MAY/JUN 2015 Vol.2 No.4

# critical comms

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## BAI partners with Sensus to bring advanced metering to Australia

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## ON THE COVER


BAI has partnered with Sensus to offer a wide range of remote system management options to boost efficiency, insight and cost savings for utilities across Australia.

Sensus is a provider for Smart Grid for water in North America and a global market leader in water meters. Its strong track record of successful implementations in overseas markets, where it has developed long-term trusted relationships with customers, has made it BAI's partner of choice for Australia. Sensus won the GB Smart Metering program and has 16 million smart endpoints connected and in service globally.

Together with BAI, Sensus offers an affordable digital meter and communications solution using long-range licensed radio that meets the characteristics of critical national infrastructure. The solution offers the flexibility to meet the immediate needs of an intelligent communications network without significant additional investment or the need to create multiple networks. Sensus also provides industry-leading metrology in the form of the iPERL water meter.

BAI and Sensus foresee benefits including: a low-whole-of-life-cost, secure, reliable communications system that provides clear channels of communication at all times on a stable technology platform; a consistent approach that can scale to include additional users and applications in the future; a single digital system to meet the specific operational needs that can be scaled and integrated with adjacent authorities' systems; and managing equipment, communications and user access so that utilities can focus on distribution operations and customer satisfaction.

*www.baigroup.com*

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# Inside

May/June 2015



# Can you tell what DMR radio he's using? Neither can we. And that's fine.

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# Transmit

The first half of this year has brought some major domestic wins, such as Motorola's contract for the South Australian GRN and Tetracom's contract with the South Australian Country Fire Service. Internationally, Tait has won a contract for the biggest DMR Tier 3 system in North America.

These are big jobs, and big jobs take time to implement - witness the case study we present in this issue about Surf Life Saving Queensland's journey from analog to narrowband to digital. As with so many of these endeavours, it was a collaboration between several different companies, and in this instance a real synergy was achieved.

Everyone is waiting to see what will come from the Productivity Commission's study into allocating mobile broadband spectrum for public safety usage. This is a challenge that is being faced by numerous countries at the moment and is one reason why international collaboration and cooperation in setting standards and sharing information is so important. The University of Melbourne, through its Centre for Disaster Management and Public Safety (CDMPS), recently signed an MOU with the US National Public Safety Telecommunications Council to share research into wireless technologies, and in this issue Geoff Spring (APCO-A and CDMPS) sets out the rationale behind the move.

Comms Connect Sydney 2015 is about to begin, at roughly twice the size of last year's inaugural event. It shows how popular Comms Connect events are - so much so that it has now been announced that there will be a series of smaller, one-day conferences in Brisbane, Adelaide and Perth over the coming 12 months, to be held in conjunction with ARCIA. The primary Melbourne event, of course, will still to be held in November.

Jonathan Nally, Editor
cc@westwick-farrow.com.au

# Calendar

## June 2015

**What:** Comms Connect Sydney
**When:** 3-4 June 2015
**Where:** Sydney Showground, Sydney Olympic Park
**Web:** comms-connect.com.au

**What:** TETRA in Thailand
**When:** 9 June 2015
**Where:** Bangkok, Thailand
**Web:** tandcca.com/events/article/23091

**What:** TETRA in Indonesia
**When:** 11 June 2015
**Where:** Jakarta, Indonesia
**Web:** tandcca.com/events/article/23092

## July 2015

**What:** Emergency Management Conference 2015
**When:** 7-8 July 2015
**Where:** Pullman Melbourne on the Park, Melbourne
**Web:** hpe.com.au/emc

## September 2015

**What:** AFAC15
**When:** 1-3 September 2015
**Where:** Adelaide Convention Centre, Adelaide
**Web:** afac.com.au/events/conference2015/home

## October 2015

**What:** LTE Asia 2015
**When:** 6-8 October 2015
**Where:** Suntec Singapore International Convention & Exhibition Centre
**Web:** asia.lteconference.com

## December 2015

**What:** Comms Connect Melbourne
**When:** 1-3 December 2015
**Where:** Melbourne Convention & Exhibition Centre
**Web:** comms-connect.com.au

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


WESTWICK-FARROW MEDIA

**A.B.N. 22 152 305 336**
**www.westwick-farrow.com.au**

**Head Office**
Cnr. Fox Valley Road & Kiogle Street, (Locked Bag 1289), Wahroonga NSW 2076 Australia
Ph +61 2 9487 2700 Fax +61 2 9489 1265

**Editor:** Jonathan Nally
cc@westwick-farrow.com.au

**Chief Editor:** Janette Woodhouse

**Publisher:** Geoff Hird

**Art Director/Production Manager:** Julie Wright

**Art/Production:** Tanya Barac, Odette Boulton

**Circulation Manager:** Sue Lavery
circulation@westwick-farrow.com.au

**Copy Control:** Mitchie Mullins
copy@westwick-farrow.com.au

**Advertising Sales**
**National Sales Manager**
**Nicola Fender-Fox** Ph 0414 703 780
nfender-fox@westwick-farrow.com.au
**NSW, QLD**
**Liz Wilson** Ph 0403 528 558
lwilson@westwick-farrow.com.au
**VIC, SA**
**Lachlan Rainey** Ph 0402 157 167
lrainey@westwick-farrow.com.au
**Asia - Lachlan Rainey**
Ph +61 (0) 402 157 167

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**Subscriptions:** For unregistered readers, price on application

Print Post Approved PP100007393
ISSN No. 2202-882X
Printed and bound by SOS Print + Media
+61 2 9549 2119

Audited Media Association of Australia
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September 2014 total CAB Audited Circulation 4,100 (77% personally requested)

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# COOL RECEPTION

Simoco Group and partner Pacific Wireless Communications (PWC) have jointly donated a rapid-deployment suitcase portable repeater to the field operational teams at Alpine Search and Rescue (alpineSAR).

The volunteer organisation comprises an experienced group of back-country skiers, mountaineers and bushwalkers who are skilled in search and rescue. In their capacity as members of Bush Search and Rescue Victoria (BSAR), they are often called on by Victoria Police to search for lost people in alpine and bush areas.

The alpineSAR teams are involved in many key rescue operations throughout the year and also support a range of outdoor events, including Running Wild's annual Alpine Challenge.

alpineSAR members work in small teams with other BSAR and emergency-services personnel. While they may come back into base by the end of the day, they are just as likely to stay out overnight, depending on the search area they have been allocated. The number of searches varies but may be from one to five per year.

Members attend training with a couple of single days and a multiday winter training event each year. The training builds on members' existing camping and bush/alpine skills by adding search, leadership, remote patient management, radio, GPS, steep snow and ice, avalanche rescue and other skills required in a search or rescue situation. A key part of the training is learning to operate as a well-functioning team with the other members.

For alpineSAR members operating in extreme sub-zero weather conditions, reliable communications are vital, enabling swift rescue coordination and response. The repeater donation will help support field communications, providing coverage to volunteers operating in difficult mountainous terrain with limited cellular and state-radio network coverage.


*David Cox, director of operations at PWC; Rik Head, alpineSAR; Duncan Maughan, alpineSAR; Robert Meachem, general manager of Simoco Australasia.*

"As a non-profit organisation, the support from Simoco and PWC has been highly appreciated by all of our volunteers," said alpineSAR President Duncan Maughan.

"Having reliable radio contact throughout field operations is vital for effective command and control and for ensuring the safety of volunteers, and the radio repeaters will enable us to do our job more efficiently."

Simoco and PWC provide critical communications to emergency-service organisations and both respect the selfless work undertaken by these committed volunteers.

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# THE GALILEO CONSTELLATION

Europe's satellite navigation system is closer to completion with the launch of the seventh and eighth satellites.

Europe's Galileo satellite navigation system now has eight satellites in orbit, following the launch of the latest pair. Galileo 7 and 8 lifted were rocketed into orbit on 27 March, from Europe's Spaceport in French Guiana, aboard a Soyuz launch vehicle.

Following initial checks, run jointly by ESA and France's CNES space agency from the CNES Toulouse centre, the two satellites will be handed over to the Galileo Control Centre in Germany and the Galileo in-orbit testing facility in Belgium for testing before they are commissioned for operational service. This is expected in mid-year.

The new pair will join the six satellites launched in October 2011, October 2012 and August 2014.

"The deployment of the Galileo constellation is restarting with this successful launch," said Jean-Jacques Dordain, director general of ESA.

"The tests in orbit of satellites 5 and 6 have demonstrated the quality and performance of the satellites, and the production of the following ones is well on track. Good news for Galileo."

Four more satellites are in testing or final integration and scheduled for launch later this year.

"With six new satellites expected to be in orbit by year's end, we are now approaching the cruise mode of production, testing and deployment of the satellite constellation," said ESA Director of Galileo and Navigation-related Activities Didier Faivre.

As set by the European Commission, the objective is to deliver a package of initial services - including a free public service, an encrypted public regulated service and a search and rescue function - by 2016, to be transferred to the responsibility of the European Global Navigation Satellite Systems Agency, GSA.

A full system capability that includes an encrypted commercial service benefiting from 24 operational satellites and six spares is expected to be in place by 2020.

Galileo is the EU's own global satellite navigation system. It will consist of 30 satellites and their ground infrastructure.

The definition, development and In-Orbit Validation phase were carried out by ESA and co-funded by ESA and the European Commission. The phase created a mini constellation of four satellites and a reduced ground segment dedicated to validating the overall concept.

The full Operational Capability phase is fully funded by the European Commission. The commission and ESA have signed a delegation agreement by which ESA acts as design and procurement agent.

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**COVERT SURVEILLANCE OPTION 2**

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# SPECTRUM-SHARING RESEARCH

The US Department of Commerce (DOC) and Department of Defense (DOD) have signed a memorandum of agreement that establishes a new collaborative framework to facilitate access to a wide range of laboratory and test facilities that support development of improved methods for sharing wireless spectrum.

The National Advanced Spectrum and Communications Test Network (NASCTN) established under the agreement is an important adjunct of the new Center for Advanced Communications (CAC), a joint effort of two DOC agencies, the National Institute of Standards and Technology (NIST) and the National Telecommunications and Information Administration (NTIA).

The CAC is implementing a key provision of the 2013 Presidential Memorandum Expanding America's Leadership in Wireless Innovation to further research, development, testing and evaluation of spectrum-sharing technologies and other wireless-related efficiencies.

Additional federal agency members and private sector participants will be invited to join the network.

"Rapid advances in communications technology have created significant new demands for access to wireless channels," Acting Under Secretary of Commerce for Standards and Technology and NIST Acting Director Willie May said. "We need efficient and effective ways of sharing spectrum to continue to benefit from technology advances while balancing the needs of commercial broadband, national security and public safety."

"Access to spectrum will advance the country's future competitiveness and global technology leadership," Assistant Secretary of Commerce for Communications and Information and NTIA Administrator Lawrence E Strickling said.

"NASCTN will play a critical role as we work toward fulfilling the Administration's commitment to making available an additional 500 megahertz of spectrum for commercial use by 2020 while safeguarding capabilities that are vital to federal interests."

"Developing systems that are efficient, flexible, adaptable and support greater sharing helps ensure our military readiness and optimises operational effectiveness while allowing more spectrum to be available for public use - witnessed in the success of the record breaking AWS-3 auction," said DOD Chief Information Officer Terry Halvorsen.

"Through NASCTN we enable the best of our engineering capacity to work together to achieve these and other objectives set forth in the DOD Spectrum Strategy."

The NASCTN will rely on a network of members who will supply and share intellectual capacity, modelling and simulation capabilities, laboratory facilities and test ranges. Initial NASCTN projects will likely include finding mutually agreeable ways for spectrum users to share specific bands of spectrum and rapidly resolve pressing challenges to co-existence.

For example, NASCTN will facilitate access to suitable federal testing facilities and resources to accurately measure and model potential harmful interference between government users and commercial wireless systems.

Through the CAC, NASCTN's coordination of tests, modelling and validation will provide stakeholders with objective and trusted information needed to evaluate the performance of proposed spectrum-sharing technologies and help find technical solutions to key co-existence issues.

The aim of the framework agreement is to accelerate the deployment of spectrum-sharing technologies, increase access to wireless spectrum and inform ongoing and future spectrum policy deliberations.

# Digital Migration Radio

## New Members Onboard

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# News

## ZETRON, KODIAK PARTNER FOR PTT

Zetron is partnering with Kodiak to develop standardised IP interfaces that will seamlessly integrate the Kodiak Broadband PTT solution with Zetron dispatch consoles in the US. Zetron says this will leverage P25 open-standards-based CSSI, enabling smartphones connected to the Kodiak Broadband PTT solution to communicate with talkgroups and other LMR systems associated with CSSI-enabled Zetron dispatch consoles. PTT devices used with the Zetron consoles will operate over the AT&T mobile broadband network. "We're very excited about the ways our partnership with Kodiak will improve the capabilities, convenience and cost-effectiveness of the solutions we're able to offer customers," said Zetron VP of Product Management Kathy Broadwell.

*More info: bit.ly/1bHS7ZG*

## APT 700 MHZ POPULAR

Building on early support from Australia, Asia and Latin America, the push for near-universal adoption of the Asia-Pacific Telecommunity APT 700 MHz band is gaining momentum around the globe, according to the ACMA. Forty-two countries are now allocating, committed to or recommending the use of the band for advanced wireless broadband services. This year has also seen the number of APT 700 MHz capable devices increase from 55 to 76 in a matter of months. In addition, it appears likely that Europe will at least partially harmonise with the APT 700 MHz plan, further increasing the benefits that come from international harmonisation.

*More info: bit.ly/1RrwqOt*

## TAIT'S HUGE US DMR WIN

Tait Communications has been selected by Alliant Energy Corporation, a midwest US energy company, to deploy the largest DMR Tier 3 system to be rolled out in North America. The new 122-site trunked network will provide coverage for Alliant Energy's service territory and replaces an ageing assortment of independent radio networks. The first phase is due to be completed before February 2017. The total deployment is expected to be complete by the end of 2017. The deal also contains a 12-year managed services contract commencing from the end of the first phase of the rollout.

*More info: bit.ly/1bHQpHB*


## Dispatch solution

The Hytera SmartOne dispatch solution is a unified communications platform for the public security sector, developed to enable public security professionals to achieve seamless communication through optimised network interconnection, allowing for dispatchers to quickly command multiple users in different networks.

SmartOne enables the transmission of signals and voice data from various communication protocols, providing both high performance and high security. SmartOne also provides a unified API interface for integrators to develop more flexible and customised applications for end users.

Features include: a multisystem intercommunication system for CSSI and ISSI interface access, wired and wireless interconnection, PMR and public network integration and SIP protocol support; advanced voice processing technology and enhanced user experience through various voice format conversions including G.711, G.729, AMBE++ and TETRA code, voice detection technology that can automatically assign talking authority by detecting voice activity of radios, and gain control technology. Also included is E2EE support.

The SmartOne dispatch system provides abundant features for unified dispatching among different systems and the key network elements can also support redundant deployment, providing 24/7 uninterrupted service. The SmartOne DS-6610 VPUC supports car-mounted installations, which makes mobile interconnection and dispatching possible. Other features include a customised GUI with multiple plug-ins, enabling short message, video, photo and reports support by the dispatch client; customers can determine the dispatch client interface layout based on their actual needs.

***Hytera Communications (Australia) Pty Ltd***

*www.hytera.com.au*

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## Multiband antennas

The ZCG Scalar ZD8Z-XP-MIMO series of multiband slant polarisation panels have many qualities that make them suitable antennas for both commercial and consumer use.

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The antennas come in two configurations of N-type female termination, allowing a maximum power input of 50 W and the higher powered 7/16 DIN female input of 100 W. The internal 45° slant configuration allows for increased data or cellular traffic to be transmitted and received in a low profile. An enclosed panel design ensures the internals are protected from the environment and gives the antennas a sleek profile. The antennas are suitable for the workplace or home, wherever data or cellular improvement is needed.

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*www.zcg.com.au*

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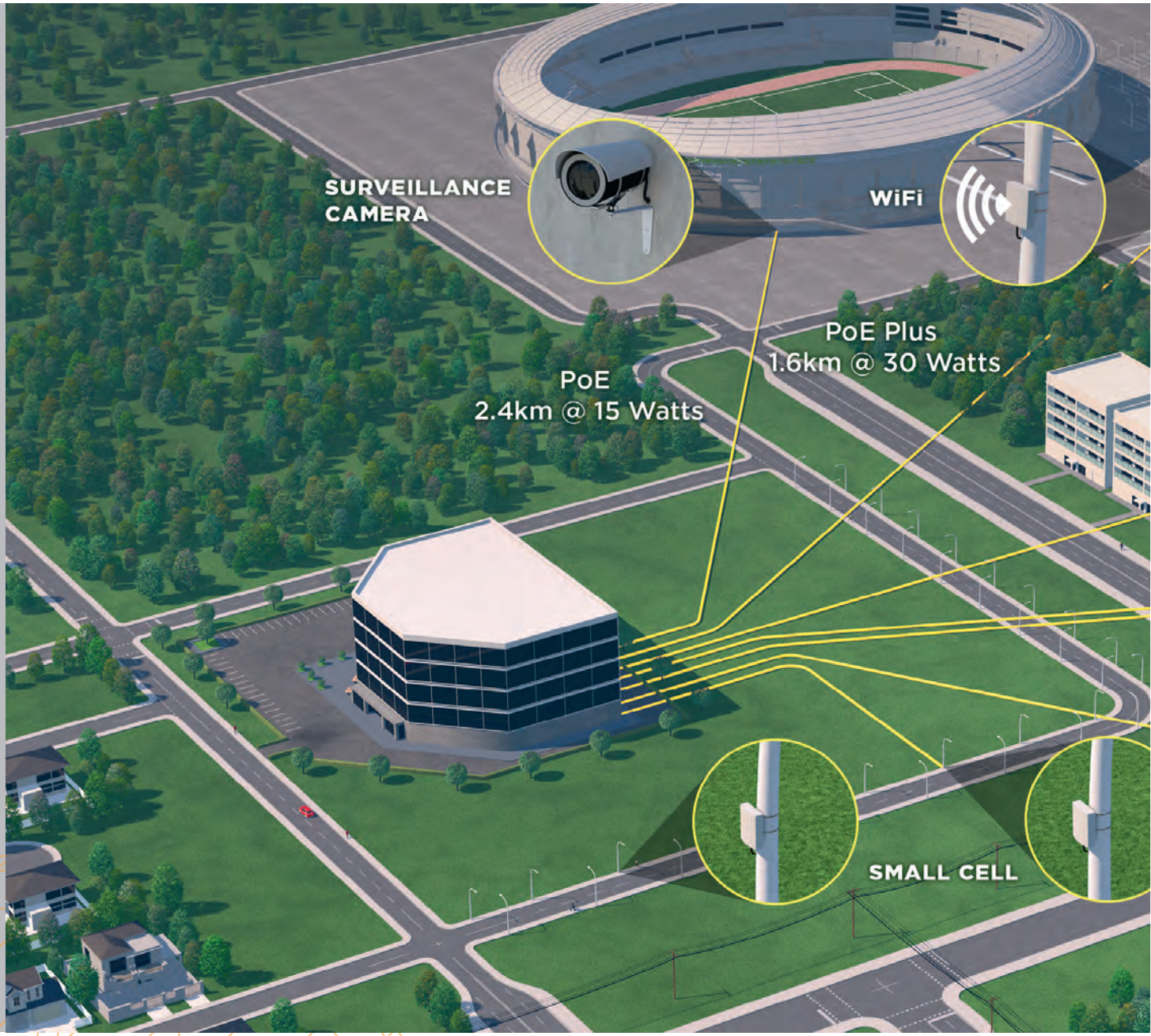


