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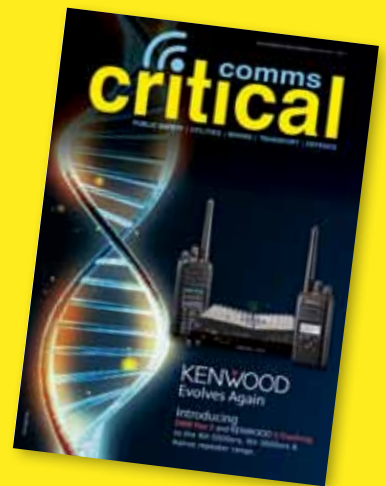
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**READ ONLINE!** *This issue is available to read and download at*  
[www.criticalcomms.com.au/magazine](http://www.criticalcomms.com.au/magazine)



JVCKENWOOD has released the KAIROS repeater, available with DMR Tier 3 and soon-to-be released DMR Software Trunking (T2.5) options. KAIROS technology enables flexible system designs leveraging distributed IP-based capabilities, such as simulcast, multicast and multisite functionality. KAIROS' key features include:

Multi-protocol: DMR Tier 2/3, P25 conventional, POCSAG, analog and DMR T2.5 coming soon.

IP multisite, multicast and simulcast: Allows for multisite systems using multiple frequencies or simulcast for areas where obtaining frequencies is a problem.

UHF linking: For areas where IP linking is not possible, KAIROS can provide out UHF linking to other KAIROS repeaters.

Light and ruggedised: The KAIROS is one of the smallest (160 x 200 x 45 mm, 1.35 kg), most ruggedised repeaters on the market. Designed to withstand harsh conditions from -30°C to +60°C, and completely fan-less, KAIROS can take communications to places many other repeaters can't.

Compact design: KAIROS' small form factor enables the user to obtain more channel capacity for rack space than most other repeaters on the market.

More information on the JVCKENWOOD KAIROS repeater can be found by contacting a local Kenwood dealer, or by visiting the company at Comms Connect Melbourne (stand 68) in November.





In this issue we look both ahead and behind. Ahead, there are all sorts of technological solutions being implemented or on the horizon. From public safety communication networks (eg, LA-RICS) to public-facing Next Generation Triple Zero (and equivalents overseas), as well as the ins and outs of the soon-to-be-here 5G world. Articles in this issue cover mission-critical communications on the

ground, below ground in tunnels and also in the air. We also look at some of the new technologies on which researchers are focusing their efforts, such as futuristic-sounding atom-based receivers.

Sometimes, technological change is seen in some quarters as being not of concern to the future of particular businesses or sectors. But as both Hamish Duff (in his Industry Talking column, page 14) and Ian Miller (Spectrum, page 66) opine, members of the radiocommunications industry in Australasia need to accept the challenge of newer technologies if they are to remain relevant to their customers' concerns and needs. Change is never easy, but it's something that must be faced, embraced and capitalised upon.

Speaking of change, the 'looking behind' part of this issue of Critical Comms deals with some interesting history in the form of the first military wireless signal sent in NSW, and also in the form of the upcoming centenary of the WWV radio time signal service. WWV is based in the US, of course, but do you remember Australia's home-grown version, VNG? For a long while it provided a vital service for many people involved in all sorts of endeavours. But VNG is now long gone, its service replaced by GPS timing signals and other solutions... just another one of those changes mentioned above.

*Jonathan Nally, Editor*  
jnally@wfmedia.com.au

# Calendar

## November

**Comms Connect Melbourne 2019**  
20-22 November  
Melbourne Convention & Exhibition Centre  
[comms-connect.com.au](http://comms-connect.com.au)

## December

**21st PSCE Conference in Paris**  
3-5 December  
[psc-europe.eu](http://psc-europe.eu)

## March

**BAPCO Annual Conference & Exhibition**  
10-11 March 2020  
[bapco.org.uk/events/](http://bapco.org.uk/events/)

## May

**Comms Connect New Zealand 2020**  
6-7 May 2020  
[comms-connect.com.au](http://comms-connect.com.au)

## June

**Comms Connect Sydney 2020**  
June 2020  
[comms-connect.com.au](http://comms-connect.com.au)

**Critical Communications World 2020**  
17-19 June 2020  
[tcca.info](http://tcca.info)

## August

**AFAC20**  
25-28 August 2020  
[afacconference.com.au/afac20-powered-by-interschutz/](http://afacconference.com.au/afac20-powered-by-interschutz/)

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



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# LA-RICS' STATE-OF-THE-ART COMMS COVERAGE

*Scott Edson*

LA-RICS is connecting emergency services agencies across an area of almost 13,000 square kilometres, home to more than 10 million residents.





**T**he Los Angeles Regional Interoperable Communications System (LA-RICS) is a modern, integrated wireless voice and data communications system that will support 34,000 first responders throughout the greater Los Angeles County region. Serving both first (law enforcement, fire and emergency medical services) and secondary (public works, transportation etc) responders, LA-RICS will provide seamless voice and data interoperability among the numerous agencies tasked with serving the most diverse geographical region in the United States.

LA-RICS is the largest and most complex local public safety communications project in the United States, integrating two distinct networks into one system: voice via LMR, and data via Public Safety Broadband Network (PSBN) as it is absorbed in the National Public Safety Broadband Network (NPSBN) as deployed by the First Responder Network Authority (FirstNet).

The LMR network is a digital trunked voice radio subsystem with an analog conventional voice radio system overlay. Although much of data demand will ride on the NPSBN, LA-RICS is also implementing a narrowband mobile data network to ensure connectivity where LTE is not available. This will provide day-to-day radiocommunications for individual public safety agencies, enable interoperability among member agencies and mutual aid providers, and support communication with regional, state and federal agencies in the event of a disaster.

The public safety broadband network provides wireless network coverage using LTE technology. It provides day-to-day communication for individual public safety agencies and a data network for secure, high-speed access to life-saving multimedia information.

The initial LA-RICS build is in the process of being absorbed into the NPSBN by AT&T, the government-selected vendor for the FirstNet deployment. Additionally, LA-RICS is implementing an additional 26 sites in order to augment coverage where the region's public safety personnel need it. Our efforts are primarily focused on the Los Angeles/Long Beach Port Complex and in the Angeles National Forest. LA-RICS is also implementing sites in local independent cities that are seeking to move to FirstNet but want to ensure coverage is acceptable prior to moving to FirstNet.

## A clear and present need

The 9/11 terrorist attacks fully revealed the lack of interoperable communications among first responders. Police, fire and emergency medical personnel were unable to readily communicate with each other, resorting to the exchange of handheld radios to relay information. The 9/11 Commission Report, released in 2007 following an exhaustive review, noted the critical need for interoperable communications between first responders. While efforts in Los Angeles County were already underway, the 9/11 Commission Report provided further urgency.

Los Angeles County presents many obstacles to such a system, most notably its geographic diversity and its jurisdictional complexity. But those obstacles are the fundamental reason for the demand for interoperability. L.A. County encompasses an area of almost 13,000 square kilometres with more than 10 million residents, making it the most populous county in the United States.

Within those confines are 3000-metre-high mountains, forests, valleys, lakes, rivers, desert and islands situated off the 100 kilometres of Pacific Ocean coastline, all of which present geographical challenges to reliable communications.

In addition, L.A. County consists of 88 incorporated cities and 76 distinct unincorporated areas served by more than 80 separate public safety agencies using a patchwork of 40 ageing radio networks and independent commercial data networks. This historical disparity results in the inability to seamlessly communicate with each other during times of emergency or mutual aid.

In most cases, police officers have been unable to communicate with fire personnel by radio, leading to delayed coordination. It is common for police officers to be unable to communicate with officers from another jurisdiction during emergencies.

While there have been efforts to connect, or 'patch', some of these disparate systems, those agencies must continue to rely on their own often ageing legacy networks, and are limited to voice-only communication on the T-band, which will be lost for public safety use in a few short years. Data service is limited to commercial carriers with public safety unable to receive commitments for priority service.

## Voice and data

With its diverse landscape and jurisdictional complexity, the need to provide modern, reli-



able interoperable communications capabilities for law enforcement, fire and emergency medical services was readily apparent. So, in 2009 LA-RICS was formed pursuant to a Joint Powers Agreement between multiple government entities, with a board of directors providing oversight, for the purpose of building a state-of-the-art system that would allow seamless communication among all public safety users and first responders.

The road to begin was a rocky one at first. Due to ever-changing requirements, funding availability, and environmental and procurement obstacles in a project of this size and scope, the initial project was delayed. In the meantime, an opportunity arose when Congress created FirstNet to establish a nationwide broadband network dedicated to first responders.

Realising the value of integrated data and voice communication, LA-RICS received a national grant to be an 'early builder' of a dedicated public safety broadband data network, which could be integrated into the LA-RICS LMR network, thereby creating a fully integrated voice and data system. This greatly expanded view of interoperability has resulted in new and creative tools for public safety.

Once again there were further delays due to ongoing funding issues, extensive environmental requirements unique to California and political posturing as well. But the recognised value of LA-RICS overcame all those issues and construction began.

The PSBN was first to start construction, followed by the LMR network. All sites are designed with the most stringent requirements possible, such as independent generator back-up power and 8.0 earthquake standards. Requirements far exceed those of commercial carriers in order to ensure uninterrupted service for public safety during any foreseeable event.

In hindsight, the delay in starting the LMR provided the opportunity to acquire and adopt data technology which greatly enhances the



WITH FIRSTNET INTEGRATED INTO LA-RICS, USERS WILL HAVE PTT AND DATA CAPABILITIES VIA COMPUTERS, COMMERCIAL HANDHELD CELLULAR DEVICES, OR ALMOST ANY DEVICE CHOSEN BY A PARTICULAR AGENCY.

functionality of a voice-only network to form a fully integrated voice and data system. The inclusion of data into LA-RICS' original vision will now enable users to use portable radios, smartphones, tablets and laptops, computers or other devices to convey information in any format.

LA-RICS is P25 compliant, adhering to a national standard for current and emerging digital voice and data communication systems for public safety and first responders.

Currently, LA-RICS is beginning to construct the final 26 sites for inclusion into the NPSBN while continuing to build its LMR network. To date, approximately 60% of the voice sites are currently completed or under construction, with an ultimate total of 58 to be built.

While LA-RICS continues to build and implement LMR, the new NPSBN sites will be part of the national FirstNet system being managed by AT&T. LA-RICS is proud to be an early builder of this national system, enabling us to better integrate this data network into the LA-RICS mission.

With FirstNet integrated into LA-RICS, users will have PTT and data capabilities via computers, commercial handheld cellular devices or almost any device chosen by a particular agency. This will enable the use of a broad range of applications for situational awareness and to provide a common operational picture for all users. Future plans include the acquisition of mobile vehicles which can be quickly deployed onsite to provide temporary additional FirstNet coverage when needed.

### System of systems

A clear example of how LA-RICS benefits public safety through its common operational picture can be seen during the annual Rose Parade in Pasadena. Due to its threat potential, local, state and federal agencies partner to ensure an enjoyable event.

One million visitors gather along an eight-kilometre stretch of the parade route. Fifteen video cameras are installed along the route providing streaming video to the multi-jurisdictional command post. In addition, personnel carry smartphones which also receive the video feed. On those same smartphone devices, personnel can communicate directly with police and fire personnel from the partnering agencies who are using standard handheld radios.

The Los Angeles County region is also highly susceptible to massive fires, which,

unfortunately, are frequent throughout California. With LA-RICS, fire personnel can utilise mobile devices to paint a graphic picture of plans, escape routes, trouble spots or evacuation centres. These maps can be immediately viewed by all LA-RICS users on handheld or in-car devices, providing a real-time operational picture of firefighting activities.

While some agencies may continue to utilise their own system, at least in the short term, LA-RICS is committed to ensuring interoperability with 'outside' systems. Those outside systems are either restricted to certain geographical areas, restricted to T-band usage which will be lost for public safety use in a few years or rely on legacy systems which are increasingly prone to failure.

LA-RICS has been designated as the 'hub' system for any other legacy systems that agencies may wish to maintain, thereby ensuring that those disparate systems will connect to the LA-RICS LMR system. This 'system of systems', with LA-RICS as its heart, will ensure that all agencies, no matter what system they utilise, will benefit from full interoperability with the ultimate benefit being provided to the public at large.

### Mobility and flexibility

With LA-RICS, users are able to communicate in any form using any type of device. Voice, data, video, pictures, mapping and location services are just some of the benefits. For instance, the use of telemetry will allow emergency medical personnel to stream critical information to doctors on their laptops or mobile devices through an encrypted, dedicated, high-speed network.

Whether users have vehicle or handheld radios, handheld smartphones devices, personal computer or tablets, or personal communication devices, LA-RICS operates on a diversity of devices that enhance 'away-from-vehicle' mobility and flexibility to access all forms of information.

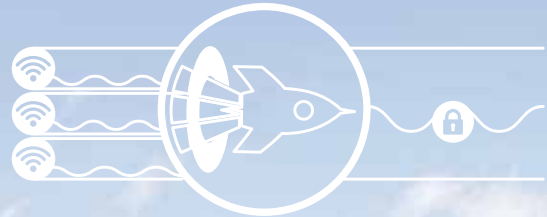
Despite the diversity of public safety bands and frequencies currently being utilised, LA-RICS will provide a state-of-the-art platform that can also accommodate interoperable communication without regard to the frequencies being utilised by outside agencies that enter into L.A. County. LA-RICS will ensure that no first responder is left being unable to freely communicate.

*Scott Edson is Executive Director of LA-RICS, the Los Angeles Regional Interoperable Communications System.*





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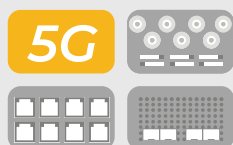


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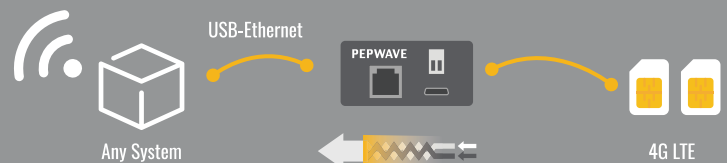
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## RF TEST SOLUTIONS TO DISTRIBUTE ADLINK IN NZ

ADLINK Technology has named RF Test Solutions as the first authorised distributor of its test and measurement products in New Zealand. ADLINK said the partnership was advantageous as RF Test Solutions has national coverage in New Zealand, an online sales service and an in-house ISO 17025 accredited calibration lab that provides aftersales repair and calibration for sold products. RF Test Solutions has also been authorised to consult and provide support for ADLINK's products. ADLINK's Asia Pacific Regional Business Unit General Manager, Vincent Tseng, said: "Today's application needs are complex and dynamic, making it extremely important for customers to identify the right products and solutions for their operational needs."

More info: [bit.ly/2MVmhNT](http://bit.ly/2MVmhNT)



## NEW STATION TO SUPPORT SPACE COMMS

A laser and optical communications lab is set to be installed at Canberra's Mt Stromlo Observatory, in a project worth \$2.4 million. The 'Quantum Optical Ground Station', to be built by the Australian National University (ANU), will develop technologies that allow licence-free and secure high-bandwidth data transmission to and from space, according to project lead Dr Francis Bennet, from ANU's Research School of Astronomy and Astrophysics. ANU Provost Professor Mike Calford said the new station "will help position Australia and the ACT as one of the world's leading centres in the burgeoning field of quantum space communications, and boost the nation's space efforts".

More info: [bit.ly/31sDzaA](http://bit.ly/31sDzaA)

## Digital multimeter with remote display

The Fluke 233 Digital Multimeter, available to rent from TechRentals, features a removable display which gives the user flexibility in unusual measurement scenarios. Users can simply put the meter where measurements are required and place the display where it can be seen easily. This functionality eliminates the need to juggle leads and the meter while reaching into confined spaces.

With a range of 10 m, the removable display allows for measurement in hard-to-reach spaces and machines or panels that are physically separated from a limit or isolator switch. It can also be used in environments unsuitable for operators such as clean rooms or hazardous areas. The product features True-RMS AC voltage and current for precise measurements on non-linear signals. It can measure up to 1000 V AC and DC, up to 10 A (20 A for 30 s), and has a capacitance range of 10,000  $\mu$ F.

**TechRentals**

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



## Software solutions

Sepura's AppSPACE is a software environment that can transform TETRA radio and operations capabilities, enabling user organisations to tailor radios to specific workflows and requirements. This includes the ability to customise radios' look, feel and function and connection to safety and critical equipment via Bluetooth, Wi-Fi or RFID.

It also enables safety monitoring of frontline officers by the scene commander or control room and the exchange of incident information with the control room to improve situational awareness and mission outcomes. Examples of applications include telemetry monitors, job dispatch and status reporting and a failed call reporter that enables an organisation to identify areas of poor coverage to improve future communications.



Sepura's SC Series hand-portable and mobile radios also feature Wi-Fi over-the-air programming (OTAP), allowing remote upgrades, in the field, with minimum disruption to radio operation. This can help organisations save time, reduce costs and keep radios in service with automatic reprogramming and updates for greater operational efficiency.

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## SEPURA RADIOS SET SAIL UNDER NEW DEAL

Sepura radios are setting sail under a new deal between the company's partner, Swedish Radio Supply, and the Swedish Sea Rescue Society (SSRS). The hand-portable and mobile TETRA radios will support the SSRS's 2200 volunteers and three full-time staff in patrolling inland waters and beaches and their continued rescue work. Currently, the SSRS has 71 rescue stations and is involved in 80% of all sea rescues in Sweden. According to Sepura, these stations will be supplied with STP9000, SC20 and SC21 radios, which can be programmed to meet their local base's operational needs using the company's Radio Manager software.

More info: [bit.ly/2Mv8TRv](http://bit.ly/2Mv8TRv)



## MARTY ANDERSON APPOINTED GM, ICOM AUSTRALIA

Marty Anderson has been appointed Icom's General Manager for Australia. Anderson told Critical Comms he will be establishing a dedicated solutions division to support dealers and end users in integrating Icom products with various platforms and protocols. Icom is providing communications support (LTE) for the Tokyo Olympics and Rugby World Cup, with the company intending to use the experience of supporting such high-profile events in future global strategies. "Icom's focus, globally, is on our next-generation products such as LTE, LPWA, satellite and Wi-Fi," Anderson said.

More info: [bit.ly/33QD3Vr](http://bit.ly/33QD3Vr)



## PoC smartphone

Hytera's PNC550 is a smartphone with an integrated Push-To-Talk over Cellular (PoC) function. It is designed to provide loud and clear audio, has a dedicated PTT button and can connect to 2G, 3G, 4G and Wi-Fi.

The dual-SIM Android phone has a 13 cm multitouch Gorilla Glass display that can be used in direct sunlight and while hands are wet or gloved, as well as a 13 MP rear camera and 8 MP front camera for image and video capture as well as a 4000 mAh removable battery to satisfy the long-hour work requirement.

It has a built-in NFC module, allowing information searches, authentication and inspection. It is IP68 rated and designed to be drop-proof up to 1.2 m, meeting military standard MIL-STD-810G.

**Hytera Communications Co. Ltd**

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

## Oscilloscopes

Keysight Technologies' UXR-Series oscilloscopes are single-box, multichannel devices that can measure and analyse wideband mmWaves produced by 802.11ay (WiGig), 802.11ad (gigabit wireless), satellite communications, radar and 5G technologies.

