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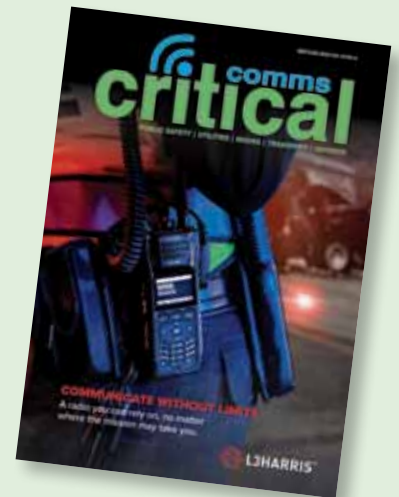




- 6 Developing and deploying mission-critical applications using broadband technologies
- 14 The future of 5G and more at Comms Connect New Zealand
- 21 Nokia and Bosch partner on 5G positioning
- 24 Network slicing in emergency services
- 31 Wireless remote monitoring for petrochemical applications
- 34 Metasurface antenna can change beam's characteristics
- 37 Superconducting amplifiers offer high performance at low power



## ON THE COVER



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# Do you read me?

The Australian Government recently confirmed that it will deliver on its commitment to improve the resilience of communications services across regional, rural and remote Australia, with consultation now open on the draft guidelines for Round 2 of the Mobile Network Hardening Program (MNHP). The program aims to reduce the risks of service outages and improve restoration times during natural disasters in impacted communities by funding projects like portable generators, power backup upgrades and physical tower hardening.

Round 1 of the program was funded through the government's Strengthening Telecommunications Against Natural Disasters Initiative, announced in January 2020, while funding for further rounds was confirmed in October 2022. The design of the second round will be informed by feedback from regional Australians, community groups and the telco industry to ensure the final guidelines meet the needs of communities at risk of natural disasters — if you want to make a submission, I encourage you to visit [www.infrastructure.gov.au/have-your-say](http://www.infrastructure.gov.au/have-your-say) before consultation closes on 30 May.

There are indeed many ways in which communication across Australia could be improved, as highlighted in this issue. Our lead story, which explores the complexity of deploying broadband technologies for mission-critical applications, includes a few words from the NSW Telco Authority on its efforts to develop a nationally interoperable public sector mobile broadband capability. The article on page 24 highlights the emergence of 5G network slicing, which was until recently seen as mostly a theoretical concept. And on page 38, guest contributor Kevin Pike argues that Australia should embrace the shared infrastructure model that has been rolled out in the US and UK.

This issue will also be distributed at Comms Connect New Zealand in June — see our teaser article on page 14. It will be my first visit to the Land of the Long White Cloud, and while I can't promise I will be

able to explore much of the country during my 48-hour stay, I do hope I will get the chance to visit again before long.



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## Calendar

### May

#### Critical Communications World

23–25 May 2023

Messukeskus Helsinki Expo and Convention Centre, Finland  
<https://www.critical-communications-world.com/>

#### ARCIA Sydney Conference

31 May 2023

NSW Teachers Federation Conference Centre, Sydney  
<https://arcia.org.au/events/one-day-conference-sydney-may-2023/>

### June

#### 2nd Global FRMCS Conference

7–8 June 2023

UIC, Paris  
<https://uicfrmcs.org/>

#### EMPA Australia 2023

7–9 June 2023

Hotel Grand Chancellor, Brisbane  
<https://empaaust.empa.org.au/>

#### UPTIME 2023

8–9 June 2023

Villa Griffone, Italy  
<https://uptime.athonet.com/>

#### Comms Connect New Zealand

13–14 June 2023

Te Pae Christchurch Convention Centre, NZ  
<https://www.comms-connect.co.nz/>

#### 5x5: The Public Safety Innovation Summit

28–30 June 2023

The Westin San Diego Gaslamp Quarter, USA  
<https://www.nist.gov/news-events/events/2023/06/5x5-public-safety-innovation-summit>

### 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.afaconference.com.au/>

### October

#### Comms Connect Melbourne

18–19 October 2023

Melbourne Convention & Exhibition Centre  
<https://melbourne.comms-connect.com.au/>

*For a full list of industry events,  
[see criticalcomms.com.au/events](https://www.criticalcomms.com.au/events)*

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# DEVELOPING AND DEPLOYING MISSION- CRITICAL APPLICATIONS USING BROADBAND TECHNOLOGIES

*Tim Clark\**

Although the mission-critical narrowband services of P25 and TETRA continue to thrive, many public safety and first responder organisations are deploying or planning for the deployment of broadband technologies to enable the use of new mission-critical (MC) applications. These will increase first responder effectiveness and productivity and ultimately increase citizen safety.

**T**he deployment of these MC applications will be complex, and success will depend upon many factors. It is essential that these applications achieve the MC quality of service (QoS) — priority, pre-emption, availability, security and resilience — that first responders demand, and that they are used to from their narrowband services. A standards-based approach is essential to help ensure interoperability and multi-vendor choice of products — public safety organisations should insist on compliance with the 3rd Generation Partnership Project (3GPP) specifications for MC services.



hardware such as the screen, microphone, speaker and camera.

Applications used by first responders can be categorised as:

- MC applications — applications making use of MCX services (MCPTT, MCData and MCVideo) requiring mission-critical QoS, priority and pre-emption.
- Secondary applications, such as business applications — for example email, calendar and other applications that assist users in performing their job — and consumer applications such as social media, weather, news, traffic information, train timetables and other applications that provide important information.

Although the quality of mobile applications has greatly increased over the last decade, there are still many developers who do not consider the many pitfalls of developing an application or service that relies upon a connection that is as unreliable or changeable as that of a mobile device. This applies just as much to an MC application as it does to a business or consumer application.

Writing an application that works well on a mobile device is complex in that it needs to take account of a basic connectivity issue — that of poor coverage. An intrinsic challenge of running a radio-based network is that certain places will lack coverage and applications running on that device need to perform well in those circumstances. Tools and simulators are widely available to help develop and test the quality of applications.

Due to the importance of the microphone and audio paths in the provision of an MC application, other applications should be written to release, for example, the microphone if it is required by another application. Audio should be delivered in a manner by which the user has control over whether the secondary application audio should be combined with any audio from the MC application or whether the secondary application audio should be suppressed. Similar considerations need to be made around other hardware components such as the screen, speaker and buttons.

MC applications rely on an end-to-end MC ecosystem that supports the necessary QoS that users can trust: from secure hosting environments for the application servers; through the transport and cellular networks; to the devices and their associated operating systems. To do their job effectively, first responders will typically require MC applications and non-MC applications to be used on the same device. This means that the use and potential misuse of device resources must be considered, and how these resources are shared between the applications running on the device. There should be a focus on how to reduce the risk of 'secondary' ap-

plications degrading MC applications with the appropriate use of device management tools and control of permissions. Given that MC applications may depend upon services provided by third parties, the whole chain of device and application support must be carefully considered and managed to avoid degraded operation.

The user experience is paramount — applications that are not intuitive and that negatively impact how users perform their job should not be used. The user experience of either the MC or secondary application can be ruined by poor integration of the two. This might apply especially in the use of





Image courtesy of Motorola Solutions

Applications need to be updated to deal with vulnerabilities and add new features. However, in order to facilitate testing by critical network operators prior to users getting the application, developers should enable beta test capabilities to allow pre-testing of updates in advance of deployment. The operator also needs to test the final version — if that is not possible then the operator must be able to block automatic updates until such time as the update has been fully tested and verified as safe to use.

The use of third-party capabilities, which are beyond the control of the MC application developer, introduces risk due to periodic updates of that component. Developers must be aware of their responsibility to utilise patched versions of capabilities such as third-party APIs and libraries to ensure security and reliability. This includes elements from Google such as Google Play Services APIs, WebView (for user interface)

and common libraries which may be open source but might not receive patching.

Broadband technologies will enable a wide array of new applications to greatly enhance the effectiveness, productivity and safety of first responders, but critical network operators need to clearly understand users' requirements and the risks they are prepared to accept when deploying MC applications. Different user groups have different requirements — it is important that these are well understood and addressed by the operator's application strategy.

Further guidance and details on mission-critical application development and deployment can be found in TCCA's white paper 'Mission Critical Broadband Applications: A guide for deploying and developing mission critical applications using broadband technologies'.

*\*Tim Clark is a TCCA board member sponsored by Motorola Solutions.*

*The Critical Communications Association (TCCA)*  
<https://tcca.info/>

## The Australian perspective — a word from NSW Telco Authority

To ensure the safety of Australians, it is crucial for our emergency services to utilise the latest technology. This involves a careful shift towards mobile broadband-based applications and technologies which cater to public safety requirements and enhance overall performance and efficiency. The process of transitioning to these new technologies is intricate and requires a concerted effort. To achieve this, all governments across Australia have come together to establish a nationwide mobile broadband capability dedicated to public safety.

NSW Telco Authority is working with NSW Emergency Service Organisations (ESOs), other states and territories and the Australian Government to develop a nationally interoperable public sector mobile broadband (PSMB) capability. The PSMB will deliver reliable and secure mobile data communications capability for exclusive and prioritised use by emergency service organisations requiring critical service levels. By providing a standardised environment, ESOs will communicate more easily with one another across organisational and geographical boundaries, helping to keep people safe right across Australia.

ESOs in Australia communicate using radios, which are reliable and secure but do not support emerging and future technology needs. To provide data capabilities to their members, many agencies are using multiple commercial mobile broadband networks. However, these services may not guarantee adequate performance during emergencies, provide sufficient coverage or prioritise ESO users in emergency situations. PSMB will deliver a mission-critical service level of mobile broadband to agencies, which is vitally important in emergency situations when commercial mobile networks may be congested or suffer an outage. It will also allow ESOs to make greater use of emerging technologies and data-heavy applications like live streaming from body cameras, personal location tracking and bushfire monitoring drones. Ultimately, this capability will help to save lives.

On behalf of all states and territories, NSW Telco Authority has led two workstreams to develop and test viable technologies. NSW Telco Authority continues to work with its state-based ESOs and contribute to the development of a national PSMB approach.



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## TELSTRA AND ERICSSON COMPLETE 100 KM 5G DATA CALL

Telstra and Ericsson have announced the successful completion of a 100 km long-range 5G data call on a mid-band Time Division Duplex (TDD) Advanced Antenna System (AAS) radio in a live commercial network.

The long-range 5G data call, said to be a world first, was conducted at Burra in South Australia — approximately two hours north of Adelaide — and was made possible through a new software feature that extends the maximum cell range from 15 km out to 100 km. The extended range feature will enable Telstra to broaden the benefits of 5G massive MIMO AAS radios to even more rural and regional areas, delivering 5G capacity and downlink speeds to more customers.

While this feature will not extend reach where it is already limited by terrain, vegetation or other obstructions, in situations where an area has clear line of sight to the antenna on an enabled site, a connection can be established as far as 100 km. The result is that there will be many areas in regional and rural Australia where effective 5G coverage will now reach well beyond 15 km, meaning more 5G coverage in more places.

“We have a responsibility to deliver the very best connectivity to regional customers, including the benefits and the experience of 5G,” said Nikos Katinakis, Telstra Group Executive Global Network & Technology. “We’re working hard and making sure we invest in the world’s best technology to make sure all Australians have access to the largest and most reliable network now and in the future. This world-first achievement is just one of the ways we are committed to improving coverage over time.”

Telstra will selectively enable this long-range capability where it can provide a coverage benefit based on each mobile site’s local requirements and environment. It is expected that selective field deployments will start later this year.

## NOKIA TO DEPLOY LTE PRIVATE NETWORK IN CHILEAN PORT TERMINAL

Nokia has announced that it will deploy the first industrial-grade LTE private network in a port terminal in Chile at San Antonio Terminal Internacional S.A. (STI). The private wireless network will be based on the Nokia Digital Automation Cloud (DAC) platform and will use 4.9G LTE to deliver pervasive high-bandwidth, low-latency connectivity, as well as improved network predictability in piers and yards.

STI is the main port terminal in Chile and one of the most important port terminals in South America. It is also connected to many key production centres in Southern Chile. STI’s goal is to move towards becoming a digital port and the basis for this is to have a state-of-the-art, high-performance network for industrial use, which should allow transmission of data with higher quality, five times faster and with more reach. In this way, it will continue to optimise its operation and service, catching up with the main ports in the world.

The new private wireless network is set to securely connect hundreds of workers, sensors, equipment and vehicles across an area of 31 hectares using Nokia DAC — an innovative, high-performance, end-to-end private wireless network and edge computing platform designed to meet the mission-critical needs of asset-intensive industries such as port terminals. The platform will enable future use cases such as remote and autonomous crane operations within the piers and yards, as well as enable new capabilities at STI. As the single supplier for the project, Nokia will also provide the RAN network, training, implementation services and remote support.



## REMINDER: CHANGES TO 800 MHZ TRUNKED SPECTRUM

The Australian Radio Communications Industry Association (ARCI) has advised that if you or your clients have trunked radio systems operating on the 800 MHz spectrum (Motorola, Tetra or GE format), then they must change frequencies as part of the 850 MHz band plan presently being implemented.

Spectrum auctions have now been conducted for the band and it is essential that all existing systems have reallocation plans in process by end of June 2023. The spectrum is available for new licensees to utilise from 1 July 2024, so it is important that frequency changes are underway immediately.

Details are available in the ACMA’s long-term strategy for the 803–960 MHz band decision paper, published in November 2015. They are also reinforced in the latest version of the ACMA’s draft five-year spectrum outlook on page 43.



