.viavisolutions.com.au

Smart DC power distribution panels

Helios Power Solutions' Smart DC Power Distribution Panels can help users to reduce unnecessary site visits and increase quality of service to their customers.

The DC load distribution panels play an important role in ensuring the safety and efficiency of communication site designs. The panels enable the connection of multiple loads, facilitating the distribution of power from a DC power supply to various devices like radios, repeaters, switches and links. By incorporating Ethernet capabilities, intelligent load panels provide the added advantage of monitoring load currents, voltages and the ability to remotely power cycle individual loads.

When selecting the appropriate DC power distribution panel for a specific application, several factors should be considered. These include the total system current and the individual load current requirements, choosing between a single bus or dual bus design, determining whether a positive or negative ground (or both) is needed, and identifying the type of overcurrent protection necessary to safeguard the connected devices.

Helios Power Solutions

www.heliosps.com.au

THE CRITICAL IMPORTANCE OF TESTING AND CERTIFICATION

The Critical Communications Association and the Global Certification Forum

The importance of the critical communications sector is not matched by its size — compared to the consumer mobile communications market it is tiny. However, it is a sector crucial to the safeguarding of people, property and critical infrastructure, and essential to the support of first responders. Therefore, cooperation between vendors is vital to achieve interoperability and ensure a wider accessible market for operators of mission-critical networks and users of mission-critical products and services.

The Critical Communications Association (TCCA) led the way in achieving TETRA market success through its leading Interoperability Testing and Certification process (IOP), which enables a truly open multi-vendor market for TETRA equipment and systems. This multi-vendor market gives concrete benefits both to the users in terms of a wide portfolio of compatible equipment, competitive pricing and rapid development of new product models; and to the industry in terms of faster market take-up and better possibilities for investment in new development.

TCCA's IOP process has been in place since 1999 and test sessions continue to be run on a regular basis, overseen by an independent certification body. Test sessions are performed on commercial products according to interoperability profile specifications and test plans. These are generated by TCCA's Technical Forum and its working groups as an agreed interpretation of the ETSI TETRA standards and are representative of actual operational conditions and users' needs.

For the established and future TETRA market, a robust process is already in place. With the advent of critical broadband, however, new programs are being developed to ensure that critical broadband products and services are also thoroughly tested and certified to ensure market strength and user confidence.

Supporting the ETSI MCX Plugtests

TCCA has been a key supporter of the ETSI MCX Plugtests since the first mission-critical communications Plugtests took place in 2017 — the first independent testing of public safety and other mission-critical LTE services initially over 4G networks. This was purely for Mission Critical Push-to-Talk (MCPTT). Since then the events have evolved to include Mission Critical Data (MCData) and Mission Critical Video (MCVideo), which together with MCPTT are collectively known as Mission Critical Services (MCX). The concept of MCX started with 3GPP Release 13 and is ongoing in current 3GPP Releases.

ETSI's Plugtests events serve two main purposes — they provide essential feedback to ETSI technical committees and 3GPP to help improve technology standards and to accelerate the standards-making process, and they enable engineers to get together to test the interoperability of their implementations. This can reduce a product's time to market. Participation is open to all organisations — whether or not they are ETSI or 3GPP members. Most attendees are vendors or equipment manufacturers;

> **MISSION-CRITICAL SERVICES … MUST BE FUNCTIONAL, RELIABLE AND RESILIENT, AND AS SUCH MUST SIMPLY WORK WITHOUT FAILURE, EVERY TIME.**

observers are allowed to watch the testing. Plugtests provide a neutral testing environment and activities are covered by a non-disclosure agreement. Implementations tested range from prototypes to commercial products — the only limitation is that they implement the relevant standard(s).

The seventh MCX Plugtests took place in November 2022, with the goal of validating the interoperability of a variety of implementations using different scenarios based on 3GPP MCX in Release 17. The testing over 4G networks was extended to include initial testing over a 5G test network. Specific focus was put to intersystem communications including IWF (Interworking Function to other technologies like TETRA or P25) and inter-MCX scenarios. The tests are based on 3GPP standards.

This Plugtests event also tested Future Railway Mobile Communication System (FRMCS) capabilities such as Functional Aliases, Multi-talker, User and Group Regrouping, MCData IP Connectivity and complex emergency call handling.

More than 1200 test cases were executed between vendors, based on 3GPP Release 17, and the seventh ETSI MCX Plugtests concluded with a success rate of 96% of the executed tests in the validation of 3GPP mission-critical services vendor interoperability. More than 150 delegates participated. The eighth MCX Plugtests are scheduled for 9–13 October 2023 in Malaga, Spain.

GCF and TCCA lead the way to certify 3GPP MCX broadband products

Mission-critical services and critical communications play an important role in keeping societies safe. These services must be functional, reliable and resilient, and as such must simply work without failure, every time.

This implies devices and networks must be interoperable and fit for purpose. With this goal in mind, the Global Certification Forum (GCF) and TCCA have been working together over the past few years to deliver a certification program for 3GPP standards-based mission-critical services.

The program will ensure that devices and applications are interoperable with mission-critical networks and are compliant with the relevant standards and specifications.

The next generation of mission-critical services will be delivered over networks that are based on mission-critical LTE evolving towards 5G. GCF and TCCA are working to include relevant industry players in the discussion about this new landscape and its certification programs.

To achieve this, TCCA and GCF have created the Mission Critical Services Work Stream (MCSWS), open to all TCCA and GCF members, and invited experts from industry. The workstream is tasked with the development of a certification program, with launch targeted for 2023. The current scope of the certification focuses on MCX, and will include both conformance and field trials testing.

How can agencies and companies engage and support this process?

Mission-critical operators and authorities are invited to join the MCSWS to help develop standards-driven mission-critical services, and to share their requirements regarding MCX products. They can also contribute to the technical development of the certification scheme, consider having field trials performed in their networks, and help grow the certification scheme by requesting GCF certification for devices or clients in tenders.

Mission-critical product suppliers are also invited to join the MCSWS. Device manufacturers and client vendors can work together in the scope of the GCF certification program to ensure interoperability on key functionalities, and also to support test platform validation activities in GCF with devices and clients implementing the latest specifications.

By working together, the mission-critical industry can help build a certification program that benefits all stakeholders and ensures the seamless interoperability of mission-critical devices and networks.

Industry Talking

ARCIA is delighted with the response to our events so far this year. With a great turnout in Sydney, members, partners and the wider community enjoyed a great daytime conference program, followed by the evening networking dinner. We have high hopes for Brisbane on 27 July to round out our conferences before the main events in Melbourne over 17–19 October.

The level of engagement seen from all sectors has been terrific; a real sign that the market is thriving, COVID is finally behind us and of course that the excellent work from the CEO and his event team is paying off for all stakeholders.