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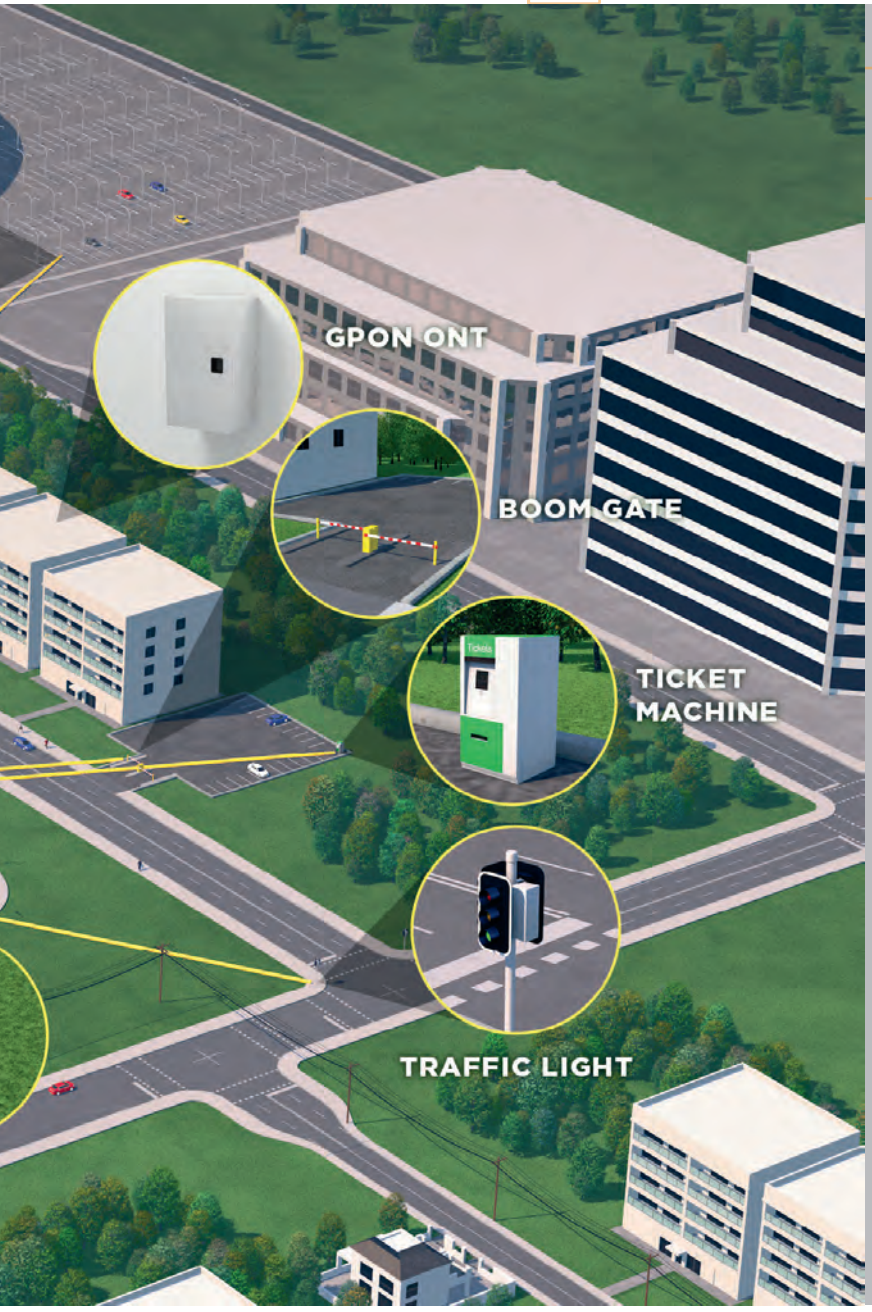


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# SURF RADIO
## A JOURNEY FROM ANALOG TO DIGITAL

*Jonathan Nally*

Surf Life Saving Queensland now has a modern digital radio network and state-of-the-art communications centres in South-East Queensland.

In a journey that has taken almost five years to complete, Surf Life Saving Queensland (SLSQ) has gone from having an almost ad hoc conventional analog radio system to a modern digital network with a rationalised radio fleet supported by two state-of-the-art communications centres.

SLSQ has more than 30,000 volunteers in 58 clubs along the Queensland coast and also fulfils most of the lifeguard contracts for local councils. Lifeguards are paid positions, whilst lifesavers are volunteers. "In addition to our volunteer arm, SLSQ also operates a fully integrated lifeguard service across the state, providing services to local government, councils and land managers," says SLSQ lifesaving operations support coordinator Jason Argent.

SLSQ's four-and-a-half-year transition from the legacy analog system to a digital system was accomplished in stages. The timeline was essentially as follows: up until early 2012, the system was still analog and not yet narrowbanded; narrowbanding took place during 2012, in time for the 2012-13 summer surf season; and throughout 2013-14, the system was converted to digital in time for the start of the 2014-15 surf season.

## Narrowbanding and the digital road

The ACMA's narrowbanding mandate forced many organisations around the nation to make changes - some major, some minor - to their communications equipment and operations. For SLSQ, it was also an opportunity to take a good, long look at what its radio communications needs would be in five and 10 years' time.

"The first step towards shifting to digital was the narrowband - down from 25 kHz to 12.5 kHz," says Argent. "It was an extensive process which saw us call in every single radio from each surf lifesaving club across Queensland. Collectively there were more than 400 radios in use, so it was a fairly sizeable project and one which took more than two years to complete."

"We focused on South East Queensland initially, which consisted of 37 surf lifesaving clubs in addition to various lifeguard and operations support services, and then in the second year we completed the rest of Queensland, from Hervey Bay up to Port Douglas."

The process of narrowbanding meant 'cleaning out' the system's odds and ends radios.

"We took that opportunity to do a full refresh," says Argent. "We made the Icom IC-F60 radio standard across the network, or the preferred radio, although we could still use some version of Tait radios at that stage.

"We completed the narrowband, which involved changing all the frequencies around and cleaning up the band plan. Traditionally speaking, we'd always had a somewhat cluttered channel list, so we took the opportunity to clean that up at the same time. We stayed with analog at that stage, and we fixed up our repeater sites and made sure they were compliant with the narrowband.

"When we started the narrowband process we discussed what the needs were moving forward, and identified that it would be a digital radio network... because obviously everyone would have to move to a digital radio network of some type at some point in time."

AA Radio had worked with SLSQ for many years, well before the digital transition project was on the horizon. "AA Radio was maintaining SLSQ's existing system and worked hand in hand with SLSQ throughout the planning and the implementation of the narrowband process," says David Lenehan, the company's marketing and business development manager. "And that was really the first critical point of the digital upgrade process itself, because it gave SLSQ the chance to ratify their fleet and remove any non-compliant radios

Image credit: SLSQ

Image courtesy Petra(Chillmimi)/Flickr/CC BY 2.0

*Surf Life Saving Queensland has two comms centres, one of which is located on the Gold Coast. A repeater is located on the top of the Q1 building (tallest building on the left of this photo), providing coverage over the entire area.*

from a narrowband point of view. It was the start of this digital upgrade project.

"So when the time came to start planning the upgrading of their system, we worked closely with them and the project evolved. We had a very intimate understanding of the infrastructure and operational requirements of SLSQ, so the transition from planning to implementation was smooth process."

"At that stage, AA Radio engaged Icom to come and chat with us," says Argent. "We listed out some requirements for any new radios. They'd have to be IP-67, have GPS tracking capability, short messaging, in the IDAS platform. And not overly heavy units - a lot of the digital radios were quite big at the time - not that it was going to be as small as the F60, but we wanted it to be somewhat comparable. So that's probably why we stayed where we were for two years; to allow Icom to develop the product, the IC-4263, which is what we use."

## Planning the job

"We place great importance on the methodology we apply to all the work we do with our clients," says Lenehan. "We work closely with all clients to understand both their business-critical and operational requirements. This is particularly important when working with an organisation such as SLSQ that deals with public safety.

"The process from the outset [for] this upgrade largely depended on our understanding of what was required, what the constraints were and what SLSQ's future requirements would be. Once we mapped out the business-critical and operational requirements, we worked through the functionality, cost implications, ease of migration and scalability of all major technology platforms such as P25, TETRA and DMR. The end result of this process was the selection of ICOM IDAS."

SLSQ gradually replaced its entire repeater network with IDAS-compliant repeaters, running them in conventional UHF mode but with the intention always to go digital once it had the budget to do so. It established a comms centre at Mooloolaba on the Sunshine Coast and started to buy handheld radios that were IDAS-capable, well before the digital network was put in.

"And then once they had the budget, we needed to assess their band plan," says Mark Wyatt, AA Radio's Queensland state manager. "Some of it had to change, as there were some legacy frequencies that were interfering with one another. This occurred during the off-season (when only full-time lifeguards use the system) so as to minimise impact to radio users."

"Whatever phase we were at, SLSQ had to be operational at the start of every season," says Lenehan. "It was a four-and-a-half-year project, and it was a very interesting process to select what we could do in terms of the budgeting and how that could be implemented and turned on at the start of each season, so that SLSQ's communications were still fully functional regardless of if we were a quarter, a third or halfway through the entire upgrade. It was challenging."

## Development of the radio

In a way, it can be said that the SLSQ requirements drove the development of the Icom radio they ended up using, the IC-4263. Icom Japan was in the process of looking at what they were going to include in their next radio, and saw the potential in SLSQ's mix of needs.

"We went to them with the specific requirements of SLSQ, being the FDMA IDAS platform, waterproof, high-level audio, GPS on board, all of which ended up being incorporated into the radios," says Colin Bresnahan, Icom Australia's sales manager.

"This was an extremely unusual case. There has never been a radio developed for any specific client outside of Icom Japan's design department. In a global manufacturing process like that, they would normally start with VHF, they'd then produce the UHF low band, and at the end of the run we'd get our high-band UHF. This was the first time ever out of Icom Japan that the UHF high-band radio has come off the production line first. So it was pretty exciting for us.

"And it is a global radio now, and it covers all bands - VHF and UHF, low and high band. It's our flagship radio for IDAS, and it would be our largest selling radio for the IDAS system, for sure."

Bresnahan says it was about six or seven months from the brief to the first product, "which was just phenomenal".

"And since then, and probably based on the back of it, we now don't have a radio coming out of the factory that's not IP67 rated - all of our portable radios are now waterproof," says Bresnahan.

## Surfcoms

As far the comm centres, or Surfcoms, go, SLSQ had been using Omnitronics' analog, line-based console solutions for many years. And then a few years ago they installed a PC-based console solution, the Omnitronics DX-64, into the Surfcom on the Sunshine Coast. A second communications centre is located on the Gold Coast.

In line with the plan to migrate to a digital radio system, SLSQ then upgraded the Sunshine Coast DX-64 to a DX-Altus, which is Omnitronics' new-generation digital radio-capable dispatch console product.

"The main benefit [of the upgrade to Altus] is the ability to operate with a digital radio system," says Bruce Forward, Omnitronics' manager for Oceania and international sales. "Whereas the DX-64 had analog capabilities, such as selective calling and ANI, the DX-Altus gives them digital calling functionality. In other words, it can interface to the Icom IDAS digital radio system and provide the operators with functionality such as individual calling, group calling, caller IDs and GPS display."

The Altus system also enables mobile operations via a SIT connection accessing the radio channels remotely. Altus can even

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> THAT'S THE NATURE OF RADIO COMMS THESE DAYS. WHEN I STARTED, YOU USED TO CHANGE CRYSTALS - IT'S A LITTLE BIT DIFFERENT NOW.

Image credit: Michael Zimmer (zayzayem)/Flickr/CC BY-SA 2.0

be run from a tablet in the field, although SLSQ doesn't presently use this feature.

SLSQ initially installed the DX-Altus system in a new Gold Coast communications centre at Mermaid Beach in 2013, having moved from Nobby's Beach. Whilst digital capable, the first season saw the equipment used in analog mode. In 2014, as part of the digital roll-out, the Sunshine Coast DX-64 system was upgraded to a DX-Altus. The two centres have the ability to provide back-up for each other - if one system were to fail, SLSQ can access beaches from the other system.

"One of the things the system was also able to provide was to enable an easy transition from the analog system to the new digital system," says Forward. "Because our system can operate with both systems in parallel, it made it easy for SLSQ to transition from one to the other.

"One of the key things they are starting to utilise now is the GPS capability of digital radio. "Back at the operator console there's a GPS map, and they can actually see where the surf lifesavers are on the beach."

The Altus is designed and manufactured at Omnitronics' production facility in Perth, and it has been a big success story for the company. "We've got Altus systems installed all over the world," says Forward. "It's been particularly popular in the maritime industry and marine-related industries."

AA Radio's engineering team, led by Nigel Porritt, "worked very closely with Icom and Omnitronics to get it all working, as this was the first time anywhere in the world that an Altus console had been interfaced with IDAS", says Icom's Bresnahan. "We had a little bit of a head start on this because we put a system in the Solomon Islands, which is a multisite trunked IDAS network, and that also runs the Omnitronics DX-64."

Working with a local manufacturer in Omnitronics made it easy too, says Bresnahan. "Any change or assistance we needed, they're only a phone call away or an hour in an aircraft," he says. "If one person didn't know the answer, someone else did. It wasn't a case of 'I'll find out for you'; they'd just put you straight through. There was no delay; it was just 'let's get this sorted' and that's all there was to it."

## Easy to use

One important aspect of the overall digital transformation that needed to be managed was ensuring that the radio fleet was easy to use for volunteers of all ages and backgrounds. That meant keeping it simple and making operations as similar as possible to the way they had been during the analog era.

"We have to bear in mind the end user when we're putting in a network - and with SLSQ, the bulk of the end users are part-time users, so it has to be easy to use," says Argent. "The radio doesn't need to have all the whiz-bang features. We need to be able to turn unneeded features off, partition programs within it, so we could set up radios with different formatting. It needed to work as similar as it could to the F60, because that was a very basic radio. Whilst these ones are very high tech, we needed to be able to simplify them."

"It's FDMA, it's true 6.25 KHz ultranarrowband, so it's spectrally efficient. It's extremely simple, the smarts are in the system," says Bresnahan. "At the end of the day, you can have all these bells and whistles - but 90% of the time, if you really dig down and find out the application and what you actually want to do with the radio, it's a simple case of 'Bill wants to talk to Jack'."

## Building the network

"After the digital coverage tests were done, we started reprogramming the repeaters to digital mode," says Wyatt. "SLSQ required a single cut-over date, because we had to make sure all the digital handhelds were out in the workforce, ready to use, because using them in multimode was going to be a little difficult for most of the users. The radios are capable of it, but after discussions with SLSQ we thought the potential for someone to pick up an old radio in analog mode in channel 1, and then pick up another one in digital mode and it has channel 1 on it as well, and not be able to talk to one another... the potential for it to create confusion was just too great."

In an emergency situation, ease of use becomes paramount. The transceivers are slightly different to use than what SLSQ was accustomed to, "so we tried to emulate as much as we could of the old radios so that the new ones operated almost the same, even though physically they're different", says Wyatt. "So the nomenclature on the screens is the same as the old ones, for instance."

"But programming the radios was something that we had to think very carefully about as well - voting capabilities, how they were implemented, which channels

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> SLSQ REPLACED ITS ENTIRE REPEATER NETWORK WITH IDAS-COMPLIANT REPEATERS, RUNNING THEM IN CONVENTIONAL UHF MODE BUT WITH THE INTENTION ALWAYS TO GO DIGITAL.


Image credit: SLSQ

went in which voting blocks, all of those factors," adds Wyatt. "So a lot of careful thought went into that, and we did that in consultation with SLSQ. Lifeguards, who were using the radios on a full-time basis, were enlisted to help us out with testing for suitability for all end users."

## Up and running

As well as the mainland coast, SLSQ also has responsibility for several tourist islands. Moreton Island is covered by SLSQ volunteers during the on-season and Stradbroke Island is covered all year. Stradbroke Island is IP linked back to Surfcom; Moreton Island has a repeater on Cape Moreton with an RF link back to the Sunshine Coast.

"There's a sufficient path there that we can RF link it," says Wyatt. "The other repeater that covers Moreton is Redcliffe, straight across Moreton Bay. Redcliffe covers the western side, and Cape Moreton covers the eastern side of the island and right around the tip.

"There are repeaters also at Hervey Bay and Rainbow Beach, and eventually it will spread up the coast. The next plan is to move into the Wide Bay, Capricorn Region. That will happen in the 2015 off-season. And then the northern barrier region, as it's known - Mackay, Townsville and Cairns - which will all feed back via IP into the Sunshine Coast eventually."

While many sites were upgraded, some were new. "Redcliffe was a brand new site, on the roof of Redcliffe hospital," says Wyatt. "We installed a new repeater there. Hervey Bay needed a complete overhaul and revamp, so all new equipment was installed there also.

"The other sites were essentially a case of reprogramming and testing - and we did extensive RF testing. We conducted a lot of testing so we could ensure coverage was sufficient... [and it] was significantly better than the conventional coverage. Much better, which surprised all of us. We expected a small increase, but we actually got something in the order of a 30% improvement in range."

So much so that of the three Gold Coast sites - Point Danger, Burleigh Heads and the roof of the Q1 building - they currently only use Q1. "Q1 is a beautiful radio site, 79 stories in the sky, enabling coverage of the entire coastline from Pt Danger to Wave Break Island," says Wyatt. "They used to use all three of those channels on the Gold Coast for coverage and, apart from a few spots in Tallebudgera Creek where topography prevents the signal reaching Q1, they just use the one, channel 7, on Q1 - the other two are on standby for back-up."