The oscilloscopes can be optionally configured with five or 10 GHz analysis bandwidth windows in and above their natively licensed bandwidth. They have >2 GHz of digital down conversion (DDC) analysis bandwidth that can be used in conjunction with available mmWave frequency extension options to extend DDC accelerated frequency ranges as high as 110 GHz.

They also have good signal integrity, with error vector magnitude (EVM) below 0.6% for 5G NR FR2 tests and 1% for 802.11ay technologies.

**Keysight Technologies Australia Pty Ltd**

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







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# Industry Talking

The end of 2019 is upon us, and the industry will gather again at Comms Connect Melbourne and of course the ARCIA annual Gala Dinner. These two premier events attract people from all over Australia and many from overseas. The dinner is how our association celebrates the year and recognises those in the industry who have been nominated for various awards. And behind every award is a great story, often many years in the making. When you listen to these stories you begin to understand how many people are working on communications projects and the impact they have all over Australia. This is a part of our industry that is not understood by many people, including those in government.

Our industry covers many different wireless technologies, use cases, locations and risk profiles. Technicians are expected to have specific knowledge of the technology they are working on plus a wide range of general experience making them part sparky, engineer, rigger, programmer, IT expert, off-road driver and many more. We may as well call them wireless MacGyvers! So congratulations to all our MacGyvers, and please keep those submissions coming into the ARCIA awards for all events, state and local.

Several events have been held in the last couple of months including the ARCIA South Australia networking event, during which two professional development training sessions were held. We had around a dozen attendees at these valuable workshops, bringing the total number of people trained to over 160 in the past 12 months. Also, the title of South Australian ARCIA Industry Professional of the Year was awarded to Stephen Biggs of the South Australian Ambulance Service for his work over many years in providing great support and good planning for the essential service's communications. Stephen is planning to retire later in the year and the fact that he will represent South Australia for the national Peter Wallace Industry Professional of the Year award in Melbourne in November will be a fitting tribute.

If you haven't already done so, keep an eye on ARCIA-led training sessions at Comms Connect Melbourne. ARCIA will look to do more of these activities in 2020 and we have plans underway to expand the kind of information and training that can be provided. Many groups find that sending staff for these short training sessions, along with a look at all the technology, is a great way to get your staff involved, as well as giving you the benefit of helping to motivate your staff and give them a great learning experience.

On ACMA matters, ARCIA has continued to respond to requests for input on spectrum bands and some members attended a session on potential new spectrum sharing models. ARCIA continues to prosecute the argument that private networks are required by many different user groups and that spectrum should be used as a productivity lever for the country. As an association we have been lobbying the ACMA and Department of Communications to recognise the demand for private or 'enterprise' LTE networks, and recent changes to the licensing regime and spectrum planning are now opening up this opportunity.

When we think about enterprise LTE networks and look at developments overseas like the Citizens Broadband Radio Service in the US, we can see that these types of services will be of real use to our traditional two-way radio clients — so this is an exciting opportunity for our industry and ARCIA members. We have foreseen that this will offer a technology pathway to give our members a long-term business model to provide employment and ongoing business for many years to come. If you haven't thought about getting involved in this part of wireless communications then now is the time to begin to learn about the opportunities it will bring; after all, the potential users are already your clients. It is important to remember that LTE is still basically just a digital radio system... the modulation format might be a little different and the frequencies a bit higher, but it is still just radio as we understand it.



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



## Command and control console system

The Zetron ACOM command and control console system serves at the centre of complex dispatch operations throughout the world.

It delivers high availability, customisation, interoperability and end-to-end redundancy in an enterprise-class server architecture that supports the full use of IP technology.

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# TAKING EMERGENCY SERVICES BACK TO THE FUTURE

*Beatriz Peon*

Next Generation 112 seeks to harness the possibilities of the Internet of Things, smart cities and internet-based communications to help save lives.

A mere 30 years ago, few could have imagined the way technology would shape the world we live in. We may still be far from flying cars and time travel, but surely our hyperconnected reality would have then resembled nothing short of science fiction. The massive implementation of the internet and its further applications have forever changed the way we interact with our environment, proving that connectivity is key.

And connectivity remains at the heart of technological developments if we look at recent big trends such as the Internet of Things, smart cities and 5G, among

others. It is thanks to these advancements that we can now confidently predict a near future where a safer and faster internet is integrated into many more aspects of our lives — not just on dedicated devices but in everyday objects and even into the cities we live in.

There is no doubt of the disruptive potential of these technologies: in Europe alone, these fields are seeing multiple high-level investments, with the European Commission earmarking 700 million euros for the 5G partnership and the EIP-SCC pledging 1 billion euros for 300 smart cities by 2020. But even as citizens everywhere are increasingly moving towards multimedia digital channels





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for their regular communications, emergency services continue to be accessible only by traditional voice call.

Next Generation 112 (NG112) aims to “modernise how citizens can reach help in case of emergency and to interconnect emergency services”.

### From emergency calls to emergency communications

The concept of NG112 relies on developing a technical architecture that will integrate new technologies with emergency services by moving communications to internet-based protocols. Emergency response centres would thus be prepared to receive

not just voice, but real-time text, photos, video calls and other data. Accessing all these new modalities of communications would provide emergency responders with invaluable insight into the situation they are dealing with, greatly improving their work and results.

Not only can NG112 revolutionise the way citizens communicate with emergency services, but the concept also calls for interconnecting emergency services organisations by creating dedicated networks that will provide new possibilities and improvement of their working processes. This way, emergency services organisations can collaborate and support each other; for

example, by diverting calls from an overloaded centre to its neighbours or through a more efficient routing that identified the language of the caller. Moreover, moving onto dedicated networks for public safety organisations would also render them less vulnerable to cyber attacks, securing emergency response and continuity of service in the event of crises.

### The future is here...

Upgrading to ‘emergency communications’ and allowing for the collection of far more data can only result in an optimised, more efficient response. Technology is bringing the future closer than ever, and the possibilities coming with it can be, literally, life-saving. But are we making the most out of them?

Implementing NG112 addresses many difficulties currently faced by emergency services and citizens. Just by enabling live text and video communications, public safety organisations would be able to grant accessibility to emergency services to citizens living with disabilities. In Europe alone, they represent 80 million of the total population and are routinely excluded from access to emergency response as this service remains voice-call based only.

Other outcomes of integrating already existing technologies would enable emergency services to receive immediate caller location information, and to provide remote assistance in emergencies. Telecommunications and data transfer technologies can bring doctors to remotely assess the condition of patients in real time as they are being transported in ambulances. This scenario is already a reality in places like Aachen (Germany), where a holistic telemedicine system has been in place for five years.

Possibilities of connectivity to emergency services extend as well to connected objects. As the market expands



for wearables (activity bracelets, smart watches) and other devices, these could be enabled to contact emergency services and transfer vital information in case of emergency. We are already witnessing some applications where connected objects can be configured to save lives. Recently this year, an intelligent watch called emergency services after detecting its 80-year-old wearer had fallen in her apartment in Germany.

Once integrated, bilateral communications could be made possible between emergency services and connected devices. Not only would intelligent objects be able to alert emergency services, they could also broadcast public warning messages (what is called 'reverse 112'). Intelligent home speakers could in this way alert of nearby emergencies, such as a breaking fire, and inform their users on how to react.

Some of these integrations are already a reality in the United States and Canada, which pioneered their concept of next-generation emergency services: NG911. Launched by the American National Emergency Number Association almost 20 ago it sought to acknowledge and embrace a new base technology. Efforts resulted in many states moving quickly towards the implementation of NG911. One of these states was Maine, where the switch was motivated by the need to modernise an ageing emergency response system and adapt it to a growing data-rich environment, as explained at the 2019 EENA Conference by Maria Jacques, President of the US National Association of State 911 Administrators. Immediate benefits of this



ONCE INTEGRATED, BILATERAL COMMUNICATIONS COULD BE MADE POSSIBLE BETWEEN EMERGENCY SERVICES AND CONNECTED DEVICES.

transition included calls being transferred based on caller location, flexible routing of calls, a system easier to access and update, and cost savings amounting to over US\$1 million annually.

NG112 is still almost non-existent in Europe, where most emergency services remain reachable only by voice call. Latest developments include EENA's pilot project, launched last April, which brings together international consortia where partners will test the technical architecture enabling NG112 in different European countries, with a focus on demonstrating its use in real-life environments.

Emergency services from Austria, Italy, Denmark, Croatia and Turkey have replied to EENA's initiative and presented their plans to test NG112. At the end of the project, the lessons learned and final results will be shared with the community.

### We need to make it happen

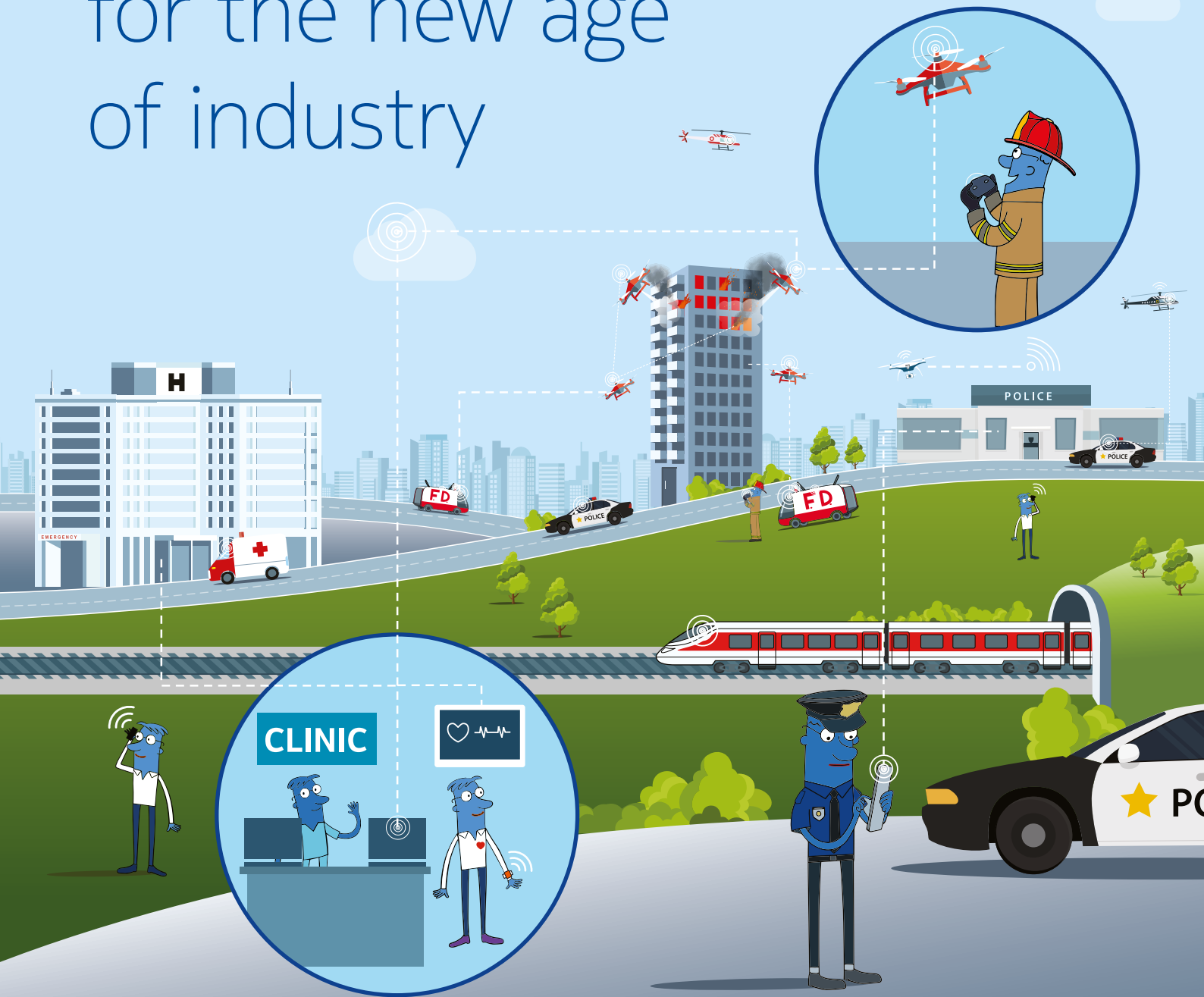
NG112 is not only the next step in emergency communications but a crucial one. As telecommunications move towards internet-based protocols, the public switched telephone network is set to be phased out soon. This move risks to render emergency numbers inaccessible if they remain one of the services available only by traditional phone calls.

Technology evolves, so does the way we interact with it and our environment, and, of course, the way we communicate. Emergencies are not an exception, and citizens in distress will expect to be able to reach out via the communications methods they use every day. This is a revolution emergency services must not be excluded from, but rather embrace this opportunity to become more efficient, accessible and flexible, launching a new generation of emergency communications.

*Beatriz Peon works as PR & Communications Manager at EENA, a Brussels-based NGO with the mission to contribute to improving the safety and security of people in Europe and beyond.*

**Make sure you don't miss the Next Generation Triple Zero presentation by Chris Beatson at Comms Connect Melbourne in November. Beatson is Director, NSW Police Force-PoliceLink Command, and lead on the National Emergency Management Program Project — Next Generation Triple Zero (000). His presentation is scheduled for Thursday, 28 November 2019 at 11.30 am.**

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# NEXT GENERATION TRIPLE ZERO IS COMING

Jonathan Nally

Australia's long-awaited Next Generation Triple Zero (000) service will be introduced in stages, beginning in 2020.

Australia's Triple Zero (000) is a well-known, long-established and very reliable emergency contact capability, which has served the country well for many years. However, in the modern era it is somewhat handicapped, in that it is a voice-only service provided via telephone. This is preventing both the public and emergency service organisations from utilising and leveraging the latest technologies and applications that now exist since the introduction of smart devices.

Australia's Next Generation Triple Zero (NG000) strategy has been developed to enable the service to accept data and information from modern devices and applications, enabling callers to provide information such as location data and imagery, and access Triple Zero (000) via other means such as messaging services and social media.

NG000 isn't here yet, but it's not too far away. To get an update on it we spoke with Chris Beatson, who is lead on the National Emergency Management Program Project — Next Generation Triple Zero (000). He is also Director of the PoliceLink Command for the New South Wales Police Force.

## What is the current status of the NG000 project?

The NG000 Strategy has been adopted by the federal government, which has responsibility for the Triple Zero (000) service. Telstra, the contracted Emergency

Call Person (ECP), has just completed its technology refresh to enable NG000.

The first major initiative is Advanced Mobile Location (AML). AML will source the GPS information from the handset being used to contact Triple Zero (000) and provide this information with the call to emergency service organisations. This will be implemented in May 2020. All emergency service organisations are now working with their computer-aided dispatch (CAD) vendors to enable AML to be received.

The next stage of the NG000 strategy is being discussed with the federal government. This stage will encompass 'messaging to 000', enabling those who can't communicate through voice to contact Triple Zero (000). This will provide benefit, for example, to the hearing impaired and those who will be placed in danger if they speak. Discussions are now occurring with the telecommunication carriers.

## Which organisations are involved in establishing NG000?

The NG000 strategy is a partnership between the federal government, Telstra as the ECP, emergency service organisations, telecommunication carriers and public safety vendors.

## Have there been any lessons learned from implementation of similar systems overseas?

The National Communications Working Group – Australia and New Zealand

(NECWG-A/NZ) has signed an MOU with the National Emergency Number Association (NENA) in the US and has affiliated with the European Emergency Number Association (EENA). All three of our groups have developed next-generation strategies.

The sharing of strategy, standards and implementation documentation has benefited all three groups to deliver an effective next-generation strategy for each jurisdiction. NECWG-A/NZ members have visited both the USA and Europe to discuss next-generation strategy rollouts.

## What will delegates learn from your upcoming presentation at Comms Connect Melbourne?

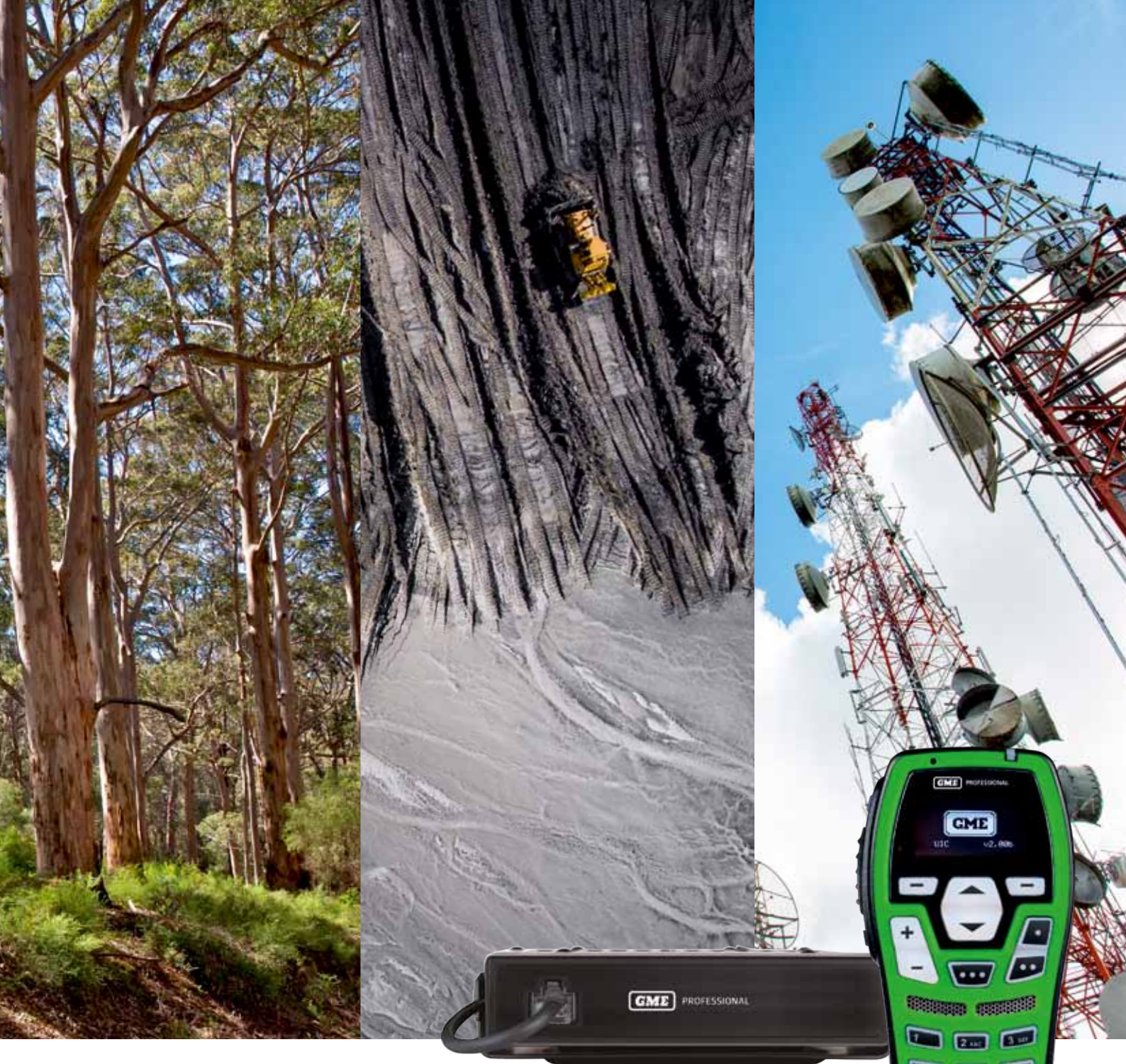
Delegates will be appraised of developments in the NG000 space, and what future changes are being considered for NG000 as NECWG-A/NZ partners with public safety vendors in considering developments in artificial intelligence, machine learning and 5G technologies.