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## PHASE SHIFTER REDUCES SIGNAL LOSS IN ANTENNA SYSTEMS

Researchers at the University of Birmingham, led by Dr Yi Wang, have developed a high-performance 'phase shifter' for use in advanced phase array antenna systems. Their results have been published in the journal *IEEE Transactions on Microwave Theory and Techniques*.

The phase shifter is a key enabling technology for advanced phased array antennas (PAA) which are widely used in mobile base stations, satellites and radar systems. These PAA systems use multiple phase shifters to provide the controlled phase increments that steer the radiation beam. However, current phase shifters typically use semiconductors and suffer from high loss of signal (insertion losses) and relatively poor power handling capability.

"An ideal phase shifter would provide a stable and wide phase angle range with a minimal loss of signal over the operation bandwidth," Wang said. "However, conventional phase shifters suffer from signal losses which increase as the phase angle increases, and the phase varies with frequency. Taken together, these issues can cause signal degradation and impair performance. Rectifying this requires additional complicated circuitry and consumes more power, which adds to both the bulk and the running cost of the entire antenna."

The research team set out to overcome these longstanding issues by designing a new type of phase shifter that uses a liquid gallium alloy, which runs in microfluidic channels and varies the phase angle of microwave and millimetre-wave radio signals. Their phase shifter was found to show low signal losses that are almost independent of phase angle. In addition, while most conventional phase shifters provide different phase delay at different frequencies (dispersion), which limits their usable bandwidth and applicability, the new phase shifter has a 'phase compensation' technique that provides extremely low phase deviation with frequency over a wide bandwidth.

"The new phase shifter does not need cleanroom facilities for fabrication, so is inexpensive to manufacture," Wang said. "The liquid-metal enabled phase shifting elements have a 'passive' nature, unlike the 'active' semiconductor-based counterparts, which potentially offers high power-handling capability. Apart from the signature application in phased array antennas, the phase shifters may find a wide range of usages from communications and radars to instruments."

## LOCKHEED MARTIN TO DELIVER MILSATCOM SYSTEM FOR DEFENCE

Lockheed Martin has been selected by the Australian Government as the preferred bidder for Project JP9102, the Australian Defence Satellite Communications System. The multibillion-dollar project is set to provide the Australian Defence Force (ADF) with a sovereign military satellite communications (MILSATCOM) system defined by its extensibility, agility and resilience, and including the following:

- New Defence-controlled and operated geostationary communications satellites
- Multiple ground stations across Australia
- An integrated satellite communications management system
- Two new satellite communications operations centres.

Lockheed Martin Australia will now progress to the next stage of the Defence procurement process, which includes engaging in collaborative tender clarification and improvement activities.

"We are proud to be selected as the preferred bidder to deliver this critical capability to the Australian Defence Force," said Warren McDonald, Chief Executive, Lockheed Martin Australia and New Zealand. "This capability will provide the Australian Defence Force with robust connectivity and reliable information when and where they need it and, by extension, contribute further to the growth and development of Australia's defence and space industries."

Lockheed Martin will leverage its deep experience in space-based mission solutions and resilient satellite communications networks for its JP9102 offer.



Image courtesy Lockheed Martin.

"We are excited to work with the Australian Defence Force and Australian industry to develop a robust solution for JP9102," said Robert Lightfoot, Executive Vice President for Lockheed Martin Space. "We are bringing to bear all of Lockheed Martin's company-wide capabilities, as well as our commitment to supporting allied nations to provide an operationally proven system that meets mission needs in terms of coverage, capacity, resilience and extensibility of the constellation."

Lockheed Martin has assembled a diverse team of Australian companies to deliver ground and control segments and beyond for JP9102. Lockheed Martin has also partnered with the Victorian Government to establish Victoria as the engineering and technical hub for the company's JP9102 solution — an investment that will create more than 200 advanced space industry jobs in the state.



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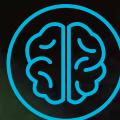
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# THE FUTURE OF 5G AND MORE AT COMMS CONNECT NEW ZEALAND

Following a very successful event at the premier convention centre in New Zealand in 2022, Comms Connect NZ is heading back to Te Pae Christchurch Convention Centre from 13–14 June this year.

**T**he event will welcome over 500 communications and technology leaders from across the region, with an expanded exhibition floor featuring 45 leading vendors and suppliers of critical comms and public safety equipment and services, plus a speaker line-up of over 40 industry experts.

One of these speakers is Josh Bahlman, Head of Telco Cloud at Spark NZ, whose keynote presentation on day two of the conference will provide insight into his company's recent 5G standalone network trials. This will be followed by a panel discussion with three of the tech companies that worked on the trials.

## From 'non-standalone' to 'standalone' 5G

5G has the potential to create a step change for business and enterprise customers through new use cases that leverage low latency and high throughput, such as enhanced virtual and augmented reality, industrial automation, real-time video analytics with artificial intelligence, digital twins and 'massive IoT'. But while networks

in New Zealand have been updated to 5G, data centres and network cores are still running on legacy, non-5G systems, which are dependent on 4G infrastructure (non-standalone 5G).

A 5G standalone (5G SA) network, on the other hand, is 'cloud native', meaning that it is fully virtualised, can run on any cloud service, is designed with a microservices approach and is architected to address evolving customer needs in a scalable way, while also offering inherent resilience. This creates flexibility in an end-to-end 5G solution and allows users of the network to realise the full range of benefits of a standalone 5G network, including advanced capabilities such as network slicing and private networks. A standalone 5G network also enables low-latency access to multi-access edge compute solutions, allowing customers to deploy solutions that can push compute capacity from the core network right to the customer's worksite, factory or workplace.

To achieve standalone 5G, data centres and core mobile networks need to be upgraded and deployed on a cloud-native platform. The problem is that existing mo-

bile networks run out of a centralised data centre have relatively static use cases and are complex to customise.

## Proofs of concept for enterprise customers and wireless broadband

Last year, Spark deployed a Mavenir 5G SA cloud-native core solution on AWS Snowball Edge, a physically rugged device that provides edge computing and data transfer services. Using the AWS device allowed Spark to create a highly portable edge solution that could literally fit into a suitcase — to process and store data close to where it's generated. The company's test results demonstrated low latency to deliver real-time video analytics — with latency reduced by 70% to single-digit milliseconds — prior to the edge deployment of the 5G standalone cores solution and analytics service.

This proof of concept allows Spark to experiment with how a highly customisable network can be sliced and adapted to evolving enterprise requirements — for example, creating dedicated virtual networks with functionality specific to the service or customer over a common network infrastructure. It also shows how businesses such as port authorities (with large mobile device fleets that require high throughput and low latency) could operate on virtual

**What:** Comms Connect New Zealand  
**When:** 13–14 June 2023  
**Where:** Te Pae Christchurch Convention Centre  
**Web:** [www.comms-connect.co.nz](http://www.comms-connect.co.nz)

network slices that optimise the use of a physical private network.

While the initial use case for Spark's 5G was to increase speed and capacity in its wireless broadband and mobile products, the company saw the opportunity to explore how its broadband service would further benefit from operating on a 5G SA network. To test this, Spark deployed a Mavenir 5G standalone cloud-native core solution on AWS Outposts, a fully managed solution delivering AWS infrastructure and services to virtually any on-premise or edge location. Testing a wireless broadband service on this proof of concept showed faster download speeds and reduced latency when compared to pre-deployment results, the telco said, providing a better experience for its wireless broadband customers.

### 5G standalone trial

Finally, Spark this year announced the completion of a 5G SA trial which successfully confirmed and validated the technical capabilities of 5G SA technology on the company's network. Delivered within a short three-month timeframe, demonstrating the ease with which standalone cloud-native solutions can be deployed, the trial showcased 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, when

compared to previous wireless technologies.

The trial was underpinned by Ericsson's cloud-native 5G Core running on Red Hat OpenShift, integrated with Spark's 5G Fixed Wireless Access Network (FWA) to test enhanced wireless broadband. Ericsson's dual-mode 5G Core network slicing and edge computing deployment capabilities are understood to create the potential for new monetisation opportunities for Spark's customers in enterprise and critical communication.

Bahlman said at the time, "These proofs of concept create line of sight for us to deliver the enhanced benefits of standalone 5G — both to New Zealand businesses looking to innovate using 5G connectivity and multi-access edge compute, and to New Zealanders accessing a network that supports applications such as instant video streaming, cloud-hosted gaming and the reaction times required for driverless vehicles."

"The 5G standalone network opens the door on capacity and low latency to help accelerate IoT trends, such as connected cars, smart cities and IoT in the home and office."

### Other Comms Connect highlights

Day one of Comms Connect will open with a keynote from Paul Smith, Relation-

ship Manager at Next Generation Critical Communications (NGCC), speaking on the journey so far for the new Public Safety Network NZ; Smith will also take part in a Q&A session following his keynote.

There will also be two presentations focusing on resilience and warning systems in the face of natural disasters — Craig Gibson from Emergency Management Otago will share some of the critical comms technology being used by the team with regard to monitoring the Alpine Fault in the South Island, and an update on Project AF8; while Smart Christchurch Program Manager Michael Healy will present on the sensor warning systems that his team are deploying in and around Christchurch, using IoT technology.

The Radio Frequency Users Association of New Zealand (RFUANZ) is again the key industry partner of the event and will be holding its annual Gala Dinner during the evening of 13 June, which will include the presentation of the 2023 RFUANZ Industry Excellence Awards. The association will also be holding its annual general meeting on day one after lunch.

For more information and to register for Comms Connect New Zealand, visit <https://www.comms-connect.co.nz/>.

Comms Connect (WFEvents)  
[www.comms-connect.com.au](http://www.comms-connect.com.au)





## STAND 41 Mobile radio

The TAIT AXIOM Mobile TMX550 has the ability to increase worker safety and productivity with coordinated communications over broadband networks, and access to applications and workflows using an intelligent vehicle network and edge computing platform in a compact, easy-to-install form factor. It is designed to ensure information gets through using dual SIM LTE, Wi-Fi or Ethernet, with optional connection to radio systems and users.

The product can use nationwide coverage from up to two cellular network providers, saving time and money without the need to buy and manage spectrum licensing or radio infrastructure. The user can turn their vehicle into a communications hotspot, boosting the range of connected portable devices and productivity for the people using them.

A handheld control head with a built-in 3 W speaker puts all functions in the palm of the hand and allows easy installation anywhere in the vehicle. The control head cable can be easily extended to the required length using the Power over Ethernet connection. Optional external 10 or 15 W speakers are also available.

Work can continue uninterrupted, even outside the range of any communications, by hosting and processing workforce applications and their data locally. The fleet can be updated over cellular or Wi-Fi networks, delivering new features, configurations and applications.

Users can easily interface audio, sensors and other equipment with the standard 12-pin and serial RS232 connectors. Future releases will provide additional interface options, including 10-pin connector and 4-port RJ45 Ethernet router.

**Tait Communications**

[www.taitcommunications.com](http://www.taitcommunications.com)

## STAND 14 All-outdoor microwave radio system

For rural WISPs, there are frequently limited or non-existent fibre options. Digital microwave radio (DMR) backhaul provides the vital connectivity between access nodes and the network core. Rural subscribers expect similar speeds and performance for their internet as city dwellers, which puts increasing pressure on WISP networks as they become more capacity-constrained in the backhaul.

For this reason, Ceragon developed the Ceragon IP-50C, which is useful for NZ WISPs looking for maximum capacity and link distance in a compact and power-efficient package. The product can support channels sizes up to 224 MHz and is therefore capable of exceeding 1.6 Gbps of capacity per radio.

The device is a dual core product, meaning two radios in one box. A single XPIC link, therefore, can easily exceed 3 Gbps of capacity. With many manufacturers only offering a 1 Gbps interface, it is impossible to take advantage of these high throughputs. That's why IP-50C has multiple optical and electrical 10G interfaces — just one CAT6 cable can supply PoE and a 10GE connection to the radio.

The product features field-replaceable diplexers, meaning that just one spare radio unit can spare an entire frequency band, reducing spares costs and the associated logistical headaches. The system is also suitable for those who have a particularly long link or are constrained by antenna size; the IP-50C-HP, available in the 11 GHz band and below, is an ultrahigh-power variant with a huge +37 dBm transmit power.

Distributor Agile Networks has created its own IP-50C link bundles consisting of the IP-50C radios with all necessary feature licences and antennas at one price for all frequency bands. The company's in-house expert team is backed by Ceragon's 24/7 global support centre. Agile also offers radio licensing and a pre-configuration service so that the radios are configured and ready to be deployed on delivery.

**Agile Networks Ltd**

[www.agilenetworks.co.nz](http://www.agilenetworks.co.nz)







## STAND 13 Fuel cells

Resiliency within communication networks has been a key discussion point of late, with recent weather events in New Zealand showing that without resiliency key parts of a network, or indeed the entire thing, can come crashing down just at the time it so desperately needed to remain intact. Quite often it is a lack of electrical power that will take parts of a network offline. Powerbox works with SFC Energy to supply communication providers with power resiliency with the EFOY Pro fuel cells.

The fifth generation of the EFOY Pro fuel cells has been designed to offer more power, more connectivity and a longer lifetime, all maintenance free. The entire management of the fuel cell can be controlled via the EFOY Cloud, ie, locating the unit, adjusting it to the individual ambient conditions by remote control and analysing the data history. Users can use any commercially available router for this purpose.