This all bodes well for the annual Comms Connect and ARCIA Gala Dinner in Melbourne, so make sure you keep an eye on the ARCIA website for these major events — https://arcia.org.au/events/. We suspect that October will be big, as the industry really gets back into gear and comes together to make the most of the collective opportunity presented.

One item that ARCIA is reworking in time for this year's Gala Dinner is the award categories. There are so many people, companies and projects happening across the country that the committee would like to recognise and so is broadening the scope of the awards. In particular, we wanted to highlight local manufacturing; it's often assumed that everything comes from overseas, when in fact there are a number of local manufacturers. Governments seek to encourage local manufacturing and there are many companies taking up this challenge, so the association thinks it high time we celebrate them.

With this in mind, watch out for the updated awards page on our website, take a fresh look and nominate those you feel deserve the recognition for what they do. We will also be looking to accent innovation as one of the award evaluation criteria, as we know many in our sector, from large organisations to small, deliver first-class innovation, which is vitally important.

The training program is in progress, with several courses now available online, including a Microwave Engineering Masterclass, Introduction to Radio Communications and Introduction to Digital LMR standards. There are more in the pipeline, with next up likely focusing on LTE/5G and Interference Mitigation. We suggest that you get in touch with us to let us know what you need for your teams, as your feedback is incredibly important. We will also survey members and those signed up to receive information from ARCIA, so please make sure your membership is up-to-date or register to receive our newsletters.

The association has also been active with the ACMA working on 4.9 GHz for public safety, the WBB mid-band spectrum, and we also received a request to enquire about radio re-broadcasting licences in remote area and mine sites.

Finally, we recommend that all involved with the critical communications community read the reports on Public Safety Mobile Broadband. It is critical that Australia gets this right and we broadly support the efforts by all levels of government to get the program up and running. There is so much to learn from other countries and the complex standards process. Communities expect our public safety agencies to have the necessary tools in place to cope with all but the 1-in-100-year events and communications technologies are a critical tool for situational awareness. The review and the government response are available at https://nema.gov.au/Public-Safety-Mobile-Broadband — ARCIA recommends that people read it and understand the situation.

Hamish Duff, President
Australian Radio Communications
Industry Association

GNSS module with integrated antenna

Antenova's latest compact high-precision GNSS module, the GNSSNova M20072, is a GNSS receiver with integrated GNSS antenna and reduced power consumption.

The product uses a MediaTek 12 nm low-energy chip with 1.8 V power supply, which is said to use 70% less power than older chipsets. The power consumption of the module can therefore be as low as 21 mW for a GPS fitness tracker, and GNSS-enabled products built with the device should have a longer battery life.

Antenova created the ready-made receiver solution for easy integration into a design. The module contains an integrated omnidirectional GNSS antenna, onboard LNA and SAW filter which work together to boost the signal to the GNSS processor if line-of-sight to the horizon is difficult. There is no RF integration to do, and the company assists customers with reference designs, design reviews and full technical support.

The product tracks four satellite constellations simultaneously in the 1559–1609 MHz bands — GNSS, GPS, BeiDou and GLONASS — which should result in greater accuracy in positioning. EASY and EPO are built in for a fast time to first fix (TTFF), so designs using the device should have fast performance.

Measuring only 13.8 x 9.5 x 1.8 mm, the module is ultra-small and requires only a small amount of clearance on the PCB, making it suitable for the smallest trackers and compact positioning devices where space on the PCB is tight. It is designed for use in wearable electronics, small trackers, bikes and e-scooters, and all battery-powered telematics.

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Modular inverters increase control and availability for mission-critical power systems

Modular DC-AC inverter systems with advanced power electronics and microprocessor technology provide scalability and fault-tolerance for mission-critical AC power systems.

Today, fault-tolerant power systems must be at the heart of mission-critical infrastructure, whether that be in telecommunications, or in industrial power such as mines, and in utilities like water and wastewater facilities. Communications systems and plants in remote areas need to maintain a constant and reliable source of power. In many cases, especially in industrial environments, very high reliability AC supply is required. Often AC power is produced by generators, but when grid or generator supply fails, inverter systems are essential – converting DC (24 or 48 Vdc) to AC (120 or 230 Vac) – to ensure no down time to critical power equipment. Eaton has now released its SR1600 modular inverter system, designed to function as an extended and fully integrated power conversion component with the existing Eaton critical power conversion range, including rectifiers, DC-DC converters and solar chargers.

Modularity for scalability

When paired with Eaton's new APS (Access Power Solutions) Series 8 modular power system and high efficiency 3 kW HDR48-ES rectifier, a scalable system can be implemented that allows the operator to start with only the capacity needed and then scale up with additional modules as the load increases over time.

For superior operating efficiency to further reduce operating costs, these systems are also compatible with Eaton 2 kW Energy Saver (ES) and 3G Access Power (APR) rectifiers, as part of an engineered-to-order AC input, DC/AC output critical power system.

The SR-1600 is a high power-density modular rack inverter solution rated at 1.6 kW per module. A 2U rack unit can support four modules for up to 6.4 kW and the system can be scaled up to 32 modules for 51.2 kW. It forms an ideal modular backup power system for telecommunication and industrial applications, and offers seamless switching between AC and DC sources.

The AC input range is capable of operating from 150 V to 265 V for a 230 V nominal system, and from 75 V to 132 V for a 120 V nominal system. The inverters are highly efficient at approximately 95% efficiency, and maintain a near-unity power factor of better than 0.99.

Safety and control

Advanced safety features include input reverse polarity protection, under-voltage and over-voltage protection, and output protection for short circuits, overloads, and over temperature. When coupled with Eaton's SC300 system controller, the SR1600 modules can be part of a full turn-key critical power system also comprising rectifiers, DC-DC converters and solar chargers. Chris Barson, Eaton's Product Manager, Power Quality ANZ, said: "The SC300 controller supports cyber-secure communication with the Eaton rectifiers, DC-DC converters, lithium batteries, AC power meters and solar chargers. The SR1600 modular inverter is being added to this list, creating a turn-key power, communication and control solution."

The modular inverter system will communicate directly via the Eaton SC300 controller, which also communicates with all other devices in the DC portfolio of products, including lithium batteries.

Advanced monitoring

The controller offers advanced control and monitoring features including Smart Alarms and a complete array of communications options with Ethernet, 4G/5G cellular (including text messaging), standard modem, TCP/IP and Modbus communications options.

The SR1600 solutions are pre-configured, and all system settings are fully adjustable in software and stored in transferable configuration files for repeatable and quick one-step system setup.

The inverter modules are hot-swappable, and new modules introduced into a system will automatically register and synchronise upon insertion, without the need for field team programming. This means that the modules can be removed and replaced easily by general technical staff without specialist power training. Mean time to repair becomes only a matter of minutes and can be done on site by keeping a strategic set of modules as spares.

Case studies and product demonstration can be arranged with an Eaton BDM. If you are interested to learn more, please contact Eaton or email EatonANZ@eaton.com.