## Any final points you'd like to make?

The positive for Emergency Service Organisations is that NG000 has been embraced by the federal government and public safety vendors, ensuring that the benefits that will be delivered through the strategy will be realised.

Chris Beatson's presentation, 'Next Generation Triple Zero — it's happening,' will be given at Comms Connect Melbourne at 11.30 am on 28 November 2019.





## Introducing the CM60 Series

Designed, engineered and manufactured in Australia for the toughest conditions, the CM60 Series provides a robust solution ideal for both the large systems integrator with an extensive network of mobiles, portables and repeaters, or the small operator with a single site.

The CM60 Series provides an analogue solution with optional licensing upgrades for P25 in Conventional, Trunk and AES 256-bit Encryption.

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All CM60 variants are compliant with AS/NZS 4295 (LMR). UHF variants are compliant with AS/NZS 4365 (CB) and all P25 variants are CAP (Compliance Assessment Program) compliant, conforms to TIA-102 Standards.



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# Hytera explosion-proof radio — solid guarantee for work safety



Numerous industrial processes give rise to dangerous gases and dusts, necessitating the use of the highest standards of safety equipment.



**F**lammable gases and combustible dusts are often present in the energy industry, such as in oil and natural gas, as well as in mining, the chemical industry, firefighting, hazardous chemicals management and airports. In these settings, a spark or burst of energy could cause an explosion, requiring the availability of special explosion-proof devices and equipment to guarantee a safe working environment. Work safety is a core mission of Hytera. From its years of in-depth research, Hytera has developed a series of explosion-proof radios. Its continuous technological innovation has produced the ultimate explosion-proof performance for its products. Its family of explosion-proof radios have received certifications IECEx, ATEX, FM, CSA, CQST, UL913 and TIA-4950 and approvals for use in explosive gases and combustible dusts environments. Hytera digital explosion-proof radios meet multiple explosion-proof certification levels and are able to satisfy the needs of a variety of customers. These radios have achieved a series of explosion-proof certification levels, from IIB explosion-proof level to IIC (protection in the most explosive gas environment-hydrogen), and from ib explosion-proof level to ia. Explosion-proof equipment certified with an ib level is for use in zone 1; those certified ia are for use in zone 0.

Hytera technological innovation in explosion-proof radios is in line with changing customer needs and has placed Hytera in the forefront of industry development. Currently, Hytera supplies thousands of users in the world with trunking systems and also provides tens of thousands of explosion-proof intercom terminals for the Moscow AO Refinery and Salym Petroleum Development N.V. in Russia, SINEREP Oil and Gas Company in Congo, and Arabian Amines Company in Saudi Arabia. Hytera launched the world's first TETRA portable two-way radio with the highest intrinsic safety level, ia, the PT790Ex, which is operable in places that contain ethylene, dimethyl ether, coke over gas, hydrogen, acetylene and carbon disulphide.

In 2016 Hytera launched ia- and IIC-level explosion-proof radio, the portable DMR two-way radio PD79XIS, which is one of the only products with the highest explosion-proof level and show the leading position of Hytera in the aspect of explosion-proof technologies. Offering safe, reliable communications, the Hytera PD792IS handheld digital radio with screen and full keypad has been designed to comply with the highest ia standards, making this the ideal communication solution for working environments that require advanced, intrinsically-safe devices.



In underground mining it is common to come across methane gas and highly combustible powder. These are hazardous as they can be ignited with small sparks, causing huge explosions. The PD79XIS and PT790Ex are designed with totally encapsulated components within enclosed shields to prevent arcing and the thermally conductive encapsulant further prevents hot spots, allowing safe operations in these highly combustible areas while facilitating communications in underground mines for personnel to perform their operations. There are many explosive and hazardous environments where ia-rated radios are required, as follows:

**Chemical industry.** Flammable gases, liquids and solids are converted and processed in many

different ways in the chemical industry. These processes may give rise to explosive mixtures.

**Landfill tips and civil engineering.** Flammable gases may arise in landfill tips. Elaborate technical arrangements are needed to avoid uncontrolled gas emission and possible ignition. Flammable gases from various sources may collect in poorly ventilated tunnels, cellars, etc.

**Power generating companies.** Lump coal, which is not explosive in mixture with air, may be converted in the conveying, grinding and drying processes into coal dusts capable of forming explosive dust/air mixtures.

**Firefighting.** As for firefighting, some task-critical situations such as oil spills or natural gas leakage need high-security electrical equipment.

**Gas suppliers.** Explosive gas/air mixtures may be formed when natural gas is released, e.g. by leakage.

**Paint-spraying operations.** The overspray generated in paint spray bays and the solvent vapours released may give rise to explosive atmospheres when mixed with air.

**Agriculture.** Biogas production plants are operated on some farms. Explosive biogas/air mixtures may arise if the gas is released, e.g. by leakage.

**Mining.** The by-product of coal mining is gas. Following coal extraction, gas will gather underground, which can lead to serious explosions.

**Food and feedstuffs industry.** Explosive dusts may arise during transport and storage of grain, sugar, etc. If they are exhausted and collected by filtering, explosive atmospheres may arise in the filter.

**Pharmaceutical industry.** Alcohols are often used as solvents in the production of pharmaceuticals. Agents and auxiliary materials that give rise to dust explosions, such as lactose, may also be used.

**Refineries.** The hydrocarbons handled in refineries are all flammable and, depending on their flash point, may give rise to explosive atmospheres even at ambient temperatures. The area around oil processing plant is generally regarded as a place where explosive atmospheres may occur.

**Recycling operations.** Processing of waste for recycling can give rise to explosion hazards, e.g. from cans or other containers of flammable gases and/or liquids that have not been completely emptied, or from paper or plastic dusts.

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# SAR COMPLIANCE IN AUSTRALIA

Chris Zombolas, EMC Technologies

The possibility of harmful effects of EMR has forced regulators to introduce SAR measurement standards for mobile and portable transmitting devices.

**R**egulations protecting people from exposure to harmful levels of RF electromagnetic radiation (EMR), also known as electromagnetic energy (EME), have been in force in Australia since 1990. The EMR regulations set limits for the specific absorption rate (SAR) of virtually all consumer RF transmitting devices. This article will discuss the Australian EMR regulations and the SAR measurement methodologies prescribed for the compliance testing of a range of wireless transmitting devices used in close proximity to the human body.

## Introduction

There has recently been a proliferation of mobile and portable transmitter (MPT) devices that are used in close proximity to the human body. To ensure the protection of the public and workers from exposure to RF EMR, most countries have enforced regulations and standards to limit the exposure of persons to RF fields from MPT devices that have an integral antenna.

To legally market MPT devices in Australia, suppliers must comply with the provisions of the Australian Communications and Media

Authority (ACMA) regulations on EMR and specific absorption rate (SAR). The ACMA has mandated the Radiocommunications (Electro-magnetic Radiation Human Exposure) Standard 2014, known as the EMR Standard.

This regulation has mandated the exposure limits prescribed by the human exposure standard published by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

The RF human exposure evaluation methods differentiate between portable and mobile devices according to their proximity to exposed persons. Current methods of measurement are intended for devices used at the ear or devices used near other parts of the body. When MPT devices are used at a distance exceeding 20 cm from the human body and operate over the range 100 kHz to 300 GHz, the exposure levels can be evaluated with respect to electric or magnetic field strength limits. These limits are often referred to as Reference Levels and measurement is generally straightforward using conventional RF field meters or assessed by computation techniques.

When the antenna of an MPT device is less than 20 cm from the human body, measure-

ment with a conventional EMR meter is not suitable because of the difficulty in trying to measure field levels in the extreme near field of a radiating antenna. The perturbation of the radiating fields caused by the close proximity of the human body adds further unacceptable measurement errors.

At distances closer than 20 cm, only SAR measurements may be used to determine compliance with the ARPANSA and ACMA requirements. The ARPANSA standard prescribes the limits and the criteria to be used to determine the appropriate evaluation method, ie, SAR or Reference Levels.

## SAR limits, regulations and standards

SAR is a measure of the rate at which RF energy is absorbed per unit mass of human tissue (W/kg or mW/g). Australian and European human exposure standards have adopted the ICNIRP recommendations, which set SAR spatial peak limits of 2 W/kg measured in a 10 g cube of tissue for devices used near the head or body. The Federal Communications Commission (FCC) in the USA specifies SAR spatial peak limits of 1.6 W/kg measured in a 1 g cube of tissue. MPT devices are evaluated





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for SAR using the standard IEEE1528 while other devices are evaluated using Specific FCC published procedures known as FCC KDBs.

The SAR measurement methodologies for Australia are given in EN62209-1 (devices used at the ear) and EN 62209-2 (devices used at the body).

### Influences on measured SAR

SAR is a measure of the rate of energy absorption per unit mass of tissue at a specific location in the tissue medium.

$\sigma$  = conductivity of the tissue (S/m)

$\rho$  = mass density of the tissue (kg/m<sup>3</sup>)

$E$  = rms electric field strength (V/m)

For most handheld transmitters, the antenna radiates within 1–2 cm of the user's head/body. Even at low power levels, relatively high field strengths would be expected near the antenna. The actual field strength is highly dependent on the location, orientation and electromagnetic characteristics of adjacent objects, including the user's body. The RF energy is scattered and attenuated as it propagates through the body tissues. To account for near-field energy coupling effects, portable transmitters are evaluated with realistic head and body models (phantoms).

### Current SAR measurement standards

The scope of both parts of current SAR measurement standard EN 62209 is limited to devices used up to a frequency range of 6 GHz.

The recently published IEC/EN 62209-1:2016, applicable for devices used at the ear over the frequency range 300 MHz to 6 GHz, has been adopted in Europe and Australia. No current harmonised standards exist for frequencies above 6 GHz; however, work on this is currently underway in international standards bodies. The latest standards also cater for concurrent exposures from multiple transmitters.

### SAR evaluation criteria

Evaluation of an MPT device for compliance against the ARPANSA limits is determined by its specific characteristics eg, frequency, power and duty cycle as well as the intended operating positions and proximity relative to the human body. The scope of the ACMA EMR Standard 2014 applies in the range 100 kHz to 100 GHz while the SAR requirements are currently limited to the range 150 MHz to 5.8 GHz. The criteria and evaluation methods are summarised in Table 1.

When the RF transmitter power is less than 20 mW averaged over 6 minutes, it is virtually impossible for the device to exceed the ARPANSA basic restrictions so it is deemed to comply without testing. This is referred to as the 'non-evaluation criteria'.

For devices used within 20 cm of the human body, and the RF transmitter exceeds 20 mW average, compliance can only be determined by means of SAR measurements. The power threshold is 100 mW for aware user devices. Note that this is not consistent with USA (FCC) and Canada (ISED) requirements.

### Devices used at the ear

In Australia, the EMR Standard 2014 accepts test method EN62209-1 for SAR measurements on mobile phones and similar devices and operating in the range 300 MHz to 6 GHz. The test report (from an accredited SAR test laboratory) must include the specific test data and other relevant information.

The Specific Anthropomorphic Mannequin (SAM) is specified for devices used at the ear and is called up by the published standards.

The SAM head phantom is based on the selected dimensions of a large anthropomorphic database of males and has specified dimensions and dielectric properties.

### Test sample configuration

A mobile phone is tested against the SAM phantom in the positions that are precisely defined in the standard. The phone is set for centre frequency channel at maximum transmit power and the SAR measured in both 'tilt' and 'cheek' positions on the left and right sides of the head. The position of highest SAR on each side of the head is then tested for the upper and lower frequencies of the band. If the mobile phone has a retractable antenna, all of the tests described above are performed with the antenna extended and retracted.

The entire process is repeated for each transmitting band and each operating mode that is likely to result in higher SAR. Typical modes include GSM, 3G and 4G, and Wi-Fi. Simultaneous activation of different operating modes such as IEEE802.11a/b/g WLAN and Bluetooth functions is necessary if consistent with normal use. Configuring the mobile phone for normal operation in each operating mode can present a major challenge for the test engineer. Generally, it is not possible without sophisticated base station simulators and controllers.

USER POSITION	APPLICABLE FREQUENCY RANGE	ARPANSA/ ACMA EVALUATION METHOD
>20 cm from human body	100 kHz to 100 GHz	Power density or field strength reference level measurements — EMR meter or computation per AS/NZS 2772.2
20 cm or less from human body, >20 mW	150 MHz to 5800 MHz	SAR measurement if more than 20 mW — EN62209-2
Close proximity to human ear, >20 mW	300 MHz to 6000 MHz	SAR measurements at the ear, mobile/portable phones — EN62209-1
Less than 20 cm from human body	100 kHz to 100 GHz	If less than 20 mW — deemed to comply without testing

Table 1: ACMA EMR Standard 2014 Evaluation Criteria.



NO CURRENT HARMONISED STANDARDS EXIST FOR FREQUENCIES ABOVE 6 GHz; HOWEVER, WORK ON THIS IS CURRENTLY UNDERWAY IN INTERNATIONAL STANDARDS BODIES.

### Devices not used at the ear

The EMR Standard 2014 requires compliance for MPT devices operating over the range 100 kHz to 100 GHz. SAR measurements are specified over the range 150 MHz to 5.8 GHz. Compliance by means of SAR computation is currently excluded. An important difference between the FCC and ACMA methods is that ACMA SAR spatial peak limit is 2 W/kg averaged over a 10 g tissue mass compared with the FCC spatial peak limit of 1.6 W/kg averaged over a 1 g tissue mass.

Devices covered by the ACMA EMR Standard 2014 include mobile phones (belt clip position), PTT transmitters, body-worn transmitters, WLAN transmitters in laptop computers and generally all transmitting devices used within 20 cm of the human body that transmit RF power exceeding the ARPANSA threshold levels per the criteria of Table 1. The scope includes hi-tech clothing, wrist-worn cellular devices and body-worn IoT devices, to name a few.

### Body phantoms for devices not used at the ear

A body phantom (also known as a flat phantom or box phantom) is specified for devices not used at the ear. The body phantom must be constructed from low-loss dielectric material with specified dimensions. The length and width of the flat phantom must be at least twice the corresponding dimensions of the device under test, including its antenna.

The tissue simulating liquid is based on the average dielectric values of muscle tissue and must be a depth of 15.0 cm.

### Test sample configuration

The body-worn position is simulated by placing the MPT device against the flat phantom and SAR is measured for each frequency band for the upper, middle and lower frequencies. Devices having an operating bandwidth of less than 10 MHz need only be tested at the centre frequency. A total of three SAR scans is usually sufficient for body-worn devices if the highest operating duty factor is used.

The effect of different operating modes, battery types and other accessories must be investigated. Battery droop or RF power drift must be factored into the final SAR result. Accessories such as headsets and microphones should be connected as per normal use and positioned against the flat phantom.

The ACMA setup for multimode devices differs from the FCC method. Special tests are described for devices where the difference between the highest output of a low-output mode and the lowest output of the high-output mode exceed 2.0 dB.

### Tissue simulating liquid

The dielectric properties of the brain and muscle tissue simulating liquids are provided in the standards. The tissue dielectric values for the centre frequency of the transmission band should be within 5% of the target value.

Linear interpolation should be used for other frequencies. The dielectric properties for muscle tissue simulating liquid are given by current FCC and ACMA standards and are provided in IEC 62209-1 and IIEC 62209-2. It is important to note that there are differences between these standards and IEEE1528 (used for FCC testing).

### Laptop and tablet portable computers

EN62209-2 prescribes the methodology for SAR testing of laptop/tablet PCs. The location of the antenna determines whether or not SAR evaluation is required. Is it on the bottom? Along the front? On the lid? Can it operate with the lid closed? The highest measured SAR levels generally correspond to the location of the antennas and their proximity to the body. When the laptop PC is used in what is considered a 'typical' use position and the antenna is located at less than 20 cm from the any part of the human body, then SAR evaluation is necessary.

**Lap-held position:** This position simulates a laptop/tablet PC used on a person's lap. The bottom side of the laptop is pressed against a flat phantom.

**Arm-held (interactive display) position:** If a tablet PC has display-mounted antennas and an interactive screen display then this test configuration may be applicable. The face of the tablet screen is pressed against the flat phantom.

**Edge position:** SAR evaluation is required when antennas are located along the edges of the screen surround as normal use is within 20 cm of the human body.

**Other positions:** All typical use positions must be considered including the 'back of lid' position.



## WLAN/Wi-Fi devices

WLAN/Wi-Fi transmitters installed in laptop computers or handheld devices must be assessed in a host device. Each operating mode must be assessed and device modulation, power output and duty cycles must be taken into account. The intent is to ensure that the worst-case SAR is determined. Some personal portable computers use three bands eg, 2.45 GHz, 5.2 GHz and 5.8 GHz and some also include the Bluetooth function. If each WLAN module has an antenna then the cumulative (worst-case) SAR levels should be determined.

Using pre-approved transmitter modules does not guarantee compliance because it is not known how the original module was configured for the original compliance test. In some cases, different antennas are used, or different modules using different modes may operate simultaneously.

## Two-way radios (PTT)/portable phones

PTT two-way radios and portable phones operating in the range 150 MHz to 5.8 GHz require SAR evaluation for the face and body positions, both simulated with a flat phantom.

**Belt-clip position:** The MPT device is placed underneath a flat phantom and suspended until the belt clip touches the phantom. If the device incorporates a headphone socket then it is a requirement to test with the hands-free earpiece/microphone connected.

**Face position:** The device is placed 2.5 cm from the phantom.

## Conclusion

The Australian SAR regulatory and approval requirements have been explained. The scope of the current harmonised SAR measurement standards includes all devices that transmit more than 20 mW and are used in close proximity to the body. The possibility of harmful effects of EMR has forced the regulators to introduce SAR measurement standards. Work is currently underway in international standards bodies and it is expected that internationally harmonised SAR testing methods and procedures will soon be available to cater for 5G devices.

## References:

Radiocommunications (Electromagnetic Radiation – Human Exposure) Standard 2014; Australian Communications Authority regulation, first gazetted 1 March 2003 under section 162 *Radiocommunications Act 1992*.

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# COMMS CONNECT MELBOURNE 2019

Jonathan Nally

A world-class range of speakers, panels and workshops has been lined up for Australia's premier communications event.

**N**ext-generation communications technologies and systems will be at the forefront of the presentations and discussions at Comms Connect Melbourne again this year, 26–28 November.

The event will kick off with a series of workshops on Tuesday, 26 November. These are always very popular, and this year will include not only discussion but also hands-on training in some cases. Of particular interest is the special two-day microwave radio masterclass, presented by Trevor Manning, Managing Director, TMC Global; see the Comms Connect website ([melbourne.comms-connect.com.au](http://melbourne.comms-connect.com.au)) for special delegate rates.