There is an EFOY Pro for every application. The spectrum ranges from 42 W output power for the EFOY Pro 900 to 125 W for the EFOY Pro 2800. For higher-power sites there is the EFOY Pro 12000, rated to 500 W.

**Powerbox Pacific Ltd**  
[www.powerbox.co.nz](http://www.powerbox.co.nz)

## STAND 47 Command and control system

Zetron's ACOM is a comprehensive, fully customisable solution for mission-critical communications management in organisations of virtually any size, type or complexity.

The system facilitates real-time situational awareness, streamlined coordination and sophisticated integrations that bridge the gap between disparate technologies (eg, telephony, radio, data, video, etc) for a customised solution for every user. Leveraging a single-platform experience to simplify and centralise communications, it delivers high-quality service and speed to public safety agencies, transportation, utilities and Fortune 500 companies all over the world.

Purpose-built for the evolving nature of communications models, data feeds, underlying technologies and the operating assumptions that shape them, the platform allows for legacy-friendly, future-ready interoperability that remains flexible and secure to scale and grow with the organisation over time — consistently delivering high levels of situational awareness and control.

**Zetron Australasia Pty Ltd**  
[www.zetron.com](http://www.zetron.com)



## STAND 5 Meshed data radio solutions

Amber Technology is a large Australian distributor of professional broadcast and communications products, with an office in Auckland serving New Zealand. The company has delivered meshed data radio solutions for communications in challenging environments from helicopters, to race cars, to remote area Vehicles-as-Hubs.

Amber's data communications systems utilise military-grade Silvus MN-MIMO meshing data radios that are now available in a fully compatible form at a level that is attractive to public safety organisations. The radios are complemented by a full technical solutions package — including BATS tracking antenna systems; video acquisition, distribution and management systems; and bonding systems using cellular and satellite — to provide secure tactical communications.

**Amber Technology Limited**  
[www.ambertech.com.au](http://www.ambertech.com.au)



# DMR platform keeps utility's field crew safe



## STAND 47

Keeping the lights and gas on for 442,000 customers across New Zealand's North Island is no easy task. The country's second-largest utility provider, Powerco, said it prides itself on safety and reliability for all, including fault crews in the field working alongside nine networks of electricity and gas lines — but emergency communication has been an issue in the past.

"We had fault staff driving an hour and a half to the top of a hill to get coverage to contact the control room," said Powerco Network Operations Manager Phil Marsh. "There were areas where they didn't have any comms or cell phone coverage, losing all communication with the control room, which is dangerous in an emergency."

Echoing Marsh, Powerco's primary field services provider also understood the need to act. John Batchelor, General Manager Power and Gas at Downer New Zealand, said, "When working with electricity during an emergency, having quick and reliable contact with those controlling the electricity network, without worrying about black spots affecting radio coverage, is vital."

To provide a safer work environment, Powerco set out to design a digital radio system capable of ensuring at least 90% coverage across its expansive work zones. Other key criteria included enabling Powerco to retain control over the network, and improving efficiency, while prioritising field staff's access to communications.

After evaluating multiple providers, Powerco chose Zetron's ACOM Command & Control System for the company's 32-position console system to complement its new fleet of Hytera DMR radios. Other solutions were considered, but ACOM was found to check all the boxes. Aside from its highly customisable touch screen display, it supported multiple simultaneous active calls, included visual/audio alerts, and provided advanced features such as Bluetooth, encrypted messaging and SIP gateways, in addition to request-to-talk (RTT) and press-to-talk (PTT) communications.

"Zetron performed a proof of concept, which gave our evaluation team insight and confidence that Zetron was the right fit," Marsh said.

The project began with Zetron and Hytera establishing a joint regional testing facility in nearby Brisbane. Technicians from both companies worked to install and integrate the new DMR system with the assistance of Powerco's engineers and lead project manager. Upon successful testing, the equipment was shipped and deployed at Powerco facilities in New Plymouth and Tauranga, and Zetron led training workshops for Powerco staff.

The system went live with zero unplanned customer or service outages. Powerco executives described the implementation as "round smooth", with minor challenges promptly addressed and successfully managed by Zetron.

Soon after deployment, the ACOM system underwent its first real test. Major storms battered the North Island, cutting power to thousands of Powerco customers. In the past, the company's network operation centre (NOC) would activate a storm room with additional operators to manage call overflow. But increased operational efficiencies of the new system enabled Powerco staff to tackle the increased call volume without incident or needing to activate the storm room.

"There were four separate storms in December, probably the worst I can remember for lightning strikes," Marsh recalled. "We had 700 strike faults to handle and 75 transformer replacements."

Since deploying the ACOM system, Powerco reports overall NOC operator call handling efficiency increasing by 50% to 70%. Marsh concluded, "Powerco now has coverage in remote parts of New Zealand that no other provider of mobile or radio has. We are set up for the future."

**Zetron Australasia Pty Ltd**  
[www.zetron.com](http://www.zetron.com)

## STAND 39 Wireless duplex handheld radio

The Benelec BWI900 is a wireless ISM 900MHz full-duplex handheld radio that allows up to 10 users to talk simultaneously with an unlimited number of listeners/PTT users.

The radios can be used in simplex-PTT or duplex modes as selected by the user. The IP65-rated radio provides a transmission range of up to 1000 m and is compatible with Bluetooth (via an optional dongle) for further hands-free use.

The units come with their own carry case including three interchangeable batteries and wall socket or USB charge cables. Each battery provides up to 12 h of radio use. An optional 5-bay drop-in charger provides fast charge of five batteries and five radios simultaneously.

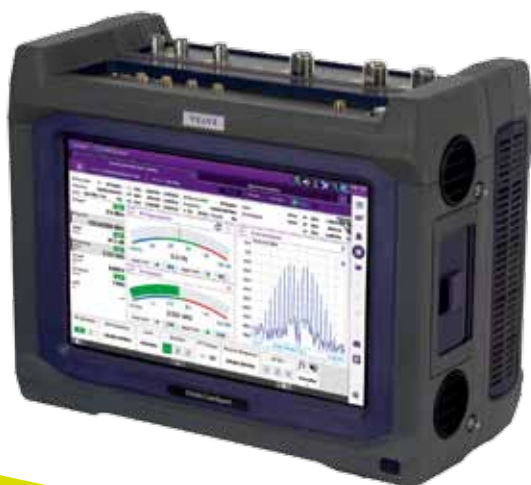
A wide range of headset options is available to meet various operational needs. 128-bit encryption is provided with each radio with each talk group able to have separate encryption keys.

The BWI900 gateway provides the means to integrate the duplex network to any two-way radio platform via a mobile or base radio, extending the capability of a radio system to duplex wireless users in the field. The gateway system facilitates duplex users to PTT back across the radio system wirelessly. The gateway can also be integrated to a radio console system so users are operationally all informed.

The palm-sized unit weighs 180 g and is suitable for occupations where hands-free radio use is necessary, such as down the wire, tool use, crane operations, security work and rural firefighting.

**Benelec Pty Ltd**

[www.benelec.com.au](http://www.benelec.com.au)



## STAND 36 Radio test set

VIAVI's CX300 ComXpert communications service monitor is an easy-to-use, complete communications test solution capable of testing everything from portable radios, to complex infrastructure, to broadband networks. A versatile tool for testing and monitoring communication networks, its main features include comprehensive network testing, modular architecture for easy upgrades, an intuitive user interface, remote access and portability for field technicians.

The product provides signal, protocol and error analysis to diagnose and troubleshoot network issues. Incorporating some of the most popular features from VIAVI's other test sets into a field-portable package, without sacrificing specs or performance, its lightweight design makes it suitable for technicians who need to perform tests and analysis in different locations. Remote access allows for troubleshooting of hard-to-reach areas.

**Vicom New Zealand Ltd**

[www.vicom.com](http://www.vicom.com)

## STAND 4 Real-time spectrum analyser

Anritsu's Field Master Pro MS2090A handheld real-time spectrum analyser (RTSA) is designed to handle the challenges of mmWave installation and maintenance. It provides robust measurements and full, uninterrupted frequency coverage from 9 kHz up to 54 GHz, allowing users to test any 5G NR signal — from FR1 to FR2 and anything in between.

The product provides several solutions for spectrum clearing at mmWave. To begin, users can use the instrument in conjunction with the company's Mobile InterferenceHunter to map out their coverage area and identify any hot spots with potential RF energy. They can then pinpoint the location of the potential interference and work to clear it out.

The instrument also offers 110 MHz of RTSA bandwidth and power density display to watch out for difficult-to-find, intermittent interference. With an omni-directional antenna, the instrument can be set up in an infinite persistence and left to run for minutes or hours to make sure no signals are present.

**WWG Comtest**

[www.comtest.nz](http://www.comtest.nz)





# Improved radio comms for London firefighters

## STAND 41

Tait Communications and its partner, Radiocom Systems Limited, have been selected by London Fire Brigade (LFB) to supply its firefighters with new fireground radio equipment that meets the brigade's requirements for improved range, clarity, safety and long-term support.

LFB is among the world's largest fire and rescue services. It operates from more than 100 fire stations across the capital city's 1600 km<sup>2</sup> and has a staff of more than 5000 people. The brigade's program to upgrade fireground communications is among changes it committed to, following investigations into the Grenfell Tower fire in 2017.

The Tait Communications solution selected by LFB equips firefighters with a powerful digital portable radio and a rugged speaker microphone. The equipment is intrinsically safe — meaning it is engineered and built to exceed safety standards for electrical equipment used in the kinds of potentially explosive atmospheres faced by firefighters.

Dave McGarry, Business Change Manager for LFB, said another defining requirement of the upgrade was to have radio communications that are engineered to perform well when used in combination with the brigade's current breathing apparatus (BA) and fully compatible with new BA equipment from supplier MSA, which the brigade has recently selected for its upgrade.

"To improve the performance of the radio when used with BA, a higher-wattage radio was specified, and Tait produced a radio that provided this whilst retaining intrinsic safety," McGarry said. "To ensure the radios could be integrated with current and future BA equipment, a remote speaker microphone (RSM) was also specified for each firefighter's radio — which will enhance BA communications across the fireground.

"An extensive evaluation of radios and RSMs that met the LFB requirements was undertaken. They were taken to the Fire Service College at Moreton-in-Marsh to assess their performance when

integrated with breathing apparatus in a number of representative environments," McGarry added. The radios were used by firefighters at a variety of locations in London to replicate the complex-built environment in which the radios would be deployed.

"During the evaluation, Tait came up with minor modifications to improve the performance and usability of the radios, particularly when connected to the remote speaker microphone. There was a positive reaction to the features and functionality that the Tait radios offered, which resulted in these radios being the preferred choice of London's firefighters."

Dave Turner, Managing Director of Tait Communications in Europe, said the company has worked extremely hard to fully understand the wide range of situations firefighters can face during a job and to appreciate how challenging it can be for them to hear what is being said over their radios and to make fellow officers understand what they are saying.

"These environments make huge demands on fire personnel, with wildly fluctuating noise levels, and the challenges wearing breathing apparatus can also affect firefighters' ability to communicate effectively," he said. "We learned that the job is made even more stressful when you are not sure if what you are reporting is being received or if you are hearing everything which the incident commander is saying.

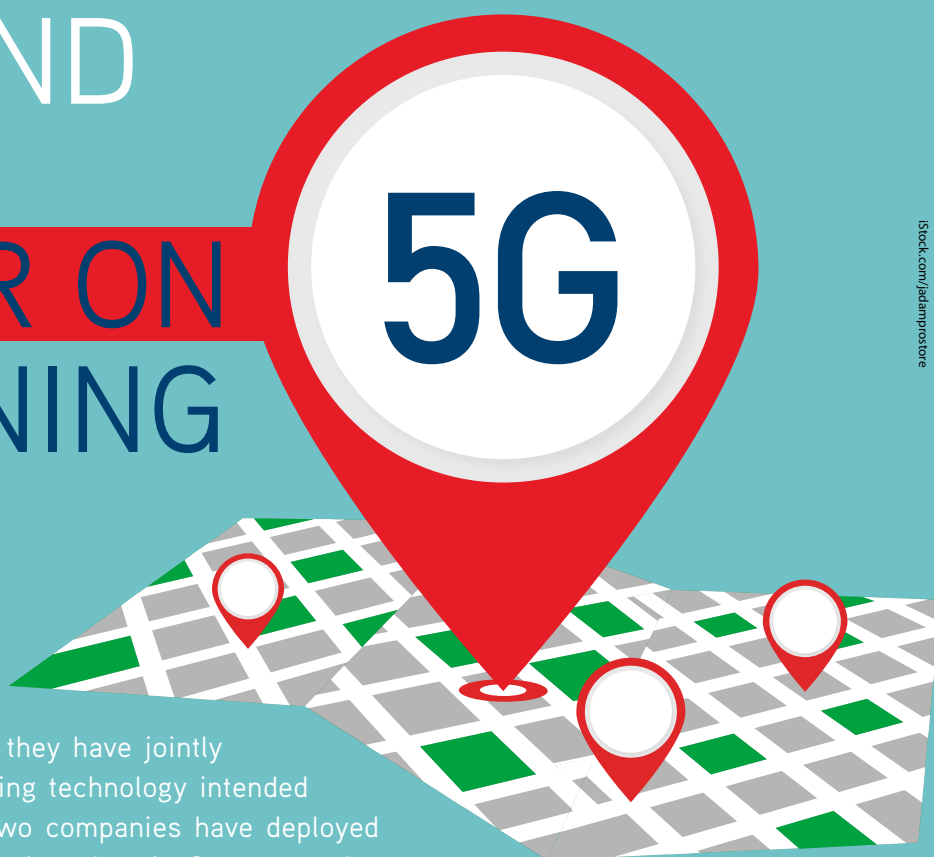
"We have developed simulations to find sound-processing solutions to these challenges, set up to deliver optimum audibility across the range of situations firefighters may find themselves in. In recent years we have had terrific assistance from a number of fire and rescue services in Britain, and their input gives us real confidence that we are helping to improve firefighter safety and coordination. Together with Radiocom Systems Limited, we look forward to serving London Fire Brigade and London's public."