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Artist's concept for NTS-3 in geostationary orbit. Image credit: 1st Lt. Jacob Lutz.

NEXT-GEN SATELLITE TO TRANSFORM MILITARY PNT CAPABILITIES

Anticipated to launch in late 2023, Navigation Technology Satellite-3 (NTS-3) will be the US Department of Defense's first experimental, integrated navigation satellite system in nearly 50 years.

Just as NTS-1 and NTS-2 served as the foundation for today's global positioning system (GPS) constellation in the 1970s, NTS-3 is on track to transform current US military positioning, navigation and timing (PNT) capabilities and lay the foundation for multilayer PNT resiliency.

As the space domain is increasingly contested, there is an urgent need to demonstrate transformative capabilities to ensure warfighters can operate successfully in GPS-degraded or -denied environments. The Department of the Air Force (DAF) has prioritised NTS-3 as one of its four Vanguard programs to do exactly that, with aerospace and defence technology company L3Harris chosen to lead the design, development, integration and test of the next resilient PNT mission solution.

"If you watch the news today, it's easy to see that the threats posed by our adversaries are becoming bolder, more frequent and more sophisticated," said L3Harris Fellow Tara Solorzano. "Our goal is to show that NTS-3's technology will not only address these evolving threats, but it will also provide our warfighters with a responsive and flexible capability to ensure mission success."

The NTS-3 is an experimental platform designed to prove resilient, robust and reprogrammable PNT functionality in space. It is also said to be the first satellite that can simultaneously broadcast and receive GPS information, which will allow US forces to operate successfully in GPS-denied environments and areas prone to spoofing.

Not only does NTS-3 have the ability to focus powerful beams to ground forces, it's also able to minimise the impacts of GPS jamming through rapidly reprogrammable signal waveforms, frequency agility and increased signal strength. The experimental satellite's embedded software and firmware is reprogrammable on orbit. When paired with agile and reprogrammable user receivers, this will allow the US Air Force (USAF) and US Space Force (USSF) to react in real time as threats change on the battlefield. Additionally, NTS-3's enhanced processors can support more complex signals, now and into the future.

"Think of NTS-3 as GPS's next-generation wingman that will provide our forces with uninterrupted PNT," Solorzano said. "This technology is designed to defeat the threat that contested, degraded and denied PNT poses to our national security."

Satellite testing was recently conducted at Edwards Air Force Base's Benefield An-

echoic Facility (BAF), understood to be the largest anechoic test facility in the world. The BAF provides shielding effectiveness that allows GPS tracking and jamming tests without frequency management or regulatory agency approval.

"The BAF is large enough and has enough infrastructure around it," said Arlen Biersgreen, NTS-3 Program Manager, Air Force Research Laboratory (AFRL). "It is a quiet enough chamber that protects the aircraft and other GPS users outside of the facility. We needed to have a shielded, large enough area to keep the energy of the testing inside the facility. Across the board, the BAF really fit the bill in a way no other facility in the United States really could."

"We are testing when a satellite sends out a signal, we can actually receive that signal and it's the correct one," added Amarachi Egbuziem-Ciolkosz, an engineer with the 772nd Test Squadron. "You don't want a satellite to send you back a signal that your house is 10 miles away when it's actually right in front of you."

NTS-3 will demonstrate technologies and techniques to augment the GPS constellation to help maintain access to GPS in contested environments. Testing at the BAF is an important step in ensuring that the AFRL team is ready to successfully conduct on-orbit experiments.

"The value of all of this is to allow for everything to be synchronised together," said Thomas Roberts, NTS-3 Chief Engineer, AFRL. "Whether it be airline schedules, take-offs/landings at the airports or military operations, NTS-3 is taking this a step further because we are using clocks, but we are also doing a demonstration of advanced signals and signal flexibility. Our ability to get that job done is dependent on the success of this testing facility."

Once all testing is complete, the NTS-3 will launch into space in late 2023 aboard United Launch Alliance's new Vulcan Centaur rocket. The satellite will remain in a near-geosynchronous orbit for another year of testing, during which it will broadcast navigation signals from its phased array antenna. But before this happens, a few more steps in the NTS-3's journey need to be made.

"After we are done here at the BAF, we will transport the satellite to Kirtland Air Force Base and get it back into our inte-gration and test facility," Biersgreen said. "We have thermal vacuum testing where we will be simulating the environment the satellite will be operating in. We also have testing to show that the ground system is compatible with the satellite. After that, we have a long training campaign for our operations crew so everyone on the team is ready to conduct this experiment after we launch."

The AFRL has already scheduled more than 100 experiments for NTS-3, which will help the USAF and USSF decide on the best ways to use the complementary satellite, ground and user equipment technologies to modernise the military's PNT architecture.

"We're incredibly excited about the upcoming launch," Solorzano said. "Once NTS-3 is in orbit, we'll be able to prove its performance and showcase the benefits of this game-changing technology. The experiments performed by AFRL will shape the way our military uses this technology to protect our nation's warfighters."

L3Harris
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IoT IN VEHICLES
RAISES SAFETY AND EFFICIENCY FOR EMERGENCY SERVICES

Jodi Favaloro, Consulting Sales Engineer Asia Pacific, Cradlepoint*

Technology innovation and the growing use of cloud-based applications is increasingly enabling organisations that operate outside the office to take advantage of in-vehicle connectivity.

Sectors like public safety provide most of their services out in the field, with their fleets and the technologies that connect them being an integral part of their operations. Allied Market Research predicts the fleet management market, valued at $6.4 billion in 2021, will reach $16 billion by 2031[1]. An uptick at that pace demonstrates just how quickly industries, including emergency services, are embracing digital transformation through IoT connected vehicles.

IoT technology using 5G and LTE for vehicles has raised the bar for safety and operational standards across enterprise fleets that want to see their technology investments go further. This presents key opportunities for various sectors, including emergency response agencies, to stay connected with their base, staff, riders and fleets. Let's explore how.

The evolution of IoT in connected vehicles

IoT-connected vehicles didn't hit the streets overnight. Many companies have cruised the highway of tech adoption for years with automatic vehicle locators (AVLs) or onboard self-diagnostic (OBD) equipment used to monitor the performance of engines, emissions and driving behaviour. Today — in large part due to the advancements in cellular broadband — vehicle-first organisations have built upon their AVL and OBD foundations to create full-blown mobile offices outfitted with dozens of connected devices from laptops, tablets and inventory management systems to video cameras, specialised sensors and much more.