On the Wednesday and Thursday of the conference, an array of local and international experts will gather to speak on a wide range of topics, covering the gamut of 21st-century communications.

As with previous years, the sessions will be broken into three streams: public safety and emergency management, technology and industry.

There will be a large contingent of international speakers in the public safety space, including representatives from FirstNet, the Public Safety Technology Alliance, Safe-Net Forum, BroadWay, TCCA and more. And, of course, Australia's public safety mobile broadband efforts will be front and centre too.

Plenary addresses will be given by Peter Clemons (Chief Designer, Quixoticity Index/Global Advisor, Genaker) and Alex Stefan (National General Manager, Government and Public Safety & Security, Telstra Global Enterprise and Services).

There will be three panel sessions. The first, to be moderated by Chris Stevens (Managing Director, CartGIS), will tackle the topic of 'Next-generation Triple 000: The road ahead'. The second panel, 'Data sharing and security in an IoT world', will be led by Ghislaine Entwisle (Director, Protiviti) and moderated by Geof Heydon (Principal Consultant, IoT Alliance Australia).

The third panel discussion will be the final item on the Comms Connect Melbourne 2019 agenda. Panellists and the audience will be asked to contemplate and discuss 'Critical communications for all, not just public safety'.

The full range of communications technologies will be put under the microscope too, from TETRA to DMR, LTE to 5G, satellite to Wi-Fi and more.

The exhibition hall will have more than 90 exhibitors all eager to show off their latest and greatest solutions, and keen to speak with the expected 1500 delegates who will attend across the two days of the event.

Don't forget that the annual ARCIA Gala Industry Dinner and Industry Awards presentation will be held on the evening of Wednesday, 27 November, preceded by networking drinks. You can book your tickets through ARCIA's website ([arcia.org.au](http://arcia.org.au)).

This year, Comms Connect will be co-located with the annual conference and exhibition of BICSI South Pacific, the peak industry body representing designers and installers of information and communications technology systems.

BICSI South Pacific's membership encompasses ICT professionals in the commercial and government sectors, with interests spanning not just voice and data but also audio, video, life safety and automation systems.

This year's BICSI South Pacific conference and exhibition will enable delegates to experience presentations from local and international thought leaders on numerous important topical issues, such as standards and regulations; IoT, smart buildings and smart cities; data centres; and 5G infrastructure.

In addition, there will be content on infrastructure for intelligent transport and autonomous vehicles; Power over Ethernet and digital power; wireless technologies such as Wi-Fi, Li-Fi and free-space optics; and intellectual property.

For full details, visit the event website: [bicsiconference.com.au](http://bicsiconference.com.au).

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8.50am	<b>Welcome and opening remarks:</b> <i>Paul Davis</i> — Events Director, WFevents followed by <b>Conference Chair:</b> <i>Chris Stevens</i>		
9.00am	<b>Opening Keynote: Global PSMB and the European BroadWay to BroadNet</b> <i>Dr David Lund</i> — President/ Coordinator of Broadway, Public Safety Communication Europe (PSCE) Forum		
9.45am	<b>Keynote: The FirstNet Roadmap</b> <i>Jeanette Kennedy</i> — Government Affairs Manager, First Responder Network Authority		
10.30am Morning Break — Exhibition Hall			
	<b>Public safety and emergency management</b>	<b>Technology</b>	<b>Industry</b>
11.15am	<b>A Public Safety Mobile Broadband capability for Australia</b> <i>Luke Brown</i> — Assistant Secretary, Department of Home Affairs	<b>Maximising interoperability by promoting open standards and open APIs</b> <i>Victoria Lee</i> — Vice President, The Public Safety Network	<b>Underground LTE — Mine case study</b> <i>Rodney Nebe</i> — Mine Superintendent - IT Senior Network Engineer, Gold Fields <i>Simon Lardner</i> — CTO, Challenge Networks
11.45am	<b>South Korea PSMB project update</b> <i>Steve Hwang</i> — Steering Committee Member, Safe-Net Forum, BDM, Public Sector APAC, Nokia	<b>Voice interoperability, multi bearer switching and application integration for mission critical operations</b> <i>Sohan Domingo</i> — Head of Product Management - Unified Solutions, Tait	<b>Mining solutions to deliver broadband and voice services seamlessly in modern underground mines</b> <i>Johan Strydom</i> — Product Manager Mining and Networks, RFI
12.15pm	<b>Why you don't need a critical communications network today</b> <i>Chris Goldsmith</i> — Programme Manager, New Zealand Police	<b>Internet of Tracking</b> <i>Stuart German</i> — Business Development, Digital Matter	<b>Transport for London's surface radio network digital transformation</b> <i>John Gardener</i> — Chief Technology Officer, Tait Communications
12.45pm Lunch Break — Exhibition Hall			
2.00pm	<b>Enhancing public safety communications with datacasting</b> <i>Andrew Maxymillian</i> — Principal Consultant, Blue Wing Services, Inc.	<b>Satellite technology trends for mission-critical communications</b> <i>Dr Ben Hale</i> — Senior Consultant, Communications, Information & Space, Nova Systems	<b>What spectrum harmonisation means for the smooth migration of critical communication networks from narrowband to broadband</b> <i>Noel Kirkaldy</i> — Business Development, Public Sector, Nokia
2.30pm	<b>Technology innovation for emergency communications — how PSCR is pulling the future forward</b> <i>Dereck Orr</i> — PSCR Division Chief <i>Ellen Ryan</i> — PSCR Deputy Division Chief and Open Innovation Team Lead <i>Jack Lewis</i> — Lead Virtual Reality Developer National Institute of Standards and Technology, Communications Technology Laboratory	<b>Is DMR over satellite the next solution?</b> <i>Sam Fasullo</i> — Business Development Manager, Norsat	<b>Voice &amp; Data — Playing a critical role in public transport provision in Australia and New Zealand</b> <i>Mark McKenzie</i> — Head of Strategic Initiatives, Transdev
3.00pm		<b>DMR Tier III — a global standard for critical communications</b> <i>James Holmes</i> — State Manager CSE Crosscom	<b>Utility case study: KEPCO Korea — critical voice and data networks</b> <i>Jean, Soon Ki</i> — Senior Manager, KEPCSO
3.30pm Afternoon Break — Exhibition Hall			
4.00pm	<b>A case study: ACT emergency service agency high bandwidth mobile radio network. Economic and independent augmentation of PSMB</b> <i>Mark Austin</i> — Director ICT and Capital Works, Justice and Community Safety, ACT Government <i>Ross Caston</i> — General Manager, DLES, Amber Technology Ltd <i>Dale Stacey</i> — Technical Director, SAT Pty Ltd	<b>Changing the 4G and 5G RAN deployment economics paradigm with OpenRAN</b> <i>David Cooke</i> — Regional VP, Pacific, Parallel Wireless	<b>Transitioning local councils in to the IoT and LTE future: how digital radio systems are supporting and advancing councils across Australia</b> <i>Rob Bellian</i> — Sales Director, Simoco Wireless Solutions
4.30pm	<b>Maximising the effectiveness of legacy systems to prepare for the challenges of the future</b> <i>Inspector Chris Fleckney</i> — Head, Radio Operational Support Metropolitan, Police Service	<b>Next-Gen control room solutions in a converging LMR-LTE world</b> <i>Ranjan Bhagat</i> — Vice President & General Manager, Zetron	<b>Building a voice and data capable TETRA network for oil and gas refinery company TATNEFT from scratch</b> <i>Nliiaz Shakhirov</i> — Business Development Manager, TISSCOM LTD, Russia
5.00pm	<b>Global mission-critical LMR and broadband standards progress — TCCA, ETSI and 3GPP supporting programs and international partnerships</b> <i>Tony Gray</i> — Chief Executive, TCCA	<b>Low interference potential devices — what are they?</b> <i>Noel Higgins</i> — Radio Communications Consultant, Analyse Solve & Test Pty Ltd	<b>Tower auditing using CSI techniques</b> <i>Michael Ryan</i> — Principal ICT Consultant, Titan ICT
5.30pm	NETWORKING DRINKS — EXHIBITION HALL — sponsored by Wireless Innovation		
6.30pm	ARCIA ANNUAL INDUSTRY GALA DINNER — MCEC		

# PROGRAM

## THURSDAY 28 NOVEMBER

9.25am	Welcome and opening remarks from the Chair: <i>Chris Stevens</i>		
9.30am	<b>Plenary Address: Critical communications at the edge (revisited)</b> <i>Peter Clemons — Chief Designer, Quixoticity Index/Global Advisor, Genaker</i>		
10.00am	<b>Plenary Address: Critical communications, a continuing story</b> <i>Alex Stefan — Principal, Public Safety Centre of Excellence, Telstra Enterprise</i>		
10.30am Morning Break — Exhibition Hall			
	Public safety and emergency management	IoT — Technology	Industry
11.00am	<b>How mission-critical AI can harness the data deluge</b> <i>Paul Steinberg — Senior Vice President, Technology Motorola Solutions</i>	<b>Security and IoT — The things to be concerned about and best practice for protecting your business, your data, your sensors and your networks</b> <i>Geof Heydon — Principal Consultant, IoT Alliance Australia</i>	<b>How airlines leverage SaaS and IoT networks for optimisation of airport ground support equipment, reducing costs and improving</b> <i>Keith Oliver — Chairman, Blackhawk</i>
11.30am	<b>Next-generation Triple 000 — It's happening</b> <i>Chris Beatson — Director, NSW Police Force - PoliceLink Command</i>	<b>The importance of trust preserving data sharing in the IoT context</b> <i>Ghislaine Entwisle — Director, Protiviti</i>	<b>Developing technology to support communications in hazardous environments</b> <i>Doug Bowden — Senior Business Development, Sepura</i>
Noon	<b>Panel session: Next-generation Triple 000: the road ahead</b> <i>Chris Beatson — Director, NSW Police Force – PoliceLink Command, further panel members TBC</i> <b>Moderator: Chris Stevens — Managing Director, CartGIS</b>	<b>IoT panel session: Data sharing and security in an IoT world</b> <b>Panel:</b> <i>Ghislaine Entwisle — Director, Protiviti</i> <i>Further panel member TBC</i> <b>Moderator: Geoff Heydon — Principal Consultant, IoT Alliance Australia</b>	<b>Correctly project engineering a radio network</b> <i>Lawrence McKenna — Principal Engineer (Manager), Cumarsaid</i>
12.30pm Lunch Break — Exhibition Hall			
	Public safety and emergency management	Technology	Industry
1.30pm	<b>Surf Life Saving TAS: Streamlining rescue services with radio dispatch</b> <i>Greg Bird — Surf Life Saving Tasmania Communications Advisor</i>	<b>Analysing and improving IoT security using the OWASP Top 10</b> <i>Tom Isaacson — Systems Connectivity Engineer, Navico</i>	<b>Critical infrastructure and the value of collaborative communication prior to and during an emergency</b> <i>Graham Manson — Director &amp; Founder, International Resilience Group Pty Ltd (IRG)</i>
2.00pm	<b>Remotely piloted aircraft from an idea to business as usual in the Melbourne Fire Brigade</b> <i>Leading Firefighter David Rylance — RPAS Chief Remote Pilot, Metropolitan Fire and Emergency Services Board</i>	<b>Overcoming the challenges of 5G data throughout</b> <i>Steve Karandais — General Manager, Keysight Technologies</i>	<b>Nagpur Metro/Maha Rail — insights in to the project with current and future requirements and directions on LMR/ broadband in India</b> <i>Devdarsh Jain — Director Marketing, Consort Digital</i>
2.30pm	<b>Transitioning to a data-enabled world in a mission-critical environment</b> <i>Station Officer Graham Tait AFSM — Operational Communications Systems Officer, Fire &amp; Rescue NSW</i>	<b>Testing the network's fibre foundation to support 5G, IoT and smart cities</b> <i>Jean-Baptiste Létang — Product Line Manager, EXFO</i>	<b>Hybrid technologies for critical messaging</b> <i>Brad Welch — General Manager Asia Pacific, TPL Systems Asia Pacific</i>
3.00pm Afternoon Break — Exhibition Hall			
3.30pm	<b>Closing panel session: Critical communications for all, not just public safety</b> <i>Panel members TBC</i> <b>Moderator: Chris Stevens — Managing Director, CartGIS</b>		
4.30pm Conference closes			

To view the full program visit [melbourne.comms-connect.com.au](http://melbourne.comms-connect.com.au).  
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# PRIORITISING PUBLIC SAFETY IN MNOs' LTE AND 5G NETWORKS

Barbara Noonan, Head of Public Sector APAC, Nokia

Prioritisation on LTE and 5G networks is technically feasible, but there are a number of legal issues that need to be carefully addressed.

Public safety authorities in many countries are moving, or considering moving, their public safety broadband services to public mobile networks using 4G/LTE today and 5G in the near future. However, prioritisation of public safety (PS) traffic on mobile networks is more than a technical issue.

There are a number of prioritisation and pre-emptive mechanisms available in LTE, and further mechanisms are planned in 5G, to make this possible. The experience of a number of countries has demonstrated that LTE and 5G are perfectly capable of handling PS traffic. However, both government legislation and MNO operations have to be configured properly for it to work.

MNOs need to be able to ensure three things to support PS applications: network availability, performance and security. In many jurisdictions, MNOs may not be set up properly to meet these requirements, or legislation is getting in the way.

Network availability varies from country to country, but many still have areas of insufficient coverage to support broadband video from a body cam, for example. Backhaul, core network functions, power supply: all need to be fully redundant and physically secure.

MNOs also need to ensure that the RAN is redundant by ensuring national roaming is implemented. Push to talk (PTT) is supported on LTE, but MNOs may not have ensured that their PTT service interworks with the existing public safety PMR or LMR system.

On the network performance side, 3GPP mission-critical standards support prioritisation and country legislation has mandated that it be implemented — but the implementation isn't actually optimal. For example, should first responder calls be given absolute priority over commercial calls?

In some countries, legislation has assigned the full capacity of the network to PS in case of emergency. But in a major incident, it will also be helpful for commercial users to be able to make calls because they provide valuable information for situational awareness, among other things. MNOs can divert commercial calls to 2G/3G layers or other 4G/LTE bands while still ensuring that PS require-

ments are met. In this case, the legislation, which is intended to be helpful, is a hindrance.

End-to-end security is a priority for all PS authorities and 4G/LTE have a number of well-established security solutions available. Again, the question is how well have MNOs implemented security and does government help or hinder? Many MNOs will forgo security in areas of the network because of the cost. But the network is only as secure as its weakest link and the solution has to be holistic. Have national security services weakened security protocols or inserted backdoors that provide unintended entry for rogue parties?

Some PS authorities are proposing to create a hybrid situation with some private LTE being used to supplement MNO infrastructure. This may be necessary wherever MNO coverage is insufficient — using deployable LTE solutions for instance. The PS authority might also leverage private LTE networks, such as those being implemented in hospitals, factories, harbours, airports and mines, when required.

Current trends in public safety planning suggest that there will be significant growth in LTE. The needs of national public safety are, therefore, a big opportunity for MNOs. However, it is critical that they make the investment in setting up their infrastructure to ensure that they can meet the network availability, performance and security requirements of public safety authorities. Governments and regulators can play an important role in ensuring this, while being careful not to create policies that hinder performance or undermine security.

The good news for public safety is that prioritisation on LTE and 5G networks is technically feasible. MNOs can handle PS traffic requirements as long as they take the necessary steps to meet the availability, performance and security needs. There are a number of legal issues that need to be carefully addressed and regulators, working closely with MNOs, will need to ensure that, without getting in the way, legislation helps to make this a success.

*For more information about public safety prioritisation on commercial networks, see the TCCA white paper: [Nokia.ly/TCCA](http://Nokia.ly/TCCA).*

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## STUART WILL, DAMM'S NEW REGIONAL SALES DIRECTOR

DAMM has named Stuart Will as its new Regional Sales Director, starting September 2019. He will be based in France. The former Airbus DS SLC Head of Channel Management has worked in the TETRA field for 14 years, holding various sales positions at Artevea, Selex Communications (now Leonardo) and Sepura/Hytera, where he covered sales for PMR (TETRA, DMR) and other technologies across several global territories. DAMM CEO Jens Thstrup said, "It is true to say that Stuart has a unique blend of experience across the sector. We are looking forward to benefiting from the wealth of experience that he brings to his new role as Regional Sales Director."

More info: [bit.ly/2pF9k2F](http://bit.ly/2pF9k2F)



## FLEET RAISES \$10M TO DELIVER REMOTE IoT

Fleet Space Technologies is set to expand its global constellation of nanosatellites, delivering IoT connectivity to remote industries such as logistics, resources and energy. It comes after the company raised \$10.8 million from companies including Momenta Ventures, Horizons Ventures, Grok Ventures, Blackbird Ventures and the Kennard family. The funding will allow Fleet to meet increasing demand for global deployments of private IoT networks, with its next-generation nanosatellites expected to launch in 2020. The satellites, combined with Fleet's long-range wide-area network (LoRaWAN) hub, will make it possible to help connect the more than 14 billion low-power, industrial IoT sensors and devices projected to come online by 2025.

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The Fluke DSX-5000QOi contains the DSX-5000 copper analyser, CertiFiber Pro OLTS quad wavelength, Optifiber Pro OTDR quad wavelength and a USB fibre inspection probe. It is available for rent from TechRentals.

The DSX-5000 copper analyser is designed to enable testing and certification of twisted pair cabling for up to 10 Gigabit Ethernet deployments and will handle any cabling system from Category 3, to 6A and Class C, to FA at Level V accuracy.

CertiFiber Pro Optical Loss Test Set offers efficient fibre optics certification. Featuring a simple user interface, the device helps eliminate errors and speeds troubleshooting. It performs Tier 1 (basic) fibre certification in 3 s and complies with all applicable cabling standards, which call out the Encircled Flux launch condition requirements for optical sources.

The Optifiber Pro OTDR offers SmartLoop technology that tests two fibres in a single test, eliminating the need to travel to the far end of the connection to perform tests. It performs Tier 2 (extended) fibre certification and displays a graphical EventMap to help trace interpretation.

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# Are legacy systems your Achilles heel?

Nick FitzGerald\*

There are two particular dates from earlier in the year that stick in the minds of many of our readers — 9 April and 9 July. Why? Because they were what many consider

the end-of-life dates for two significant and widely deployed Microsoft operating systems; Windows Embedded POSReady 2009 (the final Windows-XP-SP3-based OS) and all flavours of Server 2008, respectively.

Technically, those dates mark the end of Extended Support, and as both products moved into Extended Security Update (ESU) periods, they are not really end-of-life dates — at least, not for those who can afford to pay. ESU is an added-cost support option under which Microsoft endeavours to provide updates or mitigations for serious security vulnerabilities uncovered in the supported products for three years past their end of Extended Support.

But what does all this have to do with your company's IT security stance? Aside from perhaps having alerted you to support options you're unlikely to afford, it should direct your attention to two important questions — do you have any systems still running those OSes, and what are the equivalent issues for the OSes in all the other devices that are connected to your network? Legacy devices might still be greatly useful and valuable. Point-of-Sale systems and "kiosk" style devices may have life cycles equal to or longer than the ten-year period typically covered by the free Mainstream Support and Extended Support periods of legacy Microsoft OSes (Windows 10 introduced significant changes in the way Microsoft supports its flagship OS). Further, specific models may be sold for years after they are initially designed, meaning new devices may ship

with OSes that are already well into that ten-year support window.