*Tait Communications*

[www.taitcommunications.com](http://www.taitcommunications.com)



# NOKIA AND BOSCH PARTNER ON POSITIONING



iStock.com/jadampostore

Nokia and Bosch have announced that they have jointly developed 5G-based precision positioning technology intended for new Industry 4.0 use cases. The two companies have deployed the proof of concept in a Bosch production plant in Germany, where extensive tests under realistic manufacturing conditions have shown accuracy within 50 cm in 90% of the factory footprint.

**T**he positioning technology tracks mobile and portable devices connected to the 5G network, accurately determining their positions where no global navigation satellite service coverage is available, for instance in factories, warehouses or underground facilities. As part of the factory test, an enhanced private 5G network was able to determine the precise position of assets such as automated guided vehicles (AGVs), mobile robots and mobile control panels — tracking their movements throughout the plant in real time.

Traditionally, 5G positioning works by measuring the time it takes for mobile signals to travel from a mobile device to different base stations and anchor nodes in the network. As signals take longer to reach nodes that are further away, the positioning system can triangulate its source. Nokia and Bosch have built upon that foundation by equipping 5G nodes with multiple receive antennas, which enable the network to detect the incoming angles of signals. Advanced Nokia Bell Labs algorithms interpret this time-delay and angle-of-arrival information to determine the most probable position of the mobile device. The proof of concept

achieves a level of accuracy well beyond the current cellular position state of the art, the companies claim, providing a sneak peek at what 5G networks, both public and private, will be capable of in the future.

Precision localisation is important for many applications in industrial environments, such as robot navigation, asset tracking and worker safety. Realising both high-performance connectivity and high-accuracy positioning within a single private network's infrastructure also has many operational benefits, such as reducing the complexity of IT infrastructure, leading to a lower total cost of ownership (TCO) and higher returns on investments.

"Knowing where things are is generally very valuable information in manufacturing," said Andreas Mueller, the chief expert responsible for 6G activities at Bosch. "While today usually separate systems are used for connecting and locating devices, this may be done via an integrated private 5G solution in the future. The proof of concept conducted jointly with Nokia underpins the leading role of Bosch in exploring new opportunities for our customers and developing the factory of the future."

The announcement of the precise positioning collaboration is a key milestone, but

it is only one of the innovations Nokia and Bosch are pursuing. The companies have also begun conducting joint research in the next generation of networking, investigating how future 6G networks could be used for both communications and sensing when they are commercially available by the end of the decade.

While 5G has the potential to determine the location of devices connected to the network, 6G will have the ability to track the position of any object — whether connected or unconnected. This will allow 6G signals to function similarly to radar, giving users an awareness of their surroundings beyond their traditional senses.

"Bosch and Nokia Bell Labs foresee a future where networks do far more than communicate," said Peter Vetter, President of Bell Labs Core Research at Nokia. "Soon, 5G will track connected devices more precisely than satellites, in places satellites can't reach. In the next decade, 6G will be capable of sensing all objects in their coverage areas regardless of whether they contain active radios. We are creating networks that will endow humans with a digital sixth sense."

*Nokia Solutions and Networks Australia Pty Ltd*  
[www.nokia.com](http://www.nokia.com)



# Industry Talking

We are halfway through 2023 and it feels like there is so much happening in the industry that time is flying by.

Since we last reported we have held several events, including Sundowners and the major one-day event in Perth combining a conference and then our networking dinner. Both the conference and networking dinner were both very well supported by the industry, including ARCIA members and end users. With technology moving at speed across multiple fronts, it is very pleasing to hear so many stories about what is being achieved by commercial and government entities across Western Australia. Congratulations to our West Australian industry members for such an outstanding response to our call to get involved.

ARCIA will be following the same dual one-day format on the east coast and it is now the turn of NSW to host in Sydney, for one day only on 31 May. We are working hard to bring the industry wide-ranging and important topics for public safety and commercial sections of the market.

Make sure you check <https://arcia.org.au/events/> for all events as there are now a number of event dates online, including ARCIA training courses. Key events are in Sydney on 31 May, Christchurch on 13–14 June, Brisbane on 27 July, and of course Melbourne Comms Connect on 17–19 October, including the ARCIA annual gala dinner.

New online training courses are being worked in and added to the ARCIA portfolio. We have designed courses for many levels within our industry as we are trying to raise the standards of the entire industry. You will find available courses and dates on the website included in the events pages.

The ARCIA committee and our CEO, Paul Davis, have been busy streamlining and improving the administration of the association. We expect by the end of this year we can improve the membership experience for events, training and general administration.

There is always quite a bit of activity from the ACMA at this time of year. The annual Five-Year Spectrum Outlook (FYSO) has been out for comment and one disturbing point was that at the World Radiocommunication Congress (WRC) there will be some input from Region 1 (Europe and the African continent) pushing for review of the spectrum between 460–694 MHz, with a view to making the band available for wireless broadband. With some comments out of the USA pointing towards some manufacturers ceasing to include frequencies above 470 MHz in future models, this means that we might have some competition for spectrum above 470 MHz in the future. Given the existing status, this will be an issue as in Australia there are still significant numbers of two-way radio systems operating in that area of spectrum.

The ACMA has also decided to move to setting licence fees for apparatus licences relative to population criteria rather than increases in line with CPI. On the examples shown in reports that will probably mean increases of around 1% per annum against the CPI, which is significantly higher in most instances. The ACMA has also flagged that it will be consulting on the existing class licence arrangements for the 4.9 GHz spectrum allocated for public safety; this will happen later this year and our public safety sector should be ready to respond as required.

Finally, the committee and exec would like to thank Madeleine La Ferla, who worked for the last 14 years on producing the ARCIA annual gala dinner. Madeleine made the impossible just work and has been an integral part of this major event. Associations like ours rely on people going the extra mile and we always could count on Madeleine. Good luck in your future world; we all wish you every success.

From my desk I hope your 2023 is going well; see you at an event coming to you soon.



**Hamish Duff, President**  
Australian Radio Communications  
Industry Association



## Power supply and power distribution unit

Helios Power Solutions has introduced the latest additions to its power supply and distribution line, ICP Power's DIN Series Power Supply and the Intelligent DIN Power Distribution Unit. The two models work in tandem to provide an efficient and flexible power supply and distribution solution for various applications.

The DIN Series Power Supply offers a 360 W output at 48 or 24 VDC, with an input voltage range of 120–240 VAC, making it a versatile power supply that can deliver a stable and efficient power supply to the user's equipment. Its high efficiency rating of 90 to 91% helps to reduce energy consumption and lower operating costs, while its integrated battery charging and low voltage disconnect features mean the user's equipment continues to receive power even during power outages.

The Intelligent DIN Power Distribution Unit complements the DIN Series Power Supply by providing six DC load outputs, each rated at 15 A max and GMT fuse-protected, with an output voltage range of 10–60 VDC and a system current rating of 60 A. Its TCP/IP Ethernet connectivity, secure web server, and graphical user interface or SNMP provide easy-to-use remote monitoring and control of the connected loads, for secure data transmission.

**Helios Power Solutions**

[www.heliosps.com.au](http://www.heliosps.com.au)

## In-vehicle hybrid broadband device

Sepura has integrated its SCU3 Dual Mode LTE/TETRA device with in-vehicle infotainment solutions, using VNC Automotive's Cobalt Cube system-on-chip (SoC). Built on the Android operating system, the mission-critical hybrid LTE/TETRA device provides compatibility with a wide range of applications designed to run on existing Android products while also featuring a TETRA module, enabling narrowband voice and data.

The Cobalt Cube can be used to integrate the LTE device with a vehicle's existing infrastructure, enabling the latter to drive the transition to broadband capability while enabling organisations to run hybrid fleets. The SoC enables the integration of the SCU3 as well as ancillary devices such as light bars, sirens and CCTV, and facilitates the control of these devices through a vehicle's existing touchscreen. This capability helps to reduce the number of devices in a vehicle and the complexity of the installation, while providing an easy-to-use interface for each vehicle user.

Vehicles and control rooms can use the SCU3 Dual Mode, benefitting from access to data and applications to support their operations, and mission-critical voice through TETRA, while frontline staff can continue using their existing TETRA hand-portable devices for operational voice communications. The hybrid capability of the product offers a migration path for users looking to utilise high-speed access to critical operational data to enhance their operations.

**Sepura**

[www.sepura.com](http://www.sepura.com)



## Rugged smart device

Hytera's PNC460 XRugged Smart Device is designed to improve efficiency in the workplace. Featuring both smartphone and push-to-talk over cellular (PoC) radio capabilities, it empowers teams with high levels of connectivity and efficient collaboration.

The product is ruggedised to brave any harsh environments. Running Android 12, it allows use of third-party as well as in-house apps. Beyond data-rich services, it also provides different types of PTT calls, from group calls and individual calls to video-based dispatching.

**Hytera Communications Co. Ltd**

[www.hytera.com.au](http://www.hytera.com.au)

## STM32WBA Wireless Series

### ULP Bluetooth LE 32-bit MCU



**Certified v5.3, +10dBm, high security level**

- Bluetooth Low Energy 5.3 (Long range, advertising extension, 2 Mbps)
- Based on Arm Cortex-M33 core running at 100 Mhz with TrustZone and 407 CoreMark score
- Up to 1 Mbytes of flash memory and 128 Kbytes of RAM
- Protects your IP and increase privacy protection based on SESIP3 device capability

- Extend far end communications range thanks to +10 dBm output power
- Low voltage 1.7 to 3.6V
- Rich peripherals: 2x USART, LPUART, 2x SPI, 2x I2C, 12-bit ADC, Capacitive Touch, DMA, LPBAM and 9x Timers
- Available in QFPN 48 package
- 10 years longevity commitment

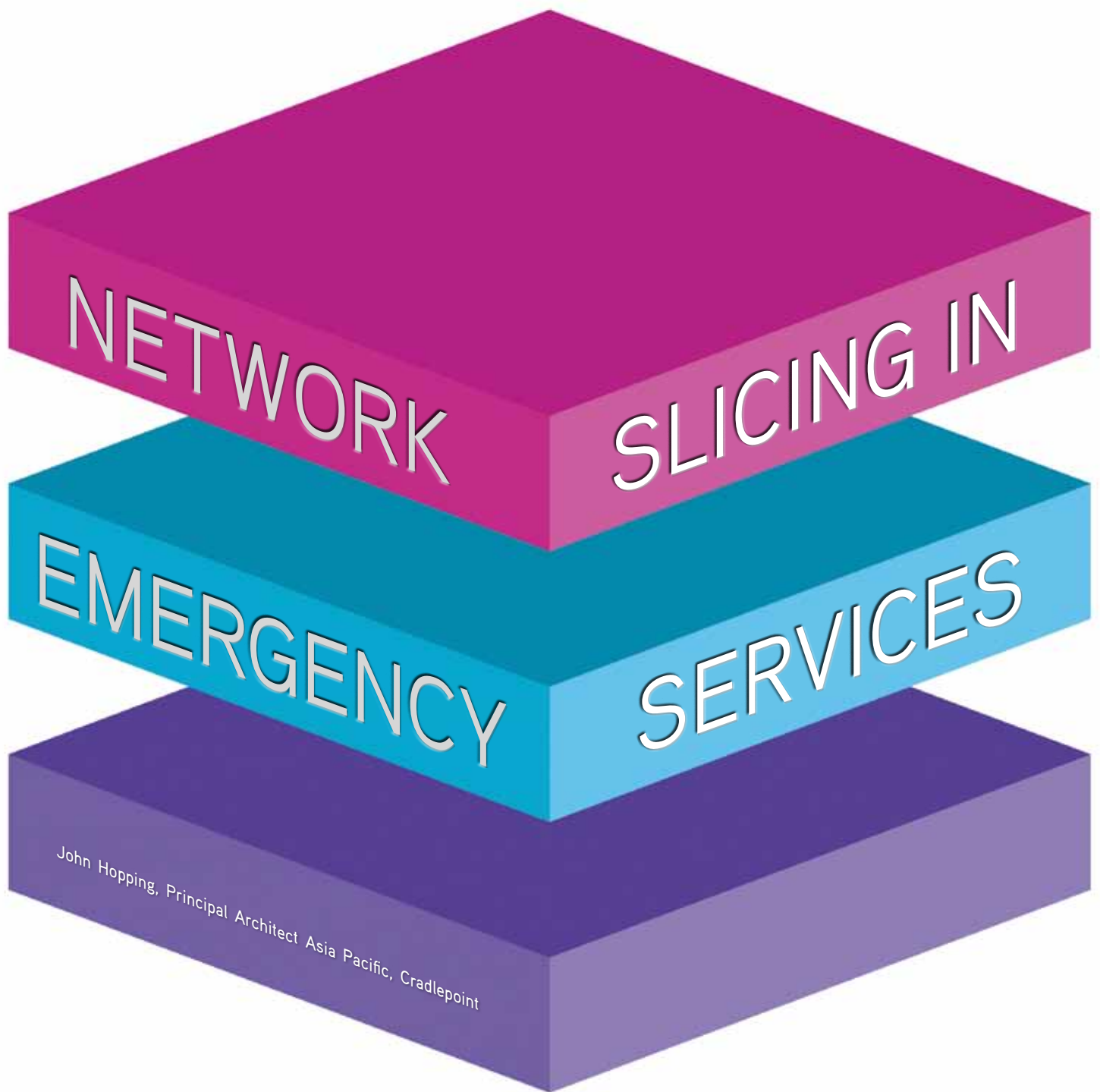


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[www.st.com/stm32wba](http://www.st.com/stm32wba)





It's hard to deny the benefits of 5G — strong connectivity, accessibility and cost-effectiveness. Unfortunately, many enterprises must still rely on MPLS links because they provide a service-level agreement, or specific connection guarantee, that cellular cannot. However, good news is on the way — the latest technology, in the form of 5G network slicing, will represent a tangible shift in the connectivity landscape.