The data collected and transmitted from IoT-connected vehicles has the ability to increase vehicle utilisation; reduce accidents; lower travel time; improve the experience and safety of drivers, passengers and bystanders; and, for emergency services, to enable clearer, faster and more accurate relaying of critical information, in any format, back to base or to other vehicles. Each of these benefits has materialised as a result of IoT and 4G/5G-connected vehicles evolving to answer fleet management questions and address the following challenges across organisations:

1. Vehicle maintenance

Early in-vehicle technology was often limited to GPS and location services. Today, IoT sensors can deliver considerably more detailed vehicle information to fleet operators, as well as trigger alerts in the case of tyre pressure drops, coolant temperature changes and more. This information gives fleet managers time to intervene before a vehicle is out of service, meaning public safety vehicles are always ready for emergencies out in the field.

2. Fleet management

As the number of IoT devices per vehicle continues to rise, it's becoming increasingly important to rely on lean IT teams to service in-vehicle wireless routers remotely through a cloud-based platform. With connected licence plate recognition devices, safety vests, smoke masks, facial recognition body cameras and fire hoses relying on always-

on connectivity, 5G vehicle routers enable faster, more secure data transmission while giving IT teams the ability to monitor and manage the routers from anywhere.

3. Driver accountability

Particularly in the case of public safety and services, agencies must have a clear picture of employee activity away from main offices. IoT-connected vehicle technology resolves this issue. For example, IoT sensors can notify headquarters of the who, when and where in the event of an emergency key box opening or trigger video recording when a firearm is pulled from its rack in a police cruiser.

Sensors can also track the routes taken by vehicles in fire or flood emergencies, enabling advice on optimal routes with the help of connected aerial drones.

4. Staff and rider safety

In case of an emergency — whether that be a child who never made it on to the school bus or a police cruiser missing from its routine patrol — IoT sensors can provide location information for unresponsive units and accountability data at a rate that far surpasses the efficiency of search parties or word-of-mouth reports.

5. Information security

Without a mobile security solution in place, the transfer of patient health records, past offences and other critical information captured through sensors, cameras and onboard devices can be an organisational security risk. 5G vehicle routers provide enhanced security with zero trust networks today while holding the promise of fortified security and performance services such as network slicing in the future.

Popular use cases for IoT in vehicles

Although different industries deploy in-vehicle IoT in different ways, organisations across the globe can agree that the proliferation of 5G for vehicles has helped IT teams overcome fleet management challenges and ushered in a new era of performance, security, reliability, reach and rapid scale. Common use cases for IoT in vehicles include:

Video

In vehicles, video is primarily used for surveillance and documentation. Similar to cameras on a police cruiser, public buses can have upwards of 15 cameras placed throughout the vehicle for passenger security and crash documentation. 5G and LTE for vehicles enable video footage to be transmitted live or wirelessly offloaded at stations.

Telemetry

Put simply, telematics measure where, when and how much. On most vehicles, telemetry devices may measure vitals such as time until the next oil change, mileage, battery runtime or even water pump levels on a fire engine. Cellular telemetry such as signal strength and data plan usage can also be leveraged for most effective use.

Sensors and switches

Sensors and switches are highly customised IoT devices that can trigger automatic responses or collect mission-critical data. For example, a fire engine siren can trigger streetlight controls to expedite response times, an automatic notification can be sent to headquarters when an ambulance's narcotic cabinet is opened and a sensor can trigger an alert when a firearm is removed from a police officer's holster. Each of these action–reaction relationships gives operators a clear picture of driver and passenger behaviour, allowing them to fine-tune fleet safety and efficiencies.

Digital signage

Digital signage on public safety vehicles uses high-bandwidth, low-latency cellular broadband to display up-to-date wayfinding announcements, route changes or risk warnings in areas that might be experiencing fire or flood events.

Pinpointing the best IoT solution for vehicles

When deciding what type of solutions and features a public safety agency needs for IoT connected vehicles, there are a few important questions to consider:

What challenges will a 5G-connected vehicle solve?

A 5G vehicle router not only opens up access to the 5G network, but also 4G through dual connectivity, providing always-on connectivity for vehicles. Some vehicle routers also provide a dual modem option, enabling the router to select the optimal carrier connection based on cellular telemetry.

If a fleet needs to be able to maintain connectivity under physical pressures such as extreme weather, shock, vibration or humidity, a ruggedised router can be installed — even on the roof.

How will information be gathered and managed?

An IoT connected fleet generates a significant amount of diverse, real-time data. If this data isn't processed or analysed quickly, it isn't helpful. To make the most of it, agencies must ensure they have a simple, cloud-based management system to view patterns and performance.

What additional functionality can be automated with the right equipment?

Support for extensibility — such as containers for edge computing or computing directly on the vehicle router — creates opportunities for custom data capture and processing. For example, a custom application used on a fire truck can be developed that tracks which areas have been back-burnt ahead of bushfire seasons.

Connected vehicle growth is on the move, and the right IoT connected vehicle solution for fleets will simplify connectivity, enable cloud management of operational complexities and increase efficiencies and safety for emergency services.

1. Allied Market Research - *IoT Fleet Management Market: Global Opportunity Analysis and Industry Forecast, 2021-2031*

*Jodi Favaloro has extensive experience in the telco sector — she has been at Cradlepoint for three years, and previously spent a year as a solutions architect at Macquarie Telecom Group. Prior to that, Jodi spent 23 years working in technical roles at Optus.

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MARITIME SECURITY LAB HELPS DEFEND AGAINST CYBER ATTACKS

Cyber attacks on industry and critical infrastructure are on the rise across the globe. Targets also include ships, which, by transporting billions of tons of goods around the world each year, form part of international supply chains — yet their onboard IT systems often lack secure protection.

For six days in 2021, the Suez Canal — a narrow waterway connecting the Red Sea and the Mediterranean Sea and an important trade route between locations such as China and Europe — was blocked by the container ship *Ever Given*. A single stricken cargo vessel caused tremendous congestion, with several hundred other container ships stuck as they waited to get through. This in turn had implications for international trade, as the resulting delays led to a shortage of containers at ports, threw schedules into several months of disarray and held up shipments.

This incident showed just how dependent we are on maritime bottlenecks like the Suez Canal: if a key trade route is blocked for more than a few days, this has a direct and disruptive impact on production and supply. And while *Ever Given* did not run aground because of a cyber attack, it is not hard to imagine what could happen in the event of a successful attack on the digital navigation and communication systems onboard one or more cargo ships.

To raise awareness of the risks of inadequate cybersecurity at sea and help develop defensive solutions for guarding against cyber attacks, the Maritime Cyber Security research group at the Fraunhofer Institute for Communication, Information Processing and Ergonomics FKIE has teamed up with the Fraunhofer Center for Maritime Logistics and Services CML to set up a modular maritime security lab. This simulates cyber attacks on ships to find ways to detect and defend against attacks.

Ships as potential targets

Ships increasingly require networking technology in general — whether for finding the best way to navigate routes, monitoring goods or allowing the crew to contact home. This makes maritime systems all the more vulnerable to cyber attacks. As explained by Dr Jan Bauer, Head of the Maritime Cyber Security research group, three different kinds of attacks are conceivable.