## A successful project

Looking back, now that the system is installed and running, how was the process? "It all went as smoothly as you could possibly hope for, largely due to the careful planning done before implementation," says Wyatt. "AA Radio's Michael Karpavicius headed up the project team in Melbourne and provided us with project timeline and plan, whilst the team in Queensland ensured that resources, both human and equipment, were available at the required times to ensure minimal slippage of critical dates.

"There's been some fine-tuning since, and in this off-season we have an Altus upgrade coming up to introduce a few more features SLSQ have requested. The Icom radios will have a software upgrade as well, so the DSP will be slightly different. That's the nature of radio comms these days. Technological advances during my career in radio have been fascinating. When I started, you used to change crystals to install new channels - it's a little bit different now."

It has been "good so far", says Argent. "It's obviously had a few teething problems - we're still not 100% operational; there are gaps in our equipment, our technology. In the past we've relied on RF between our repeaters and back to our communication centres, and I think that hampers us on the Sunshine Coast, as it's such a large expanse that it covers. On the Gold Coast we still use RF, but we have our main repeater on the top of the Q1 building, which covers the 23 clubs on the Gold Coast quite comfortably, almost all the way to Point Lookout."

"The really good part about this whole process is that it's never been a case of 'their part of the network' or 'our part of the network'. If there's a problem, we're all in on it," says Bresnahan. "We had a couple of issues that were clearly just Icom problems; well, Omnitronics were there all the way to make sure we found where our problem was. And likewise, when there was an Omnitronics design issue, we had guys up in Queensland working hand in hand with them, making sure they got it across the line. It was brilliant; it was just like one team."

*AA Radio Services Pty Ltd*
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*The Icom mobile radio used by Surf Life Saving Queensland.*

*Surf Life Saving Queensland uses the Icom IC-4263 handheld transceiver.*

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# DOUBLE DATA

## A nanoscale IC enables simultaneous transmission and reception at the same frequency

A team of researchers at Columbia University in the US have invented a technology - full-duplex radio integrated circuits - that can be implemented in nanoscale CMOS to enable simultaneous transmission and reception at the same frequency in a wireless radio.

Up to now, this has been thought to be impossible: transmitters and receivers either work at different times or at the same time but at different frequencies.

The Columbia team, led by Electrical Engineering Associate Professor Harish Krishnaswamy, claims to be the first to demonstrate an IC that can accomplish this.

"This is a game changer," said Krishnaswamy. "By leveraging our new technology, networks can effectively double the frequency spectrum resources available for devices like smartphones and tablets."

In the era of big data, the current frequency spectrum crisis is one of the biggest challenges researchers are grappling with and it is clear that today's wireless networks will not be able to support tomorrow's data deluge.

Today's standards, such as 4G/LTE, already support 40 different frequency bands, and there is no space left at radio frequencies for expansion. At the same time, the grand challenge of the next-generation 5G network is to increase the data capacity by 1000 times.

So the ability to have a transmitter and receiver re-use the same frequency has the potential to immediately double the data capacity of today's networks.

Krishnaswamy notes that other research groups and start-up companies have demonstrated the theoretical feasibility of simultaneous transmission and reception at the same frequency, but no-one has yet been able to build tiny nanoscale ICs with this capability.

"Our work is the first to demonstrate an IC that can receive and transmit simultaneously," he said. "Doing this in an IC is critical if we are to have widespread impact and bring this functionality to handheld devices such as cellular handsets, mobile devices such as tablets for Wi-Fi, and in cellular and Wi-Fi base stations to support full duplex communications."

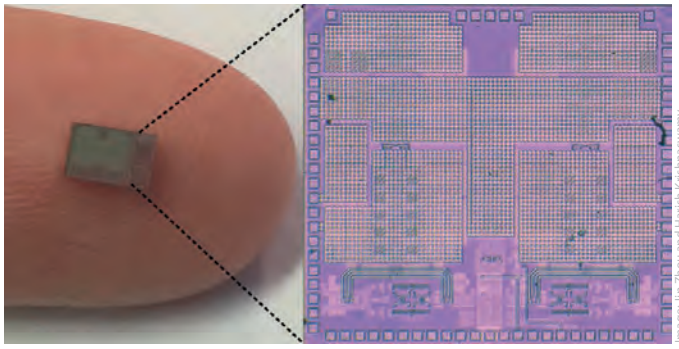

Image: Jin Zhou and Harish Krishnaswamy, Columbia Engineering.

*The CoSMIC (Columbia high-Speed and Mm-wave IC) Lab full-duplex transceiver IC that can be implemented in nanoscale CMOS to enable simultaneous transmission and reception at the same frequency.*

The biggest challenge the team faced with full duplex was cancelling the transmitter's echo.

"Transmitter echo or 'self-interference' cancellation has been a fundamental challenge, especially when performed in a tiny nanoscale IC, and we have found a way to solve that challenge," explained Jin Zhou, Krishnaswamy's PhD student and the paper's lead author.

Krishnaswamy and Zhou plan next to test a number of full-duplex nodes to understand what the gains are at the network level.

The researchers presented their work at the International Solid-State Circuits Conference (ISSCC) in San Francisco on 25 February. The work was funded by the DARPA RF-FPGA program.

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# News

## U. MELB/NPSTC MOU

The US National Public Safety Telecommunications Council (NPSTC) and the University of Melbourne, through its Centre for Disaster Management and Public Safety (CDMPS), signed a memorandum of understanding at NPSTC's Governing Board meeting held on 20 March 2015, at the International Wireless Communications Expo. The agreement covers support for the development of the attributes and requirements of wireless technologies for public safety communications. CDMPS Senior Advisor Geoff Spring said that the agreement will allow the exchange of information and the sharing of research outcomes with NPSTC related to mission-critical communications and, more broadly, disaster management and public safety.
*More info: bit.ly/1zUkXSt*

## LATEST GPS SAT IN ORBIT

The ninth GPS IIF satellite is safely in orbit and sending signals following its launch on 25 March aboard a United Launch Alliance (ULA) Delta IV rocket from Cape Canaveral Air Force Station, Florida. Boeing, ULA and the US Air Force successfully launched four GPS IIFs last year, the highest tempo for more than 20 years. The latest launch is the first of three planned for 2015. The IIF series satellites are advancing and modernising the GPS constellation by improving accuracy, signal strength and anti-jamming capability. The series also introduces the L-5 civilian 'safety-of-life' signal, intended mainly for aviation and transportation.
*More info: bit.ly/1luayho*

## $100M FOR BLACK SPOTS

The federal government's $100 million Mobile Black Spot Programme has reached a milestone, with proposals now received for funding under the program. "This is about delivering on the Coalition's election commitment to boost mobile coverage in outer metropolitan, regional and remote Australia," said Paul Fletcher MP, Parliamentary Secretary to the Minister for Communications. "Each of the mobile network operators - Telstra, Optus and Vodafone - has come forward with a proposal. The government is currently assessing the proposals and aims to be in a position to announce the list of base stations by 30 June 2015," Fletcher said.
*More info: bit.ly/1JzOxfG*

## Satcom LMR bridge


The Exelis SwitchplusIP LMR Bridge can seamlessly bridge radio networks, enabling real-time communications between talkgroups, nets or channels across the globe.

The LMR Bridge is portable, rugged and takes only a few minutes to set up, making it suitable for in-field deployments, while enabling worldwide PTT 'radio net-to-radio net' calls to be established with end-to-end AES 256 encryption and dual backhaul links to ensure privacy and reliability.

The system comes with an integrated configurable gateway and supports a range of radio network types including VHF, UHF, 700/800, P25, TETRA and conventional. The system can also support a variety of backhaul options, including Iridium Satellite, VSAT or 4G.

***EXELIS C4i Pty Ltd***
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## Antenna

Panorama has upgraded the PWB-BC3G-26-RSMAP antenna so that it covers all frequency bands from 698 MHz to 2.7 GHz, which makes it suitable for use with any 2G, 3G, 4G LTE, WLAN or WiMAX device.

The antenna's sleek design profile and articulated SMA male connector fixing enables easy adjustment for optimum fine-tuning of the antenna's position. Combining a wide range of frequency bands and minimalistic form in a plug-and-play package makes the PWB-BC3G-26-RSMAP a suitable choice for a ground-plane independent antenna for use with modems.

***Panorama Antennas Australia***
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## Spectrum analyser

The ThinkRF WSA5000 RTSA has all the power expected from a traditional lab spectrum analyser, with a frequency range from 100 kHz to 8, 18 or 27 GHz, real-time bandwidth (RTBW) up to 100 MHz, probability of intercept (POI) as short as 1.02 $\mu$S and spurious free dynamic range (SFDR) up to 100 dBc.

Features include: flexible 10/100/1000 Ethernet interface for direct connection to laptop or network access without any additional hardware; DSP filtering and decimation; real-time FPGA triggering for detection of elusive, time-varying signals; waveform recording and playback; Open APIs for use with Python, MATLAB, C/C++, Standard protocols SCPI and VRT to facilitate quick integration and interoperability; and interface with external digitisers for real-time bandwidth of up to 160 MHz.

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# COMMS CONNECT SYDNEY 2015

## 3-4 JUNE, SYDNEY SHOWGROUND, OLYMPIC PARK

*Jonathan Nally*

Comms Connect Sydney is almost here - don't miss it!

Now in its ninth year, Comms Connect has become Australasia's leading conference and exhibition for combined communications users and industry. This year sees the return of Comms Connect Sydney, following on from the highly successful first event held in 2014. A new, centrally located venue will make it easier for everyone to attend and capitalise on the networking and learning opportunities.

Hundreds of like-minded professionals from government, the resources sector, first responders (police, fire, paramedic/ambulance), transportation, utilities, enterprise and other sectors who use critical communications will gather to ensure that they have access to the very latest information and technology solutions.

### Speaker sessions

Comms Connect always attracts a top-of-the-line list of speakers from a variety of backgrounds: industry, government and academia. This year's line-up will be no exception, with experts from home and abroad coming together to share their knowledge and insights. Among the many experts lined up to speak are:

- Dr Brian Burns, Prehospital & Retrieval Specialist, Sydney Helicopter Emergency Medical Specialists, Ambulance Service of NSW
- Garry Kerr, Executive Manager, Emergency Response Systems, Public Safety Business Agency - Queensland
- Shaun Smith, Managing Director, New South Wales Telecommunications Authority
- Phil Kidner, CEO, Tetra and Critical Communications Association
- Mark Loney, Executive Manager, Spectrum Operations & Services Branch, ACMA
- Gerard Cusick, Managing Director, Mingara Australasia
- The full program is available on the Comms Connect website (comms-connect.com.au)

### Exhibitors

Both the exhibition space and number of exhibitors are almost twice what they were at last year's Comms Connect Sydney, demonstrating that the industry has embraced the concept of holding this event as an adjunct to the larger Melbourne event.

Among the 60-plus exhibitors expected are: 4RF, Anritsu, ARCIA, Australasian Tetra Forum, Codan, Critical Comms, CRS

**What:** Comms Connect Sydney 2015
**When:** 3-4 June 2015
**Where:** Sydney Showground, Olympic Park
**Web:** comms-connect.com.au

Accessories, Delta Gamma, Emona Instruments, Gencom, GME, GMG Solutions, Hytera, Icom, ICS Industries, Kenwood, Keysight Technologies, Mastercom, NEC Australia, Omnitronics, Orion Network, Panorama Antennas, Polar Electronics, RF Technology, Sepura, Spectrum Engineering, Survey Technologies Inc, Tait, Vertel, Vicom and Zetron.

If your company hasn't already booked its exhibition space, it might not be too late - contact the Comms Connect team on 02 9487 2700 for details.

## Workshops

Comms Connect workshops are always popular, and this year's line-up at Sydney will be no exception.

**Workshop 1:** *Advanced radio over IP*, presented by Paul Whitfield (Team Leader, Software Engineering, Omnitronics) and Peng Zhang (Lead Sales Engineer, Zetron Australasia). This workshop will provide an overview of the technology, the key standards and some of the technical issues, covering: the difference between RoIP and VoIP; implementing one-to-one and many-to-many connections; identifying network issues affecting RoIP/VoIP quality, maintenance and redundancy; building block design elements; and calculating network bandwidth requirements.

**Workshop 2:** *Practical guide to working with fibre optics*, presented by Brett Moore-Carter (Systems Support Engineer, Vicom Australia). This workshop will provide an overview for technical staff into what is involved in working with fibre optics. There are some critical work methods that are essential as technicians begin to become involved in this new segment of converged communications, and this session will cover many of the underlying basics involved.

**Workshop 3:** *TETRA: Addressing ICT migration and integration with evolving critical wireless technologies*, presented by the Australasian TETRA Forum and the international TETRA and Critical Communication Association. This workshop will help attendees understand TETRA and provide a comparison with other open standards-based technologies (DMR, DPMR, P25) for mission-critical operations.

**Workshop 4:** *Next-generation public safety capabilities* will see leaders in public safety communications leading a discussion on issues facing the sector. Presenters will include Chris Beatson, Director, NSW Police Force Policelink Command, and Lance Valcour, Chair, Law Enforcement Information Management Section, International Association of Chiefs of Police.

## Industry case studies

A variety of industry case studies will be presented by members of the teams themselves, including:

- Nissan Motorsport race communications
- Eurobodalla Shire Council UHF SCADA telemetry upgrade project
- TETRA for New Jersey Transit's communications
- Integrated Wi-Fi, CCTV and WAN platform for councils
- Software controlled radio with CSIRO technology
- Vertel's national DMR Tier 3 network
- Telemetry design in the Pilbara

Comms Connect Sydney is a golden opportunity for you to hear from the experts, discuss your requirements with leading vendors and suppliers, and share the challenges you face with industry colleagues and professionals who use communications technology in their working environments. See you there!

*Comms Connect*
*www.comms-connect.com.au*

## More events around the nation

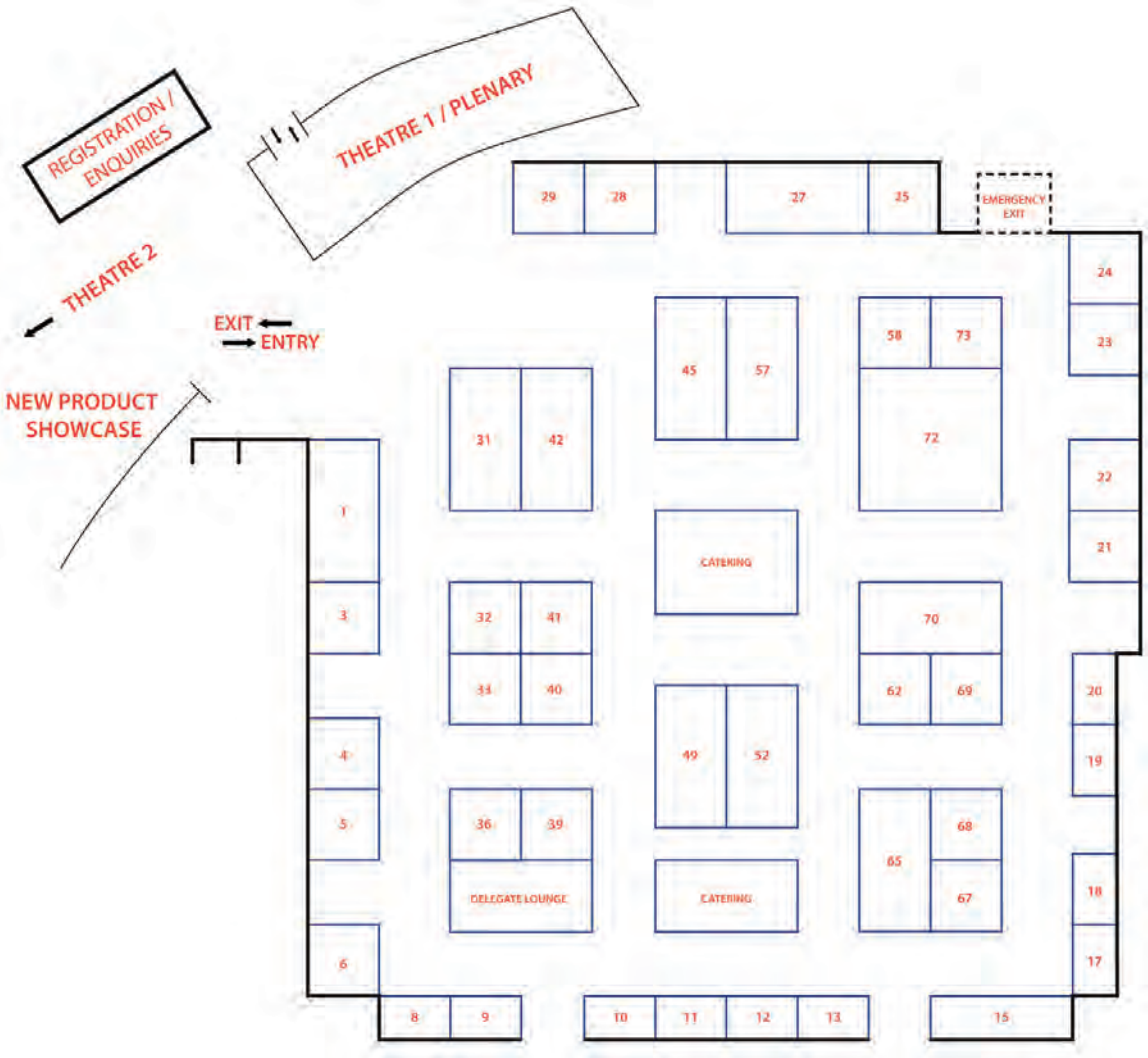
Following the first joint ARCIA and Comms Connect event in Perth in March, WF Media has announced that it plans to work on a number of additional projects with ARCIA in order to deliver further one-day 'mini' Comms Connect conferences in the 2015-16 financial year. These will start with Brisbane in late July 2015, moving to Adelaide in September and then back to Perth in March 2016.

"These will be stripped back, single-day conferences with no exhibition, aimed at those who aren't able to come to Sydney or Melbourne and who would like to have access to the educational side of what we do," said Paul Davis, WFM's Events Director. "There's a whole raft of content developed for each show and by sharing this already generated material further afield, everybody wins.

"The feedback from Perth was fantastic - almost 80 delegates attended and the ARCIA dinner in the evening had record numbers, so it makes sense to visit other state capitals where there's demand for subject matter on critical communications and other wireless technologies," added Davis.

COMMS 2015 CONNECT

## FLOOR PLAN




## EXHIBITOR LIST

# Two Way Radio: We only compare apples with apples, there are no oranges

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# News

## NEC TO UPGRADE ESTA

The Victorian Government has awarded NEC Australia a multimillion-dollar telephony solutions and services contract for the state's Emergency Services Telecommunications Authority (ESTA), the agency that provides the link between the community and the state's emergency service agencies. NEC Australia will maintain and support the telephony solutions and services, including the state's Triple Zero platform to enable a robust service with a highly reliable, fault-tolerant platform that ensures continuous emergency services for agencies across the state. The seven-year contract covers the agency's telephones, including SV9500 PABX units and a Genesys call-centre solution. The timeline will be determined between ESTA and NEC.