Innovation in this space is continuously being developed. Late last year, Cradlepoint demonstrated application-based traffic steering into two carrier-defined network slices on its fixed wireless and in-vehicle 5G enterprise networking solutions. Using Cradlepoint 5G routers at the WAN edge and leveraging Optus's 5G standalone live network based on Ericsson's 5G Core and RAN with network slicing capability enabled, we conducted the world's first demonstration of dual network slicing for businesses using a live production network.

## Defining network slicing

Network slicing is the ability to create differentiated end-to-end services, on a single network connection. This means that service providers can deliver a 5G connectivity guarantee, from end to end, that is equivalent to the MPLS service-level agreements organisations have come to expect. An October report<sup>1</sup> predicted that the network slicing market will generate approximately US\$12 billion in revenues in 2030 — translating to a 50% compound annual growth rate from now to the end of the decade. In other words, it's poised for tremendous growth.

But how can organisations like emergency services effectively leverage these new connectivity capabilities? For those organisations that will want to take advantage of network slicing, there will be a different playbook — centred on software-defined wide area networks (SD-WAN).

Let's begin by taking a look at the state of play in Australia today. Network slicing — at least network slicing that's cost-effective and done at scale — was seen as mostly a theoretical concept until news broke of 5G standalone (SA) deployments. In Australia, Telstra, in partnership with Ericsson and Cradlepoint, already offers 5G Standalone automated and orchestrated services for enterprises. The services fully enable automated 5G network slicing, delivering network-defined differentiated services to customers; Local Packet Gateway, providing enterprise customers with onsite local data breakout; and 5G enterprise routers with network slicing capabilities delivered by Cradlepoint.

Standalone networks such as these create the ability to segment the radio, core and transport network — thereby giving service providers the ability to offer differentiated end-to-end network segments that can be purchased by either consumers or enterprises. Each differentiated network, or 'slice', will meet the requirements of a different application category. For context, 3rd Generation Partnership Project (3GPP) standards define four application categories:

- Ultra-reliable low latency — This category includes applications that need very reliable, low latency connectivity.
- Enhanced mobile broadband — This category includes high bandwidth applications with low latency such as broadcast video.
- Machine to machine communication — This category includes sensors, actuators and other IoT deployments.
- Public safety — This category includes government, emergencies and other public safety requirements.

## The benefits of network slicing

Currently, many emergency services organisations leverage an MPLS link because it provides a dependable, end-to-end connection. Service providers offer MPLS connections with SLAs because their fibre installations all have a guaranteed bandwidth, a guaranteed latency and a guaranteed level of data loss on the link. However, because MPLS services typically use fixed connections like fibre, these services can cost tens of thousands of dollars and take weeks/months to establish. The appeal of 5G is its ability to create a high-speed connection with little time, staffing resources and money. With 5G network slicing, organisations can ensure their applications experience the strong connection they need with each of these benefits. This also contributes to the secure capabilities of network slicing which is critical for sensitive applications and environments.

While emergency services headquarters, like a police station, are fixed locations that have fibre as an option for connectivity, network slicing could become a game changer for use cases where vehicles are involved. In a police headquarters use case, the headquarters obviously cannot connect to its cars through a cable link and likewise, vehicles cannot connect to other vehicles using cable. Also, each car probably has critical connected technology — licence plate readers, dash cams, body cams, radars. These applications require 5G connectivity and with network slicing,

each car can connect to a first responder network with an SLA and pricing structure. If there is an issue with connectivity back to headquarters, vehicles could leverage a secondary modem that can access alternative carrier networks to ensure 100% uptime.

## SD-WAN's role in network slicing

Early implementations of network slicing will need SD-WAN to support thousands of applications, including public-cloud hosted applications, SaaS applications and custom applications. Software-defined wide area networks (SD-WAN) can recognise, then classify, all those diverse applications, with policies that can steer those applications to the appropriate network slice, based on pre-programmed performance thresholds. That SD-WAN intelligence can reside within the service provider or the enterprise environment and regardless of where it lives, will play a crucial role in the initial rollouts of network slicing. With the knowledge of what network slices the carrier is extending to that particular enterprise, applications can be classified and then policies that ensure each application gets connected to the right network slice can be created.

## The future with network slicing

Network solutions are at their best when they allow mobility, security and adaptability. Despite the fact that 5G provides each of these benefits, organisations have slowly been rolling out networks for mobile, IoT and fixed sites to connect where fibre isn't available or is cost-prohibitive for the business model. With the availability of 5G network slicing, organisations are able to cut the cords often synonymous with connectivity. Instead, organisations can leverage versatile cellular networks that greatly reduce implementation costs and maximise business resources.

1. 'Network Slicing Global Market Report 2022: Use Cases of Network Slicing, Including Remote Education, Work and Healthcare to Further Boost Sector', Research & Markets, August 2022

Cradlepoint Australia Pty Ltd  
www.cradlepoint.com/au





# Transition to Hybrid Critical Communications Networks

There has been much talk amongst critical communications users about LTE networks, broadband capability and an evolution of devices, networks and functionality. A number of mines in Australia are already trialling such systems, and are seriously considering switching platforms in the medium term.

**B**ut what advantages does a broadband network offer to critical communications users above those solutions that are already in place? And how can organisations ensure that they will receive a continuous Quality of Service if they look to transition?

In this article, leading figures from the critical comms industry answer the key questions facing organisations looking to implement broadband solutions. Ronan Rafferty is Country Manager for Australia at Sepura, a long-time manufacturer of both TETRA and LTE solutions, with a strong market presence in the Australian mining market. Murray Wales is Principal Consultant and Solution Architect at DXC Technology – Connect, with many years' experience in designing and implementing critical communications solutions. Finally, Keven

Graham is CEO of The Critical Communications Association, the professional body for all critical communications users.

## What is an LTE or broadband critical communications solution?

**Ronan Rafferty:** Mission-critical communications rely on dedicated Land Mobile Radio (LMR) networks to provide a high grade of service for availability, reliability and security. In the last twenty years or so, these have predominantly been based on the TETRA standard, providing narrowband voice and data services to frontline mobile and office users.

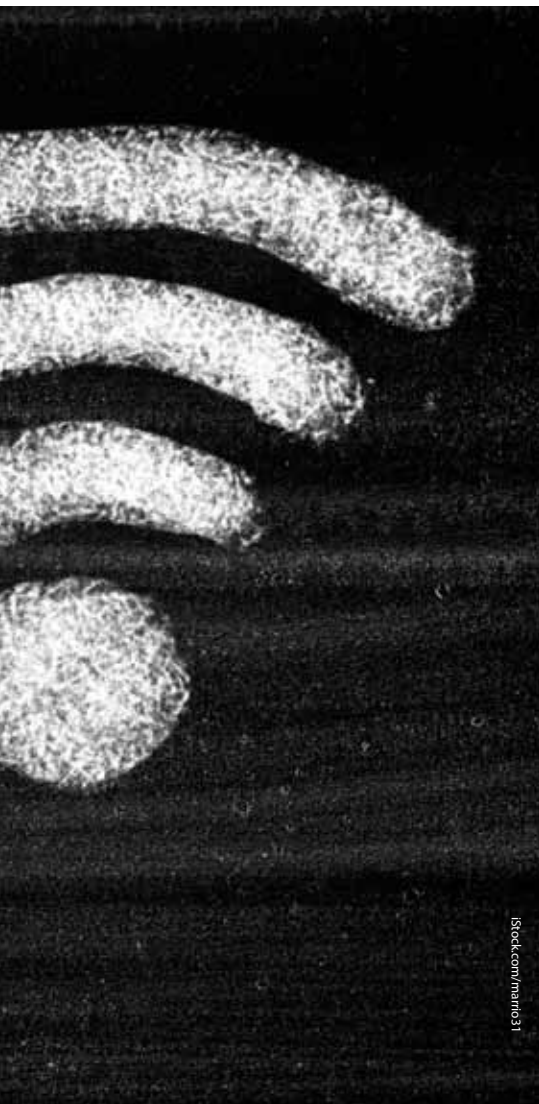
There is now increasing interest from these users for data services such as video which require high-speed data and broadband connectivity to complement their narrowband communications. Typically, these can be provided by Wi-Fi or 4G/5G LTE networks, although these are not

yet capable of providing an equivalent service for mission-critical voice, which guarantees that communication is always available when it's needed.

## Why is the critical comms industry looking to move toward LTE solutions?

**Murray Wales:** In mining and Oil and Gas, LTE has already been deployed across onshore and offshore oil and fields, and open cut mines, whilst some mines have completed successful proof of concepts with LTE. These industries require both broadband data for autonomous operations video, telemetry and SCADA, as well as critical voice. The business needs broadband mobile data and mission-critical voice.

**Ronan Rafferty:** The increased bandwidth of LTE allows for the advancement in safety applications such as personal monitoring, video stream and secure incident feed backup. Other opportunities include vehicle automation,



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increased interoperability of devices and other IoT functions.

**Kevin Graham:** While some users have embarked on a strategy to migrate from narrowband to broadband over a managed transition period, other critical users are looking for a hybrid strategy. The motivation for both is to leverage much higher data transfer payloads than can be supported in narrowband networks.

#### What are the advantages of LTE over existing LMR solutions?

**Kevin Graham:** Primarily big data, plus 5G ultralow data latency, enabling a device to support mission-critical video and data.

**Ronan Rafferty:** The emergence of mission-critical broadband will ultimately improve operational tasks by bringing more data to the field user. This drives the mobilisation of existing applications such as database queries and analytics. As an example, users in the field can use smart devices such as tablets, smartphones, laptops and body worn cameras.

**Murray Wales:** My experience is that where there is broadband coverage over an operational site,

applications come out of the woodwork. Examples include the wider IoT family, as well as worker efficiency (for example Time on Tools efficiency or Automated Dispatch), but also covering safety (location, operational awareness), video streaming for instruction or surveillance and the expanded use of Remote Operation Centres.

#### Can users expect to match or exceed their existing service from an LTE or hybrid solution?

**Murray Wales:** LTE being deployed in higher frequencies logically means more base stations will be required to provide the same coverage — and they're not cheap. 5G tends to be available in higher frequencies allowing greater bandwidth, but this is in smaller areas.

Initial private LTE deployments included minimal or no redundancy and were not designed for voice but were specifically designed and deployed around the application data requirements of fleet management and autonomous haulage and drills — this is an altogether different application data profile requirement to mission-critical voice. The future, next-generation deployments of private LTE will be designed from the ground up with PTT voice as a critical application. [In the short term] a hybrid ruggedised device with a digital radio incorporated would be a very workable option.

**Kevin Graham:** All stakeholders need to understand that the passage from commercial-grade LTE to MCX grade capability will take time just as was the case with digital narrowband services.

**Ronan Rafferty:** Current mission-critical users want the same features from LTE broadband networks as they can currently achieve with TETRA or DMR networks, with the increased benefit of LTE data. This would include instant PTT communications, extended coverage, choice of availability, secure encryption, and so on.

To achieve this, users in the foreseeable future will need to rely on hybrid solutions. Until such as LTE broadband networks are proven to be truly mission critical, TETRA, DMR and other platforms will be the only globally proven mission-critical standards available to LMR users. Only when these standards are achieved will it make economic sense to transfer services from the existing narrowband voice and data networks and these become time expired.

**Murray Wales:** As a consultant currently engaged by customers across open cut mining and some of Australia's biggest ports, new TETRA deployments are still the recommended and approved critical comms voice technology.

#### Which industries would benefit from the additional features that LTE provides?

**Ronan Rafferty:** Potential users would include pretty much all users who have a thirst and desire for more data to aid in the efficiency of their industry. This could include transport organisations, underground, metro and mainline rail systems, airports, ports, utilities plants, mining organisations and oil and gas plants.

**Kevin Graham:** All critical industries, including government and public safety and mission-critical transport and utility organisations, would find value in the additional data capability provided by LTE.

#### What are the reasons to be cautious about LTE networks for mission-critical communications?

**Ronan Rafferty:** It is vital that the standards around mission-critical voice over LTE are hardened to include availability, robustness of devices, coverage, direct mode operation, pre-emption, priority calls, low latency, and more. The networks are typically run commercially, and this means they are subject to the same issues as commercial networks — specifically coverage and availability. Without significant investment, particularly in rural areas, commercial networks may not be able to provide the required level of reliability and availability to support critical communications; during a significant emergency, network congestion could consider first responders' ability to effectively co-ordinate their response.