"Generic attacks are not aimed specifically at ships and are therefore the most common threat," Bauer said, highlighting the example of a USB stick infected with ransomware being connected to the onboard computer. "Targeted attacks that are carried out with a high degree of expertise and can make ships simply vanish from radar, for example, are far more dangerous."

Another possible type of attack involves what is known as electronic warfare. This is not strictly a cyber attack, but it can have a similar impact in that it affects systems such as GPS by means of interfering with transmitters or using high-frequency radio waves ('jamming' or 'spoofing').

A realistic test environment

Researchers at Fraunhofer FKIE can simulate these different kinds of cyber-physical attacks, ie, attacks that impact the real world, in a maritime security lab. The true-to-life stationary ship's bridge under development at Fraunhofer CML in Hamburg is currently being expanded to create a cybersecurity lab as part of the MaCy (maritime cybersecurity lab) project. This onshore facility features all the tools and systems usually found at sea: the bridge hardware, marine radio and AIS (automatic identification system) transceivers, a radar unit and the ECDIS (electronic chart display and information system), which is used for navigation, among other things. Within this realistic and controlled test environment, the research

Manipulation of the radar image by the Bridge Attack Tool (BRAT) in a simulation scenario in the Rostock-Warnemünde area. Image ©Fraunhofer FKIE

The navigation simulator at Fraunhofer CML running a simulation in the Port of Hamburg. Image ©Fraunhofer CML

group is using a variety of developments to detect, investigate and, ideally, avert IT security breaches.

The Bridge Attack Tool (BRAT) makes it possible to carry out effect-based simulations. Developed as an offensive security tool, BRAT has the capability to carry out various attacks itself — such as denial-of-service (DoS) attacks or disrupting and manipulating radar and positioning systems — and show the tangible impact they have on the onboard systems. With a subsequent analysis, the researchers can then highlight existing weaknesses in software systems to industry partners and help them rectify these issues and develop countermeasures by drawing on areas such as cryptography.

To help detect cyber attacks on ships as early as possible, the team has designed a maritime intrusion detection system that automatically spots anomalies. This Cyber Incident Monitor (CIM) evaluates potential attacks and provides information and guidance to the crew over an ergonomic user interface.

"In stressful situations, warnings and recommendations for the ship's crew need to be simple and straightforward to implement," said Florian Motz, Head of the Organizational Ergonomics research group at Fraunhofer FKIE.

"That's why, when developing CIM, we paid particular attention to ensuring that audible warnings, for example, are only triggered when urgent action is needed, and that alarms and warnings come with information and aids for making decisions — such as advice not to trust the GPS for the time being. The alarm and warning concept is in line with performance standards for bridge alarm management from the International Maritime Organization (IMO)."

The team has been working on CIM and parts of the development of BRAT in collaboration with the company BM Bergmann Marine under the SINAV research project — a study on integrating and processing sensory, navigational, communication and automation information for semi- and fully autonomous ship operation in order to guarantee safe navigation — on behalf of the German Federal Ministry for Digital and Transport.

Raising awareness and developing measures

The researchers' objective is to use the maritime security lab to raise awareness among companies, authorities and nautical experts of the dangers of cyber attacks at sea and to work with industrial partners to develop protective measures. On the one hand, they can test and upgrade existing systems. On the other, they can provide research data to develop new solutions and thus help establish an approach based on the concept of security by design. Bauer believes that systematic prevention combined with effective methods for detecting potential cyber attacks offers the best protection from harm.

"We mustn't be lured into a false sense of security just because cyber attacks on ships have not been widely reported," he said. "Particularly, the systems on older cargo vessels, which have been in use for decades now, are in urgent need of upgrading."

IoT modem

The Webdyn EasyTunnel 4G is a powerful, all-in-one IoT solution for demanding industrial, agricultural, utility and environmental applications. With RS232, RS485, dual SIM and digital I/O interfaces, plus embedded TITAN V6 firmware (Modbus, MQTT, IPSec, logger, webserver), the unit provides the required functionality for many complex IoT projects.

A key feature is the user-programmable scripts, based on JavaScript, that permit easy programming of customised functions for specific applications (edge computing). Additional functions include FIFO/LIFO modes for data queuing, SSL/TLS support, and data sending options (HTTP/HTTPs/FTP/FTPs/MQTT/MQTTs) with custom JSON formats.

Webdyn's Titan V6 firmware comes with an embedded webserver to make configuration and setup simple and quick. Additional features of the firmware include: two simultaneous 4G-to-RS232/485 connections; serial data collected by RS232 or RS485 (Modbus, sensors, meters, I/Os); full control by SMS with phone number authorisations; alarms (digital input, temp, MBus data read); full management with AT Command by serial, socket, SMS, modbus, SNMP); SSH encryption, which supports TACACS+; and protocol IEC 60870-5-102 for meter reading.

These features make the unit applicable for various IoT projects and suitable for Industry 4.0 applications, including: gathering data from electrical meters; monitoring solar/photovoltaic systems; monitoring frequency drives used in pumping or other applications; temperature/humidity monitoring; and irrigation pump control and monitoring plus water metering.

The product can also be used to replace legacy 3G equipment, as it can be configured/customised to communicate to a legacy device previously connected to an older 3G modem.

Australis M2M Pty Ltd
australism2m.com.au

Drone-in-a-box solution

Nokia is offering a turnkey drone-in-a-box solution, designed to meet the growing demands of organisations including public safety agencies, smart cities, construction, energy and defence. CE-certified to meet safety requirements of the European Union, the Nokia Drone Networks solution connects over public and private 4G/LTE and 5G networks to enhance situational awareness for first responders and other professionals.

The product is manufactured in Europe and comprises Nokia drones, a docking station, dual gimbal camera and edge cloud processing using Nokia MX Industrial Edge (MXIE). Using cellular connectivity technologies offers high data rates and low latency, enabling more data to be streamed than over Wi-Fi.

Beyond visual line of sight (BVLOS) operations with real-time kinetic (RTK) positioning improves situational awareness. Dual modem connectivity allows the drones to simultaneously connect to multiple networks, complying with system redundancy that is commonly required by aviation regulatory bodies.

The product can be operated remotely for search and rescue activities, and to assess damage in a hazardous environment. The drones can also be programmed to manage autonomous scheduled flights for applications like additional security at large events or to manage regular remote equipment inspections. The docking station protects the drone and payload, such as the sensor devices or dual gimbal camera, from external hazards and harsh weather while it remotely charges the drone to prepare for the next flight.

When used in conjunction with Nokia MXIE, data from the drones can be collected and processed in real time at the edge cloud. An open API framework allows agencies and enterprises to onboard pre-integrated Nokia and third-party applications and systems and take advantage of a growing number of public safety and Industry 4.0 use cases for drone automation, including object identification, tracking and network measurements.