*More info: bit.ly/1Etht4A*

## TOWER DEMOLISHED

The Department of Defence demolished the Omega communication tower on the former Naval Transmission Site at Darriman, Victoria, on 22 April. Parliamentary Secretary to the Minister for Defence and local member for Gippsland Darren Chester said the demolition was completed successfully and without incident. Defence's contractor, Liberty Industrial, cut selected guy cables by explosive charge, then the tower structure was destabilised and it collapsed upon itself in four large sections. Now that the Omega tower has been demolished, Liberty Industrial will clear the site of materials. In due course, Defence will dispose of the site.

*More info: bit.ly/1clZAhJ*

## TETRA ASIAN GROWTH

The growth of TETRA in the Asian market will reach 11%, according to research by analyst firm IHS. "The TETRA terminals installed base in Asia is set to grow by 11% by 2018, mostly driven by significant uptake in Oceania, China, Hong Kong, Singapore, South Korea and Taiwan. TETRA terminals shipments are expected to reach almost 200,000 in 2018," said Elizabeth Mead, senior analyst, Critical Communications, IHS. "TETRA technology now represents 24% of the digital technology market for LMR worldwide and has achieved record shipment growth of 17% in 2014 in the EMEA region. TETRA remains a favourite for many nationwide rollouts," said Mead.

*More info: bit.ly/1EZFHqF*

## P25 portable base repeater

The Benelec BLPR2500 P25 portable repeater is a full duplex repeater/base station that provides a compact and flexible deployment solution for reliable communication operation. It enables rapid set-up in situations where this is normally not possible, such as in emergency or natural disaster scenarios. It can also provide solid communication operations for temporary situations such as event security or as a backup of a base system.

The repeater provides 5/25 W output power and has been configured to provide the user with maximum flexibility. It has the ability to function as a fixed-base or a stand-alone repeater and is available in all VHF and UHF bands. The internal Li-ion battery provides up to 8 h use. The lightweight construction means the unit is practical to carry to required locations without the need for transport assistance. Total weight is less than 13 kg with dimensions of 510 x 350 x 175 mm.

It has an integrated 4G/LTE and Wi-Fi IP-linking gateway capability with an option for AES 256-bit encryption. A compact, rapidly removable duplexer is also standard.

The unit is able to be powered by an external AC (100-290 VAC) or DC (9-48 VDC) source, with these ports conveniently mounted on the base of the unit. Heat sinks are mounted on the sides of the case to provide for continuous rated use of the repeater with the lid closed. In base mode, the microphone and speaker are internally mounted for easy access. External accessories include an 8 m lightweight mast and tripod with 4G and a Benelec 1/2-wave ground-independent antenna.

***Benelec Pty Ltd***

*www.benelec.com.au*

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## Wireless PTT footswitch

The CRS Accessories Wireless PTT footswitch is for crane and other vehicle operators who must have both hands on the controls but need to be in constant communication via their mobile two-way radio. This simple solution is suitable for all brands of two-way vehicle radios and can eliminate (in most instances) costly fit-outs.

The Wireless PTT button (transmitter) has been built into a commercial-grade footswitch that can be easily fitted to the crane/vehicle. The Wireless PTT (transmitter) is IP67 rated. There is no charging of batteries as the product has been designed to be pressed 300,000 times (approximately two years) before the Wireless PTT button needs replacing. If the Wireless PTT button does fail there is a second PTT backup button located on the receiver.

The microphone is designed to be mounted on the door pillar of the vehicle or, if there is already a gooseneck microphone in the vehicle, secured to this apparatus. A built-in amplifier in the microphone provides high sensitivity, enabling the operator to comfortably communicate back to base in their normal seated position.

The Vehicle Wireless PTT is easy to install as the device simply plugs into the front of the radio. Where this is not possible, an unterminated version can be hardwired at the rear of the radio. The Wireless PTT is CE ticked.

***CRS Accessories***

*www.crsaccessories.com.au*

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## Power analyser

Keysight Technologies has released IntegraVision, a power analyser that combines accurate power measurements and touch-driven oscilloscope visualisation capabilities in a single instrument.

The power analyser is suitable for R&D engineers who want to quickly and interactively measure AC and DC power consumption, power conversion efficiency, operational response to stimulus and common AC power parameters such as frequency, phase and harmonics - all with 0.05% basic accuracy and 16-bit resolution. It enables engineers to characterise power consumption under highly dynamic conditions, with 5 Ms/s digitising speed and 2 MHz bandwidth.

IntegraVision enables engineers to address multiple test scenarios with the flexibility of wide-ranging, isolated inputs up to 1,000 V RMS (Cat II). The instrument offers external sensor inputs, and 2 and 50 A RMS direct current inputs, on all channels. The external sensor input supports current probes and transducers up to 10 V full scale.

The user interface is based on technology from Keysight's InfiniiVision 6000 X-Series oscilloscope, including its 12.1″ multi-touch capacitive touchscreen with pinch, zoom and scroll capabilities. Keysight's development of the user interface was guided by extensive feedback from engineers. The result is an intuitive user experience that enables engineers to gain measurement insights within minutes.

***Keysight Technologies Aust Pty Ltd***
*www.keysight.com*

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## DMR repeater

The Kairos true dual-mode analog/DMR Tier II repeater is a compact, lightweight and full-featured platform that includes many linking and networking features. The unit is a fanless software-defined radio, enabling very low power consumption. It can be easily upgraded to include new protocols and standards.

Kairos includes IP linking of both analog and DMR channels, making it a suitable building block for any DMR application - from simple stand-alone repeaters to wide area networks. The repeater can also be used for narrowband long-range RF links where an IP backbone is not available and can be used to link in analog, DMR or dual modes.

Other features include software diversity to enhance coverage performance, SIP connectivity for dispatch consoles and remote control set-up and maintenance. Kairos is available in 66-88, 136-174, 400-470 and 450-520 MHz.

***Logic Wireless Limited***
*www.logicenergy.co.nz*

## Microwave system

NEC Australia has launched iPASOLINK VR, a model in the iPASOLINK Series of ultracompact microwave communication systems that enables ultrahigh-capacity wireless transmission and is suitable for next-generation 5G networks.

iPASOLINK VR combines the highest modulation techniques with IEEE 1588v2 synchronisation methods to provide a futureproof, high-capacity wireless transmission solution. iPASOLINK VR hardware is MPLS-TP and MIMO capable, and optionally equipped with 10 GbE and 10G CWDM interfaces. NEC-developed wireless transmission technology that enables the use of a 4096 quadrature amplitude modulation (4096QAM) method will be incorporated in the iPASOLINK VR products.

iPASOLINK VR is suitable for building seamless transmission networks serving fibre-optic and wireless networks. NEC radio technology supports the larger 112 MHz channel size that allows full utilisation of the wideband channels recently released by ACMA to the Australian market for ultrahigh-capacity applications. iPASOLINK VR also provides the Hierarchical QoS (H-QoS) function, paving the way for the simultaneous operation of mobile networks owned by multiple telecom operators with different service levels and clocking architectures on a single transmission network. In addition, the new product incorporates NEC's SDN-based network automation and optimisation tool called BRM, which optimises the traffic flow over the radio transmission network.

***NEC Australia***
*www.au.nec.com*


# INTEGRATED COMMS

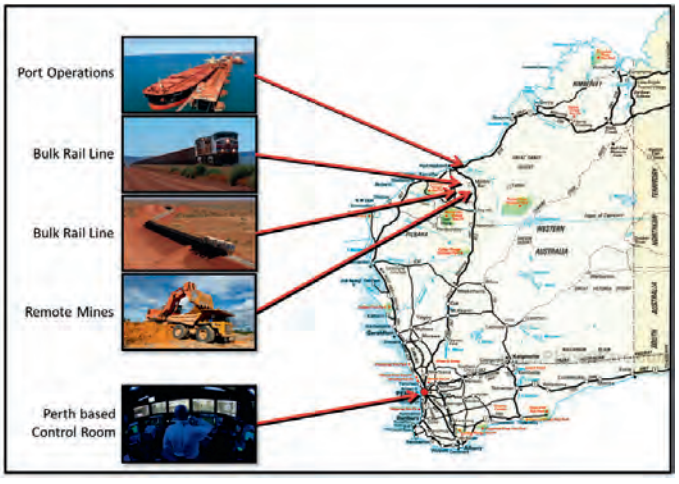
Integrating four TETRA systems via Exelis Switch*plusIP* consoles has solved one mining company's comms problems.

A major mining company in northwest Western Australia has a rail network that comprises more than 600 km of track. With a 40-tonne axle load capacity, it has the fastest and heaviest haul lines in the world. Up to 14 trains per day, each carrying more than 32,000 tonnes of iron ore, make a nearly 300-km trip from remote mines to a shipping port.

The rail network services four primary mines, two of which are located at the end of a main rail line about 260 km from the port, with the other two on a 120-km spur line.

Once at the port, inload circuits unload the ore from the trains and stack it onto blended stockpiles where it is reclaimed and verified for quality, via two robotic sample plants, and then loaded onto ships via the outload circuits.

The team controlling this activity is located at a control centre 1200 km away in Perth, where an integrated system tracks the trains via GPS and operating instructions are delivered direct to the train via digital communications, providing greater utilisation efficiency and improved safety controls.




## Communications infrastructure

From a communications standpoint the system utilises a latest-generation, distributed TETRA system that is split into four separate networks - one each for the mine operations, one for the main rail line and a separate system for the port - all managed remotely from the operations centre in Perth.

Yet even with all of the latest-generation technology, a challenge would arise when the trains entered the port area. The rail operators in Perth could not communicate simultaneously

> THE SITUATION RESULTED IN OPERATORS LOSING CONTACT WITH THE RAIL SYSTEM TEMPORARILY AND PRESENTING A POTENTIAL SAFETY ISSUE.

with the trains and the port operations, even though they utilise the same TETRA technology from the same vendor. The problem was not with the vendors' underlying TETRA technology, however - it stemmed from a system ownership and management issue, which restricted the systems from being connected and operated as a single large system. This situation resulted in rail operators having to log off their rail system and onto the port operations system to communicate with port operations, losing contact with the rail system temporarily and presenting a potential safety issue.

## Integrated solution

A project to solve this problem involved the roll-out of a number of the latest-generation Exelis Switch*plusIP* consoles into the Perth control room to provide the capability for the integration of discrete systems, as well as enabling simultaneous communications across the mine, rail and port environments from a single headset.

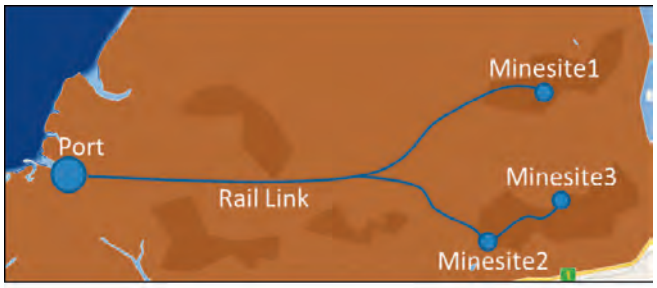
The first stage of the project addressed the integration of the rail and the port systems. Train control operators can now facilitate subscribers on both networks and communicate directly with operational staff on those networks. Individual subscribers and talk groups from the two different networks can be patched together, giving greater coordination and flexibility to the control room operator.

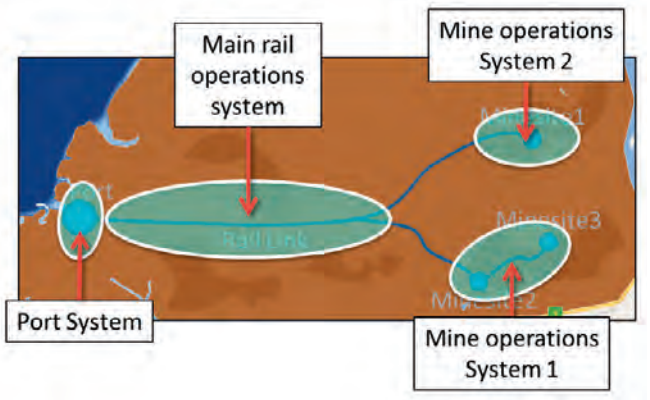
Switch*plusIP* is currently one of the few products in the world that can span multiple separate digital radio systems from the same or different vendors, providing a seamless view to operators. This enables operators to focus on the task at hand rather than worrying about which person is connected to which system.

The Switch*plusIP* system consists of touch screen operator positions connected to communications server equipment in the Perth equipment room via dual IP networks. The system is then connected separately into the different sets of remote TETRA infrastructure via the mining company's wide-area IP network.

The system accesses the infrastructure via direct IP interface, which gives the operators access to a number of advanced features, including:

- the ability to make group calls to multiple talk groups and patch talk groups together;

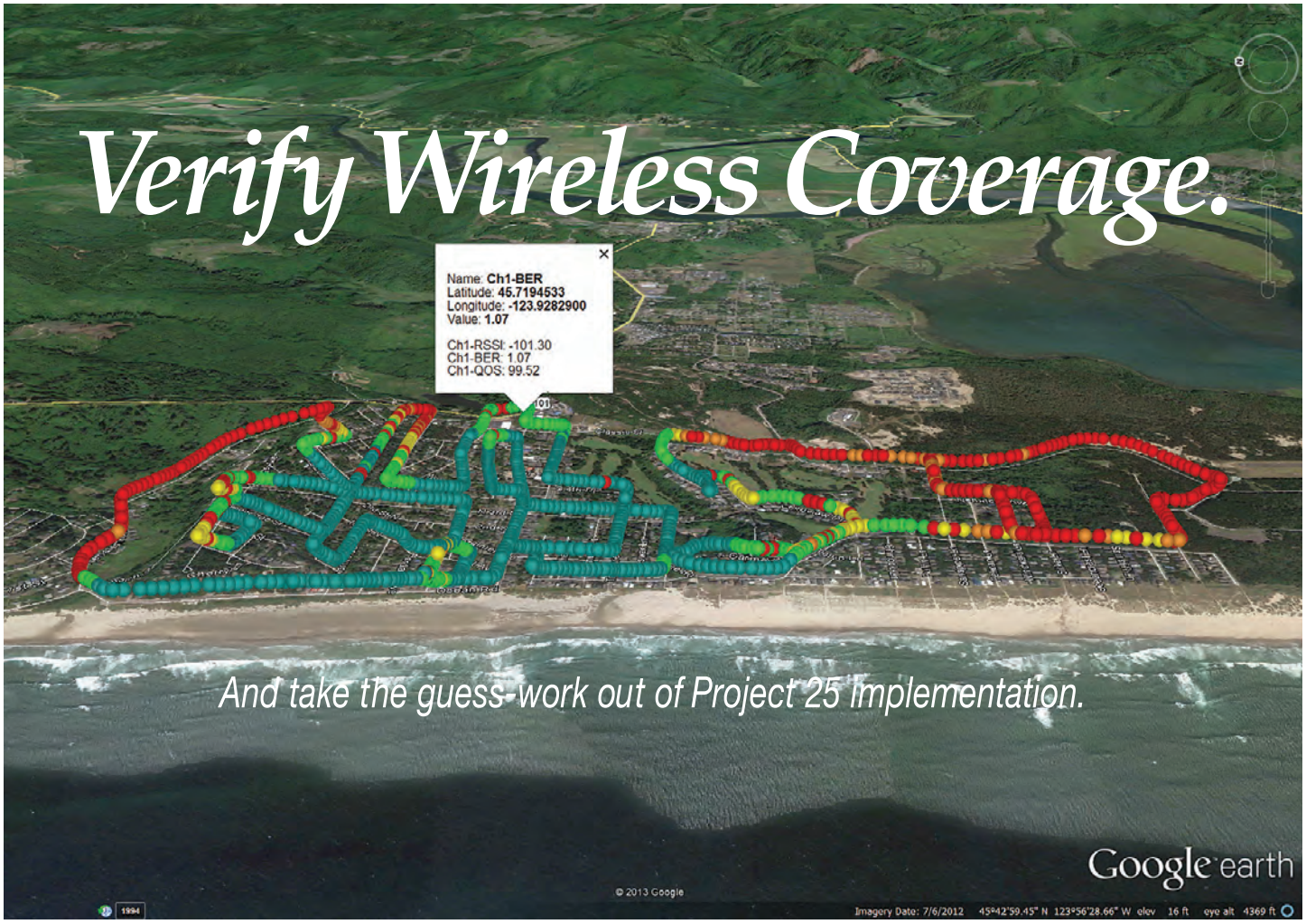



- the ability to make and receive individual calls (both duplex and half-duplex);
- receiving and initiating emergency calls;
- the ability to make announcement calls;
- support for SDS messaging; and
- GPS tracking of talk groups and individual radios while displaying locations on an integrated mapping page which includes a pan and lock in the event of a man-down situation.

Switch*plusIP* is a fourth-generation, true end-to-end, IP-based voice and data communication system designed to provide fault-tolerant, integrated communications through a wide variety of interfaces using an intuitive touch screen interface. Exelis says it was developed specifically to address the requirements of mission-critical applications and uses a combination of commercial off-the-shelf components, purpose-built and -designed hardware and software elements, open standards-based interfaces and an open-architecture design to provide this advanced capability.

*EXELIS C4i Pty Ltd*
*www.c4i.com*

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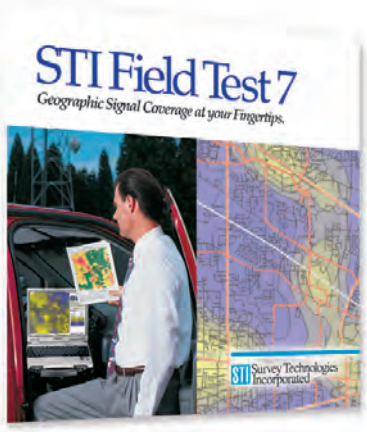


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# MAKING THE CONNECTION

## POWERED FIBRE FOR REMOTE DEVICE DEPLOYMENT

*Glenn Johnson*

Powered fibre enables easier connectivity for Wi-Fi access points and small mobile device cells.


Image credit: USAF

In 2012 the ITU (International Telecommunication Union) predicted that in 2015 the number of networked devices will be twice the global population, and that there will be as many as 25 billion devices online by 2020 as the Internet of Things (IoT) revolution takes off, and the proliferation of technologies such as machine-to-machine communications will be the primary driver of the growth.