**Murray Wales:** The levels of redundancy and single points of failure need to be considered in the LTE architecture. Until this is resolved, TETRA networks are still being designed and deployed over the next few years with organisations still expecting a ten-year return on investment. There is likely to be an extended parallel transition with bridged talkgroups while standards are hardened and agreed, but many organisations are designing their next LTE upgrades to support PTT over LTE.

Sepura have extensive experience of providing mission-critical solutions to users in the mining, transport, utility and public safety markets. To discuss how a hybrid solution could help your organisation, visit [www.seapura.com](http://www.seapura.com) or email [sales@sepura.com](mailto:sales@sepura.com).

# sepura

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[www.seapura.com](http://www.seapura.com)



## Wearable situational awareness device

Raytheon Blackbird Technologies, a subsidiary of Raytheon Technologies, has announced the NexGenTrac (NGT) Watch and NexGen Global SIM. For government, military and other organisations that need to meet safety protocols for their globally deployed workforce, the watch provides global situational awareness, secure communications and personnel accountability in the convenient form of a wearable device.

The NGT Watch uses the global data services of Blackbird's NexGen Global SIM technology to provide secure mission-critical communications, emergency signalling, and safety and accountability status. As a result of its design, the watch can be deployed as a standalone capability anywhere in the world where connectivity is paramount, and network service is managed by cybersecurity and defence industry experts to protect user data.

Features of the NGT Watch include: position location reporting; duress signalling; data encrypted at rest; local and remote data wipe; integration with Gotham back-end server; team situational awareness (SA); personnel safety and accountability; and an LTE modem enabling standalone functionality.

Features of the NexGen Global SIM include: cellular coverage for a global workforce; compatibility with eSIM/SIM-enabled mobile devices; secure connectivity; data transfer cost reductions; tiered or fixed price models; and availability in eSIM, SIM or MFF2.

### Raytheon Australia

[www.raytheon.com.au](http://www.raytheon.com.au)



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## NB-IoT industrial modules with GNSS geo-location capability

STMicroelectronics' ST87M01 ultra-compact and low-power modules combine robust NB-IoT data communication with resilient GNSS geo-location capability for IoT devices and assets. The fully programmable, certified LTE Cat NB2 NB-IoT industrial modules cover worldwide cellular frequency bands and integrate advanced security features.

Offered in accordance with the latest 3GPP Release 15, the IoT cellular product provides extended multi-regional LTE coverage. The integrated native GNSS receiver with multi-constellation access provides enhanced localisation along with optimised power-savings features while operating during NB-IoT sleep time slots. The complete module has a diminutive 10.6 x 12.8 mm LGA footprint, making it suitable for applications where a small form factor is desirable.

Qualified over the industrial temperature range (-40 to +85°), with ultra-low power consumption — less than 2  $\mu$ A in low-power mode — and transmit output power up to +23 dBm, the unit targets wide-ranging IoT applications that require reliable LPWAN connectivity. These include smart metering, smart grid, smart building, smart city and smart infrastructure applications, as well as industrial condition monitoring and factory automation, smart agriculture and environmental monitoring. It is also suited to tracking applications such as locating pets, children and elders, safety monitoring for remote workers, asset tracking for equipment such as power tools, and general intelligent logistics.

The device offers flexibility for product developers, presenting a fully programmable IoT platform that lets users embed their own code directly in the module for simple applications. Alternatively, the module can be combined with a separate host microcontroller, permitting more sophisticated use cases. A variety of protocol stacks is available to handle popular IoT use cases, including IPv6, TCP/UDP, CoAP/LWM2M, MQTT, HTTP/HTTPS and TLS/DTLS.

The device is designed to support both standardised 3GPP AT commands along with ST enhanced AT commands. The modules also integrate a state-of-the-art ST4SIM eSIM, certified according to the latest industry standards.

**STMicroelectronics Pty Ltd**

[www.st.com](http://www.st.com)

## Dual-band GNSS timing module

u-blox has announced a compact dual-band timing module that has been designed to offer nanosecond-level timing accuracy, thereby meeting the stringent timing requirements for 5G communications. The NEO-F10T is compliant with the u-blox NEO form factor (12.2 x 16 mm), allowing space-constrained designs to be realised without the need to compromise on size.

The NEO-F10T is the successor to the NEO-M8T module, providing an easy upgrade path to dual-band timing technology. This allows users to access nanosecond-level timing accuracy and enhanced security.

u-blox's dual-band technology is designed to mitigate ionospheric errors and reduce timing error, without the need of an external GNSS correction service. Additionally, when within the operational area of a satellite-based augmentation system (SBAS), the module offers the possibility to improve the timing performance by using the ionospheric corrections provided by the SBAS system. As the product supports all four global satellite constellations and L1/L5/E5a configuration, it simplifies global deployments as the same device can be used universally.

The module includes advanced security features such as secure boot, secure interfaces, configuration lock and T-RAIM to provide high-level timing integrity. This means that uninterrupted service is delivered as any attempt to interfere with the receiver is unlikely to be successful. Additionally, advanced anti-jamming and anti-spoofing algorithms are included to further enhance security.

The module has a single RF input for all the GNSS bands and dual SAW filters for good signal selectivity and out-of-band attenuation. It is compatible with u-blox's ANN-MB1 L1/L5 multi-band antenna, making it simple to evaluate the performance of the timing modules. The devices operate from a single 2.7 to 3.6 V supply and draw just 19 mA (@3 V) during continuous operation.

The product is designed to meet the timing synchronisation requirements in 5G small cells and private networks on a global scale. By reducing the time error of cellular network synchronisation, the module will help operators maximise the performance of their networks and so optimise the return on their investment in 5G communications.

**u-blox Singapore Pte Ltd**

[www.u-blox.com](http://www.u-blox.com)



## Indoor radio unit

Ericsson's IRU 8850 indoor radio unit, part of the Ericsson Radio Dot System portfolio, is a purpose-built, high-performing device for single- or multi-operator deployments in medium-to-large venues such as airports, offices and stadiums. The product can serve up to eight venues from one centralised location, with a 10 km fibre reach. It also supports both purpose-built and Cloud RAN architectures.

Designed for simple and speedy deployment, it delivers up to four times the capacity of its predecessors, enhancing network performance and user experience. It is also said to be up to 70% more energy-efficient compared to active distributed antenna system (DAS) technology, with up to an 80% reduction in physical equipment space and up to 50% lower total cost of ownership (TCO) due to network sharing.

**Ericsson Australia Pty Ltd**

[www.ericsson.com/au](http://www.ericsson.com/au)

## Modules for mmWave fixed wireless access

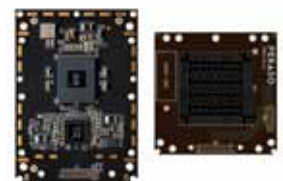
Peraso's PERSPECTUS family of modules is designed for high-capacity fixed wireless access (FWA) networks in the unlicensed 60 GHz spectrum. The modules provide complete, efficient solutions for point-to-multipoint FWA applications.

The modules include three distinct phased array antenna configurations offering different gain and coverage. Enabling operation in the unlicensed 57 to 71 GHz band, the modules feature Peraso Directional Beam Scan and Connect (DBSC) for establishing long-range point-to-point and point-to-multipoint links.

With automatic rate adaption, dynamic beamforming and automatic calibrations, the modules come in compact form factors and feature a digital interface. With a single 5 V power supply input, they provide efficient 802.11ad/ay solutions.

**Richardson RFPD**

[www.richardsonrfpd.com](http://www.richardsonrfpd.com)





# Radio Matters

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What a fantastic time of year — short days and long nights, the sun shining and the snow sliding, and tourists flocking to the slopes keeping us warm with the tales of woe overseas. On a global scale, though, the future is currently looking rather bleak.

Disregarding external events, New Zealand has been on a 'way too late' reality check which has been caused by an incongruous cacophony of natural phenomena leaving large regions as dystopian wastelands.

The events started kicking off over a decade ago with the dreaded Christchurch earthquakes, followed by so many other events and most recently the relentless flooding of the east coast of the North Island. All of these events are still causing locals to have to deal with the consequences on a daily basis.

New Zealand, like the rest of the world, will be heavily reliant on resilient communications more than ever. But we have a problem that plagues all industries: a country of accountants needs engineers.

The technology in the communications industry has developed from aging analog infrastructure to a digital renaissance that is so flexible and scalable that there is apparently no communications problem that can't be measured in dollars.

We need to be training and recruiting fresh people into the industry.

The last dedicated training was apprentices from the Post Office ending in 1987. This has now culminated in the boomers aging out, along with the analog equipment.

Easy fix — 'just go digital'. Well no, not really. RF fundamentals haven't changed, just what can be done with the signal. So where is our fundamentals radio training?

Over a decade ago, RFUANZ started looking at training in the industry due to the attrition. RFUANZ and other independents have delivered some content, but we are still driving the conversation forward.

Our MoU with ARCIA is providing a content bridge, but it's still early days.



**John Laughton**  
Chairman  
*Radio Frequency Users Association New Zealand*



## 5G NR Release 17 modules

Quectel Wireless Solutions has announced its latest-generation 5G New Radio (NR) module series, the RG650E and RG650V, both of which follow the 3GPP Release 17 standard. The industrial-grade 5G modules deliver high performance in data rates, capacity, power saving and latency, in order to address the growing 5G fixed wireless access (FWA), enhanced mobile broadband (eMBB) and industrial automation markets.

Based on the latest Snapdragon X75 and X72 5G Modem-RF Systems from Qualcomm Technologies, the series can work on both 5G non-standalone (NSA) and standalone (SA) modes. The RG650E supports a maximum bandwidth of 300 MHz in the sub-6 GHz spectrum, while the RG650V supports up to 200 MHz bandwidth. The adoption of Option 3x/3a/3 and Option 2 network architectures makes the modules backward compatible with global LTE and WCDMA networks. Additionally, the modules' support of OpenWRT allows them to provide advanced networking features in a wide range of upstream ecosystem applications.

Integrated with a Quad-Core A55 processor, the modules support 5G NR downlink carrier aggregation (CA), improving data rates to meet the demand for super-high data speeds in IoT verticals and applications, especially for FWA devices like CPE, home gateways, enterprise gateways, industrial routers, mobile hotspots, eMBB terminals including high-definition live broadcast, AR/VR devices and drones, as well as industrial automation applications such as automated guided vehicles (AGVs), remote control and robots.

The series supports Qualcomm Location Suite with Qualcomm GNSS HW Gen 9.v6 (Concurrent GPS, BeiDou, Galileo, GLONASS, NavIC and QZSS). The integrated GNSS receiver simplifies product design and provides a fast positioning capability for applications in any environment. Additionally, the modules provide a wide range of interfaces such as USXGMII, PCIe, USB 2.0/3.0/3.1, PCM and supplementary functions including VoLTE and VoNR.

**Quectel**  
[www.quectel.com](http://www.quectel.com)



# WIRELESS REMOTE MONITORING FOR PETROCHEMICAL APPLICATIONS

Wireless telemetry systems are becoming increasingly important for plant-wide monitoring and control applications as cabling cost and the disruption caused by the associated installation and maintenance work become prohibitive. In many cases, the cost of installing control cables is many multiples more than the cost of the instrumentation itself, making wireless networks a much more attractive option. Here Darren Barrett, Product Manager at wireless telemetry specialist Omniflex, discusses the increasing popularity of wireless telemetry systems for specialist applications such as petrochemical plants.

**W**ireless remote monitoring technology provides the most convenient and cost-effective method for plant and asset managers to monitor and manage all important system data across their sites. In highly regulated industries, such as petrochemical plants, laying cables for data monitoring applications is not always feasible because of strict regulations and the extensive planning permissions required. Here, wireless communication systems can help facility managers retrieve and manage critical data from the field wirelessly, safely and efficiently.

When dealing with radio-based wireless telemetry systems, it is important to remember that radio transmission distance and bandwidth is finite. This is based on factors such as the power of the transmitter, the sensitivity of the receiver, the distances involved, the type of antenna you're using, the operational frequency and even weather conditions. These factors will determine whether you get a good signal or not.

It's important to note that in most coun-

tries globally the radio spectrum is regulated using licensed and unlicensed frequency bands to prevent interference between different users. Space on licensed frequency bands is at a premium and, with more businesses setting up radio telemetry equipment, demand will only increase. Until January 2018, there were just eight frequencies for license-free radios in the UK, ranging from 446.00625 MHz to 446.09375 MHz. Since then, the frequency spectrum has expanded significantly. For example, the 5 GHz band runs from 5150 MHz to 5850 MHz, before being broken down into three A-C bands.

For many plant managers, the need to pay a fee for exclusive transmission rights means operating on a licensed band is undesirable. Instead, many opt for license-free bands that are open to everyone. Two of the most common unlicensed bands in Australia are 2.4 GHz, which is the same frequency as Wi-Fi and Bluetooth, and 920 MHz.

The narrow coverage area and lack of penetrability of 2.4 GHz signals means its application is often confined to residential settings. In contrast, 868 MHz can transmit

across longer distances and penetrate most objects. Although it requires a larger antenna than 2.4 GHz, it has a range of up to 800 m and a lower power consumption. While mobile phones, Wi-Fi networks and other similar devices operate on 2.4 GHz, 868 MHz can support much of the radio equipment found in industrial settings, such as remote sensing, security and alarm systems.

Despite offering non-exclusive access, interferences are rare on 868 MHz bands. While open to all devices, 868 MHz is only really used for industrial, scientific and medical applications, meaning there's less competition from neighbouring sites for bandwidth.