If you have such devices and replacing them is uneconomic (imagine a CnC milling machine or similar) you might at least be able to put them on isolated networks, air-gapped from the internet and your other critical administration and production networks. For some devices this may be more problematic, as network access from arbitrary client machines might be a significant part of the value proposition of the device (imagine a high-volume, extremely fast printer). However, you may be able to abate the risks of it unavoidably running an outdated OS with strict firewalling that only allows access to its HTTP management interface.

The larger and more obvious devices, and those running Microsoft OSes, will probably be well-known and their OS support status readily determined, but that leads us to the second of those questions above — what are the equivalent issues for the OSes in all the other devices that are connected to your network? What OS runs your IP cameras? What version? When was their firmware last updated? Did all of them receive those updates? What application software sits atop that OS? A webserver? Some custom or OTS management software? Telnet access? Other remote access? Are there hardcoded or other backdoor accounts that can access the management software, video streams or even the OS via one or more of those interfaces? What about the network video recorder those cameras connect to? Do you know the answers to all the same questions for it? Or do these cameras have to be connected to the internet to be managed via some cloud-based control panel? What else could go wrong with that?

What about the smart building devices in your offices such as the thermostats, smoke/fire detectors, door access card or key readers, smart locks, air quality monitors and so on? Do you know the answers to the above questions for all those devices? Would you even know where to start to find those answers?

Aside from the obvious computers in your network, such as your servers, desktops, laptops, tablets and smartphones, which are probably fairly modern and automatically updating their OSes and even their critical applications, what is the status of all those less obvious, even hidden, computers? The more obvious stuff such as network printers, hardware firewalls and routers, and so on are probably also managed and maintained, but what about all those others? The odds are high that many of them are running old versions of Linux with far too many services enabled and at least a few of those will have other overly permissive configurations and/or built-in backdoors.

If you are worried that the security of your network may be weakened due to the presence of legacy systems — and you should be — then maybe you should be sweating the small stuff. Don't let the dates of 9 April and 9 July continue to haunt you — take proactive steps to move forward and protect your business today.

*\*Nick FitzGerald is a Senior Research Fellow at ESET, a pioneer in the field of Internet cybersecurity. Today, ESET protects more than 110 million users worldwide with leading antivirus and firewall solutions.*

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An airborne mesh system combining multiple technologies is providing reliable comms for firefighting efforts.

In 2018, the National Aerial Firefighting Centre (NAFC) recommended deploying Silvus Technologies meshing data radios for use on aerial firefighting assets in Australian states and territories. The purposes envisioned for data links in aerial firefighting assets are:

1. To provide video and data links to command and control from sensor platforms such as optical and infrared cameras installed on fire surveillance helicopters, facilitating real-time situational awareness of emerging developments and ongoing firefighting operations.
2. To provide a subset of that information (typically video feeds without data) simultaneously to ground crews and other aircraft operating in the vicinity of the helicopter.
3. To provide a data feed from command and control to ground crews and other aircraft, allowing near real-time updating of these crews' situational awareness packages from control. This ensures that the crews have access to the very latest information at all times, again enhancing both safety and efficiency.

The key to this is the presence of real-time metadata (primarily positional information) along with the video feed, and a bidirectional network connection to the aircraft, enabling direct interfacing from the command and control systems to the inflight sensor platforms. The availability of this information for the control centre significantly enhances the ability to manage the safety and operational efficiency of ground crews.

These facilities are typically provided by cellular connections and will increasingly be provided by the public safety mobile broadband (PSMB) system. The subsequent improvements in management efficiency have been demonstrated to be so significant that the associated workflows have rapidly become critical to the day-to-day operations of emergency services that have deployed these resources.

The ultimate goal is to connect a helicopter for video and metadata transmission as well as all types of assets, which lie within the coverage area.

One way this could be achieved is to utilise an integrated mesh system, where network data is able to hop from one radio to another to another, cross-linking through mesh radios, telco sites and terrestrial networks. This



*A Silvus dual transceiver radio unit mounted on a pole.*

# AERIAL MESH COMMS FOR FIREFIGHTING

*Ross Caston and Dale Stacey*

capability can be used to link all assets into a single operational picture.

## Challenges with existing infrastructures

Although cellular and PSMB connections may be available 99% of the time, it has been regularly demonstrated that they cannot be guaranteed in an emergency situation. The infrastructure that they depend on may be compromised. This is especially true during natural disasters such as bushfires or floods, and public happenings such as large stadium events. Often during natural disasters, physical damage to infrastructure can occur, while at public events, cellular systems can be overloaded by the presence of large numbers of people gathered in one small area accessing the networks.

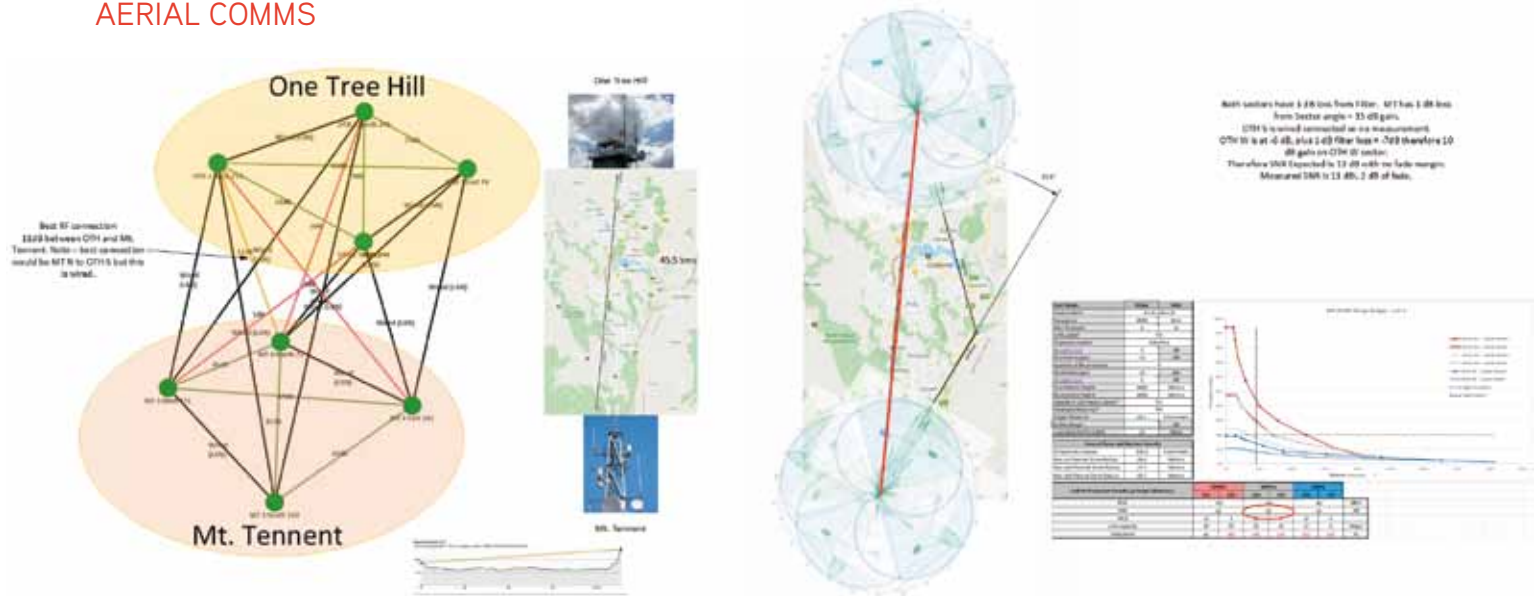
It is during these 1% of occasions that emergency services are especially vital, and in remote or compromised areas the mesh system can assume the networking duties in their entirety, with links back to a central network established where required and feasible.

## Benefits of mesh technology

The prescribed Silvus data meshing system provides a transportable, mobile networking structure, which can operate either together with, or in the absence of, regular cellular or PSMB services.

This is achieved using different processes, either by 'bonding' cellular and Silvus links into a single large link or by switching between links in a prescribed order of preference, which is set typically as the most affordable. For example, Silvus Link (free) followed by

## AERIAL COMMS



*Topology of the Silvus mesh communications system.*

cellular connection (not free) and then satellite link (expensive but available anywhere that the sky can be seen).

In either case, if any link can be found by the system, it will be made available without operator intervention. This means that the operators (crews, command and control) have a far greater chance of being able to use their normal data-dependent workflows without interruption.

The Silvus system uses meshing to establish distributed data connections whereby every radio in a network relays data from every other radio. For example, this could enable a helicopter to establish a link with a ground station while a search and rescue team ventures into a cave, and relay video from the end of the cave through intermediate radios right back to a hovering helicopter, and

then back to command and control, enabling full, real-time video observation of the situation in the cave at any point in the chain.

## Solution

After much research, NAFC selected Silvus MN-MIMO radios as their network link of choice for aerial applications. The Silvus system has been extensively used in the USA and Europe for similar applications, with great success.

Silvus has a family of mesh radio products specifically designed to address the growing demand for distributing video and other high bandwidth data in harsh tactical environments. Silvus StreamCaster radios, featuring MN-MIMO at the core, join together to form a robust, self-healing, self-forming fluid mesh network.

SAT Pty Ltd and Amber Technology worked closely under the auspices of NAFC with Microflite and McDermott Aviation, providers of helicopter surveillance services to several emergency services operations across Australia, to design, install and integrate a bonded mesh solution, establishing phase one of the system. This comprises the ground receive sites and the bonded helicopter fit-out.

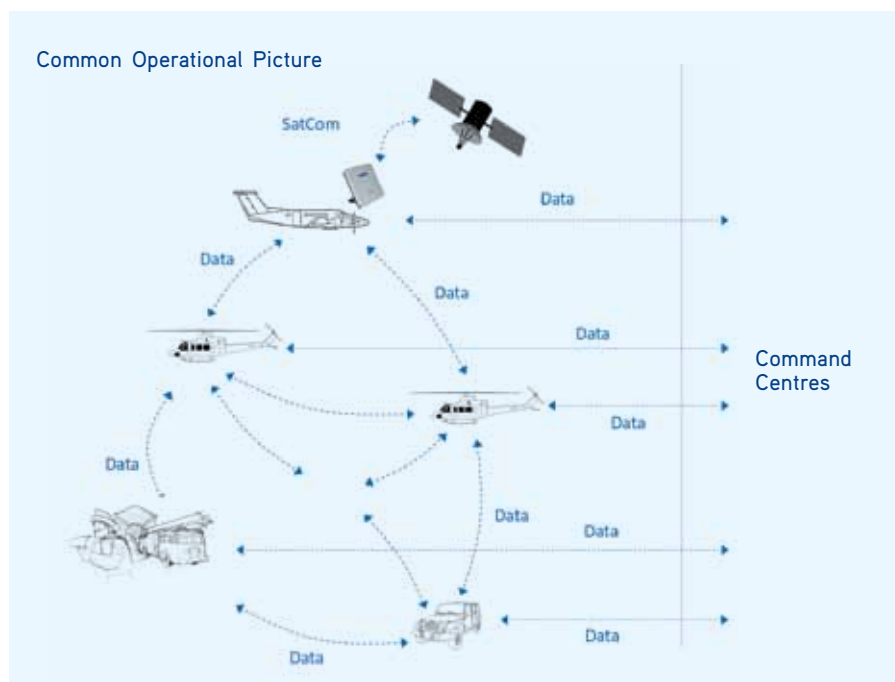
The result is demonstrated network links from a helicopter to a state's emergency network from a range of around 150 kilometres from the receive sites, delivering video and metadata to control, and feeds to ground crews, either with or without service from the cellular system.

An easy-to-use graphical interface enables monitoring, control and configuration of all radios on a single screen, from any node on the network. An extensive application programming interface enables full interaction with a wide range of ISR and management systems.

Emergency services operating with this system are able to utilise this technology for a number of major emergency scenarios including real-time communication regarding the specific location of a bushfire to ground crews, enabling the crew to navigate through smoke-filled bushland quickly and safely to tackle the flames. There are a great number of locations that do not provide any cellular coverage, making this solution a significant emergency asset for every Australian citizen.

Ross Caston is General Manager, DLES, Amber Technology Limited; Dale Stacey is Technical Director of SAT Pty Ltd. Caston and Stacey, along with Mark Austin (Director ICT & Capital Works, Justice & Community Safety, ACT Government) will present this case study in depth at Comms Connect Melbourne 2019, at 4 pm on 27 November. Visit <https://melbourne.comms-connect.com.au/program/> for more details.

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Going further in critical communications



# Radio Matters

Earlier this year RFUANZ launched the New Zealand Certificate in Electrotechnology (Level 3) in conjunction with Shift ETEC. While this course is aimed at installation technicians and new entrants to the industry, RFUANZ's long-term goals are to work with industry to further develop subsequent training levels right up to engineering level (ARE). For an industry to attract new blood and continue to grow and develop, it needs to provide a career pathway.

Although our industry has plenty of opportunities for young people, a clear progression pathway is not easy to find.

RFUANZ has been speaking with RSM recently on this very topic. RSM, too, has identified future issues with a lack of suitably qualified personnel working their way up through the ranks. Where are our next ARC and AREs being built?

RSM and RFUANZ are looking to plan some industry workshops to discuss this topic and help develop the training pathway through to ARE. RFUANZ would like expressions of interest from the New Zealand RF industry for both participation in these events and also a gauge of how many people are interested in upskilling to ARC or ARE level. Please send any feedback through to [admin@rfuanz.org.nz](mailto:admin@rfuanz.org.nz). Further information on the Level 3 Installers Course can be obtained from Carine Vaccari at Shift-Etec, email [CarineV@shift.org.nz](mailto:CarineV@shift.org.nz).

RFUANZ has been discussing the Single Frequency Repeater (SFR) subject with RSM. Single frequency repeater technology uses both slots of a single 12.5 kHz TDMA simplex channel to extend coverage. In a group of radios, the SFR receives calls on slot 1, while simultaneously repeating the call on slot 2. SFR technology is quick to deploy, simple to operate and requires minimal hardware to implement. This technology has many applications such as short-duration coverage extension (events, search and rescue, temporary worksites) and mobile operations (traffic management, harvesting crews, mowing operations).

The issue currently in New Zealand is that RSM's interpretation of this technology is that it needs to be treated as a repeater. This means that the channel used would need to be licensed to a specific location. This approach, however, will severely limit the benefits of this simple and easy-to-use technology.

RSM has concerns around these devices being used at existing high sites and causing de-sensitising of receivers. While RFUANZ understands RSM's position, RFUANZ believes with some conditions put in place (such as a limited TX power), the SFR technology should be able to be used on any land mobile simplex channel that has been licensed for the area of operation and TDMA digital emissions. RFUANZ welcomes any feedback on this topic; please send to [admin@rfuanz.org.nz](mailto:admin@rfuanz.org.nz).

Further to an earlier announcement regarding G Band, RFUANZ encourages all those in the industry to utilise the 174-184 MHz band (G Band). We have been advised that equipment is now available and can be purchased in New Zealand for use in this band. For more information, please contact an RFUANZ committee member.

Finally, please save the date 6 May 2020, for the RFUANZ annual Gala Dinner to be held once again at Te Papa in Wellington.

Corey Weir  
Chairman, RFUANZ



## Rackmount frequency converter

Nova Electric's model GRSLPFC4.5K3/4-440(3)-115(3) solid-state three-phase frequency converter systems are designed for demanding applications in high shock, vibration, humidity and EMI environments in compliance with MIL-STD-1399, MIL-STD-461, MIL-S-901, MIL-STD-167 and MIL-STD-810.

Its compact IP54-rated rackmount chassis weighs 34 kg and measures 5U high, 48.26 cm wide and 70 cm deep. It has a shipboard power input of 440 VAC 60 Hz three-phase delta and an output 115 VAC, 400 Hz three-phase delta. It is suitable for use on mobile power units, shelters, transportable systems, tactical systems and ground support.

**Metromatics Pty Ltd**

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



## Dispatch management software

Omnitronics' scalable enterprise dispatch management software, omnicore, is designed for mining and resources companies. It features blast and emergency tones; enterprise reporting functionality with dashboards and system and performance analytics; the option for deployment in the cloud, a data centre or onsite; remote operations centre capability and a configurable interface.

The software is suitable for small organisations to large enterprises scaling beyond 100 operators and/or 200 channels and can grow with demand. It also allows dispatchers to communicate via trunking and conventional systems and aims to give them access to all available digital radio features, including GPS.

**Omnitronics Pty Ltd**

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





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## Handheld spectrum analyser

Earlier in 2019 Anritsu introduced the Field Master Pro MS2090A handheld spectrum analyser with continuous frequency coverage up to 54 GHz and 5G NR demodulation support with 100 MHz bandwidth. The analyser has recently been updated to add 3D indoor and outdoor coverage mapping for 5G NR as well as a Real Time Spectrum Analyser (RTSA) function.

The Field Master Pro MS2090A is specifically designed to meet the test challenges of a full range of wireless technologies in use today, including 5G, wireless backhaul, aerospace/defence, satellite systems and radar.

Key features of the MS2090A include sub-6 and millimetre-wave (28 and 39 GHz) 5G NR demodulation, including cell ID, beam ID, RSRP/RSRQ, SINR and EVM in all 5G bands, making it a suitable test tool for the rollout of 5G NR. It can also be used to conduct compliance testing, including EIRP, spectral emission mask and time offset, as well as harmonic and spurious testing.

When it comes to 3D coverage mapping for 5G NR, the integrated field test solution of the Field Master Pro MS2090A with Signal Mapper provides indoor and outdoor coverage mapping capabilities. It enables wireless professionals to conduct more accurate measurements than conventional instruments using 2D data, to ensure 5G NR networks meet performance specifications both indoors and outside.

The 100 MHz portable wideband RTSA is designed to provide an extremely high probability of interception and FFT rate for a handheld spectrum analyser, providing for accurate interference monitoring in the cellular bands or the full ISM band. Persistence and spectrum displays help to identify and track intermittent or pulsed signals.

The 10" colour touchscreen enables users to swipe and scan across the frequency range, or pinch and zoom to quickly view signals of interest.

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# MEETING 5G'S DEMAND FOR POWER AND EFFICIENCY



The imminent spread of 5G small cells and the overall need for energy-efficient, secure, low-maintenance infrastructure is driving changes in the telco sector.

**W**ith 5G rollouts underway across the nation and around the world, attention is turning to ways in which telecommunications enterprises can ensure their infrastructure meets efficiency, security and environmental expectations. Suppliers and operators at all levels within the sector have a role to play in this.

To find out more about some of the issues involved, we spoke with the Dan Agnew, Managing Director of Eaton ANZ, a provider of energy-efficient management solutions for electrical, hydraulic and mechanical power systems. Eaton is a global manufacturer with 2018 sales of \$21.6 billion. The company has a network of more than 900 resellers and partners in power quality, and over 1000 electrical wholesale branches in power distribution servicing a variety of sectors across ANZ such as telecommunications, data centres, education, transport and industrial.