Depending on the deployed configuration, the drones offer more than 50 min of flight time and cover distances of more than 30 km due to the hardware architecture, integrated software innovations and 4G/5G connectivity.

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

L1/L5 GNSS receiver module

The u-blox ZED-F9L is an L1/L5 GNSS receiver module that has been tailored for automotive applications. With its fully integrated dead reckoning technology, new-generation six-axis IMU, multiple outputs and robust automotive grade hardware (AEC-Q104), the module is suitable for innovative automotive designs that demand high performance and seamless integration.

The product leverages L1/L5 band signals and six satellite constellations simultaneously, including NavIC. The receiver has been designed to provide continuous sub-metre-level positioning accuracy. Due to its built-in algorithms, the module combines GNSS measurements, IMU data, wheel ticks and vehicle dynamics to achieve appropriate positioning and attitude, even when GNSS services are unavailable.

With an operating temperature of up to 105°C, the device enables telematic control units (TCU) under the roof or smart antennas, for example. The module also supports motorbike applications. In addition, it incorporates the latest security features, including anti-jamming and sensor-based anti-spoofing techniques.

The GNSS receiver is suitable for telematics (TCU), V2X and advanced navigation. The receiver is equipped with features including a 50 Hz output rate with low latency for real-time applications, multiple outputs to support diverse automotive architectures and a high-protection security level. Furthermore, the product offers an upgrade path to RTK technology as it is pin-to-pin compatible with the ZED-F9K module.

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

Magnetic cable hangers

Adept Direct specialises in designing and manufacturing high-quality cable hangers and cable rollers for all industrial sectors, including mining applications. The company's FRAS magnetic cable hangers are made with robust materials to withstand the demanding conditions of these industries.

The magnetic cable hangers are easy to install, even in harsh environments. They come with a powerful magnet that can stick to any metal surface, meaning the hangers remain securely in place — even when subjected to vibrations and shocks.

The magnetic cable hangers can be used with a variety of cables, including power cables, communication cables and control cables. They can hold multiple cables at once, keeping cables organised and out of the way, reducing clutter and the risk of tripping hazards, and saving space.

The magnetic cable hangers are built to last in harsh environments, as they are made of robust materials that can withstand extreme temperatures, moisture and other environmental factors. They are also resistant to chemicals and UV radiation, so that they remain in good condition for an extended period.

The magnetic cable hangers are thus suitable for any industrial or mining operation looking to improve safety and efficiency. They are easy to install, versatile and durable, making them useful for anyone who uses cables regularly. They can help users to maintain an organised and safe workspace, leading to increased productivity and reduced downtime.

Adept Direct - Cable Rollers & Lead Stands
www.adeptdirect.com.au

Hand-portable TETRA radio

Sepura has launched the SC23, a robust hand-portable TETRA radio with a reduced keypad and streamlined feature set of core TETRA functionality. The radio complements the existing SC series of TETRA radios, providing a device for users who do not require extended functionality such as in mining, utilities, transport and airport baggage handling.

Featuring critical safety features in line with the SC20, including enhanced fidelity audio, easy-find emergency buttons, water porting and dust protection, the unit has a monochrome screen and does not include Wi-Fi or Bluetooth. It also features the same accessory connections and batteries as the existing SC20 and SC21 TETRA radios, meaning that existing audio accessories, battery chargers and carrying devices are compatible.

The product operates on the same frequency bands as the SC20, including VHF, providing extended coverage across expansive outdoor environments or complex underground networks. This streamlined capability means the device is suitable for pool users and other operators who need simplified functionality to perform their role. It can seamlessly be added to a Sepura fleet to provide core critical communications.

Sepura
www.sepura.com

Radio Matters

A fond farewell

As the outgoing Chairman I would like to thank the committee for the two years at the helm, with a particular note of thanks to Corey and Debby for mentoring me in the role and always being available to bounce ideas off when needed. Thanks are also due to the various members of ARCIA, WISPA RSM and *Critical Comms* who I have interacted with over the last few years, too many to name but you know who you are. Finally, to our sponsors, partners and members, without your ongoing support RFUANZ would cease to exist.

Over the two years I have gained some unexpected experiences. At the height of COVID we managed to have the only Comms Connect event for two years in 2021, during which I was unexpectedly nominated for the role of Chairman. Then we went back in lockdown and out again, followed by a year of uncertainty. During this time Comms Connect rolled the dice on the new convention centre in Christchurch, this being the first time we had the event in the South Island of New Zealand. This was then followed by Comms Connect Melbourne in October last year, which I was lucky enough to attend with the support of the committee.

Comms Connect NZ 2023 in June made it evident that we're all back better than ever, with unseen numbers on the floor and the biggest Gala Dinner to date. The event as it stands at Te Pae Christchurch Convention Centre will be remembered by myself as the highlight of my career in the radio industry. The talk on the floor was about getting new blood into the industry; the 'how' is still being formed as to ways to get out there, make the connections and bring them to the table.

RFUANZ is in good hands with Justin Wonderlick stepping into the role, bringing his years of technical and professional excellence to the head of the table. Good luck Justin, so long, and thanks for all the fish.

John Laughton
Outgoing Chairman
Radio Frequency Users Association of New Zealand

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Engaging our purpose

As the newly elected Chair of RFUANZ, it is my pleasure and privilege to address the coming year ahead. However, I would first like to thank John Laughton for his efforts and time as Chairman over the last several years as well as everyone involved with a great Comms Connect show and Gala Dinner.

While I must say I was not expecting this turn of events in becoming Chairman, nor having to be prepared to speak at the Gala Dinner, I was reminded by several friends afterwards that I should have told you who I am. I can say quickly that my time working in telecommunications came about from working within the electricity utility business — where things must work reliably and be built to endure. Like electricity, being able to communicate is something that can make you feel helpless when you no longer have it — and is rarely thought about when you do have it. It is this purpose that drives me to provide services and now service to the RFUANZ membership.

Having moved to Hawke's Bay last year to work with Unison, the local electricity distributor, Cyclone Gabrielle harshly reminded me of how important the radio industry is and the abilities of our members to provide support in emergency situations. While the region lost cellular communications, electricity and internet from days to weeks, the local LMR networks were operating through the entire ordeal. It is these services that can provide the wherewithal and capability to help coordinate efforts to bring essential services back to the population. Unfortunately, I believe we need to bring these capabilities back to the forefront of government, emergency services and local business understanding. They may not be 5G or Ultrafast Fibre services bringing faster internet speeds; however, LMR is constantly evolving and provides simple and effective communication which time after time proves its worth in the worst of situations and when you need it most.

In the year ahead we have several initiatives which we hope to bring benefit to our members. The Level 4 education course is continuing to gather steam and we are looking to get a great foundation for future radio installers, technicians and engineers. Furthermore, we wish to engage with our members more closely regarding the new RSM Register of Radio Frequencies (RRF) as well as the future Radio Licence fee review. I will be encouraging our committee members to engage with our members, and I encourage our members to reach out to us as well.