A good wireless telemetry partner can integrate radio equipment seamlessly, providing support from the initial enquiry to purchasing and installation. To learn about Omniflex's wireless telemetry offering, which can help facility managers to achieve wireless connectivity in different licence-free bands, visit the website.

Omniflex (Australia) Pty Ltd  
[www.omniflex.com.au](http://www.omniflex.com.au)



# Infrastructure-free Communications for Rural Council Areas with Digital Dividend

Local councils across rural Australia are faced with a unique set of challenges when it comes to critical communications. Not only do we have the increased frequency of adverse events like bushfires and floods to deal with but we also have a distinctly unhelpful geography not only from the point of view of size but also terrain.

With mobile cellular coverage being patchy to non-existent in large parts of the country, councils to date have been reliant on the good old two-way radio which has been a great servant for voice communications. And quite rightly so, because safety for council workers and residents has to be the number one priority. But with budgets under pressure how do you justify the cost of a network of radio base stations in areas of low population density, especially if they have to be rebuilt or repaired after every cyclone or bushfire?

## Converging on a Solution

As if delivering voice coverage were not problematic enough, we now have the added dimension of the need for digital applications. Council workers in urban areas would be lost without access to email, Microsoft Teams and WhatsApp and this access to digital is now also part of the remit for rural areas. No matter how remote the location, councils want the

benefits of digital transformation bringing to their workers from a cost-efficiency as well as a safety and worker wellbeing point of view. Faced with these challenges councils are increasingly looking at innovative approaches to providing reliable voice communications and access to data-based services in remote areas, without spending a fortune on infrastructure. One approach is offered by Simoco Wireless Solutions, using its Velocity technology within the council vehicles to provide converged communications, which includes two-way radio but which also makes use of cellular LTE/4G networks with a failover to satellite communications, where radio and cellular networks are not an option.

## Never out of Range

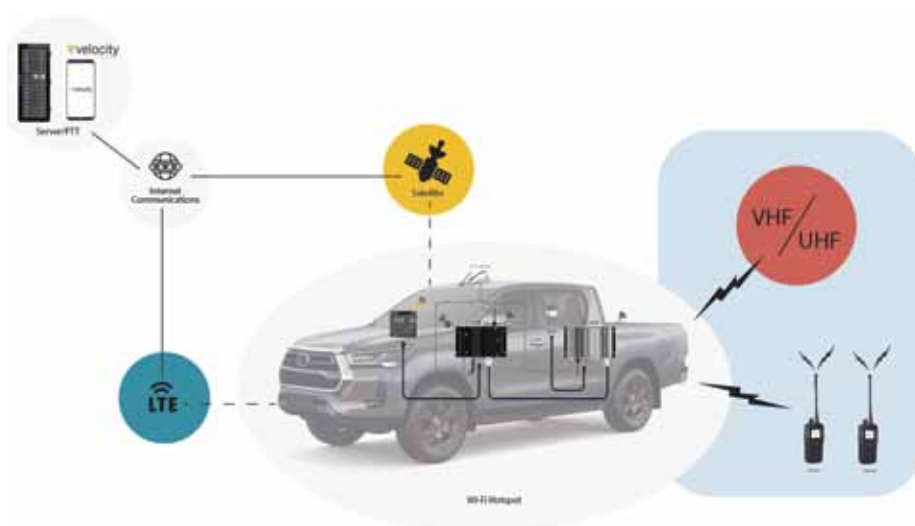
Velocity is an intelligent edge computing device that sits in the vehicle alongside the existing two-way radio but provides access to cellular networks and satellite communications as and when required. When out range of two-way radio it connects, using “push to talk over cellular”, or PTToC, to the LTE/4G network and when there is no cellular

coverage will continue to deliver voice via a satellite link. The intelligence within the Velocity unit means that it uses least cost routing to select the best carrier from a cost and signal point of view, while the users are blissfully unaware that they have been switched from two-way radio to cellular to satellite, possibly on the same call. Effectively we have two-way voice coverage across an entire council area, no matter how remote, with zero fixed infrastructure.

## Turning Vehicles into Mobile Wi-Fi Hotspots

Beyond voice, the converged always-on nature of Velocity means that we can unlock the digital applications that are becoming so essential to councils in their day-to-day operations. Each vehicle is now effectively its own Wi-Fi hotspot, so workers can connect via cellular or satellite using their smart devices like tablets and laptops to send and receive emails or even hold a Teams, Skype or Zoom call with headquarters from the top of a remote mountain or in a valley gorge. As much of council work is involved in routine





maintenance of infrastructure like water and power systems the problems can be more complex than can be conveyed over a two-way radio call and the ability to stream video could speed up any repair process dramatically. We can also imagine the value of video in an emergency situation where live streaming could relay essential information to fire and ambulance crews in real time. And from an employee wellbeing point of view, being connected via email or WhatsApp could be a major benefit when working a long shift hundreds of miles from home.

### Integration with Satellite Comms — Game Changer for Remote Areas

Velocity was developed by Simoco in Australia to solve a problem for councils across Australia and takes account of the special challenges they are facing in remote areas. Even where population density is low or even in uninhabited areas councils still have to provide essential services, so the “do-nothing” option is not on the table and yet the cost of radio communications infrastructure cannot always be justified when

they may only have a fleet of 50–100 vehicles. The ability to provide the options of cellular and satellite connectivity is a game changer in this respect and the cost of satellite communications has come down dramatically in recent years with the advent of low earth orbit providers like Starlink, which offer broadband data rates at a tenth of the cost of previous generations.

### User Experience Matters

The kind of innovation that the infrastructure-free approach offers will only be adopted if it meets the needs of councils across the country from a functionality, costs and most importantly a safety point of view. Continuous communication, the ability to integrate digital applications and the potential for cost reduction only add up if the user experience is seamless. Being a leading player in the two-way radio space over many years, Simoco realised that the user wants to be able to pick up the “fist mic” and “get on the radio”. Now that “radio” call may be delivered using a digital route over different carriers, but it has the same familiar look and feel as the trusted two way radio.

### Squaring the Circle

The converged communications without infrastructure approach offered by Velocity gives councils across Australia a ‘here and now’ solution to a perennial problem of providing cost-effective coverage across wide, sparsely populated areas of the country. At the same time it provides much-needed access to digital services and, with satellite communications costs coming down, there is an opportunity for councils to get the best of both worlds, in terms of always on, reliable voice and digital services, which could extend to the integration of IoT devices for water and flood and fire monitoring. As councils continue to try to square the circle between delivering services safely with a vigilant eye of the cost to the ratepayer, this kind of innovation is essential.

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wireless solutions

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[www.simocowirelessolutions.com](http://www.simocowirelessolutions.com)



# METASURFACE ANTENNA

## CAN CHANGE BEAM'S CHARACTERISTICS

The structure and characteristics of antennas cannot traditionally be changed once fabricated. But in a significant breakthrough, researchers from Hong Kong and China have now developed a so-called 'sideband-free space-time-coding (STC) metasurface antenna' that allows manipulation of the direction, frequency and amplitude of the antenna's electromagnetic waves.

**D**escribed in the journal *Nature Electronics*, the team's research is set to enable greater user flexibility and to play an important role in 6G wireless communications.

The key to the antenna's powers is that the response of the metasurface — an artificial, thin-sheet material with sub-wavelength thickness and made of several sub-wavelength meta-atoms — can be changed by switching the meta-atoms on its surface between radiating and non-radiating states, like turning switches on and off, by controlling the electric current. This allows the STC metasurface antenna to realise complicated wave manipulation in the space and frequency domains through space-time coding (ie, software control), and to create a desired radiation pattern and a highly directed beam.

Research leader Professor Chan Chi-hou, from City University of Hong Kong (CityU), said the breakthrough relies on the successful combination of two research advances: amplitude-modulated (AM) leaky-wave antennas and space-time coding techniques. Post-doctoral fellow Dr Wu Gengbo first proposed the concept of AM leaky-wave antennas in 2020 during his PhD studies at CityU.

"The concept provides an analytical approach to synthesise antennas with the

desired radiation patterns for different specific uses by simply changing the antennas' shape and structure," Wu explained.

But as with other antennas, once the AM leaky-wave antenna is fabricated, its radiation characteristics are fixed. At about that time, Dr Dai Junyan from China's Southeast University, who pioneered STC technologies, joined Chan's group at CityU.

"Dr Dai's expertise in space-time coding and digital metasurfaces to dynamically reconfigure antenna performance added a new, important dimension to the antenna research," said Chan, who is the Director of CityU's State Key Laboratory of Terahertz and Millimeter Waves (SKLTMW).

The time modulation of electromagnetic waves on metasurfaces usually generates unwanted harmonic frequencies, called sidebands. These sidebands carry part of the radiated electromagnetic wave energy and interfere with the useful communication channels of the antenna, leading to 'spectrum pollution'. Chan and his team proposed a novel design which makes use of a waveguide (a line for transmitting electromagnetic waves by successive reflection from the inner wall) and successfully suppressed the undesired harmonics, achieving a high-directivity beam and enabling secure communication.

"With the AM leaky-wave antenna and space-time coding technologies, we achieve

the designated radiation characteristics by controlling the on-off sequences and duration of the 'switches' on the antenna through software," Chan said.

"A high-directivity beam can be generated with the new antenna, allowing a wide range of radiation performance without having to redesign the antenna, except for using different STC inputs," Wu added.

The energy from the radiated beam of the STC metasurface antenna can be focused to a focal point with fixed or varying focal lengths, which can be used for real-time imaging and treated as a type of radar to scan the environment and feedback data. The invention is thus expected to play an important role in the integration of sensing and communications (ISAC) for 6G wireless communications.

"For example, the radiated beam can scan a person and create an image of the person, allowing mobile phone users to talk to each other with 3D hologram imaging," Chan said. "It also performs better against eavesdropping than the conventional transmitter architecture.

"We hope that the new-generation antenna technology will become more mature in the future and that it can be applied to smaller integrated circuits at lower cost and in a wider range of applications."



# Increased power density for mission-critical DC power systems

Modular DC rectifiers provide high scalability and energy density for mission-critical DC power systems.

**R**eliable, efficient and flexible modular DC power systems must beat the heart of all mission-critical infrastructure, and modular DC rectifiers can play a significant role in improving energy density and efficiency for such systems.

A DC rectifier is a device that converts AC power from the utility grid to DC power, which is then used to charge batteries or power other DC loads. A modular DC rectifier consists of several smaller rectifier modules that can be added or removed as needed, providing redundancy, flexibility and scalability in DC power systems.

## Mission-critical applications

Eaton Modular DC power systems are engineered to provide uninterrupted DC power to mission-critical equipment such as telecommunications, industrial and any other application that needs essential power. Eaton has now expanded its range of modular rectifiers with the HDR48-ES, providing 3 kW of power capacity at 48 VDC and energy saving through extra-high efficiency and much-improved energy density. It is intended to power telecom infrastructure like 4G and 5G macro base stations, fibre-optic repeaters, telecom data centres and industrial mission-critical equipment.

## Efficient energy density

Darren Salter, Eaton's APAC Product Manager, said the HDR48-ES is designed for ease of deployment and delivers industry-leading power efficiency leading to significant cost savings for telecom operators over time.

"Energy consumption is increasing dramatically as 5G is deployed — similar to the same way previous generations were deployed," he said. "In the past, densifying networks implied high energy outputs which led to substantial increases in operator expenses. "The HDR48-ES is designed to flatten the energy curve for network operators while enabling dense network deployments, reducing operational costs and environmental impacts."

The HDR48-ES features intelligent digital signal processing for enhanced control, producing peak efficiency approaching 97% for typical operating loads, while also maintaining a very high minimum operating efficiency of 96% over a very wide range of loads.

The HDR48-ES is part of the Eaton APS (Access Power Solutions) Series 8 modular power systems. These 19" rack-mount systems are available with up to nine of the Eaton HDR48-ES 3 kW rectifier modules, providing an output of up to 562 A. A modular subrack system such as the APS9 allows the operator to start with only the capacity needed and then scale up with additional rectifier modules as the DC 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. The systems include an integral DC distribution panel, with a range of MCB and low voltage disconnect options available.

## Advanced control

The systems also include the SC300 system controller that manages all the rectifier modules, ensuring a

good state of health, equitable load sharing, and perfectly managing power to the batteries. 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 Access Power 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 set-up.

## Fault tolerance

The rectifier modules are hot-swappable, since the SC300 microprocessor controller allows them to automatically configure themselves to the power system requirements upon insertion. 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 DC BDM. If you are interested to learn more, please contact Eaton or email [EatonANZ@eaton.com](mailto:EatonANZ@eaton.com).



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## Wearable broadband communication device

The TAIT AXIOM Wearable is a rugged broadband communications device for staff members who need to contribute to or monitor their radio network traffic but without the expense of a dedicated radio unit, in order to extend coverage beyond their radio network footprint or to broadband-enable their existing portable radios. First released in 2022 with support for DMR Tier 3, the device can now also connect to P25, DMR Tier 2 and analog networks.



The device has been made compatible with Tait TeamPTT and ES-Chat solutions, enabling connection to any LMR network. As a result of integrating the ESChat application with the wearable, public safety and other first-responder agencies using P25-standard radio networks can achieve the benefits of the device. The development is the result of a long-term technology partnership between Tait and ESChat.

The wearable is suitable for staff who don't need a fully optioned portable radio, enabling them to contribute to all radio traffic from anywhere there is broadband connectivity such as Wi-Fi or LTE. The addition of ESChat provides customers a public safety-grade broadband PTT solution. When combined with ESChat's wire-line integrations, ESChat-enabled devices offer seamless interoperability with LMR, dispatch, CAD and logging recorder solutions.