A great deal of what is, and will be, driving this growth is the ever-increasing number of connected devices equipped with the IP protocol. Among non-domestic device deployments, common types of technologies have included CCTV cameras, as well as telecommunications infrastructure devices such as Wi-Fi access points (APs) and small mobile device cells. For example, in 2014 the number of IP-enabled CCTV cameras began to exceed the number of legacy analog cameras.

As the costs come down, more and more organisations are deploying such IP technologies. Deployment of CCTV cameras and Wi-Fi devices, for example, are easy enough to do when the you own the infrastructure where it is being deployed, or where distances are not too great – for example, in a single plant, building or campus where all the necessary infrastructure is available. Challenges arise however, when the end device is located more than 100 m from the nearest data switch, or is located on somebody else's building or in a public space where electrical power for the end device is not readily available.

In short, there are three situations that can be challenges for remote device deployment:

- No power local to the remote device, especially if the device is to be located outside the device owner's property or infrastructure
- The device is outdoors
- The device is more than 100 m from the switch.

## Power availability

The owner of the device must negotiate access to local power with building owners. Some building owners want the device owner to put electrical meters on the power circuit for bill payment purposes. Even without the need for meters however, the negotiations about access to power can take weeks or months, requiring considerable planning and design. Once access to power is negotiated, electricians must be deployed to the site to bring power to the device or cluster of devices. In many instances, such as in public parks, there may be no electric power available at the required site at all.

It is also recommended in the Ethernet standards that devices at each end of an Ethernet data circuit do not have different mains earth connections, since earth loops can occur that can induce interference currents on the data cable. Designing and deploying such a system requires care, particularly if shielded cables are used.

If the power can be delivered remotely along-side or within the data cable, then the problem of sourcing power, and therefore the overheads and costs of deployment are reduced considerably.

## Power over Ethernet (PoE)

The PoE 802.3at standard can provide up to 25.5 W of power to end devices on Cat 5 cable (or higher). To provide power for PoE, the Ethernet switch must have an additional power supply delivering typically 1480 W solely for PoE ports.

The main advantage of PoE is that it supplies power and connectivity over one cable as long as the remote device is designed to accept power in that manner. APs and IP cameras are often set up for PoE. A disadvantage is that it must be done over standard Ethernet shielded or unshielded twisted pair cable, so it precludes using fibre, which is needed for some high-bandwidth applications.

## Powered fibre

A powered fibre cable combines single mode or multimode fibre along with a copper power cable. The complete cable system includes a rack-mounted power and optical fibre termination point, the cable, and a remote termination node for each device that plugs into the cable. The system uses plug-in electrical connectors.

> POWERED FIBRE GIVES ORGANISATIONS THE OPPORTUNITY TO DEPLOY THEIR TECHNOLOGY WITHOUT HAVING TO NEGOTIATE ELECTRICAL POWER ISSUES WITH BUILDING OWNERS.

In a powered fibre system, each cable is capable of powering a 25 W device, although much higher power is possible on shorter cable runs. The remote termination unit includes a media converter that allows the powered fibre cable system to be used for PoE.

The system incorporates DC/DC conversion technology to eliminate DC line powering calculations, and it features primary, secondary, and tertiary electrical protection for use in harsh outdoor environments as well as indoor venues.

## Outdoor deployment

Deployment of devices in outdoor environments, and at remote buildings, can present additional challenges.

**PoE uses copper cable.** Delivering the power to the remote device from a central point not only eliminates having to install power at the remote end, but also eliminates the 'floating earth' problem described above. However, because PoE runs over copper cable, it is still subject to picking up electrical interference and other induced currents, such as surges caused by nearby storm activity, providing a risk to sensitive electronic equipment at both ends of the cable.

Surge protection devices should be fitted, and if shielded cable is used it must be earthed only at the source end, to eliminate earth loops caused by the shield.

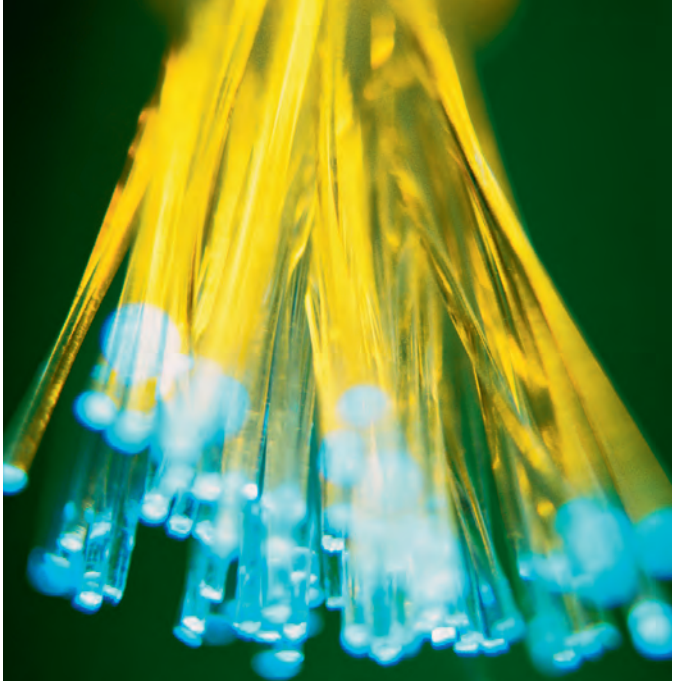
## Powered fibre technology

TE Connectivity (TE) supplies all elements necessary to support powered fibre deployment. TE's hybrid copper and fibre cable can currently be supplied in one- and two-fibre versions, either single mode or multimode. Versions with up to 12 fibres will be available in the future. The power conductors in the cable can be either 12 AWG or 16 AWG, and there are versions with sheaths suitable for both indoor and outdoor applications.

TE has partnered with GE Critical Power to supply the head end SELV power supply, which is a rack mount unit with a modular design, supporting up to four modules of eight power circuits each, for a total of 32 circuits per unit. Each circuit is limited to 100 VA at 60 VDC maximum. Complying with IEC 60950.1, these units allow the cabling to be deployed conduit-free, and a licensed electrician is not required for installation.

The management of the head end wiring is important. TE can supply rack mount combiner panels to allow the separation and management of the power and fibre elements of the cable, providing a fibre splice tray with front-facing fibre connectors and copper terminal blocks for the power connections.

Where PoE devices must be supported at the remote end of the powered fibre, a PoE extender designed for outdoor use with an IP67-sealed enclosure with full surge protection is available. The PoE extender is a full Ethernet media converter with a PoE+ RJ45 output.



**Fibre improves surge immunity.** Optical fibre cable is usually specified where noise and surge immunity needs to be guaranteed. Working on the principle of light propagation, it is not subject to having currents induced from nearby magnetic fields or lightning. This is why it is typically specified for outdoor Ethernet communications, particularly where large interference sources are prevalent such as in many industrial plants or around electrical substations.

Powered fibre provides the essential noise immunity on the data-carrying fibres. The power conductors can be protected with surge protection devices.

## Overcoming distance limitations

The PoE 802.3at standard can provide up to 25.5 W of power over distances of up to 100 m on Cat 5 cable (or higher).

When using powered fibre however, the possible distance is increased to a kilometer for the data over multimode fibre. To support this, each cable is also capable of powering a 25 W device, giving the system much farther reach than PoE systems. Powered fibre systems using single-mode fibre can be extended even further.

## Applications

For distance of greater than 100 m, and where remote device power may not be readily available, powered fibre provides an excellent solution, being robust, interference-free, and supporting much greater distances. There are many scenarios where powered fibre technology can be of great assistance in deploying remote devices.

In airports, and industries such as oil and gas, electricity distribution, chemicals, wastewater, refining and mining, the use of wireless is increasing, but in some cases, it is either unreliable or too risky from a safety or security perspective. For example some parts of the wireless spectrum are not permitted to be used around airports, and in some industrial environments, the interference is too great, or the cyber-security risk of Wi-Fi is considered too high. Powered fibre provides an elegant solution in these situations.

Car parks, transport and public recreation areas such as parks and shopping malls also provide suitable environments where powered fibre can be of assistance. Many city and municipal councils, as well as law enforcement agencies, are now increasing their CCTV presence in public areas. Many city councils are also providing free Wi-Fi services in public areas. Powered fibre gives these organisations the opportunity to deploy their technology without having to negotiate electrical power issues with building owners, and to increase the number of end devices due to the higher bandwidth that powered fibre provides.

*TE Connectivity*
*www.te.com/enterprise*

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# Industry Talking

ARCIA would like to thank the team at Westwick-Farrow Media and Rob Howes, ARCIA Western Australia, for working together and making the combined event in Perth a huge success. ARCIA has been listening to your feedback and, as we continue to refine these events, we understand that people enjoy a combination of technical information and networking with industry peers. Along with the tremendous support we receive from Westwick-Farrow, the ARCIA committee has decided to continue the same model for all state events... of course, leading up to the big one in Melbourne.

ARCIA has also started to recognise industry people at each state event and we are delighted to announce that the first Western Australian winner was Ralph Dix, known for his role in training most of the radio communications apprentices in WA for many years. This was a popular choice and a recognition of a dedicated and committed trainer. We will also be making similar presentations in Sydney, Brisbane and Adelaide, so please put your thinking caps on and nominate your local state nominee - someone who has gone out of their way to promote our industry.

The next event will be Comms Connect Sydney, and ARCIA will once again be running a networking dinner at the Novatel Homebush. I call on all New South Welshmen and women to come out in force and show your support for our vital industry.

ARCIA has recently published a mobile installation standard. We need to thank our sister organisations - the FCSUK and RFUANZ, in the UK and New Zealand respectively - for their help with this document. I encourage all members and other organisations to start using this standard in tenders, quotes and projects. Of course this is a living document, so ARCIA welcomes input from members on areas such as HF or satellite installations, for example.

At the end of April I had the pleasure of attending the annual conference of the RFUANZ in Wellington and presented the ARCIA economic study on the value of land mobile radio. This ongoing dialogue is very important for our industry. Regardless of the device or technology used, critical communications needs to be understood and valued properly. The major storms and flooding in the Hunter Valley again demonstrated the reliance on communications networks. Massive power outages over multiple days meant systems failed and public safety, government and commercial industry members rallied to get systems up and running and then keep them going. If any members have photos or stories about these kinds of events, please send them to ARCIA so that we can continue to highlight the great work that people do.

Looking ahead, we have events coming up in Brisbane during the last week of July and in Adelaide during the last week of September - make a note in your diaries now and watch for more details coming up soon. The Productivity Commission has an enquiry on now into the requirements for public safety mobile broadband (PSMB), and ARCIA will be making a submission into this important communications area. We are also meeting with the ACMA on long-term licensing (LTL) for the government spectrum.

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

## Handheld analyser options

Keysight Technologies has introduced two cable test options for its FieldFox handheld analysers: time domain reflectometry and extended range transmission analysis.

The time domain reflectometry (TDR) cable measurement option enables TDR measurements for the cable and antenna analyser. With this option, the FieldFox analyser becomes a suitable tool for any cable system test. The option complements the analyser's return loss (RL) and distance-to-fault (DTF) measurements. Furthermore, it measures impedance changes along the cable and helps identify specific faults, while the analyser's RL measurement capability exposes mismatch of cable connections and DTF capability indicates faults and poor connections along the cable.

The extended range transmission analysis option addresses one of the major challenges of measuring cables in the field: measuring in-situ, long lossy microwave cables. With extended range transmission analysis, two FieldFox instruments are deployed at each end of the measured cable. One analyser acts as a source, while the other acts as a receiver. Both instruments are step synchronised with hardware triggers. By taking advantage of Keysight's InstAlign spectrum analysis technique, engineers and technicians can use this configuration to make accurate cable loss measurements without calibration and warm up. The option can also be configured with frequency offset to measure devices such as mixers and converters.

***Keysight Technologies Aust Pty Ltd***
*www.keysight.com*

## Power supply

The Xantrex XFR 2.8 kW is a programmable DC power supply suitable for providing reliable power for research, production testing and development, and OEM applications.

The XFR 2.8 kW has a voltage range 0 to 600 V and current range 0 to 4 A, with good thermal management that enables units to be stacked in rack mounts without any ventilation space between them. Additionally, soft switching virtually eliminates switching transients for high efficiency, reduced heat generation and decreased stress on the switching transistors.

The unit also has overvoltage and overtemperature protection, plus remote sense with 5 V line loss compensation.

***TechRentals***
*www.techrentals.com.au*


## 40 GHz vector voltmeter

Anritsu has introduced a vector voltmeter mode (VVM) option for its Microwave Site Master S820E that enables the S820E to be used as a drop-in replacement for legacy vector voltmeter instruments. With the ability to provide full A/B and B/A ratio capability without additional and expensive VNA options, the S820E with the VVM provides users with a compact and cost-efficient single-instrument solution to make key field measurements when deploying or maintaining wireless networks.

The Site Master S820E combines performance, functionality, reporting and durability to meet the most demanding field-testing requirements. It provides handheld field vector voltmeter measurements specified to 40 GHz. When using the A/B and B/A ratio capability, a unique Auto-tune feature allows the S820E to successfully lock onto an external reference source signal that can be as much as ±100 kHz away from the selected tuned frequency, without having to widen the measurement IFBW or establish common 10 MHz reference time-base signals. Input sensitivity for either the A or B reference receiver ranges automatically from +5 dBm to -60 dBm, surpassing the range of traditional vector voltmeters. A Reference Signal Detection message advises users when the instrument successfully locks onto the external source signal when making A/B and B/A ratio measurements. The message is displayed at the bottom of the display in bright green.

The S820E can measure 1 DUT or the user can select a table display format, which allows up to 12 DUTs to be displayed simultaneously. All 12 DUT measurements may be made relative to a stored reference measurement. Reflection and/or transmission measurements made in VVM mode may be vector error corrected via the calibration process and do not require an external CW source or bridges, couplers or splitters.

***Anritsu Pty Ltd***
*www.anritsu.com*

## Digital radio gateway

The Omnitronics DRG600i has been designed to meet the need to access multiple talk paths on Tier III (trunking) digital radios such as DMR and NXDN. The device can access up to six simultaneous talk paths and share those talk paths amongst multiple dispatch consoles.

The unit will connect to the radio infrastructure (repeater or controller) using ethernet and provides a secure and flexible gateway to the dispatch console IP network. The gateway forms a natural firewall between the two networks and provides flexibility for integration into the user's IP infrastructure.

Although the product is suited to Tier III trunking applications, it can also be used to provide multichannel access to Tier II systems.

***Omnitronics Pty Ltd***

*www.omnitronics.com.au*

## Wireless microphone for PTT

Wireless Pacific, the inventor of the X10DR secure wireless microphone that enables a user to talk up to 300 m from their vehicle's mobile, has introduced the X10DR-LTE-4P solution for smartphone PTT operation.

The X10DR-LTE power microphone is designed to allow a mobile phone running an LTE/PTT application to function as a regular handheld portable radio. The IP55-rated speaker microphone simply plugs into the headset socket on smartphones running a variety of PTT apps.

Designed to be extremely rugged, the device delivers high-powered audio. The smartphone can be securely kept in a pocket, protected from the elements and safe from damage, drops and other everyday mishaps. A 3.5 mm audio headphone jack is provided for quiet, secured communications when privacy demands.

***Pacific Wireless Communications Pty Ltd***

*www.pwcau.com*

# BROAD ANALYSIS
# PUBLIC SAFETY MOBILE BROADBAND

*Jonathan Nally*



Industry and users eagerly await the results of the Productivity Commission's study into public safety mobile broadband.

In November last year, the federal government asked the Productivity Commission to undertake a 'first principles' analysis of the most efficient and effective way of delivering a mobile broadband capability for public safety agencies by 2020. The study will consider the "most cost-effective combination of private and public inputs, services and expertise".

The Commission's terms of reference were released in March this year and are as follows:

1. Undertake a 'first principles' analysis of the most efficient, effective and economical way of delivering mobile broadband capability to public safety agencies by 2020.
2. Consider the most cost-effective combination of private and public inputs, services and expertise to deliver the capability.
3. Consider aspects of this capability such as national interoperability across jurisdictions and agencies, coverage, integration of voice services, security, capacity, resilience, sustainability of arrangements into the future and compatibility with end-user devices.
4. Consider domestic and international developments that might be applicable to Australia.

The announcement of the terms of reference was accompanied by explanatory notes, which said that the Commission needed to pay particular regard to:

1. The most cost-effective combination of private and public inputs, services and expertise to deliver the capability. This should include an assessment of the relative costs, benefits and risks of:
   - deploying a dedicated public safety mobile broadband network
   - an approach that is fully reliant on commercial networks, and/or a combination of the two.
2. The ability for the capability to:
   - be nationally interoperable, within and across agencies and jurisdictions
   - operate in both metropolitan and regional Australia
   - integrate voice communications that are traditionally carried on narrowband networks
   - maintain integrity and security of communications
   - ensure accessibility, priority and sufficient capacity for public safety agencies, particularly during periods of peak demand and during a localised incident
   - be resilient and maintain continuity of service including under adverse operating circumstances
   - consider the sustainability of arrangements in the context of rapidly changing technology and increased demand, including convergence of voice and data services
   - be cost effective, in terms of both capital and operating cost
   - be nationally available by or before 2020
   - be compatible with a variety of end-user devices.
3. Relevant domestic and international reports and experiences (eg, work underway through the Asia Pacific Telecommunity Wireless Group (AWG), International Telecommunication Union (ITU), 3rd Generation Partnership Project (3GPP) and implementation of similar capability in other countries that may be applicable to Australia.

The notes also said that, in conducting the analysis, "the Commission is to have regard to the Australian Communications and Media Authority's (ACMA) role as the independent national regulator and technical expert on communications matters, with final decision-making responsibility for allocation of and conditions of access to spectrum. The Commission should also, where practicable, have regard to the Government's broader review of the spectrum policy and management framework."

The Commission released an issues paper (pc.gov.au/inquiries/current/public-safety-mobile-broadband/issues) on 20 April and called for comments to be received by 25 May. The next step will

be the release of the draft report in August this year, followed in December by the final report, which will be given to the government before being publicly released.

## Reaction from industry and users

Needless to say, the whole critical communications sector in Australia is eagerly (perhaps even nervously) awaiting the results of the Commission's study. *Critical Comms* contacted several leaders in the field to get their opinions and feedback.

Telstra National General Manager, Government and Public Safety and Security Alex Stefan said, "Telstra welcomes the review to help to identify the best approach to delivering a public safety and security mobile broadband capability in Australia by 2020, and we look forward to participating in the study."

Australian Radio Communications Industry Association (ARCIA) President Hamish Duff was also supportive, saying, "ARCIA welcomes the Productivity Commission review and will be happy to participate as required. ARCIA members have tremendous experience with public safety agencies and the suitability and cost-effectiveness of various delivery models." Duff added that ARCIA's recent report, 'Valuing mission critical radio services in Australia', had been forwarded to the Productivity Commission for reference.