I will remind our members that there is a big blue button on the top right of our website (https://rfuanz.org.nz) which opens a simple message service — drop us a note, let us know what it is we are doing well or not. Let us know if you would like someone to talk to about your concerns or issues.

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

TETRA portable radio

Hytera's PT590 is designed to be ready for critical missions today and tomorrow, with an abundance of hardware and software features including good audio quality, wide communication coverage, data security, personnel safety, a long-lasting battery and a robust plastic and liquid silicone rubber case.

The rugged TETRA radio offers easy operation at the frontline, due to its ergonomic design, intuitive display, one-fits-all Type-C, remote radio management, multi-device collaboration and voice commands.

Hytera Communications Co. Ltd

www.hytera.com.au

Multiband transceiver

The LoRa LR1121 is an ultralow-power, long-range transceiver offering support for terrestrial, industrial, scientific and medical (ISM) band communications and S-Band support for satellite connectivity. The transceiver is suitable for applications requiring compliance with radio standards, including smart meters, asset tracking applications, parking sensors, environmental sensors and home automation.

The transceiver supports any combination of LoRa, (G)FSK and long-range FHSS (LR-FHSS) modulations. It complies with a broad range of radio standards, including ETSI EN 300 220, FCC CFR 47 Part 15, ARIB and Chinese regulatory requirements. It includes an integrated PA regulator supply selector, simplifying dual power +15/+22 dBm with a single board implementation (sub-GHz).

The transceiver is fully compatible with LoRa Connect SX1261/2/8 devices and the LoRaWAN protocol defined by the LoRa Alliance. Featuring a robust cryptographic engine, it supports AES-128 encryption/decryption-based algorithms.

Mouser Electronics

au.mouser.com

Reconfigurable intelligent surface product for 5G-A

ZTE Corporation has unveiled its second-generation Dynamic Cooperative Reconfigurable Intelligent Surface (Dynamic RIS 2.0) product, which aims to further drive the green evolution of 5G-A. Compared to its predecessor, the device features reduced specifications and power consumption, as well as more convenient deployment.

As an emerging technology, reconfigurable intelligent surfaces (RIS) utilise programmable, two-dimensional metamaterials along with phase control components to achieve signal propagation, direction regulation and interference suppression in three-dimensional space. Their primary goal is to establish an intelligent and controllable wireless environment, surpassing the limitations of traditional wireless communication.

Originally, RIS operated as a static surface, enhancing signal coverage at fixed points. However, the coverage provided by a single fixed beam was relatively limited and couldn't adapt to dynamically distributed users. To address this, ZTE introduced Reconfigurable Intelligent Surface Dynamic Collaboration technology, which is built upon 5G base stations. This technology enables rapid scanning of multiple beams and real-time user tracking. By incorporating key techniques from 6G's RIS advancements into 5G, it has become a pivotal technology for 5G-A.

In 2022, ZTE unveiled the first-generation Dynamic Cooperative Reconfigurable Intelligent Surface product (RIS 1.0) and completed prototype verification of its Dynamic RIS technology. The verification results demonstrated that the cooperative beamforming technology between base stations and reconfigurable intelligent surfaces not only enhances base station coverage, it also facilitates seamless user connectivity in mobile scenarios. Moreover, the beam can be dynamically adjusted to accommodate diverse deployment scenarios.

The Dynamic RIS 2.0 model offers advancements over its predecessor in terms of wide coverage distance and high user gain. Through the incorporation of new materials and an evolved architecture, products achieve an 80% reduction in power consumption. The integrated design also contributes to a light and aesthetically pleasing appearance. Additionally, Dynamic RIS 2.0 is designed for easy installation and adaptability to diverse environments, making deployment, management and maintenance more streamlined.

The latest version serves the purpose of expanding network coverage in a cost-effective and energy-efficient manner. It also aims to address challenges associated with higher frequency bands, such as millimetre waves, which suffer from high propagation loss and penetration loss. Dynamic RIS 2.0 enables high- and low-frequency co-site and co-coverage, thereby reducing construction and operation costs for high-frequency networks.

ZTE Corporation

www.zte.com.cn

AUSTRALIA'S PSN NEEDS MORE REGULATION
TO KICKSTART DEPLOYMENT

Simon Dux

Progress on Australia's Public Safety Mobile Broadband (PSMB) capability for first responders has fallen behind many countries and requires further funding and regulation to become a reality.

Despite being on the agenda for nearly a decade, the network — which would provide emergency service workers reliable and ubiquitous access to data — has seen "relatively minimal" progress and will need to rely on the big three mobile operator networks to succeed.

Speaking at the recent Australian Radio Communications Industry Association (ARCIA) conference in Sydney, NSW Telco Authority Chief Digital and Technology Officer James Pickens said commercial mobile networks almost always underpin PSMB efforts in many countries and that regulation has been used to kickstart deployment in countries already implementing or operating public safety networks.

"As a consequence of the current spectrum landscape in Australia, the PSMB solution going forward will need to share spectrum with mobile network operators… Regulation has facilitated the delivery of PSMB capability in many countries including laws mandating multicarrier roaming and the prioritisation of emergency service traffic over shared spectrum assets," he said. "We need to prioritise the move to the next phase of PSMB delivery and seek clarity of support from all players in the space. Government and industry are going to be needed to make this a reality.

"With a national PSMB capability the situation would be vastly different," he said. "We have the technology to provide this capability now. What we don't have is a network that can provide it at the mission-critical grade that these emergencies require."

He added: "A commitment to funding; a commitment to the engagement of industry in solution design and momentum from the creation of a suitable national body are needed to move this forward."

Pickens praised the federal government's recent commitment of $10.1 million to establishing a central taskforce to drive PSMB delivery. "The Commonwealth leading a body with appropriate staffing and resources, charged with the accountability to deliver, operate and manage a PSMB, is an incredibly welcome development and a critical step in advancing PSMB capabilities," he said.

However, he warned that the relatively small number of first responders meant that a commercial solution to PSMB may not happen without further action by government and industry.

"What we really need is Australians coming together, whether they work in government or industry, to fulfil a moral obligation to provide a fit-for-purpose Public Safety Mobile Broadband capability for first responders who put their lives on the line

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to protect us," he said. "Australian first responders are less than half a million people out of a population of 26 million. Whether it's paramedics, firefighters, police or SES volunteers, all of us rely on them to be there on our hardest days… What we need is governments, regulators and commercial operators to approach the PSMB through a lens that encompasses not only the market perspective, but also the public good."

Mandatory always-on roaming
Despite major reluctance from the three mobile network operators, Pickens said permanent roaming for emergency services is what is wanted by first responders. "Providing continuous PSMB roaming for most service organisations ensures that they're less affected by a single operator outage and, at the same time, providing them with the greatest mobile coverage," he said. The ACCC is currently investigating temporary roaming during natural disasters or other emergencies as part of its Regional Mobile Infrastructure inquiry.