### Tait Communications

[www.taitcommunications.com](http://www.taitcommunications.com)



## 5G NR M2M industrial gateway

D-Link Australia has launched the DWM-3010 5G NR M2M Dual SIM Industrial Gateway, specifically designed for enterprises and SMBs to address critical IoT connectivity demands and to help drive new efficiencies in the current digital revolution known as Industry 4.0. The gateway facilitates private network deployments to enable low latency for near-instantaneous M2M communications.

The product features dual SIM slots as well as band support for all major 5G networks in both Australia and New Zealand, along with support for industry standard IoT/M2M field communication protocols such as Virtual COM, Modbus and MQTT. As such, the gateway enables an extensive range of IoT devices to communicate efficiently with one another. With a robust and rugged design, it is suitable for smart industrial applications and can withstand wide temperature ranges from -30 to 60°C.

The product expands 5G to Industrial IoT by offering 5G private networks that provide ultrahigh speeds with virtually unlimited capacity for high-bandwidth and low-latency services. Users can connect large numbers of devices with fast 5G network connectivity in harsh working environments, and with the industrial-grade feature set needed for efficient and robust communication between them in virtually any setting. Remote, centralised management of the gateway is particularly easy when combining it with the D-Link Edge Cloud Solution (D-ECS), developed for users where connectivity status, GPS tracking and route history are critical to their business.

### D-Link Australia Pty Ltd

[www.dlink.com.au](http://www.dlink.com.au)



## RF power monitoring system

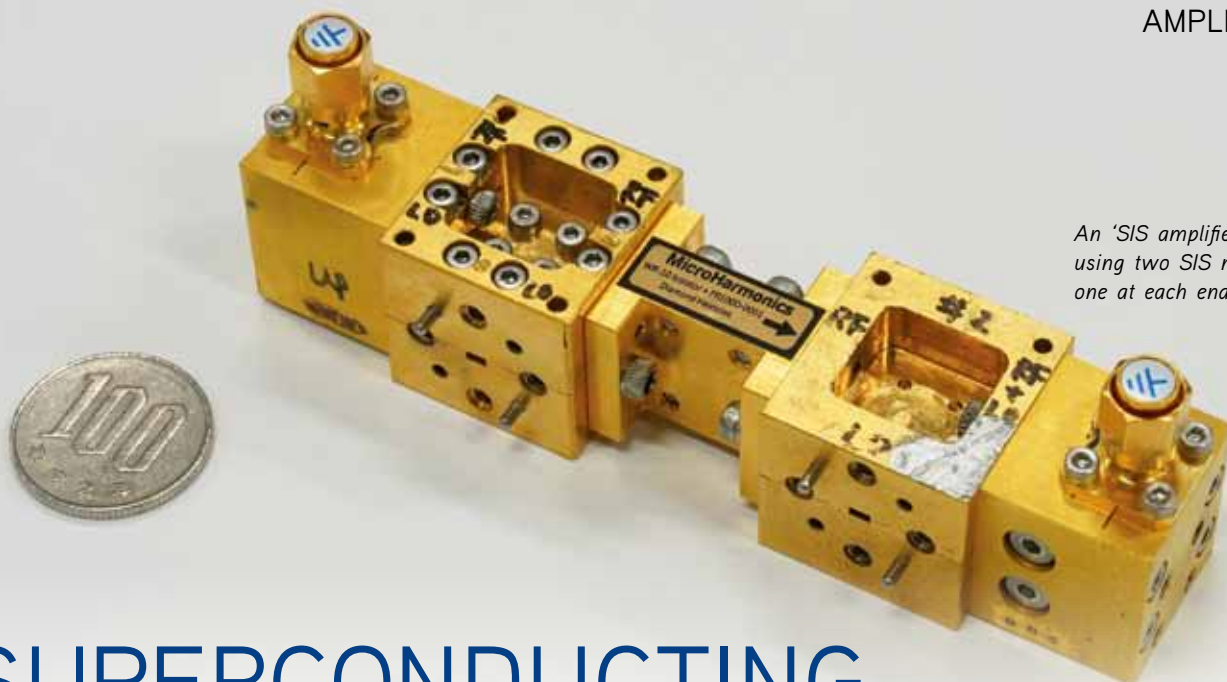
Wireless operators today often deploy multiple wireless systems based on different technologies and RF frequencies. Managing a myriad of distinctively different wireless systems in a unified way is challenging due to different technical requirements in terms of application bandwidth, frequency, transmit power, number of carriers, scanning speed, etc. To help ease these challenges, Sinclair Technologies has launched the IntelliSENSE 2.0 RF Power Monitoring Solution to enable futureproof, wideband, high-precision and real-time channelised monitoring for LMR, cellular, aviation and maritime wireless systems.

The power monitoring solution offers wide bandwidth, ultrafast speed for real-time monitoring, PIM optimisation and an easy-to-use RF spectrum analysis feature to help detect and identify interference that negatively impacts system performance. It has the ability to monitor anything remotely at a radio tower site with a single device, detect interference and identify the origin of any equipment desense.

Supporting all major wireless technologies and bands, the product is designed to enable preventive maintenance and to reduce unplanned issues and outages. Features include an intuitive web-based graphical user interface, secure user access and management, flexible alarm setting, and remote RF diagnostics eliminating truck-roll.

### Sinclair Technologies

[www.sinctech.com](http://www.sinctech.com)



An 'SIS amplifier' using two SIS mixers, one at each end.

# SUPERCONDUCTING AMPLIFIERS

## OFFER HIGH PERFORMANCE AT LOW POWER

Researchers at the National Astronomical Observatory of Japan (NAOJ) have devised a new concept of superconducting microwave low-noise amplifiers for use in radio wave detectors for radio astronomy observations, and successfully demonstrated a high-performance cooled amplifier with power consumption three orders of magnitude lower than that of conventional cooled semiconductor amplifiers.

**D**escribed in the journal *Applied Physics Letters*, the team's work is expected to contribute to the realisation of large-scale multi-element radio cameras and error-tolerant quantum computers, both of which require a large number of low-noise microwave amplifiers.

The researchers utilised an SIS mixer, a device which is named after its structure — a very thin film of insulator material sandwiched between two layers of superconductors (S-I-S). In a radio telescope, cosmic radio waves collected by an antenna are fed into an SIS mixer and the output signal is amplified by low-noise semiconductor amplifiers. An SIS mixer operates in a very low temperature environment, as low as 4 Kelvin ( $-269^{\circ}\text{C}$ ), and the amplifiers are also operated at that temperature.

To improve the performance of radio telescopes, researchers are developing a large-format radio camera equipped with

2D arrays of SIS mixers and amplifiers. However, the power consumption is a limiting factor. The typical power consumption of a semiconductor amplifier is about 10 mW, and by assembling 100 sets of detectors, the total power consumption reaches the maximum cooling capability of a 4 Kelvin refrigerator. The research team came up with a simple but innovative idea to realise a superconductor amplifier by connecting two SIS mixers, whereby they would exploit the basic functions of the SIS mixer: frequency conversion and signal amplification.

"The most important point is that the power consumption of an SIS mixer is, in principle, as low as microwatts," said research team leader Associate Professor Takafumi Kojima. "This is three orders of magnitude less than that of a cooled semiconductor amplifier."

After obtaining successful preliminary results in 2018, the team advanced both the theoretical studies of the system and the physical implementation of its various

components. In the end, the research team optimised the system and realised an 'SIS amplifier' with 5–8 dB (three to six times) gain below the frequency of 5 GHz and a typical noise temperature of 10 K, which is comparable to the current cooled semiconductor amplifiers such as HEMT and HBT, but with much lower power consumption.

"By changing the configuration of the components, we can further improve the gain and low-noise performance of an SIS amplifier," Kojima said. "The idea of connecting two SIS mixers has broader applications for making various electronics that have functions other than amplification."

This low-noise, low-power-consumption amplifier is also expected to be suitable for large-scale quantum computers. Currently available quantum computers are small scale, with less than 100 qubits, but larger-scale, error-tolerant, general-purpose quantum computers will require more than 1 million qubits. To handle a large number of qubits, a large number of amplifiers must be installed, and a dramatic reduction in amplifier power consumption is required.

NAOJ has experience in the development of superconducting receivers for a number of radio telescopes, including the Nobeyama 45 m radio telescope which began operation in 1982. NAOJ is also currently working to upgrade the superconducting receivers to improve the performance of the Atacama Large Millimeter/submillimeter Array (ALMA), which is operated in the Republic of Chile in cooperation with East Asia, Europe and North America. Of the 10 types of receivers (corresponding to 10 different frequency bands) currently installed on ALMA, three were developed by NAOJ, as were the SIS chips at the heart of these receivers.



## Futureproofing Australia starts with solidifying its foundational connectivity infrastructure

Being connected has become one of our greatest dependencies and as Australia's communication landscape evolves, so too must the connectivity solutions we depend upon. For the first time in four years, Australia's ranking in the IMD World Digital Competitiveness Ranking rose six places to 14th in the world. Despite the overall improvement, Australia's greatest opportunity for growth is in communications technology, where it ranked 47th.

Australia's capacity to remain competitive in the digital economy hinges on having the foundational infrastructure to support transformative technologies like Internet of Things (IoT), big data, edge computing and artificial intelligence (AI). Elsewhere, in countries like the UK and US, enterprises and governments are embracing emerging and intuitive infrastructure models necessary to support a more connected future — shared infrastructure and access networks.

Overseas, we have seen great success utilising the shared infrastructure model across a range of industries, including transport and smart precincts. How can we learn from this and apply it locally to adopt smart technologies for public safety and enhance quality of living standards in Australia?

### Using shared infrastructure to enable a connected community

Transport connectivity plays an essential role in the continuous growth of Australia.

Faced with the challenges of increased demand from passengers for continuous connectivity in underground tunnels, while also having to modernise their infrastructure, a central network with shared connectivity makes better commercial sense. Mobile network operators (MNOs) and transport operators no longer need to develop siloed

projects with separate networks; the open access network model can help deploy cellular and Wi-Fi connectivity for commuters.

BAI's 20-year partnership with Transport for London (TfL) is a good example of this. Aimed at delivering high-speed mobile connectivity across the capital, TfL's transformation will serve as a leading example (or shining light) for other cities keen to embrace the benefits of smart city technologies, and private investments in public infrastructure can help turn their vision into a reality.

It does not stop there.

Transport connectivity will form part of a network of smart precinct developments. At the foundation of smart precinct projects is the reliance on robust and reliable communications networks to support a range of use cases that make for better places to live.

For instance, Sunderland City Council entered a unique 20-year public-private partnership with BAI to create a 5G-centric network of networks. As part of this collaboration, the partners are working closely with the University of Sunderland to deploy advanced wireless technologies to support and enhance research, teaching and student experience.

The rollout of an IoT network across the university's campuses will improve opera-

tional efficiency for services such as estate management and footfall analytics. Superfast public Wi-Fi will be made available for students, staff and guests via EduROAM and a 5G test lab will be established, creating a hub for research into the potential uses of 5G and IoT technologies in manufacturing, health care and other sectors.

### Is shared infrastructure really worth the investment?

A study by BAI Communications recently found that 99% of organisations in the US and UK agree that the open access network model can help them to achieve their business and connectivity goals. In addition, the complexities of 5G networks, compared to previous generations, mean shared infrastructure is a necessity and not just a 'nice to have'.

In the open access network model, the managed service provider for the shared connectivity infrastructure — the single entity responsible for deployment, operation and maintenance — can provide solutions that are fully integrated and 'plug and play', enabling high speed to market and low total cost of ownership. Not to mention, this provides customers with the focus they need to concentrate on their core business.

### How do we ensure long-term success?

The reality is that many of the outcomes we desire from smart precincts might take years of work behind the scenes.

To address the many challenges faced when making smart, transformative communities, public-private partnerships are key. Smart, connected precincts are not built by governments alone; they demand the coordinated efforts of a range of stakeholders, including public sector organisations, network service providers and private businesses. Building on partnerships with a shared infrastructure or access network provider can help serve as a bridge between stakeholders and provide the kind of long-term commitment to put Australia on the path of continued success.



Kevin Pike is the General Manager, Network Solutions at BAI Communications Australia, and is responsible for products and solutions on network infrastructure assets. Before taking up this role in September 2022, Kevin held several key roles at BAI, predominantly overseeing the property and energy portfolios, including management of the property tenure and land sale programs, and power procurement. Prior to joining BAI, Kevin played a key role in the delivery of telecommunications deployment programs throughout Australia.

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# DAMM frequency sharing functionality

The official launch of the frequency sharing functionality in the DAMM Outdoor Base Station BS422 is here! With this functionality it becomes possible to...

## Improve spectrum efficiency

Frequency sharing allows adjacent BS422s to use the same frequencies. This is a significant benefit in low density networks and gives the possibility to cover for example a railway line with just two frequency pairs.

## Simplify repeater systems

With frequency sharing an indoor repeater system can be built without optical fibres. The same hardware can be used as base station and repeater unit, increasing redundancy and simplifying the network architecture by having one unified network management system and reduced spare part stock.

## Obtain base station geo-redundancy

With the BS422, network availability can be brought to a new level. Two BS422s located at two sites can act as one fully redundant base station, sharing the same frequencies. This will add redundancy not only to the base station, but also to the whole antenna system.

Learn more at the  
Comms Connect Series  
or go to  
[dammcellular.com](http://dammcellular.com)

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