Police Federation of Australia Chief Executive Officer Mark Burgess expressed some concerns. "Our major concern relates to the fact no other sector has had to undergo a cost-benefit analysis for access to spectrum - why is it that public safety has to jump through such hoops and hurdles?" he said.

"That being the case, we are confident that the Productivity Commission will come down in favour of a minimum of 20 MHz (2 x 10 MHz) of spectrum being made available for public safety, bearing in mind previous research conducted by the University of Hong Kong, 'Public Protection and Disaster Relief (PPDR) Services and Broadband in Asia and the Pacific', the London School of Economics study into the 'Socioeconomic Value of Mission Critical Mobile Applications for Public Safety' in the EU and the UK, as well as the more recent report for the European Commission - 'Is Commercial Cellular Suitable for Mission Critical Broadband?'" added Burgess. "All have leaned in favour of 20 MHz of spectrum being made available for public safety. If the Productivity Commission in Australia comes up with something completely different from these reports, one will need to ask why.

"We are, however, concerned about the comments made by Minster Turnbull when the Productivity Commission's terms of reference were released when he said, 'It's very difficult to see how anybody, I'd argue, in government… or a government agency could replicate the density of redundancy and resilience of the telcos' networks… These wireless networks are going to become denser and denser: the nature of the mesh network will see more and more and more base stations. It's hard to see how a public safety network, on a standalone basis, could ever compete with that. So the issue is prioritisation,'" said Burgess. "It appears that the Minister is trying to either influence the Productivity Commission's outcomes or at least pre-empt them."

Burgess added, "The Minister might need to be reminded about his and the government's obligations under the Radio Communications Act, and that is '… to provide adequate spectrum for Australian defence, national security, law enforcement and emergency services'.

"We will continue to remind the government of its responsibility under the Act," said Burgess.

UK-based consultancy Quixoticity founder and Managing Director Peter Clemons has a keen interest in the area of public safety communications and is very familiar with Australia's situation, having been a regular visitor to our shores.

"I actually see this as a positive move with potential global repercussions," said Clemons. "The terms of reference touch on the main points in this debate and it is to be hoped that all sides of the argument contribute to the discussion.

"We have seen that early efforts around the world to deploy public safety mobile broadband networks, such as USA's FirstNet and UK's ESMCP/ESN, have been extremely challenging, with limited progress so far towards final goals," said Clemons. "FirstNet is being bogged down by excessive bureaucracy, whereas ESMCP is being driven too much by the need to decrease costs by involving commercial networks that have not traditionally been able to deliver mission-critical solutions.

> A TRUE PARADIGM SHIFT IS ABOUT TO OCCUR - AN OPPORTUNITY THAT COMES ALONG ONCE IN A GENERATION TO MAKE A REAL DIFFERENCE.

"The study undertaken by the Productivity Commission will give the Australian, Asia-Pacific and global critical communications community the opportunity to reflect on current best practice around the world and decide the best approach to tackling next-generation public safety communications as new technologies, solutions and applications become available over the coming 5-10 years with 2020 the focus of attention for the possible start of deployment of new solutions."

Clemons said that interoperability at all levels will be the key to success, and that there is a need to develop affordable, truly statewide and nationwide solutions for metropolitan, suburban and rural areas based on the maximisation of social value as well as economic value. He said that Australia also has an opportunity to lead the rest of the world with innovative, forward-looking solutions integrating existing digital PMR with future broadband in a single seamless network for all emergency services.

"Let's hope this new study creates a new benchmark for public safety mobile broadband and allows a sensible, low-risk, high-value migration," said Clemons. "I'll be keeping a close eye on the progress made by the Commission and maybe Quixoticity will make its own submission based on our knowledge of the current status of multiple projects currently active across all continents.

"These are exciting times for public safety, but future convergence with commercial networks needs to be very carefully managed and controlled by public authorities to guarantee the best possible outcomes for everyone," added Clemons. "We will see new technology, new applications and innovative ways of working and interfacing with the general population. A true paradigm shift is about to occur - an opportunity that comes along once in a generation to make a real difference."

## Wi-Fi access point

The Ruckus ZoneFlex R710 Wi-Fi access point supports major technical advances in the 802.11ac standard, enabling the simultaneous transmission of multiple client streams to different devices over the same frequency, a new capability called multiuser multiple input/multiple output (MU-MIMO). This enables over two times the density of mobile devices versus Wave 1 and aggregate data rates exceeding 2 Gbps. The ZoneFlex R710 supports up to four spatial streams and 500 concurrent clients. Additionally, each ZoneFlex R710 integrates Ruckus-patented BeamFlex adaptive antenna technology, designed to enhance the operation of Wave 2 802.11ac technology by optimising antenna coverage on a per client, per transmission basis.

With four discrete, dual-band smart antenna arrays, the ZoneFlex R710 is capable of dynamically creating over 4000 unique directional antenna patterns per radio, mitigating up to 15 dB of RF interference while also reducing co-channel interference. Dual-polarised smart antennas enable the R710 to automatically adapt to the changing physical orientation of mobile client devices, helping to maximise uplink performance and reception of weak mobile client signals.

***Ruckus Wireless Inc***

*www.ruckuswireless.com*

## UHF CB starter kit

The GME TX3100VP Starter Kit comprises the TX3100 - a compact, 5 W UHF CB radio - and the AE4018K2 - a high-performance, 6.6 dBi ground-independent antenna.

The Australian-designed TX3100 features front-mounted controls, designed for unobtrusive mounting in modern vehicles; 5 W output; CTCSS and DCS privacy; digital signal processing; advanced signal management; dynamic volume control; and a display flip function for mounting options.

Feature of the AE4018K2 are: a fibreglass colinear antenna with 6.6 dBi gain; high-quality elevated feed for ground independence; an electro-polished, stainless steel, heavy-duty parallel spring; and a 4.5-m low-loss coaxial cable and PL259 plug.

The kit also comes with a radio mounting bracket and screw pack, microphone and microphone clip, a DC power lead and an MB407SS antenna mounting bracket.

***GME***

*www.gme.net.au*


## TETRA system

The DAMM TetraFlex Outdoor System is a user-friendly, flexible and cost-effective TETRA infrastructure system. Its high reliability and design make it suited to mission-critical communications in the harshest environments.

The TetraFlex system is scalable and can handle small single-site solutions with local coverage through to large-scale multisite solutions, using any combination of outdoor or indoor TetraFlex base stations. Fully IP-based technology provides full architectural network flexibility with all network components connected in a single state-of-the-art infrastructure without the need for a central switch. Featuring full support for battery backup as well as redundant controllers and carriers, TetraFlex meets the highest requirements on reliability. The intelligent distributed architecture replicates information to all sites in the network, avoiding any single point of failure. TetraFlex is supplied with Application Gateways for easy access to the application programming interface (API), packet data gateways and voice gateways, enabling straightforward development of customer-designed applications or integration to existing telephone systems and control room equipment.

The TetraFlex Outdoor System has recently obtained the European EN 50121-4 certification, which means it can be used in rail applications for signalling and telecommunication apparatus installed in railway environments.

***GMG Solutions***

*www.gmgsolutions.com.au*



## LTE data-ready TETRA radio

The Sepura SC2020 hand-portable radio combines TETRA's mission-critical performance with an optional, second high-speed data bearer. Sepura says it is the first TETRA hand-portable radio that can claim to be LTE data ready.

Featuring smart menus and intuitive operation, the product handles tough environments and conditions. The unit's large, high-resolution screen enables easy deployment of existing and future applications via high-speed data. It is viewable in all light conditions, including direct sunlight.

The radio's 2 W audio capability, enhanced by water-porting technology, allows for good audio clarity even in continuous heavy rain. The product also boasts an IP67 environmental protection rating. Its design enables it to be rinsed, making it suitable for use in demanding environments such as emergency services and other commercial sectors.

A powerful Class 3 TETRA engine is paired with a receiver that surpasses the ETSI specification. This provides a combination that extends the operational range.

***Sepura PLC***

*www.sepura.com*

## GPS tracking

KORE Wireless is launching the Position Logic platform in the Asia-Pacific market. The product is a powerful, customised and hosted GPS tracking solution for industry which operates on a global scale. It empowers businesses with integrated applied business intelligence, precision technology and customised services, including hosted solutions/SAAS, enterprise solutions and precision mobile application solutions.

Position Logic integrates more than 380 devices into an intuitive, cloud-based platform that enables users to control their assets in real time. Available on any desktop or mobile browser, the location-based services and support are also accessible through a responsive mobile application, enabling users to get the customised tools and support they need anywhere in the world. The foundation of the entire model is to make it easy for companies of all sizes to deploy powerful location-based services with complete scalability and with integrated features that allow for deeper visibility and control.

***KORE Wireless Asia Pacific Pty Ltd***

*www.korewireless.com.au*

## RF cables

Elspec's high-quality RF cables are built in accordance with MIL-C-17 and IEC specifications. The MRC100XLFRNC or RG316 cables are double shielded, halogen free and capable of withstanding soldering.

The stranded internal wiring and small size of the products make them flexible with markedly better electric qualities than conventional RG316 or RG174, according to the company. The special method of construction enables phase stability with no PTFE knee. A special feature is the attachment of a selected RF foil as an exterior conductor, giving an impedance accuracy of up to 50 Ω (+/-1.5).

The cables are suitable for UAVs, radar stations and test and diagnostic units.

***Delta Gamma Consultant***
*www.delta-gamma.com*

## Digital oscilloscope

The Teledyne LeCroy Model HDO6000 high-resolution digital oscilloscope includes spectrum analysis as standard, which - together with its bandwidth range of 350 MHz to 1 GHz, 12-bit ADC resolution (up to 15-bit with enhanced resolution), long acquisition memory of up to 250 Mpts/Ch, 2.5 Gs/s sampling rate - puts power into the hands of users of test tools.

Additional features include: HD4096 high-definition technology that enables capture and display of signals up to 1 GHz with high sample rate and 16 times more resolution; debugging of complex embedded designs with integrated 16-channel mixed-signal capability; touch screen for easy configuration of channels, timebase, trigger and all functions; WaveScan, which quickly searches waveforms for runts, glitches or other anomalies; and LabNotebook, which lets users save all results and data with a single button press and create custom reports.

Powerful advanced software analysis tools are available including Power Analysis, Serial Bus Trigger and Decode and PROTObus MAG Serial Debug Toolkit.

***Scientific Devices Australia***
*www.scientific-devices.com.au*

# RADIO ON THE RAILS

*Jonathan Nally*


Access to a dedicated radio communications band is revolutionising the Australian rail network.

The federal government has allocated $15.5 million as the first tranche of funding for the national Advanced Train Management System (ATMS) project.

Presently, train control in Australia (and in pretty much all other countries) uses a very ancient trackside signalling system - and those systems date back to not the last century but the century before. The ATMS will use broadband communications, GPS navigation and state-of-the-art computer technology to locate and route trains in real time, enabling trains to operate more safely and closer together.

Deputy Prime Minister and Minister for Regional Development Warren Truss said the system will become the accredited standard for train management across the national rail network managed by the Australian Rail Track Corporation (ARTC).

"ATMS will further improve the reliability of our national rail network, increasing on-time performance and safety. It will also increase capacity for the movement of freight across the nation, boosting the productivity of our industries," Truss said.

"The Australian Government has committed $50 million to start the roll-out of ATMS across Australia and trains operating between Whyalla and Port Augusta in South Australia will be the first to implement ATMS as part of Stage 1, with the technology later able to be extended across Australia."

In addition to the federal government's commitment, the ARTC is contributing funding to the estimated $65 million project.

ARTC Chief Executive Officer and Managing Director John Fullerton said ATMS will transform Australia's rail industry by increasing the cost effectiveness of the network and reducing reliance on expensive signalling and other physical trackside infrastructure.

"ATMS will be gradually scaled up in a live but safe operational environment so the system's full capabilities can be tested," said Fullerton. "Initial trials commenced in January 2015 and, so far, two locomotives that travel between Port Augusta and Whyalla have been fitted with in-cab ATMS equipment.

"Planning is already underway for the next set of trials, which will involve further consultation with the end users of the system - rail operators. These trials are expected to commence later this year. The system is custom-engineered technology and will transform the way freight rail infrastructure is managed and monitored across the country."

This initial stage of the ATMS implementation is being jointly delivered by ARTC and Lockheed Martin Australia.


*Under ATMS, train drivers will have an information display in the cab of the locomotive.*

*At train control centres, operators will have positive position knowledge of trains on the network.*

"ATMS is designed to improve rail network capacity and reliability through a communication-based train management system that allows network controllers and the train drivers to operate trains in closer proximity than ever before and to be assured that they are doing it safely," said Australasian Railway Association (ARA) CEO Bryan Nye.

"It also minimises the need to construct new or upgraded track infrastructure and increases capacity on the existing single-track network that meets industry's need for greater rail capacity on a network which is enormously geographically extensive.

"ATMS is the cornerstone technology that will boost improved communications and digitalisation in the rail industry. It is incredibly important as it allows for a safer, more cost- and time-efficient and ultimately more productive system that will benefit not only the Australian rail industry but also the nation's economy, given the forecasted increasing freight task."

## Spectrum is the key

"One of the things we've achieved is getting a common frequency for the whole of Australia, which has not been done anywhere else in the world," said Nye. "Getting the 1800 MHz spectrum, the same spectrum, means a freight train going through from Sydney to Perth will go from one control centre to another, but they'll be compatible, and so you'll be removing a lot of redundant communications.

"We had a ding-dong battle with the federal government to get control of that 1800 MHz, because obviously all the telcos wanted it as well. We'd actually purchased the OneTel spectrum when they went bankrupt, and [we've] got that for 15 years.

"One of the [reasons why] owning that spectrum is going to be incredibly important for us [is that] we're going to get high-speed rail eventually and, if you think about it, borders and jurisdictions are irrelevant to the transport sector, so we needed national coverage," said Nye.

Presumably there are lots of controls centres dotted around the country? "Under digital train control, you don't need that many," said Nye. "[We're taking] the technology being used by air traffic control [and putting it] into the railways.

"Obviously the challenge of every budget cycle is getting the funding through overall. You can't [do it] all at once; you have to keep the redundancy of the current signalling system and upgrade bit by bit. You're replacing old with new.

"ATMS is the country network, and that's using the 4G network. But within the cities themselves, we're adopting GSMR where the industry has its own spectrum in the 1800 MHz band to do exactly the same [thing as ATMS]."

The railways "had to put up our [their] poles and everything else, because we need the redundancy because [train operations are] much closer and much tighter", noted Nye.

The ATMS is expected to bring about a 20% increase in capacity, as well as improving the safety of operations. Fitting more trains into the same system is "not as sexy as building more railway tracks, but it's far more beneficial to the operation of the network", said Nye.

"To me, it's the most quantum leap forward for the rail industry," said Nye. "This is fundamentally going to take us to the next level."

## DMR equipment

The TB9300 base station is the foundation of Tait DMR Tier 2 and Tier 3 networks, providing the required RF performance and migration path for customers from Tier 2 to sophisticated Tier 3 solutions. The TB9300 Tier 2 base stations and networking equipment can be ordered in both single-site and multisite modes.

The robust base station, coupled with Tait tough terminals, provides a comprehensive portfolio. Tait DMR base stations and terminals adhere to the DMR standard for both Tier 2 and Tier 3 modes. Support for open standards provides end users with freedom of choice in procurement and throughout the life of their communications network and protects their investment.

Tait DMR Tier 2 networks support the DMR Applications Interface Standard and are certified with applications including Omnitronics RediTalk and Logic Wireless Crosswire.

***Tait Communications***
*www.taitradio.com*

## In-building DAS

The InterReach Unison from TE Connectivity is a flexible wireless DAS networking system that adapts to changing needs easily and keeps system life-cycle costs low. Its modular architecture provides wireless operators and building owners with power and intelligence in a single, versatile solution.

The InterReach Unison features an easy-to-deploy, double-star architecture with three components: a main hub, an expansion hub and a remote access unit (RAU). The main hub and expansion hub connect using singlemode or multimode fibre. The expansion hubs connect to the RAUs with Cat 5/6 twisted-pair cable.

Unison is suitable for such diverse applications as ships, small and medium enterprises, and anywhere a network overlay is needed.

***TE Connectivity***
*www.te.com/enterprise*



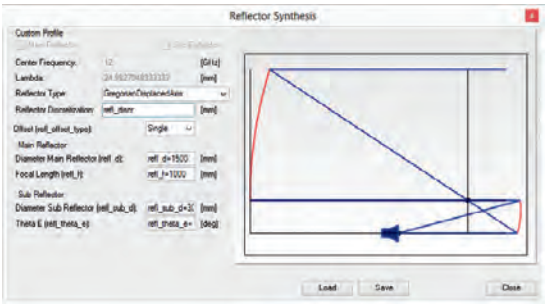
## Field simulation tool

$\mu$Wave Wizard is a fast field simulation tool based on mode matching and is a suitable choice for filter, complex wave guide component and antenna design.

With the synthesis tool, it is ease to design low- and band-pass filters and corrugated antennas, including body of revolution. The simulation can be performed on a laptop computer in only few minutes instead an hour.

With the $\mu$Wave Wizard 7.11 synthesis tool for reflector antennas it is easy to design parabolic, Cassegrain and Gregorian reflector antennas with a centric configuration, as well as those with an offset in one or two directions. In combination with the horn synthesis tool, the fast simulation and optimisation of an antenna design can be done in hours instead of days.

***Delta Gamma Consultant***
*www.delta-gamma.com*




## LXI digitisers

Spectrum has extended its digitiserNETBOX series of LXI-based instruments and released eight new models. Available with two, four or eight fully synchronous channels, the new units feature sampling rates up to 5 GS/s, bandwidth in excess of 1.5 GHz and onboard acquisition memory up to 8 GS. The unique combination makes the digitisers suitable for capturing long complex high-frequency signals and for characterising fast timing events that go down to the nanosecond and sub-nanosecond ranges.

Fully LXI compliant, the digitiserNETBOX products enable remote control and data transfer over fast Gigabit Ethernet. Connect them directly to a Notebook or PC, or in fact to anywhere on a company LAN, and automated data acquisition becomes easy. Offering significant advantages in measurement speed, flexibility, size and channel density, the products can be used to replace conventional bench instruments such as oscilloscopes, spectrum analysers, multimeters, counters, timers and older generation digitiser products.