## What sort of tech challenges is 5G presenting?

The customers that we service, such as data centres and telecom central offices, are a critical backbone for 5G networks and require intelligent, highly efficient and low-maintenance infrastructure for successful rollouts to ensure the lowest operational costs.

The demand for faster speed and higher connectivity increases the power demand on customer sites, with significant upgrades required to traditional power supplies to ensure a smooth transition in this new era.

We are investing globally in our DC range to ensure telecom and data operators are able to manage the exponential growth in power consumption. This includes the launch of a

DC portfolio which focuses on providing intelligent energy storage, intelligent control and high-power density. Eaton ANZ has taken a lead with specialist engineering capabilities and a wide range of DC services including design, installation, remote monitoring, on-site services and training.

## Does Australia present any special challenges?

In terms of regulation, one of the biggest challenges for the rollout of 5G is the time and cost to deploy a small cell. Traditionally, to install a small cell, a telco needs to gain site and equipment approvals; negotiate fees with the city or other landlord; ensure it has sufficient power and back-up; and ensure compliance with local environmental requirements. If every small cell has to go through that process, the cost and scalability of the network is severely compromised.

Geographically, Australia's vast landscape is at a disadvantage when compared to other countries. 5G coverage requires 100 to 350 micro cell sites per square kilometre throughout metropolitan areas, rather than the every 1 to 5 per square kilometre that is needed for 4G. This network densification through small cells is essential for the successful rollout of 5G and remains a huge challenge in order for Australia to achieve ubiquitous 5G coverage.

## How are your customers responding to environmental concerns?

What we are seeing, particularly from data centres, is an interest in software technologies such as electrical power management systems that provide greater visibility into power consumption and can identify and improve wasteful energy practices.

Demand response is also a growing interest area across organisations, and we have been doing a lot in this space globally. With a growing amount of renewable energy being integrated into Australia's interconnected energy system, it is becoming increasingly difficult for Australian energy providers to balance production and load demand. Globally, large data centre operators are harnessing this opportunity by selling their excess power back to the grid through demand response, which helps energy operators maintain power quality.

## What are the next trends coming up?

Underpinning 5G is edge computing technology, which needs to be delivered efficiently and effectively and is top of mind for our partners as 5G networks continue to take shape. But with these opportunities come cybersecurity challenges.

That's why Eaton is collaborating with global safety science organisation UL to advance cybersecurity for power management technologies across industries; we are the only company in the industry to have two labs approved to participate in UL's Data Acceptance Program for cybersecurity.

This collaboration is helping establish measurable cybersecurity criteria for network-connected power management products and

systems so we can provide cybersecure products that give our customers peace of mind.



*Dan Agnew,  
Managing Director,  
Eaton, ANZ*

# MULTI-MODE ON THE ROAD

A multi-mode system spanning 4G PTT, DMR and analog radio is keeping key roads and tunnels operating efficiently.

**T**unnel Network Services (TNS) provides incident response, operations and maintenance for a number of Brisbane roads and tunnels, for the safe operation of which it needs reliable, clear and user-friendly communications.

The company began using PTT-over-cellular (PoC) communications in March 2017 following a successful trial of the technology. PoC was to replace its existing radio network, which had become unreliable. At this time, TNS provided incident response and maintenance for only one tunnel.

During the trial of PoC, there was a truck fire in the tunnel, which really put communications to the test. Lucas Anderson, Safe Lane Availability Manager, said the PoC was clear and reliable, and “the only problem was that some of the crews were still using the old radios” during the incident.

Having grown to now cover three tunnels plus interconnecting roads and junctions, TNS had been left with three disparate radio networks — a different radio system left over from each tunnel. This made coordination of teams across the network difficult, and many staff would have to carry several radios to enable them to communicate across all the areas they operated in.

As a first step to unified critical communications across the network, TNS deployed the IMPULSE Wireless Mission-Critical Portable (MCP), an intelligent radio that enables operation on 4G PTT, DMR and analog radio networks.

MCP’s ability to automatically hand over between modes, talkgroups and channels means it can automatically route communications via the most appropriate mode based on a number of factors, and is tailored for the application in which it is deployed.

The hardware for the MCP is the Hytera Advanced Multi-Mode Radio. MCP services, developed locally by IMPULSE Wireless, hands over between modes and provides seamless mission-critical communications.

The intelligent MCP services provide redundancy, such as when the 4G network is out of reach or affected by an outage. Optimal transmit and receive paths and the timing of their individual selections are automatically and continuously assessed and chosen, based on various factors.

The MCP can automatically use the device’s DMR radio to provide mission-critical simplex or direct-mode communications, enabling communications off-network or when the network fails. It can also switch intelligently between 4G and DMR modes when available DMR networks should be used.

For a similar road operator, a solar-powered DMR Tier II radio network provides radiocommunications through a Telstra blackspot. The PTT and DMR networks are linked to provide seamless communications from user to user and to Omnitronics consoles in the control room, regardless of the field user’s location. The MCP radios intelligently roam between the 4G PTT and DMR modes, with no intervention from the users required.

The advantages of the system are greatly reduced costs compared with building a radio network to cover the client’s entire area of operation; clear voice quality when on 4G; enhanced remote support and updates for devices; and Australia-wide coverage when management staff have to leave the operational area.

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**Update**



**NX-3000 SRS**



**NX-5000 SRS**

**KENWOOD**

# NSW'S FIRST MILITARY WIRELESS SIGNAL

More than 100 years ago, civilian and army personnel combined to send the first military wireless signal in NSW.

Three civilians — Edward Kirkby, Walter Hannam and Reginald Wilkinson — have been honoured with a new plaque in Sydney's south, recognising their involvement as the signallers who played an integral part in the first successful military wireless signal transmitted in NSW.

Sutherland Shire Council supported a grant application by the Shire Military History Club to secure NSW Government funding for the creation of the plaque, and co-hosted an unveiling event in late August.

Around 80 guests attended Veno Street Reserve in Heathcote for the unveiling of the commemorative by Sutherland Shire Mayor Councillor Carmelo Pesce, Member for Heathcote Lee Evans, representatives from the Shire Military History Club and a descendant of Edward Kirkby.

In 1910, the Australian Army experimented successfully with sending wireless signals from an overhanging rock ledge near Waterfall to a tent near Heathcote railway station. Prior

to this, the Army used semaphore flags or Morse code by heliographs to send signals.

George Taylor, then a lieutenant in the Army Intelligence Corp, was interested in how technology could assist during war and was determined to prove the value of wireless signals in notifying troops of impending threats and enemy movements.

With no wireless skills himself, Taylor decided to call in the expertise of Kirkby, Hannam and Wilkinson to conduct the test during an annual artillery camp at Heathcote.

"Today is an important moment in our local history, where we can formally acknowledge the important role these three skilled civilians played in sending the first military wireless signal in NSW," said Mayor Pesce.

"The hard work of these men will now be recognised, alongside Lieutenant Taylor, for many years to come and Council is proud to have supported this initiative of the Shire Military History Club and Kirkby family."

The NSW Government provided \$1800 to the Shire Military History Club as part

of the 2018–19 Anzac Community Grants Program to assist with the production of the plaque.

A single plaque already exists at the Veno Street Reserve Memorial, recognising Lieutenant Taylor.

Clive Baker, President of the Shire Military History Club, said the club was proud to help give recognition to everyone who was involved in this historical event.

"The addition to the current memorial to include recognition of the civilians involved in this event was raised by Brian Kirkby, a descendant of inventor Edward Kirkby, and the club supported the project by raising the extra costs required for the plaque," Baker said.

"Our local members, including Frank Purvis and the late John Risebow, did significant research for this project and we would like to see more descriptive plaques for Sutherland Shire, to help residents recognise the local military history and the sacrifices made by our past residents."



From left: Sutherland Shire Mayor Cr Carmelo Pesce; Frank Purvis, local history researcher and member of the Shire Military History Club; Brian Kirkby, great-grandson of Edward Kirkby; Clive Baker, President of Shire Military History Club; and Lee Evans MP, Member for Heathcote.



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# Icom launches the VE-PG4 (radio gateway) in Australia

**T**he VE-PG4 is a versatile RoIP (Radio over IP network) gateway unit, which seamlessly interconnects LMR radios, LTE radios, IP communication terminals, IP phone systems and external devices. In addition to the IP Network (LAN/WAN), the built-in LTE module provides a wide area network communication coverage.

The VE-PG4 comes with the following features:

## All in One Package

The VE-PG4 includes built-in RoIP, SIP gateway, IP router, IP PBX and IP communication terminal controller functions, in one box. In comparison with similar systems combining several devices, installation and administration is simpler, with less conflict of settings.

## Call Recording to a USB Drive

Incoming/Outgoing calls can be recorded to an external USB device connected to the VE-PG4. Up to four recording settings are programmable. The recording call type is selectable from All, Group, and Individual calls. In addition, the Monitor function transfers the received audio data to an intended device.

## Microphone Connection for Base Operation

Connect HM-241, optional speaker-microphone to the microphone connector on the VE-PG4's front panel to enable simple base operation. Echo canceller and noise canceller functions are built-in for full-duplex communication with IP advanced radio system, like the IP100H or IP503H / IP501M.

## Position and Status Information

GPS position and status information from the IP503H/IP501M LTE transceivers can be received and transferred to a PC to track the location of the radio users or a user in a vehicle.

\* GPS mapping software is required for GPS data

## Remote Communicator Software, RC-FS10

The optional RC-FS10 remote communicator creates an IP-based virtual radio on a PC, and can communicate with land mobile radios, LTE radios, and IP communication terminals through the VE-PG4.

## Serial Pass-through Function

The Serial Pass-through function enables you to connect a serial device to the VE-PG4 to extend the communication range between the connected device and a controller PC. The virtual serial port software

for Windows® PC is supplied with the VE-PG4.

## SIP Server and IP-PBX Functions

The built-in simple SIP server enables you to assign IP phone numbers with extension groups. The VE-PG4 can be connected to external SIP server as a client. The following IP-PBX settings are programmable.

- Voice Phonebook
- DID (Direct Inward Dialing)
- Used with Panasonic KX-UT and KX-HDV series IP phones
- Call log
- Extension presence
- Phone number routing
- Outside line regulations
- Caller prioritization
- External call limiting
- SIP conferencing

## Router Functions with VPN Tunnel

The VE-PG4 supports LAN, DHCP client, Static IP or PPPoE connections. The VPN function creates a secure IP tunnel connection over the Internet.

## Built-in Controller for the IP100H, IP Communication Terminal (Wireless LAN)

The VE-PG4 has a built-in IP100H IP communication terminal controller function that can control up to 50 IP100H IP Communication

Terminals, and IP100FS Remote communicators.

The IP100H can send and receive voice and preprogrammed text messages to the other units through the wireless LAN access points. The IP communication terminals are suitable for intra-building communication, which will communicate anywhere your network has Wireless LAN access.

## Bridge Connection between Radio Systems

The VE-PG4 interconnects with two or more radio systems, even when the systems are using different bands and different categories. All received audio is bridged to opposing radio system, so a radio user can talk to all connected radio users. The built-in digital voice converter converts analog audio to IDAS™ compatible digital audio.

## LTE Transceiver Gateway

By installing a custom SIM card to the built-in LTE module, the VE-PG4 can interconnect IP501H/ IP501M LTE transceivers with conventional radio systems and IP100H IP communication terminals. GPS position information from the LTE transceivers can be received and transferred to a PC.

## Satellite PTT

With a VE-PG4 RoIP gateway, the IC-SAT100 can interconnect with an IP phone, IP, LTE, IDAS digital (Type-D multi-site trunking and conventional systems) and analog transceivers.

## Multi-site Connection between VE-PG4s

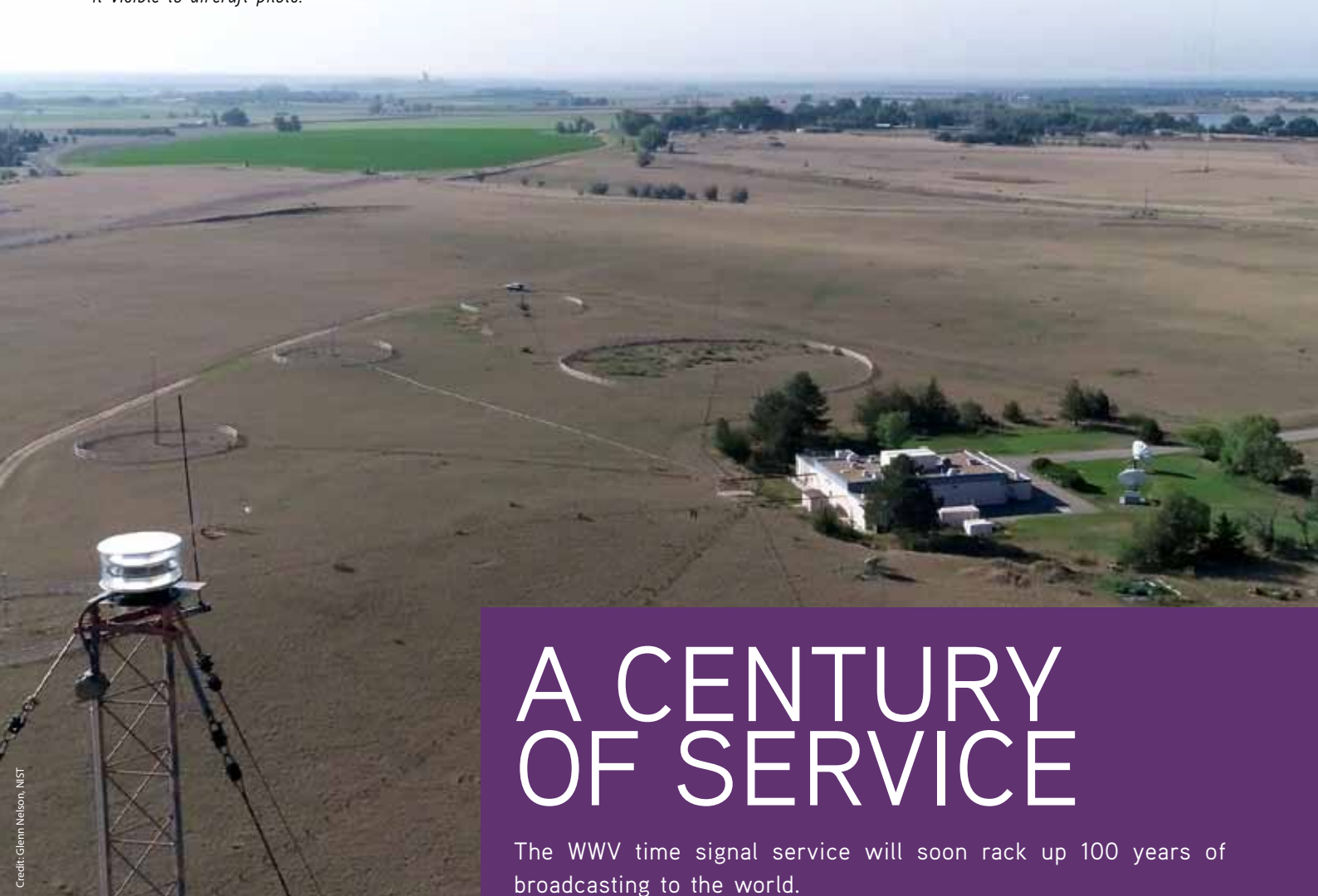
Two or more VE-PG4s can be connected through LAN or LTE (4G) and 3G networks. The communication area can be flexibly expanded, and dispersed radio sites can be connected, regardless of distance or radio system used.



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*NIST radio station WWV from the air. Each of the six frequencies the radio broadcasts on has its own antenna, each one surrounded by a white safety fence. The tall antenna for the lowest frequency has a flashing white strobe on top (in the left foreground) to make it visible to aircraft pilots.*



# A CENTURY OF SERVICE

The WWV time signal service will soon rack up 100 years of broadcasting to the world.

*Laura Ost*

Which technological application has had musical, timekeeping, navigational, scientific, traffic-control, emergency-response and telephone applications? Answer: WWV, one of the world's oldest continuously operating radio stations.

The US National Institute of Standards and Technology (NIST) received the call letters WWV a century ago, in 1919. Since then, it has operated the station from several different locations — originally Washington, DC, then a succession of locales in Maryland, and now Fort Collins, Colorado.

WWV broadcasts time and frequency information 24 hours a day, seven days a week, to millions of listeners worldwide. The station broadcasts standard time (aka Coordinated Universal Time) at standard frequencies (eg, at 5, 10 and 15 MHz) for use in calibrating radio receivers, as

well as alerts of geophysical activity and other information.

WWV broadcasts on six different shortwave frequencies with transmission effectiveness and reception clarity varying depending on many factors, including time of year, time of day, receiver location, solar and geomagnetic activity, weather conditions and antenna type and configuration.

Over the years, WWV has had a startling number of applications.

"Historically, WWV will always be interesting because of the huge role it played in the development of radio in the United States by allowing broadcasters and listeners to check and calibrate their transmit and receive frequencies," said Michael Lombardi, leader of NIST's Time and Frequency Services Group.

"Today, WWV still serves as an easily accessible frequency and time reference that provides information not available elsewhere," Lombardi said. "For example,

along with its sister station, WWVH in Hawaii, WWV provides the only high-accuracy voice announcement of the time available by telephone. These phone numbers receive a combined total of more than 1000 calls per day.

"Both the radio and telephone time signals are used by many thousands of citizens to synchronise clocks and watches, and also by numerous industries to calibrate timers and stopwatches," Lombardi added. "We also know that WWV is highly valued by scientists performing radio propagation studies because it provides them with accurate time markers on six different shortwave frequencies."

NIST time and frequency broadcasts are also available via the internet, of course, but the internet is not always available. Radio broadcasts can also support celestial navigation and can provide backup communication of public service announcements during disasters or emergencies.



*The radio station's main building houses the timing, signal-generation and transmitting equipment.*



*Goodrid Hicks of the US National Bureau of Standards sorts the mountains of mail received after WWV first went on the air from Fort Collins, Colorado, in 1966.*

WWV is also popular with amateur radio operators, who use the broadcasts to get geophysical alerts — indicating how far HF radio signals will travel at the current time and receiver location — as well as to tinker with their electronics and teach young people how radio works.

As a ham operator said on US National Public Radio, WWV is “the heartbeat of shortwave radio. When something goes wrong, you check WWV to see if you’re picking up their signal. And you know then that everything’s OK. Maritime operators, military operators, amateur radio operators, we all listen to and use WWV regularly.”

Many technical papers and even books have been written about NIST’s radio work. One such book, published by NIST, is *Achievement in Radio*.

The radio broadcasting craze started after World War I. NIST, then known as the National Bureau of Standards (NBS), got the call letters WWV for its experimental radio transmitter on 1 October 1919.

A 1919 newspaper story recounted that NBS experimented with broadcasting “music through the air”, transmitting tunes played on a Victrola record player several hundred yards to an NBS auditorium. That demonstration might have been sponsored by military laboratories then operating at NBS.

WWV began broadcasting in May 1920 from Washington, DC, at a frequency of 600 kHz. The first broadcasts were Friday evening music concerts that lasted from 8.30 pm to 11.00 pm. The 50-watt signal could be heard about 40 kilometres away.