"An aggregate of all three networks will provide the best [solution] and concerns around … network congestion should be alleviated by considering that we only require this functionality for a very small subset of people," he said.

During the 2022 NSW floods he said there were more than 800 reported telecommunications impacts on networks and 18 communities were left with no access at all. "The absence of phone and mobile data services caused by network outages impeded the disaster response and prevented emergency services from accessing time-critical information and from sending emergency warnings and evacuation orders that also didn't make their way through to … communities," he said. "This compromised the safety of first responders in the field. The situational awareness was predominantly limited to voice-only."

Pickens added that regulation should address increasing network resilience, or hardening. Operators would need to deliver additional capabilities around QoS, prioritisation and pre-emption for mission-critical services — each are sensitive areas for mobile operators providing commercial services. While QoS measures network performance, priority ensures that critical communications receive preferential treatment over non-critical communications when the network is congested. Pre-emption means non-critical communications can be interrupted to allow critical comms to continue when necessary.

"During the Black Summer bushfires more than 200 mobile sites experienced outages for substantial periods of time, largely due to power and in mostly populated areas," he said. "Operational command centres often had to rely on voice communications alone exacerbated by the fact that, for example, in the NSW–Victorian border, the two networks are very different and the two jurisdictions couldn't actually communicate with each other."

Pickens said some existing federal and state mobile investment programs could be leveraged but the gap may need to be filled through regulation. "It's unlikely operators will invest in the network hardening to the degree required unless they have to," he said.

"PSMB needs to be built for the increasingly frequent worst-case scenarios with the resilience to withstand severe disasters," he said. "Emergency services most critically need access to broadband at these times when there are often network outages or congestion, which impact commercial networks."

Pickens said that with a renewed emphasis on public safety, there may be an opportunity to examine telecom operator obligations under the Telecommunications Act with resilience as a lens to see a greater emphasis needs to be put on uptime. "It's not the Telco Authority to say definitively what it should look like but it's a question for the industry," he said. "It's vital for

emergency services to have access to accurate real-time data on operational status networks during emergencies. This includes network outages, performance issues and the expected time to regain full service.

"We have the technology to deliver PSMB. We should have the confidence in our ability to work out in detail all necessary agreements, both into governmental and commercial."

Telco Authority tech trials
NSW Telco Authority operates the highly reliable Public Safety Network in that state but it only offers voice and narrowband capability. There are interoperability issues between jurisdictions and the network can't evolve to deliver broadband services. "Emergency service workers in every line of service and in every state and territory have communicated the urgent need for mission-critical data and particularly video capabilities to enable the use of best practice digital technologies," Pickens said.

The Telco Authority achieved an Australian-first demonstration of commercial multicarrier roaming with dedicated PSMB core, as well as interoperable mission-critical communications, between jurisdictions, which Pickens said lays the groundwork for the development of a national PSMB.

However, in the absence of PSMB capability, the Authority has been trialling mobile and satellite technologies as part of the NSW Government's $3.5 million Next Generation Digital Connectivity project. Pickens said the results of the trials will be made public very soon.

"We've got trials underway in NSW RFS, the Reconstruction Authority, the State Emergency Service, the ACT Emergency Service Agency, Service NSW, NSW National Parks and Wildlife, and the Ambulance Service," he said. "We're working with a variety of vendors including Wireless Innovations, Av-Comm, Vocus, Optus, FSG and have 10 or so more technology partners lined up for future experiment work."

In one trial, NSW Telco Authority is using low Earth orbit satellites for firefighters in areas of low or no coverage, including the ability to remain connected while in transit, on fire trails and in dense bushland — all areas where traditional satellites struggle. In another trial, the Authority has created temporary large-area Wi-Fi coverage using a combination of drones and satellites.

"We're also testing recovery connectivity, whether through portable devices or satellite systems that can be quickly deployed to restore communication networks after a disaster or during an emergency situation," Pickens said.

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Harnessing the power of radio: a journey from curiosity to connectivity

Hello, I'm Alex Stewart, the founder and Managing Director of WombatNET — a Wellington-based service provider with a keen focus on the radio industry and evolving communication methods. My journey into the radio industry began not from a calculated career choice, but from a spark of interest ignited by a simple question.

I was around 12 or 13 years old, spending time in a rural beach settlement outside my hometown, Whanganui. My father was there for work, and I was just a kid, known to be tech-savvy, but certainly not an expert. The locals, aware of my affinity for technology, asked if I knew of any ways to improve their subpar connectivity. This question, simple as it may seem, sparked my interest in radio-based technologies and set me on a path that I continue to traverse today.

At 14, I founded WombatNET. The company was born out of a vision to eradicate New Zealand's digital divide; a lofty goal for a teenager, but one I was determined to pursue. As the market evolved and new players entered the scene, we scaled back our focus to the Wellington region. This decision allowed us to use the region as a 'testing ground' of sorts, a place where we could develop, test and implement an array of technologies new to the country. The creation of WombatNET happened entirely by chance, but it was a chance that I seized with both hands.

The radio industry is a fascinating world. The more I learned, the more I realised the immense power these small pieces of equipment held. It felt like I had suddenly understood the mechanics behind Thor's hammer! But, like any industry, it has its challenges. In New Zealand, we often face the 'tall poppy syndrome' when trying to do anything out of the ordinary. It's a cultural phenomenon where people are criticised or resented because of their achievements. But if you're strong enough to push past all that, the potential benefits to you and society could be massive.

In 2021, I was personally awarded Young Wellingtonian of the Year. This was something I did not expect to receive (I had yet to prepare a speech!), but it made me feel that my work for the region and its communities was appreciated. This recognition was not just a personal achievement but a testament to the impact that WombatNET was making. It was a feeling that made me always want to keep going and do even better.

To the younger generation, I say this: the radio industry is a vast and exciting field. There are an incredible number of different roles in this industry, and if the one you want doesn't exist, make your own just like I did! Radio tech is here to stay — so make it your own. Depending on your role, you may have lots of room for error. You get to fiddle and experiment with technology and computers on a whole new level. There is something here for everyone, jobs pay well and apprentices often find themselves effortlessly gliding into their careers.

The radio industry is not just about technology; it's about connecting people. It's about ensuring that everyone, regardless of where they live, has access to the digital world. It's about bridging the digital divide and creating a more inclusive society. And the best part? You don't need to be a tech wizard to make a difference. All you need is a spark of interest, a willingness to learn, and the courage to seize the opportunities that come your way.

At 18 years of age, Alex Stewart is the founder and Managing Director of WombatNET, a Wellington-based service provider with a focus on the radio industry. He founded the company at 14 with a vision to eradicate New Zealand's digital divide. In 2021, Alex was awarded Young Wellingtonian of the Year in recognition of his contributions to the region and its communities.