The digitiserNETBOX instruments include Spectrum's powerful SBench 6 software that enables full instrument control, graphical display, data storage and analysis. The program offers both oscilloscope and transient recording modes, including continuous data streaming. A special feature of SBench 6 is the segmented acquisition view, which is suitable for capturing burst type signals together with all the associated trigger time-stamping information. SBench 6 can be used to measure parameters, perform FFTs and run a variety of different math and processing functions such as filtering, averaging and histograms. Data can be exported into a number of formats such as ASCII, Wave and MATLAB, making it easy to use the digitiserNETBOX products with a variety of third-party software tools.

***TRIO Test & Measurement Pty Ltd***

*www.triotest.com.au*

# INTERNATIONAL COLLABORATION

*Geoff Spring*



Sharing of information is essential to achieve the best possible public safety mobile broadband capability.

The last couple of months have been a busy time for the international mission-critical public safety communications community. We have seen the Australian Productivity Commission announce its terms of reference to study how a mobile broadband capability can be provided for Australia's public safety agencies (PSAs). The Canadian government announced decisions resulting in 20 MHz of broadband spectrum in the 700 MHz band, initial funding towards providing a mobile broadband capability long sought by Canada's PSAs and the opportunity for alignment with the FirstNet project in the United States.

The International Telecommunications Union announced the Agenda for the World Radio Conference to be held later this year, where it appears there will be a resolution proposing more study of the impact of mobile broadband on personal protection and disaster response (PPDR) spectrum. In the United Kingdom, the Home Office continued with the tender process for the Emergency Services Network Project to select a commercial provider of a new mobile broadband network for the UK's PSAs. Across Europe, consideration continues to be given to how a public safety mobile capability can be provided to Europe's PSAs based on 20 MHz of spectrum provided for this use.

The international mission-critical public safety communications community continues to closely watch both the FirstNet Project and the Emergency Services Network Project for the lessons to be learned as a result of the different approaches being taken. This community could just as easily become very interested in the Australian Productivity Commission.

There already exists a massive body of global information and knowledge produced by industry associations, standards bodies and research organisations about how to provide PSAs with a mission-critical mobile broadband capability. This body of knowledge has informed decisions made by governments, bureaucracies and regulators about the allocation and use of scarce resources, ie, spectrum and funding, required to deliver services that meet ever-increasing community expectations and at the same time build community resilience.

Perhaps, then, instead of producing another study, the Productivity Commission should be collecting, analysing and synthesising the findings, recommendations and outcomes from this existing body of information and knowledge. In this way, it could produce an Australian contribution to the conversation about how the world's emergency management sector might best be provided with a mission-critical public safety mobile broadband capability.

Australia's contribution could be significant in a period where strategic investment decisions are being made that will impact the global direction of mission-critical public safety communications for decades to come. This contribution could be used to enable Australia's states and territories to make informed decisions that can be implemented in a coordinated manner to build a national public safety mobile broadband capability, as part of a broader mission-critical communications ecosystem meeting the immediate needs and future expectations of our communities in the most economic and socially effective manner.

The more exposure we can give to these decisions through international sharing and collaboration to enhance the understanding, relevance and application of information and knowledge on which these strategic decisions can be based can only result in better outcomes for everyone.

*Geoff Spring is a senior advisor to the University of Melbourne Centre for Disaster Management and Public Safety, a member of the P25 Standards Steering Committee and a board member of APCO Australasia.*

## UHF wideband Yagi antennas

The Polar Electronics model 327X comprises two 11-element UHF wideband Yagi antennas incorporated into a single mounting tube. Configured as individual horizontal and vertically polarised antennas with separate feeder cables and high isolation between antennas, the product is intended for use in polarisation diversity systems.

The antenna is constructed using heavy-wall aluminium tubing with the elements (20 x 1.6 mm wall thickness) welded to the boom (40 x 40 x 2.5 mm wall thickness). A heavy-duty mounting clamp, suitable for attachment directly to 35-61 mm vertical support tubes, is supplied.

Specifications include: a frequency range of 380-520 MHz; impedance of 50 Ω; bandwidth of 50 MHz; VSWR of <1.5:1; vertical-to-horizontal isolation of >31 dB; gain (each antenna) of 10 dBd; front-to-back ratio of 17 dB; beamwidth of 42° (E-plane) and 48° (H-plane); power rating (each antenna) of 250 W; DC ground lightning protection; N female termination; overall length of 1270 mm; and weight of 5 kg.

***Polar Electronic Industries Pty Ltd***
*www.polarelec.com.au*

## Multiband in-building DAS

Economical and easy to maintain, the InterReach Fusion multiband in-building distributed antenna system (DAS) solution offers advanced configuration options suitable for mobile operators deploying up to three bands.

The InterReach Fusion features easy-to-deploy double-star architecture. One main DAS hub supports up to four expansion hubs connected via fibre. Each expansion hub connects via CATV 70 Ω cabling to up to eight remote access units. Its distributed amplifier and thin cabling also make it suitable to upgrade SISO to MIMO when and where needed for 4G. It is designed for mid- to large-size enterprises, campuses and public venues such as hotels, hospitals and retail shops.

***TE Connectivity***
*www.te.com/enterprise*

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# LTE MEETS SMART METERS

Trials show that LTE is highly viable as a communications medium for utility smart metering systems.

Research conducted by Ericsson, Telefónica Germany and the E.ON Research Centre at RWTH Aachen University has demonstrated the feasibility of using LTE networks in conjunction with smart meters for the energy sector.

The trials showed that LTE prioritisation, a standard feature of LTE, can provide a highly reliable and flexible alternative to existing powerline or fixed network connections of smart meters.

Smart meter rollout planning is picking up speed in many countries. At the same time, ongoing LTE network deployments are opening new opportunities for utilities to use public networks for communicating with their smart meters.

LTE can provide a highly reliable and flexible communications link from the smart meter to utility IT systems, as the trials showed.

Utility IT systems can use the information collected from smart meters as a tool to help them manage their power networks, particularly in the context of the increasing integration of volatile renewable energy sources, such as wind and solar power, into the power network.

New energy tariffs can be sent to the meter to encourage the use of energy at the time when it is available in the network - for example, from renewable energy on a sunny or windy day.

"We see the trial results as confirmation that public LTE networks, such as Telefónica Germany's, offer a reliable and cost-effective communications option to utilities companies deploying smart meters," said Sven Koltermann, head of energy sales in Telefónica Germany.

The trials, using commercial Ericsson LTE base stations, demonstrated that even under heavily loaded radio network conditions, the stream of messages from the smart meters can be received at the central utility IT systems within the expected transmission time period of less than 100 milliseconds.

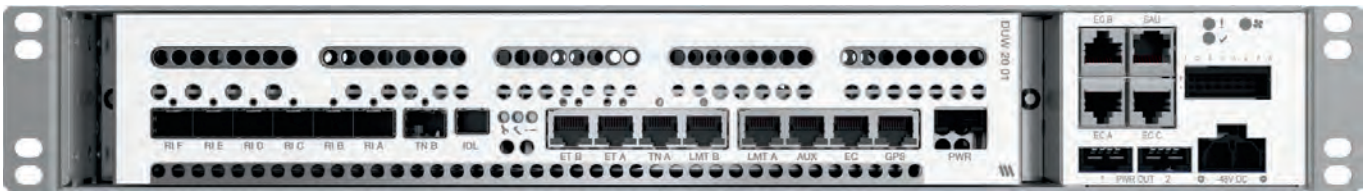
"As the installation of smart meters progresses, and communications and power network technology develops towards smart grids, more and more business opportunities are opening up for utilities," said Professor Antonello Monti, director of the Institute for Automation of Complex Power Systems (ACS) at the E.ON Research Centre.

"They can improve the services they offer their customers and to optimise their networks, enabling the large-scale integration of renewable energy sources into the power generation mix while maintaining the highly reliable power network service that society needs to function efficiently," he added.

## Using quality to measure quantity

LTE offers features that will make it the solution of choice for many use cases for utilities. The new features available in LTE Release 13 and beyond will enable further improvements in LTE performance for utility use cases, and when 5G is available, even the most challenging of utility real-time use cases will be addressed by wireless networks.

In the trials, the stream of message from the smart meters was prioritised using the quality of service (QoS) features of LTE. Using prioritisation, smart meter messages were promptly received even in an overload situation, when other traffic on the network had heavy delays.



> LTE CAN PROVIDE A HIGHLY RELIABLE AND FLEXIBLE COMMUNICATIONS LINK FROM THE SMART METER TO UTILITY IT SYSTEMS.

"We were happy to see that the QoS features of LTE fully met the communication requirements for power network automation, which are far more stringent than other requirements specifications for smart meter measurement acquisition," said Dr Fiona Willliams, research director at Ericsson.

The advantage of applying the QoS features to the meter traffic is that even in the rare case of overload conditions, the smart meter messages will not be delayed or dropped and will be delivered to serve smart meter applications.

This means that messages sent to a pre-paid meter to reconnect a customer that has just phoned to buy a top-up for their electricity or gas meter will happen instantly, regardless of the network load conditions.

The trials were conducted using an Ericsson LTE base station set up at the ACS Institute of the E.ON Research Centre at RWTH and connected to the Ericsson Core Network facilities available at Ericsson Eurolab in Aachen. The centre's RTDS power network simulator was used to generate the stream of messages according to the specifications of the smart meter use case provided by Telefónica.

The tests followed an independently conducted set of simulations of the messaging use case on the Ericsson LTE high-performance simulator. The results from the simulation showed that the prioritised MMS message streams were transmitted promptly even in radio network overload conditions. These simulation results were confirmed by the tests sending the messages over the air with the real base station.

## Intelligent battery charger

The Logic Wireless Ultra Intelligent Charger is a customised radio cradle and smart charging system that is fully integrated into one device, ensuring that batteries are revitalised, equalised and optimised with every charge cycle.

The unit is built to perform in extreme temperature ranges and has a ruggedised small cradle which requires minimal dashboard real estate and can be placed anywhere in the vehicle.

Intelligent Pulse technology protects batteries from generating a memory effect from suboptimal charging. The Equalise feature ensures the total voltage in the battery cells is performing to the highest levels during use, providing maximum daily output of the battery and making it last longer in the field. The Optimise feature automatically tops up the battery and retains charge levels during busy work shifts, when radio and battery units might get moved in and out of the charger many times.

***Logic Wireless Limited***
*www.logicenergy.co.nz*

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## Signal generator

The Tektronix TSG4100A combines an RF signal generator and vector signal generator (VSG) and can be easily upgraded in the field to deliver more advanced vector and digital modulation capabilities.

The series includes three models with carrier frequencies from DC to 2, 4 and 6 GHz respectively and offers a wide variety of modulation capabilities. Modes include AM, FM, phase modulation and pulse modulation.

Units can be software upgraded to support VSG applications. With the vector upgrade, the series offers full support for vector signal modulation on RF carriers between 400 MHz and 6 GHz. The series can be used together with the USB-based RSA306 spectrum analyser, MDO4000B and MDO3000 mixed domain oscilloscopes.

***element14***
*au.element14.com*

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## Surveillance solution

Zetron's Video Surveillance and Security solution improves the ways in which facilities such as government buildings, parking lots, schools and warehouses can be monitored and protected.

The Video Surveillance and Security solution enables recorded video to be digitally watermarked and stored for evidentiary purposes. Because it is able to apply analytics - such as item-left-behind and motion sensing - it is suited to campuses and enterprise customers.

The system can scale easily from small operations to very large, enterprise-wide environments, making it a cost-effective solution for organisations that expect to expand over time. And it enhances the scope and depth of Zetron's control-room solutions, which include emergency call-taking, CAD, mapping, radio dispatch and logging recorders.

***Zetron Australasia***
*www.zetron.com*

# News

## WHITESPACE STANDARD

The WhiteSpace Alliance (WSA), a global industry organisation that promotes the shared use of underutilised spectrum, has announced that the core technology underlying its Wi-FAR specification has been approved to become an ISO standard. The approved standard will be referred to as ISO/IEC/IEEE Std. 8802-22:2015. Wi-FAR, a derivative of the IEEE 802.22 Standard, provides industry-recognised, cost-effective, broadband internet access through dynamic allocation of underutilised TV band spectrum, or whitespace. Wi-FAR is an interoperability and certification point-to-multipoint wireless broadband specification optimised for operation in the VHF and UHF TV bands, in the frequency range between 54 and 862 MHz.

*More info: bit.ly/1zUldAJ*

## HYBRID P25, LTE SOLUTION

Codan Radio Communications has announced the launch of Stratus, a hybrid P25 and LTE communications network solution. The integration of P25 and LTE (3G/4G) leverages the strengths of both technologies to provide secure mobile voice communications anywhere with public cellular coverage, while linking into established analog or P25 networks for wide area coverage. A lightweight and portable solution, a Stratus network consists of one or multiple Stratus Repeaters, Power Centre and Rapid Antenna, linking to a fixed Stratus Server and optional P25 DFSI console over encrypted channels within a VPN, providing the security of double encryption.

*More info: bit.ly/1EtgwJF*

## 3G PTT PROGRESS

A copyright agreement is now in place that will allow the Open Mobile Alliance (OMA) Push-to-Communicate for Public Safety (PCPS) specifications. This is based on the OMA Push-to-talk over Cellular (PoC) to be used in 3GPP specifications for mission-critical push-to-talk (MCPTT). According to the OMA, the agreement, approved by the OMA Board and now out for signature among the 3GPP SDOs, is a vital aid to the progress of the work of 3GPP's new SA6 working group, enabling them to use PCPS 1.0 texts where needed to complete 3GPP MCPTT without having to 're-invent the wheel'.

*More info: bit.ly/1RrvAkV*

## Wideband area monitor

The Narda Safety Test Solutions AMB-8059 is a wideband area monitor that monitors electromagnetic fields up to 7 GHz in conformance with the ITU-T Recommendation K.83. Depending on the probes used, the unit can capture electric field strengths in the frequency range 100 kHz to 7 GHz. The lower frequency range from 10 Hz to 5 kHz is covered by probes for electric and magnetic fields.

The area monitor stores the measurement data internally, which can then be accessed locally using ethernet, USB or RS232 or remotely by transmission via a mobile modem. It can also be transferred to an SD card.

If required, the monitor transmits its position as GPS coordinates along with the measurement data. Each monitor is completely autonomous due to power from solar cells, with a reserve of up to 80 days of operation in darkness.

A web-based monitoring system, which has wide area coverage and is time contiguous, can be set up using the EMF Observatory software. This automatically collects the data from the area monitors, stores it on a server, generates reports and statistics and reacts immediately to alarms - such as when limit values are exceeded - or to messages about the operating status of individual stations. The user interface is designed so that it can be operated almost without any prior training.

***Airmet***

*www.airmet.com.au*

## Single Port USB Vector Network Analysers


The MS46121A 1-port USB VNA is a small (USB power sensor-like) 1-port VNA series with two frequency ranges from 40 MHz to 4 GHz and 150 kHz to 6 GHz. A user-supplied computer supplies power and control to these VNAs through a USB cable.

The MS46121A comes standard with an N(m) connector for easy connection to N(f) connectorised devices such as antennas and cables. ShockLine software controls the MS46121A and provides the tools and graphical user interface for easy debug and testing of 1-port RF devices. ShockLine is compatible with Windows 7 or Windows 8 (32- and 64-bit) operating systems making it very easy to integrate the MS46121A into most test application environments. For remote programming, the MS46121A supports a complete SCPI command set as well as LabView, LabWindows, Matlab, C# and other software interfaces through an IVI-C driver.

MS46121A VNAs support efficient multisite testing by enabling up to sixteen 1-port VNAs to operate in parallel from a single host computer using a powered USB hub. Using multiple MS46121A VNAs in place of a single VNA and a switch box setup improves throughput by enabling true parallel testing of devices.

The 1-port USB VNA is compact and lightweight, making it well suited for applications such as near-field antenna testing where direct connection to the DUT is an advantage. Eliminating RF interface cabling improves calibration stability and measurement quality while reducing the cost of test for such applications.

***Anritsu Pty Ltd***

*www.anritsu.com*

## Spectrum analyser

The Aaronia SPECTRAN HF-60105 V4 is suitable for field strength measurement and analysis of Wi-Fi, cellular, radio, TV station and radar applications. It is available to rent from TechRentals.

This portable spectrum analyser possesses a 14-bit dual analog-to-digital converter, digital down converter hardware-filter, demodulator for AM/FM/PM/GSM and a high-precision time base (0.5 ppm).

The unit comes with a HyperLOG 60100 antenna (680 MHz to 10 GHz - will operate at lower frequencies for relative measurements) and a magnetic field tracking MDF 9400 antenna (9 kHz to 400 MHz).

Its specifications include: a frequency range of 9 kHz to 9.4 GHz; displayed average noise level of -155 dBm (1 Hz) or -170 dBm (1 Hz) with pre-amp; resolution bandwidth of 200 Hz to 50 MHz; and 1 MB memory with USB interface for data download and software interface.

***TechRentals***

*www.techrentals.com.au*


## Satellite terminal

The Explorer 5075GX auto-deploy flyaway systems are lightweight, rugged and highly portable. They are configured specifically for operation on the Inmarsat Global Xpress (GX) network, which delivers high-speed, seamless, worldwide data coverage.

The product can be deployed in 10 min and each terminal has its own global IP address. The portfolio of GX devices ranges in size: from 60 cm, lightweight and highly portable terminals with low-power consumption for those needing a high-speed mobile office, through to fixed-site installations of up to 2.4 m.

The solutions ensure implementation of the quality of service needed in order to deliver bandwidth for voice, data and streaming applications, all backed by a robust service-level agreement (SLA).

***Applied Satellite Technology Australia Pty Ltd***

*www.asta.net.au*

# FIRE GROUND
## COUNTRY FIRE SERVICE GOES DIGITAL

*Jonathan Nally*

South Australia's Country Fire Service has awarded Tetracom a $7 million contract to upgrade all of its frontline radios to digital standard.

South Australia's Country Fire Service will progressively replace its fire ground radios over the next few years with a whole new fleet of Tait mobiles and portables, in a $7 million contract won by local company Tetracom.

"It is good to see the South Australian Government awarding contracts such as this to a South Australian company, as this keeps employment and investment within the state," says Tetracom's managing director, Jeff Perry. The company has worked with the emergency services in South Australia for 20 years.

This is thought to be the largest radio contract awarded in South Australia outside of the South Australian Government Radio Network (SAGRN). It is estimated that the process will take up to three years to complete, with the contract also including a five-year maintenance agreement.

Tait Communications will supply its TP9400 portable and TM9400 mobile radios through Tetracom as the prime contractor.

South Australian Emergency Services Minister Tony Piccolo said the new digital radios will provide superior audio for line-of-sight communication and greater reliability for on-ground tactical radio communication during major incidents.

"Volunteer safety and effective communications on a fire ground is very important and you cannot underestimate its value when it comes to the safety of our volunteers," says Piccolo.