Among many other relevant activities, NBS supported the public’s use of the novel technology by publishing instructions on how to build one’s own radio receiver. The agency’s 1922 how-to publication cost 5 cents.

### **A legacy of impact**

WWV and WWVH had a broad impact on the world in their early years, as the 1958 NBS annual report indicated:

*The radio broadcast technical services are widely used by scientific, industrial, and government agencies and laboratories as well as by many airlines, steamship companies, the armed services, missile research laboratories and contractors, IGY [International Geophysical Year (PDF)] personnel, satellite tracking stations, schools and universities, numerous individuals, and many foreign countries. They are of importance to all types of radio broadcasting activities such as communications, television, radar, air and ground navigation systems, guided missiles, anti-missile missiles, and ballistic missiles.*

NIST has conducted several surveys of WWV users. Many people rely on WWV to set the clocks and watches in their homes, as indicated by regular increases in calls to the telephone time-of-day service whenever daylight saving time starts or ends.

In one interesting example of the NIST radio station’s impact, WWV time codes were used in a 1988 project by the city of Los Angeles to synchronise traffic lights at more than 1000 intersections. City officials estimated that this project saved motorists 55,000 hours a day in driving time, conserved 83 million litres of per year in fuel and prevented 6000 to 7000 tonnes of pollutants per year.

“It’s not easy to think of a lot of technical services offered by the government that have stayed relevant for 100 years, but WWV is about to do just that,” Lombardi said.



## Digital multimeter

The Fluke 28II Ex digital multimeter — available for rent through Tech Rentals — is completely sealed, IP67 rated, intrinsically safe and suitable for use in hazardous environments.

The device provides true-RMS readings for AC voltage and current for accurate measurement of nonlinear signals. It can also handle frequency measurements to 200 kHz, as well as testing involving resistance, conductance, diodes, capacitance and temperature.

It can measure up to 1000 V, 10 A AC and DC; includes 10,000  $\mu$ F capacitance range and offers Ex certifications from world-leading certification bodies. It is designed to be waterproof, dust-proof and drop-proof and comes with a backlit keypad and large, bright display.

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## VHF TETRA radio

DAMM's VHF FT5 TETRA radio has 3 W output power, allowing it to provide wider coverage and help users save on infrastructure costs by reducing the number of base stations needed to cover a rural area.

It has a robust, shock-resistant rubber coating to protect against drop damage, IP protection for outdoor usage and location positioning, including GPS, GLONASS, Galileo and BeiDou.

It can also connect to DAMM's MultiTech Outdoor Base Stations, which can run a VHF-only network or a combination of UHF and VHF on separate base stations in the same network, allowing users to operate in rural and/or built-up areas with one infrastructure.

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## TONY HUDSON, VERTEL'S NEW COMMERCIAL DIRECTOR

Australian telecommunications carrier Vertel has appointed Tony Hudson as its new commercial director to lead the company's sales, marketing and customer experience teams. Hudson joined Vertel as Head of Government Sales in 2016, with 30 years' experience in the information technology and telecommunication sectors under his belt. Vertel Managing Director Theo Belekas said Hudson "brings a unique combination of industry experience, a strong focus on customer success, and an understanding of Vertel's vision of smarter, healthier and safer Australian communities". Hudson said that the "key to Vertel's service is listening to and understanding customers and future customers' needs and goals, even beyond the ICT challenges".

More info: [bit.ly/35TvPBY](http://bit.ly/35TvPBY)



## PETER SCARLATA APPOINTED CEO SIMOCO AUSTRALASIA

Simoco Wireless Solutions has appointed Peter Scarlata as CEO of Simoco Australasia. Scarlata, who has more than 20 years of experience working at senior levels in national and multinational product management, sales and marketing management, engineering, system integration and general management roles, joins Simoco from Intelematics, Bosch and CNG Systems, where he has held the position of general manager. To be based at Simoco's Melbourne headquarters, he will be responsible for the next phase of business growth with a focus on important infrastructure projects and will oversee all management, sales and marketing activity, as well as national and multinational product management and development.

More info: [bit.ly/33LITZ5](http://bit.ly/33LITZ5)



### PoC radio

Hytera's PNC380 Push-To-Talk over Cellular (PoC) radios can connect to 2G, 3G, 4G and Wi-Fi — allowing one-to-one or one-to-many voice communication, 4G video transmission and instant messaging. They also have GPS, GLONASS, BDS and AGPS positioning for location sharing and a dedicated emergency button.

The radios feature dual-mic noise reduction technology — designed to provide loud and clear audio, and a 4000 mAh battery which can supply up to 24 hours of talk and standby time on a 5-5-90 duty cycle.

They are IP67 rated — meaning they are dust-proof and waterproof up to one metre for 30 minutes — and also meet the MIL-STD-810G standard to withstand a 1.5 m drop.

They are suitable for use in various scenarios, including: city management, property security, logistics, major events, industrial parks and airports.

**Hytera Communications Co. Ltd**

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



### DC power supplies

ICT's Platinum Series DC power supplies offer 800 or 1600 W of 12, 24 or 48 VDC output. They replace the Digital Series product line and have several battery management features, including state of charge and estimated run-time reporting, auto/manual discharge testing, automatic equalisation and user-adjustable battery charge current.

They also have improved network security, supporting protocols SNMPv1 and TLS1.2 and can maintain remote communications. The power supplies are designed to provide a reliable and flexible DC power solution for LMR communications networks, broadband, radio access and demanding remote site power applications.

On display at Comms Connect Melbourne 2019, stand 12.

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# SYNTHETIC HALL EFFECT FOR ONE-WAY RADIO TRANSMISSION

The results of new research could be used to produce devices that protect sources of radio waves from potentially harmful interference.

Researchers at the University of Illinois at Urbana-Champaign have replicated one of the most well-known electromagnetic effects in physics, the Hall effect, using radio waves (photons) instead of electric current (electrons). Their technique could be used to create advanced communication systems that boost signal transmission in one direction while simultaneously absorbing signals going in the opposite direction.

The Hall effect, discovered in 1879 by Edwin Hall, occurs because of the interaction between charged particles and electromagnetic fields.

In an electric field, negatively charged particles (electrons) experience a force opposite to the direction of the field. In a magnetic field, moving electrons experience a force in the direction perpendicular to both their motion and the magnetic field.

These two forces combine in the Hall effect, where perpendicular electric and magnetic fields combine to generate an electric current. Light isn't charged, so regular electric and magnetic fields can't be used to generate an analogous 'current of light'.

However, in a recent paper published in *Physical Review Letters*, researchers have done exactly this with the help of what they call "synthetic electric and magnetic fields".

Principal investigator Gaurav Bahl's research group has been working on several methods to improve radio and optical data transmission as well as fibre-optic communication. Earlier this year, the group exploited the interaction between light and sound waves to suppress the scattering of light from material defects and published its results in *Optica*.

In 2018, team member Christopher Peterson was the lead author in a *Science Advances* paper which explained a technology that promises to halve the bandwidth needed for communications by allowing an antenna to send and receive signals on the same frequency simultaneously through a process called nonreciprocal coupling.

In the current study, Peterson has provided another promising method to directionally control data transmission using a principle similar to the Hall effect.

Instead of an electric current, the team generated a 'current of light' by creating synthetic electric and magnetic fields, which affect light the same way the normal fields affect electrons. Unlike conventional electric and magnetic fields, these synthetic fields are created by varying the structure that light propagates through in both space and time.

"Although radio waves do not carry charge and therefore do not experience forces from electric or magnetic fields, physicists have known for several years that equivalent forces can be produced by confining light in structures that vary in space or time," Peterson explained.

"The rate of change of the structure in time is effectively proportional to the electric field, and the rate of change in space is proportional to the magnetic field.

"While these synthetic fields were previously considered separately, we showed that their combination affects photons in the same way that it affects electrons."

By creating a specially designed circuit to enhance the interaction between these synthetic fields and radio waves, the team leveraged the principle of the Hall effect to boost radio signals going in one direction, increasing their strength, while also stopping and absorbing signals going in the other direction.

Their experiments showed that with the right combination of synthetic fields, signals can be transmitted through the circuit more than 1000 times as effectively in one direction than in the opposite direction.

Their research could be used to produce new devices that protect sources of radio waves from potentially harmful interference, or that help ensure sensitive quantum mechanical measurements are accurate.

The team is also working on experiments that extend the concept to other kinds of waves, including light and mechanical vibrations, as they look to establish a new class of devices based on applying the Hall effect outside of its original domain.

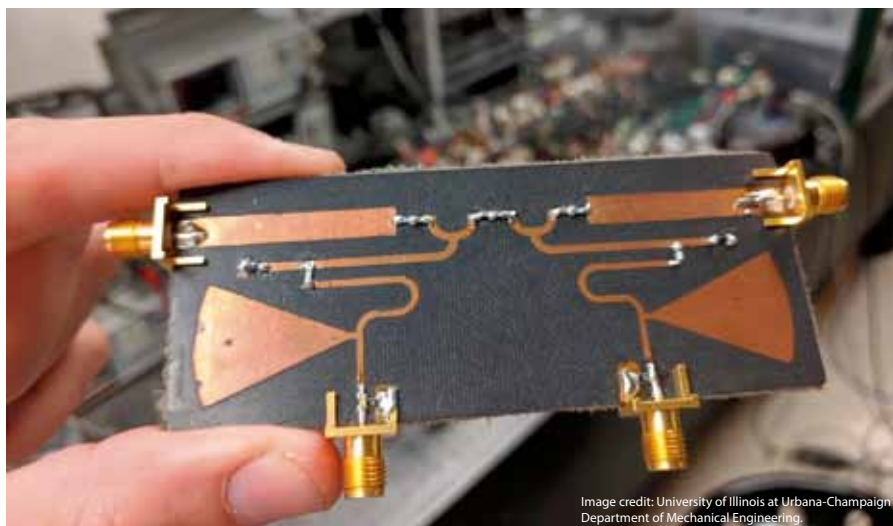


Image credit: University of Illinois at Urbana-Champaign  
Department of Mechanical Engineering.

A microstrip circuit used to demonstrate the Hall effect for radio waves.





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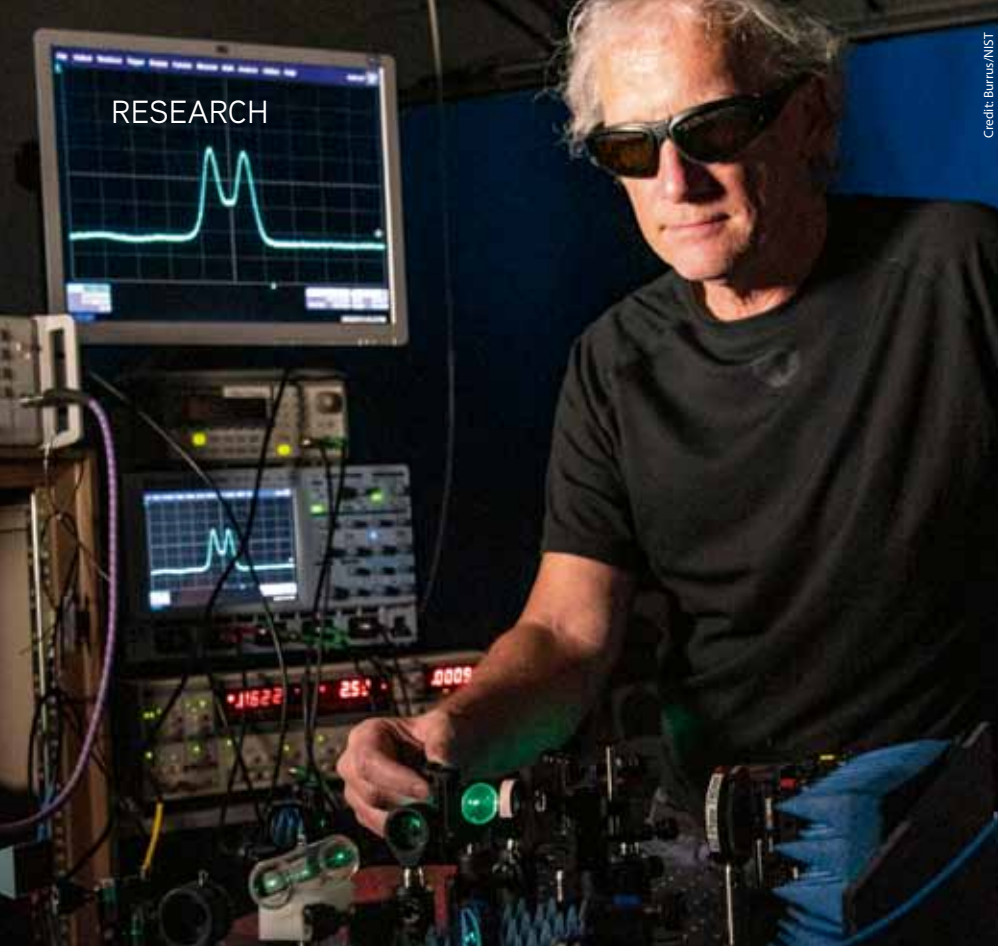
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Credit: Burus/NIST

*Left: NIST researcher Chris Holloway adjusts a mirror to align a laser beam used in an atom-based receiver for digitally modulated communication signals.*

# RESEARCHERS TEST ATOM-BASED RECEIVERS

Researchers at the US National Institute of Standards and Technology (NIST) have demonstrated a new type of sensor that uses atoms to receive commonly used communications signals. This atom-based receiver has the potential to be smaller and work better in noisy environments than conventional radio receivers, among other possible advantages.

The NIST team used caesium atoms to receive digital bits in the most common communications format — phase shifting or phase modulation — such as those used in mobile phones, Wi-Fi and satellite TV.

“The point is to demonstrate one can use atoms to receive modulated signals,” Project Leader Chris Holloway said. “The method works across a huge range of frequencies. The data rates are not yet the fastest out there, but there are other benefits here, like it may work better than conventional systems in noisy environments.”

As described in a new paper, the quantum sensor received signals based on real-world phase-shifting methods. A 19.6 gigahertz

transmission frequency was chosen because it was convenient for the experiment, but it also could be used in future wireless communications systems, Holloway said.

The NIST team previously used the same basic technique for imaging and measurement applications. Researchers use two different colour lasers to prepare atoms contained in a vapour cell into high-energy (‘Rydberg’) states, which have novel properties such as extreme sensitivity to electromagnetic fields. The frequency of an electric field signal affects the colours of light absorbed by the atoms.

In the new experiments, the team used a recently developed atom-based mixer to convert input signals into new frequencies. One RF signal acts as a reference and a second serves as the modulated signal carrier. Differences in frequency and the offset between the two signals were detected and measured by probing the atoms.

While many researchers have previously shown that atoms can receive other formats of modulated signals, the NIST team was the first to develop an atom-based mixer that could handle phase shifting.

Depending on the encoding scheme, the atom-based system received up to about 5 megabits of data per second. This is close to the speed of older, 3G mobile phones.

The researchers also measured the accuracy of the received bit stream based on a conventional metric called error vector magnitude (EVM). EVM compares a received signal phase to the ideal state and thus gauges modulation quality.

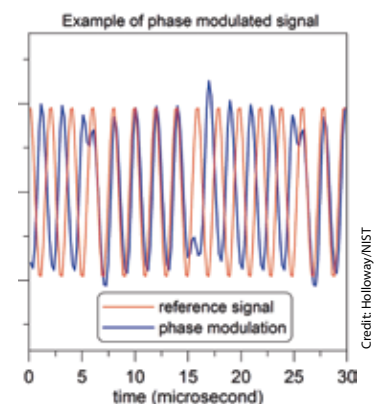
The EVM in the NIST experiments was below 10%, which is decent for a first demonstration, Holloway said. This is comparable to systems deployed in the field, he added.

Tiny lasers and vapour cells are already used in some commercial devices such as chip-scale atomic clocks, suggesting it might be feasible to build practical atom-based communications equipment.

With further development, atom-based receivers may offer many benefits over conventional radio technologies, according to the paper. For example, there is no need for traditional electronics that convert signals to different frequencies for delivery because the atoms do the job automatically. The antennas and receivers can be physically smaller, with micrometre-scale dimensions.

In addition, atom-based systems may be less susceptible to some types of interference and noise. The atom-based mixer also can measure weak electric fields precisely.

The researchers now plan to improve the new receiver by reducing laser noise and other unwanted effects.



Credit: Holloway/NIST

*Wireless communications often use a format called phase shifting or phase modulation, in which the signals are shifted relative to one another in time. In this example, the communications signal (blue) contains periodic reversals relative to the reference signal (red). These reversals are the blips that look like cats' ears. The information (or data) is encoded in this modulation.*





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## Design software

MathWorks has introduced Release 2019b of MATLAB and Simulink, featuring capabilities in support of artificial intelligence, deep learning and the automotive industry. The release also introduces products in support of robotics, training resources for event-based modelling, and updates and bug fixes across the MATLAB and Simulink product families.

MATLAB highlights include the introduction of Live Editor Tasks, which enables users to interactively explore parameters, pre-process data and generate MATLAB code that becomes part of the live script. MATLAB users can focus on the task instead of the syntax or complex code, and automatically run generated code to quickly iterate on parameters through visualisation.

Simulink highlights include Simulink Toolstrip, which helps users access and discover capabilities as they are needed. Tabs are arranged according to workflow and sorted by frequency of use, saving navigation and search time.

In R2019b, Deep Learning Toolbox builds on the flexible training loops and networks introduced previously. The latest capabilities enable users to train advanced network architectures using custom training loops, automatic differentiation, shared weights and custom loss functions. In addition, users can now build generative adversarial networks (GANs), Siamese networks, variational auto-encoders and attention networks. Deep Learning Toolbox also can now export to ONNX format networks that combine CNN and LSTM layers and networks that include 3D CNN layers.

The release also offers Stateflow Onramp, an interactive tutorial to help users learn the basics of how to create, edit and simulate Stateflow models. This self-paced learning course includes video tutorials and hands-on exercises with automated assessments and feedback.

### MathWorks Australia

[au.mathworks.com](http://au.mathworks.com)



## Ethernet tester

The Viavi SmartClass 4800 Ethernet Tester is a modern tool for ensuring data and voice services achieve expected key performance indicators. It examines electrical (10/100/1000M) and optical (100M, 1GE) Ethernet links. It is available to rent from

TechRentals.

The product offers fast examinations with automated enhanced RFC 2544 and SAMComplete testing per ITU-Y.Y.1564. It also features an integrated burst testing approach per MEF 34 and RFC 6430 TrueSpeed TCP throughput testing.

It is suitable for applications including performance assessment of Carrier Ethernet services, activation and maintenance of metro Ethernet networks, deployment of active Ethernet (point-to-point) access services, switched networks, traffic generation and QoS verification.

The device is optimised for field use with its multitouch screen, scripted workflows and clear results. It supports efficient practices with repeatable procedures and methods.

### TechRentals

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



## Wireless client and access point

The revamped Hirschmann BAT-C2 wireless client and access point offers a compact industrial wireless option. Available from Control Logic, the BAT-C2 offers improvements on BAT-C including a new range of software and hardware features, such as 802.11ac support.

Offering both point-to-point and access point modes of operation, the BAT-C2 is suitable in applications where physical cabling is not achievable or where mobile assets are used. It offers a high operating temperature range of -40 to +70°C and the both water- and vibration-proof IP65 housing allows installation in almost any environment.

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## Antennas

Panorama's L[G]P-7-38[-24-58] range is designed to decrease the lifetime cost of machine-to-machine (M2M) and IoT applications by offering a low-profile antenna with a compact, hockey puck-like envelope.

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The 'hockey puck' design features a wideband 4G/5G LTE element, 2.4 and 4.9–6 GHz Wi-Fi/WiMAX element (optional) and integrated GPS antenna (optional), and is suitable for installation without a ground plane.

**Panorama Antennas Pty Ltd**

[www.panorama-antennas.com](http://www.panorama-antennas.com)



## P25 radio

The Motorola Solutions APX NEXT is a mission-critical P25 radio that is FirstNet Ready and comes with embedded LTE connectivity enabled by the FirstNet communications platform to quickly deliver enhanced communications and data-centric application services for first responders in the field.

APX NEXT is Motorola Solutions' first APX radio to feature a touchscreen with a user interface designed specifically for public safety. The touchscreen can be used in the rain and when wearing gloves. It offers one-touch access to radio controls, large touch targets and an optimised user interface for fast navigation. In addition, ViQi, a public safety virtual assistant, provides information to first responders and allows users to operate APX NEXT via voice control.

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# THE FUTURE OF UTILITIES' FIELD CREW SAFETY

Powerco's DMR platform with Zetron's ACOM Command & Control System is bringing comfort and security to 1.1 million utility customers.

**K**eeping the lights on and the gas flowing to 442,000 homes, businesses and organisations across New Zealand's North Island is no easy task. However, as the country's second-largest utility provider, Powerco prides itself on safety and reliability for all. That includes fault crews in the field every day working alongside nine networks of electricity and gas lines.

But as the company's needs changed, emergency communication became an issue with the electricity network.

"In the past, when we used the RT system that had a far smaller reach, we had fault staff

needing to drive for half an hour to the top of a hill to get coverage so they could contact the control room," said Phil Marsh, Powerco Network Operations Manager.

"There were places in areas such as the Tararua, Wairarapa and Rangitikei where they simply didn't have any comms or cell phone coverage — losing all communication with the control room, which is dangerous, particularly in an emergency."

Echoing Marsh's statements, Powerco's primary field services provider also understood the need to act.

"When working with electricity, it is vital to be able to quickly and reliably contact





those controlling the electricity network if there is an emergency, without worrying about black spots affecting radio coverage,” said John Batchelor, General Manager Power and Gas, at Downer New Zealand.

### Mitigating hazards

With the vision of providing a safer working environment as a clear goal, Powerco set out to design a digital radio system capable of ensuring at least 90% coverage across the company’s expansive work zones.

Other key criteria included enabling the company to retain control over the network and improve efficiency, while ultimately prioritising its field staff’s access to communications at Powerco’s network operations centre.

### Partnering with technology innovators

After evaluating equipment options from multiple communications providers, Powerco chose Zetron’s ACOM Command &

Control System to drive the company’s 32-position console system and complement its new fleet of Hytera DMR Tier III VHF radios.

While there were other solutions the company considered, the ACOM system checked all the boxes. Aside from its highly customisable touchscreen display, the system supported multiple simultaneous active calls, included visual and audio alerts, and provided Powerco staff the ability to leverage advanced features, such as Bluetooth, encrypted messaging and SIP gateways, in addition to request-to-talk (RTT) and press-to-talk (PTT) communications.

Adding an Eventide Voice Recorder and Surveyor Manager Reporting System added extra desired functionality to the overall solution.

“Zetron performed a proof of concept at Powerco’s site, which gave the Powerco evaluation team the insight and confidence that Zetron was the right fit,” Marsh explained.

### Deployment

The project kicked off with Zetron and Hytera establishing a regional joint testing facility in 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 to and deployed at Powerco facilities in New Plymouth and Tauranga.

From there, Zetron led training workshops for Powerco staff, including two ‘super user’ members of the company’s original design team.

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 the Zetron team and other suppliers.

### Boosting safety and efficiency

Soon after deployment, the ACOM system underwent its first real test. Major storms battered the North Island and cut power to thousands of Powerco customers. But this time was different. Because of the new Digital Radio System, the company was better prepared to navigate the challenges.

In the past, the company’s Network Operation Centre would activate a storm room with additional operators on hand to manage the call overflow. But with the increased operational efficiencies provided by the new system, Powerco staff members were able to tackle the call volume without incident, and without needing to activate the storm room.

“There were four separate storm events in December, and three of those were after we moved in. It was probably the worst December I can remember for lightning strikes. We had 700 strike faults to take care of and had to replace 75 transformers,” Marsh said.

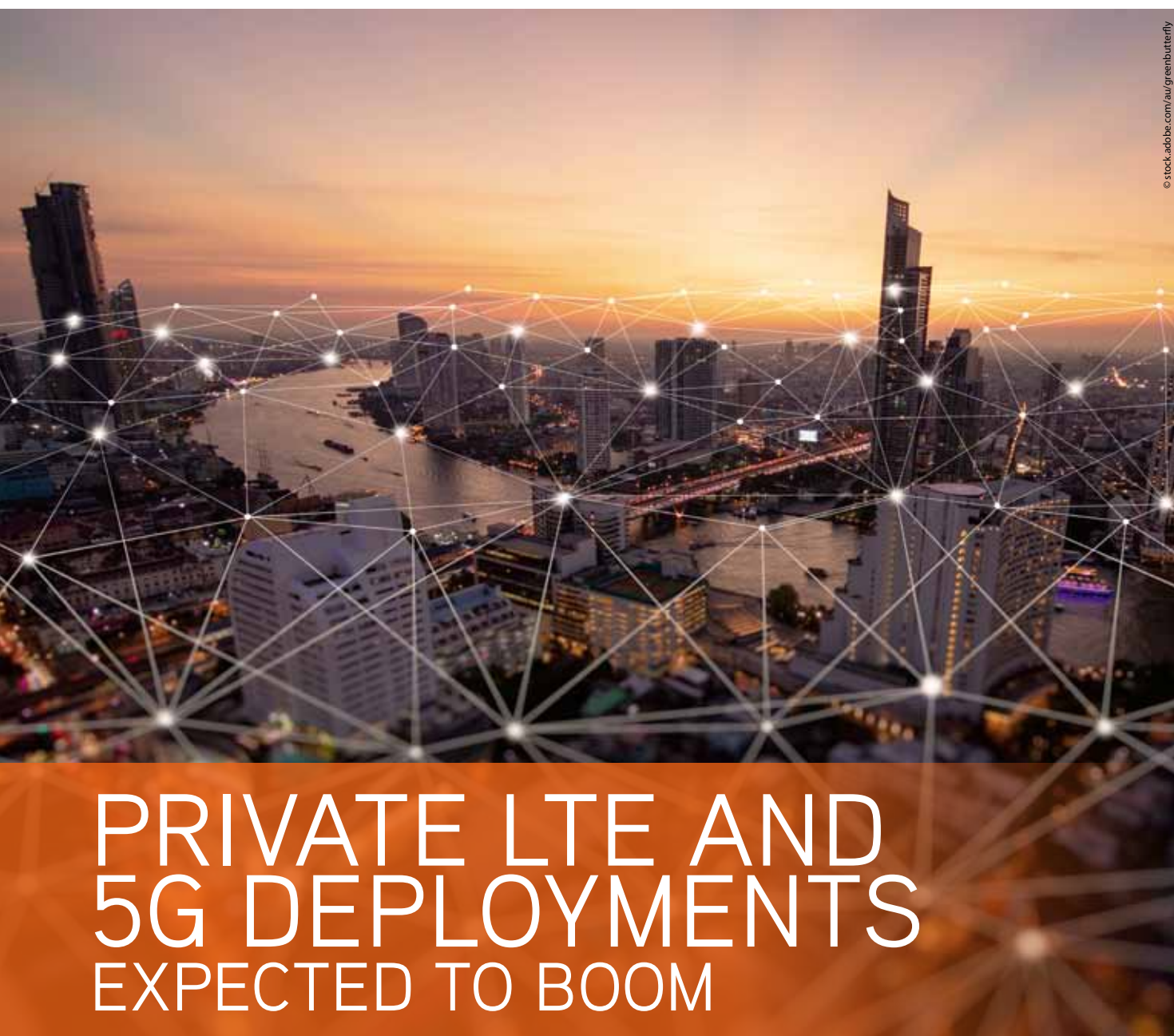
In fact, since deploying the new ACOM system, the company reports NOC operators have increased their overall call handling efficiency by 50% to 70%.

“Powerco now has coverage in some remote parts of New Zealand that no other provider of mobile or radio has. We are set up for the future,” Marsh said.

Going forward, Powerco plans on exploring AVL technology. But for now, the company’s customers, executives, staff members and line crews can rest easy knowing the ACOM system and new digital radios provide a safer and more efficient working environment for all, while empowering the company mission of delivering New Zealand’s energy future.

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# PRIVATE LTE AND 5G DEPLOYMENTS EXPECTED TO BOOM

**A**n annual global investments in private LTE and 5G network infrastructure — which includes radio access network (RAN), mobile core and transport network equipment — will reach \$8 billion by the end of 2023, according to research from SNS Telecom & IT.

With the standardisation of features such as MCX (mission-critical PTT, video and data) services and ultra-reliable low-latency communications (URLCC) by the 3GPP, LTE and 5G New Radio (NR) networks are rapidly gaining recognition as an all-inclusive critical communications platform for the delivery of both mission- and business-critical applications.

By providing authority over wireless coverage and capacity, private LTE and 5G networks ensure guaranteed and secure connectivity, while supporting a wide

range of applications — ranging from PTT group communications and real-time video delivery to wireless control and automation in industrial environments.

Organisations across the critical communications and industrial IoT domains — including public safety agencies, militaries, utilities, oil and gas companies, mining groups, railway and port operators, manufacturers and industrial giants — are making sizeable investments in private LTE networks.

The very first private 5G networks are also beginning to be deployed to serve a diverse array of usage scenarios spanning from connected factory robotics and massive-scale sensor networking to the control of automated guided vehicles (AVG) and augmented and virtual reality (AR/VR).

For example, Daimler's Mercedes-Benz Cars division is establishing a local 5G

network to support automobile production processes at its Factory 56 in Sindelfingen, Germany, while the Korea Military Academy is installing a dedicated 5G network in its northern Seoul campus to facilitate mixed reality-based military training programs.

In addition, with the emergence of neutral-host small cells, multi-operator connectivity and unlicensed/shared spectrum access schemes, the use of private LTE and 5G networks in enterprise buildings, campuses and public venues is expected to grow significantly over the coming years.

The practicality of spectrum sharing schemes such as the three-tiered Citizens Broadband Radio Service (CBRS) framework and Japan's unlicensed Shared Extended Global Platform (sXGP) has already been proven with initial rollouts in locations such as corporate campuses, golf courses, race tracks, stadiums, airports and warehouses. >





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A number of independent neutral-host and wholesale operators are also stepping up with pioneering business models to provide LTE and 5G connectivity services for both mobile operators and enterprises, particularly in indoor settings and locations where it is technically or economically not feasible for traditional operators to deliver substantial wireless coverage and capacity.

Expected to reach US\$4.7 billion in annual spending by the end of 2020, private LTE and 5G networks are increasingly becoming the preferred approach to deliver wireless connectivity for critical communications, industrial IoT, enterprise and campus environments, and public venues.

The market will further grow at a CAGR of 19% between 2020 and 2023, eventually accounting for nearly US\$8 billion by the end of 2023.

SNS Telecom & IT estimates that as much as 30% of these investments — approximately \$2.5 billion — will be directed towards the build-out of private 5G networks, which will become the preferred wireless connectivity medium to support the ongoing Industry 4.0 revolution for the automation and digitisation of factories, warehouses, ports and other industrial premises, in addition to serving other verticals.

Other key findings of the report include:

Favourable spectrum licensing regimes — such as the German Government's decision to reserve frequencies in the 3.7–3.8 GHz range for localised 5G networks — will be central to the successful adoption of private 5G networks.

A number of other countries — including Sweden, United Kingdom, Japan, Hong Kong and Australia — are also moving forward



THE USE OF PRIVATE LTE AND 5G NETWORKS IN ENTERPRISE BUILDINGS, CAMPUSES AND PUBLIC VENUES IS EXPECTED TO GROW SIGNIFICANTLY OVER THE COMING YEARS.

with their plans to identify and allocate spectrum for localised, private 5G networks with a primary focus on the 3.7, 26 and 28 GHz frequency bands.

The private LTE network submarket is well established, with operational deployments across multiple segments of the critical communications and industrial IoT industry, as well as enterprise buildings, campuses and public venues. China alone has hundreds of small- to medium-scale private LTE networks, extending from single-site systems through to city-wide networks — predominantly to support police forces, local authorities, power utilities, railways, metro systems, airports and maritime ports.

Private LTE networks are expected to continue their upward trajectory beyond 2020, with a spate of ongoing and planned network rollouts, from nationwide public safety broadband networks to usage scenarios as diverse as putting LTE-based communications infrastructure on the Moon.

In addition to the high-profile FirstNet, South Korea's Safe-Net and Britain's ESN nationwide public safety LTE network projects, a number of other national-level engagements are also underway — most notably the Royal Thai Police's LTE network (which is already operational in the greater Bangkok region), Finland's VIRVE 2.0 mission-critical mobile broadband service, France's PCSTORM critical communications

broadband project and Russia's planned secure 450 MHz LTE network for police forces, emergency services and the national guard.

Other segments within the critical communications industry have also seen growth in the adoption of private LTE networks. Recent investments have focused on mining, port and factory automation, deployable broadband systems for military communications, mission-critical voice, broadband and train control applications for railways and metro systems, ATG (air-to-ground) and airport surface wireless connectivity for aviation, field area networks for utilities, and maritime LTE platforms for vessels and offshore energy assets.

In the coming months and years, SNS Telecom & IT expects to see significant activity in the 1.9 GHz sXGP, 3.5 GHz CBRS, 5 GHz and other unlicensed/shared spectrum bands to support the operation of private LTE and 5G networks across a range of environments, particularly enterprise buildings, campuses, public venues, factories and warehouses.

Leveraging their extensive spectrum assets and mobile networking expertise combined with a growing focus on vertical industries, mobile operators are continuing to retain a strong foothold in the wider private LTE and 5G network ecosystem — with active involvement in projects ranging from large-scale nationwide public safety LTE networks to highly localised 5G networks for industrial environments.

A number of independent neutral-host and wholesale operators are also stepping up with pioneering business models to provide LTE and 5G connectivity services to both mobile operators and enterprises. For example, using strategically acquired 2.6 GHz and 3.6 GHz spectrum licences, Airspan's operating company Dense Air plans to provide wholesale wireless connectivity in Ireland, Belgium, Portugal, New Zealand and Australia.

Cross-industry partnerships are becoming more commonplace as LTE/5G network equipment suppliers wrestle to gain ground in key vertical domains. For example, Nokia has partnered with Komatsu, Sandvik, Konecranes and Kalmar to develop tailored private LTE and 5G network solutions for the mining and transportation industries.

The full findings of the research can be found in the report at <http://www.snstelecom.com/private-lte>.



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# Backhaul

*Take a trip down memory lane as we look at what was happening in the comms sector of yesteryear.*

**25 YEARS AGO.** The cover of the December/January 1994–95 issue of *What's New in Radio Communications* featured the Tait inform text dispatch system, which could be used as part of an off-the-shelf voice and data system using open standards such as MAP27 and MPT1327. Inside the magazine, we reported on Panasonic releasing what was thought at that time to be the world's smallest GPS receiver, with a mass of 510 g and dimensions of 92 x 54 x 177 mm. We also reported on Telstra Mobile Satellite & Radio Service extending the Radphone Direct Dial HF service due to popular demand (with the number of users exceeding forecasts by 300%). And we had a fascinating article on BHP halving the cost of managing more than \$40 million of spare parts using a Santa Cruz Operation (SCO)-based wireless inventory control system, which used barcoding methodology, RF networking and paperless workflows running under SCO UNIX to manage more than half a million different items. It was believed to be one of the earliest sites in Australia using spread-spectrum RF technology.



**10 YEARS AGO.** The cover of the November/December 2009 issue of *Radio Comms Asia-Pacific* featured the Rohde & Schwarz NRP family of power sensors, capable of measuring DC to 67 GHz and from 200 pW to 30 W. Inside the magazine we reported on the formation of the Digital Mobile Radio (DMR) Association, the goal of which was to make DMR “the most widely supported 21st century digital radio standard for business”. The ACMA was reported to have released a discussion paper as part of a review of the technical frameworks that apply to spectrum licences. The ACMA had also signed a contract with the Wireless Institute of Australia for the latter to issue amateur radio certificates of proficiency, make recommendations to the ACMA about call signs and provide examination services to the amateur community.



## Spectrum

### Radio is dead — long live wireless!

We all know that the headline above is an oxymoron; after all radio is wireless, just with a more modern terminology. However, if we acknowledge that wireless is now seen as the new radio, then we get to the crux of the headline — to modern generations, radio as we knew it probably is dead, and to them wireless is the most important technology.

So what does this mean for our industry? Well, the answer is that it gives us a whole new range of options for our clients. Over recent years ARCIA has been pressuring our spectrum regulator (the ACMA) to accept that most business-critical users want to be able to utilise mobile data, yet they are very nervous about putting the running of their business into the hands of a third party (mobile phone carriers). Considering the number of problems our public carriers have occasionally, this is understandable.

After patiently pressing the case we can now see the regulator creating new licence types that will cater for area-wide frequency allocations that will suit private



or ‘enterprise’ mobile data networks. As well as that, the spectrum allocations are now being reviewed and we can see that very soon there will be spectrum allocated for these systems. Enterprise LTE systems will be specifically designed for the users of business-critical communications — our customers. This will be a game changer for our industry.

Until now, the radio communications industry has treated mobile phones and mobile data as the enemy, but this must change. Many have already discovered that properly set up PTT-over-cellular (PoC) products can meet user’s needs — needs that historical radio systems couldn’t provide. Well, consider how the customer will benefit from having their own mobile data network, complete with integrated radio communications, as well as their own Internet of Things devices and control and data acquisition facilities... all within one customer-controlled network.

If you haven’t already heard of the Citizen Broadband Radio Service (CBRS) in the US, poke Google in the ribs and ask it some questions, as you really need to learn about it. In a nutshell, CBRS is a localised LTE service operating on shared spectrum, possibly licence free. The ACMA is already working towards providing a similar type of spectrum allocation here in Australia, so the future is here now. This is technology that can be designed and installed by our members — radio professionals who already understand what our clients need in terms of ongoing support.

There is no doubt that our customer base is slowly going to wither away with time, unless we give our clients a really good reason to remain with us. Enterprise LTE services are the real benefit to our clients. By showing users how we can not only supply their mobile data systems, but that they will still have the same high level of personal support they have had for their communications until now, they will welcome the opportunity. So there you have it — radio might be slowly fading away, but we know wireless and so we can be the new technology suppliers. Embrace the future.



*Ian Miller is Executive Officer of the Australian Radio Communications Industry Association and Principal Consultant of Orange Horizons.*



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