"The new units will complement the recently announced upgrade to the South Australian Government Radio Network... [which] provides command and control communications to firefighters, while this upgrade to the tactical command radios will benefit firefighters working together on the fire ground."

The CFS currently uses four types of radio systems on a day-to-day basis and during incidents:

- The SAGRN for command and control;
- Short-range infrastructure-independent VHF for fire ground operations;
- Long-range HF;
- UHF CB radio for liaison with Farm Fire Units.

The SAGRN is P25 and enables wide-area communications from incidents to command centres, but it is not a part of the new CFS contract. The GRN operates on UHF, between 420 and 440 MHz, whereas the CFS fire ground radios are VHF between 150 and 155 MHz.

### The digital upgrade

It has been a while since the CFS upgraded its radio equipment. The service's current fire ground radios are VHF simplex analog units that Tetracom supplied about a decade ago. Every CFS brigade in South Australia will have its equipment updated, with installations commencing in July 2015.

According to the CFS, the advantages of moving to a digital fire radio system will include:

- Information such as unit ID, status buttons and enhanced text messages embedded into a single digital radio channel;


- Noise cancellation;
- A number of new software applications, such as GPS location information (see below) and improved emergency button functionality.

The new contract will include around 1200 vehicle-mounted Tait mobile units and just under 3000 Tait portable units. A substantial number of the installations will occur next financial year, with the balance the following year when the CFS has another budget release.

The speaker microphone for the mobiles will be yellow to differentiate it from GRN mobiles and the portable will be a high visibility green. Tetracom will supply and install the VHF mobiles and portables, provide training in their use and offer ongoing support and maintenance.

The radios will be trunking capable, which will enable them to be compatible with interstate fire services. For instance, when the CFS is asked to assist the Victorian CFA, they can go onto the Victorian network. The radios are programmed in four zones: an analog zone; the new digital zone; a Victoria zone; and one that's compatible with the NSW RFS. Such interoperability will enable volunteers from interstate to use their existing radios on the fire ground rather than using loan radios, as was the case with the recent Sampson Flat bushfire.

The contract also includes emergency trailers full of repeater equipment, and "suitcase repeaters for P25, which aren't common, so we're building them up", says Perry. "The components are off the shelf, but we assemble them in the format that's required and then mount them up into waterproof portable cases."

## GPS functionality

The radios also have GPS built-in to assist in locating firefighters who have initiated an emergency call. In conjunction with Tait, Tetracom is programming custom software so that when a call is received by a radio, the relative position of the caller is shown. "So they'll be able to see that, for instance, the person calling is 200 m away in a south-southeast direction," says Perry. "Tait originally did this for DEPI in Victoria, but this is an extension of what they've done there that's going to become mainline from now on."

"This feature is crucial when volunteers are working in the dense smoke of a fire ground, for example, and it will help ensure our volunteers are safe," adds Piccolo.

"The other thing we're doing as part of the contract is developing a software application that will allow strike team leaders to look at a wireless tablet and be able to see where all the units they're responsible for are, what state they're in, whether they need water, are under duress and so on," says Perry. "We're only doing a proof of concept as part of this contract. But obviously, if it works as it's intended to, they'd be looking to roll it out across the organisation."

At the time of writing, the proposed order for the roll-out was the CFS HQ and State Training Centre first, followed by aviation units, then the six regions in groups of two, and lastly the CFS engineering unit.

"Volunteer safety and effective communications on a fire ground are imperative operationally," said Ann De Piaz, CFS executive director of frontline services support. "Without these two we compromise our emergency service delivery, which impacts directly on the public's safety.

"We are excited about this roll-out, which will further strengthen our service delivery and our communication with our partner agencies on the fire ground."

*Tetracom Pty Ltd*
*www.tetracom.com.au*

## VHF and UHF transceivers

Icom Australia has released the IC-F1000/F2000 series of VHF and UHF transceivers. The IC-F1000/2000 is a compact portable radio series with convenient features such as a built-in motion sensor, an inversion voice scrambler, channel announcement and IP67 waterproof and dust-tight protection.

The 24.5 mm slim-depth radio series is available in VHF (IC-F100) and UHF (IC-F2000). Each version has three different interface options to suit different user requirements: no display (IC-F1000/F2000), simple keypad (IC-F1000/F2000S) and full keypad (IC-F1000T/2000T).

Additionally, the series includes programmable 'man down' and 'lone worker' emergency functions. The radios can detect position, state of motion and non-motion and can send an emergency signal. Further, the motion function can detect if the transceiver is moving or shaking.

For added convenience, the series features channel announcement which audibly announces the selected channel number when rotating the channel knob. This enables users to make radio adjustments without having to look at the radio.

***Icom Australia Pty Ltd***

*www.icom.net.au*

## iPod adapter

CRS Accessories has developed the CRS-Q2/ iPod adapter so that operators can use their MP3/iPod earpieces and be connected to their two-way radios. People have particular likes and dislikes when it comes to what style of earpiece they like to use, so CRS developed the adaptor for its range of harnesses. One end has a 3.5 mm connection to plug into an MP3/iPod earpiece and the other end connects to the CRS Accessories 1-wire/2-wire/WPTT harness range that goes directly to the user's chosen two-way radio.

***CRS Accessories***

*www.crsaccessories.com.au*

## Communications solution

As an IP-based multimedia overlay network, Mutualink is designed to leverage the sharing of radio, video, telephone and IP sensory equipment including disparate systems, as well as next-generation communication technology.

Mutualink's architecture provides flexibility, reliability and control. Security and public safety agencies have the benefit of maintaining full control of their radio, video, telephone and IP sensory resources whilst also making them available for interoperable connection with other agencies' systems with the click of a mouse. Interconnection with the Mutualink network is achieved without impacting the operation of existing console and remote control equipment.

The 'always on' system is available around the clock. The product blends IP and traditional radio networking technology with application software designed to solve interoperability problems. The highly scalable solution supports intra- and interagency interoperability scenarios across multiple disciplines and jurisdictions.

***Push2Talk***

*www.push2talk.com.au*

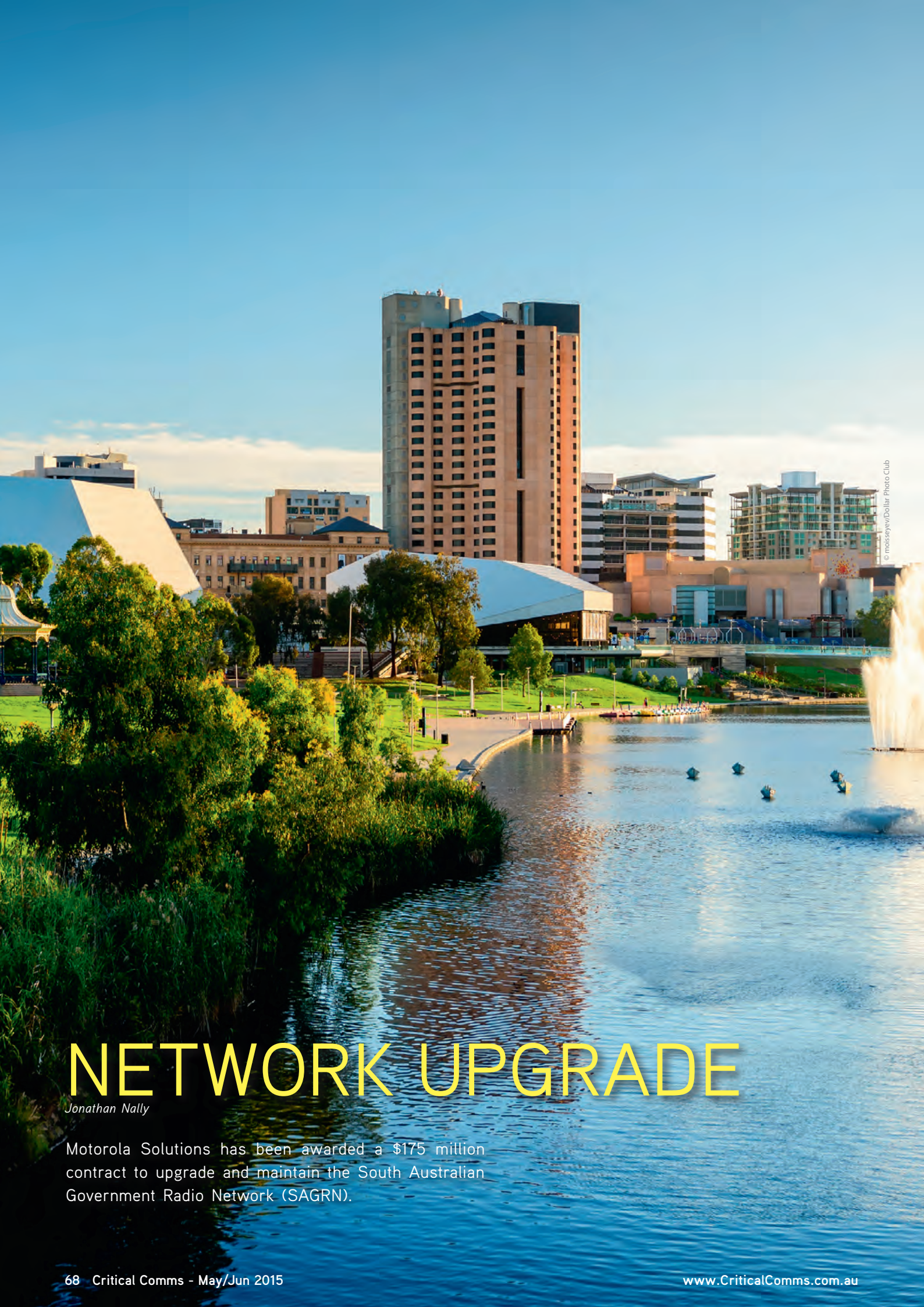
## Wi-Fi-to-satellite 'hotspot'

The IsatHub is a compact, lightweight and easy-to-use Wi-Fi-generating 'hotspot' that enables the user to connect to 10 devices (smartphone, tablet, laptop etc) almost anywhere in the world for calls, texts and data.

The product is a satellite device that connects to Inmarsat's network of 11 satellites orbiting the Earth, ensuring mission-critical communication. This means that remote workers can send and receive emails to and from the office or lab, rather than waiting until they are back at the desk. They could take a photo of an issue in the field and email it to safety advisors for review, rather than having them come out to inspect the problem. At the same time, they could call colleagues with regular safety updates or even take a conference call.

***Applied Satellite Technology Australia Pty Ltd***

*www.asta.net.au*




# NETWORK UPGRADE

*Jonathan Nally*

Motorola Solutions has been awarded a $175 million contract to upgrade and maintain the South Australian Government Radio Network (SAGRN).

South Australian Emergency Services Minister Tony Piccolo said the greatest benefit of the project was increased safety for the community and emergency service personnel.

"The South Australian Government is making a significant investment to give our emergency services secure and reliable voice and paging communications," said Piccolo. "This will support them from their day-to-day operational activities through to times of emergency or crisis.

"Furthermore, Motorola has confirmed around 25 new full-time equivalent positions will be created in South Australia during the upgrade and ongoing management of the SAGRN, as well as a direct investment of nearly $40 million in locally based industries.

"Motorola put forward an excellent proposal for the upgrade and ongoing management of the network."

The SAGRN is an existing Motorola P25 environment that has been in operation for over 10 years. It's used by just over 20 different agencies, from the usual emergency services through to others such as fisheries and public transport.

It is also one of the largest systems in the world, covering 220,000 km$^2$ and having just over 20,000 users. One of the major parts of the upgrade is coverage expansion and improvement. To that end, included will be additional transmission sites to deliver substantial voice radio and/or paging coverage improvements at locations such as Gilbert Valley, Northern Flinders Ranges, Meningie, the Adelaide Hills, Mintaro, Yorke Peninsula and Kingston.

The upgraded network will provide 99.999% availability to the users of the SAGRN.

Motorola Solutions Managing Director Steve Crutchfield said his team would rely on its strong knowledge of the communications needs of South Australian agencies as it builds and manages the SAGRN.

"It is a large, complex integration project that incorporates a lot of different moving parts," said Crutchfield. "So having Motorola stand behind the project and manage it for a two-and-a-half-year period is good testament to the 45 years of experience we've had in this region.

"We are investing $40 million with third-party contractors in the state of South Australia, and the program will require a significant amount of people - up to 25 to run the program, and then some additional people to expand on the team that's already in place to manage that particular environment.


© Rafael Ben-Ari /Dollar Photo Club

> IT IS ONE OF THE LARGEST SYSTEMS IN THE WORLD, COVERING 220,000 KM2 AND HAVING JUST OVER 20,000 USERS.

"It does speak to the fact that that we are known as a manufacturer of great hardware and equipment, but in Australia and NZ we're very much a service-led organisation," said Crutchfield, adding that "this is a large integration project, and a large contract to manage the environment over a seven-year period and maintain it to a mission-critical standard".

Crutchfield says the deal is focused specifically on the network and the subsystem of components that fit in around the voice and paging services. It is a complete refresh of the voice network, the paging system and some of the associated subsystems that go around that. Included are console positions in the emergency response centres and voice logging, which is used for operational capability as well as downstream forensics in relation to how an incident has been managed.

"Over the years they have been through some upgrades of terminals - they have done some of what I guess I would describe as surgical pieces of the upgrade… but this [new contract] is the large bulk of the upgrade that now takes them to the next level," said Crutchfield.

"The important thing is that the ability for them to expand [with the present system] is somewhat limited, so the refresh of technology will allow them to grow," he added. "Then, as part of the ongoing management basis, they've tasked Motorola with managing the life cycle so at the end of that seven-year period they don't have a dead asset - they have an asset that is state of the art and in a very current form.

"In terms of P25 itself, it has an integrated voice and data capability. It is something that the state is looking to take advantage of, and that could take the form of location services so that they understand where each and every individual user is at a given point in the time so that they can better manage those particular personnel. That would be one example."

Work has already commenced and the upgrade is expected to be complete by September 2017.

The contract reflects a trend for managed services deals in the public safety communications space. According to Crutchfield, this is something Motorola Solutions Australia has been keen on developing and even spreading further afield into the global Motorola Solutions enterprise.

"We have exported some of that knowledge… particularly around the managed services," said Crutchfield. "The Australian model, and the consumption of mission-critical communications as a service, is a trend that is starting to happen elsewhere in the world. We are definitely exporting some of our knowledge here in Australia into the US in particular.

"Up until the last year or two, [the US] has been much more focused on the capital model, but that trend is starting to change - we're starting to see much more of a service consumption model occurring there, and that trend will only increase over time. I think it's a trend across ICT that consumption models are moving much more toward a service model, and I think it makes good sense in the world of mission critical as well."

*Motorola Solutions Australia Pty Ltd*
*www.motorola.com/au*

# Backhaul

Backhaul takes you on a trip down memory lane as we look at what was happening in the critical communications field 25 and 10 years ago.


**25 YEARS AGO.** The cover of the June/July 1990 issue of *What's New in Radio Communications* featured a system from Motorola's National Parts Division, comprising MasterTech R-4000A operating software and circuit analyser hardware, complete with an IBM-compatible PC. Inside the issue, John McKendry from Philips Radio Communications Systems looked at the state of PMR and whether it would survive the challenge of paging, trunked radio, CB and mobile data. His conclusion was that PMR would see moderate growth rates and still be alive in the year 2000. There was also an article from Andrew Mowat (Expertech) detailing error-handling schemes in radio data communications, and a preview of the 1990 Professional & Commercial Radio Communications Product Show - a forerunner of Comms Connect - to be held at the Old South Melbourne Football Ground.


**10 YEARS AGO.** The Rohde & Schwarz FSH 6 GHZ handheld spectrum analyser featured on the cover of the May/June 2005 issue of *Radio Comms Asia-Pacific*. Inside, in a reflection of the post-9/11 world, the issue dealt with the lack of interoperability between emergency services organisations. In the US a new thing called P25 was making waves, while here at home, then NSW Deputy Police Commissioner Andrew Scipione declared that "radio interoperability is a primary concern across the country", adding that radios are "sitting on a shelf, ready to go, but there is no guarantee that they will work if communication is needed across other radio networks". He also took a swipe at manufacturers, saying, "We rely very heavily on encrypted communications. Even if they were working to an industry standard such as APCO 25, if we do not have the algorithms in each radio we cannot talk."

# Spectrum

## Managing spectrum flexibly and efficiently

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Spectrum is a scarce and precious resource, critical to supporting a networked and digital society. Efficient use of spectrum will underpin future economic growth, with mobile broadband alone contributing $33 billion to the Australian economy in the six years to 2013, largely through productivity gains.

The legislative framework for managing the allocation and use of spectrum is more than 20 years old and was last reviewed in 2002, well before the exponential rise of wireless technologies. Consider that the first iPhone was released in 2007; there are now more than 12 million smartphones in use in Australia.

And this revolution of connected devices has only just begun. Gartner forecasts that the number of devices connected to the Internet globally will increase fivefold over the next five years, from 4.9 billion devices to 25 billion devices.

In this context, we need to manage spectrum more flexibly and efficiently.

The government's Spectrum Review, being carried out by the Department of Communications, seeks to simplify the spectrum management framework by eliminating unnecessary regulations and facilitate new services and technologies that rely on spectrum, including cognitive radio and dynamic spectrum sharing.

I am currently considering the report from the first phase of the review. The department's review team held more than 40 meetings with industry, government and community stakeholders and received more than 80 submissions.

It found that current regulatory arrangements are too slow, too rigid and too cumbersome. As a result, spectrum is not being allocated quickly and efficiently, and both industry and government are bearing unnecessary costs.

There is consensus for the reform. Together with the industry, we want a better, more forward-looking regulatory environment that offers flexibility in allocation and use; provides price and service predictability; supports user and industry confidence in the framework; and can respond to our current and future digital challenges.

One of those challenges is ensuring that digital technologies are leveraged for mission-critical communications. Two-thirds of the 8.5 million calls to Triple Zero are made from mobile phones and a robust and effective mobile broadband capability is a critical enabler for Australia's public safety agencies - police, fire, ambulance and emergency services.

That is why the Productivity Commission has been tasked by the government to examine the best way to secure a mobile broadband capability to meet the long-term needs of Australia's emergency services.

It is undertaking a 'first principles' analysis of the most efficient, effective and economical way of delivering this capability by 2020.

The commission's inquiry will consider three options to deliver a public safety mobile broadband capability: deploying a dedicated network; relying entirely on commercial networks; and a combination of the two. It will assess the costs, benefits and risk of each and will also consider the sustainability and flexibility of each to meet technological developments. The commission is engaging widely with government, end users and industry on the issue. It is due to report by the end of this year.

*Malcolm Turnbull is the federal Minister for Communications and Broadband, and member of the House of Representatives for the seat of Wentworth in Sydney.*

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