MAR/APR 2016 Vol.3 No.3

comms critical

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Inside

March/April 2016

ON THE COVER

The R&S Scope Rider from Rohde & Schwarz is equally impressive in the lab and in the field. With an acquisition rate of 50,000 waveforms per second, a 10-bit A/D converter developed by Rohde & Schwarz and a maximum bandwidth of 500 MHz for the analog input channels, this portable oscilloscope outperforms comparable instruments.

The R&S Scope Rider integrates five functions to offer a level of versatility not found in any other instrument. It is based on a high-performance oscilloscope featuring a precise digital trigger system, 33 automatic measurement functions, mask test and XY diagram mode. Plus, the R&S Scope Rider can function as a logic analyser with eight additional digital channels, as a protocol analyser with trigger and decoding capability, as a data logger and a digital multimeter. This wealth of functions makes it suitable for a wide range of tasks.

The handheld oscilloscope is the first to be equipped with a large-format capacitive touchscreen, enabling it to be operated as intuitively as a tablet PC. It also features large buttons for use with gloves and a practical multifunction wheel for convenient parameter adjustment. Users can confidently read their results at any time, as all measurement information is displayed in a clear, application orientated manner on the screen.

The R&S Scope Rider is available as a four-channel or a two-channel instrument, the latter with a digital multimeter, with bandwidths of 60, 100, 200, 350 and 500 MHz.

Rohde & Schwarz (Australia) Pty Ltd
www.rohde-schwarz.com

Transmit

In this issue we feature a range of articles on a diverse spread of communications technologies and solutions, from HF to LTE, from antennas to VPNs, and use cases from mining to transport and deep space telemetry. We're particularly pleased to be able to present a number of stories about Australasian companies and technologies taking on the world… and succeeding.

As Australia begins to head down the long road of establishing a public safety mobile broadband (PSMB) capability, it is instructive to get some insights from those who are already some way along that road. That's why we're particularly pleased to welcome FirstNet Vice Chair Jeff Johnson's comments on the US experience so far (see Spectrum at the back of the magazine). Chief Johnson gives the communications community some very sound advice, and it's important that we listen to the wisdom he shares. Australia will have only one chance to get its PSMB system right, so it is vital that we take every opportunity to start off on the right foot.

As this issue was going to press in early March, the one-day joint ARCIA/Comms Connect event in Perth was about to be held, with Comms Connect Wellington in New Zealand in April rapidly approaching. These and the other Comms Connect events (Sydney, Adelaide, Brisbane and Melbourne) are ideal fora for all those in the business- and mission-critical communications industries to hear about the latest developments, get hands on with the latest technologies and network with potential collaborators, customers and suppliers. Make sure you get along to at least one Comms Connect event this year.

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

Calendar

April 2016
What: Comms Connect Wellington
When: 14–15 April
Where: Melbourne Convention & Exhibition Centre
Web: comms-connect.co.nz

May 2016
What: Australian & New Zealand Disaster and Emergency Management Conference
When: 30–31 May
Where: Jupiters Gold Coast
Web: anzdmc.com.au

What: Critical Communications World
When: 31 May–2 June
Where: Amsterdam Rai, Amsterdam
Web: criticalcommunicationsworld.com

June 2016
What: Comms Connect Sydney
When: 22–23 June
Where: Sydney Olympic Park
Web: sydney.comms-connect.com.au

July 2016
What: Comms Connect Brisbane
When: 27 July
Where: Rydges South Bank
Web: brisbane.comms-connect.com.au

September 2016
What: Comms Connect Adelaide
When: 23 September
Where: National Wine Centre, Adelaide
Web: adelaide.comms-connect.com.au

November 2016
What: Comms Connect Melbourne
When: 22–24 November
Where: Melbourne Convention & Exhibition Centre
Web: melbourne.comms-connect.com.au

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

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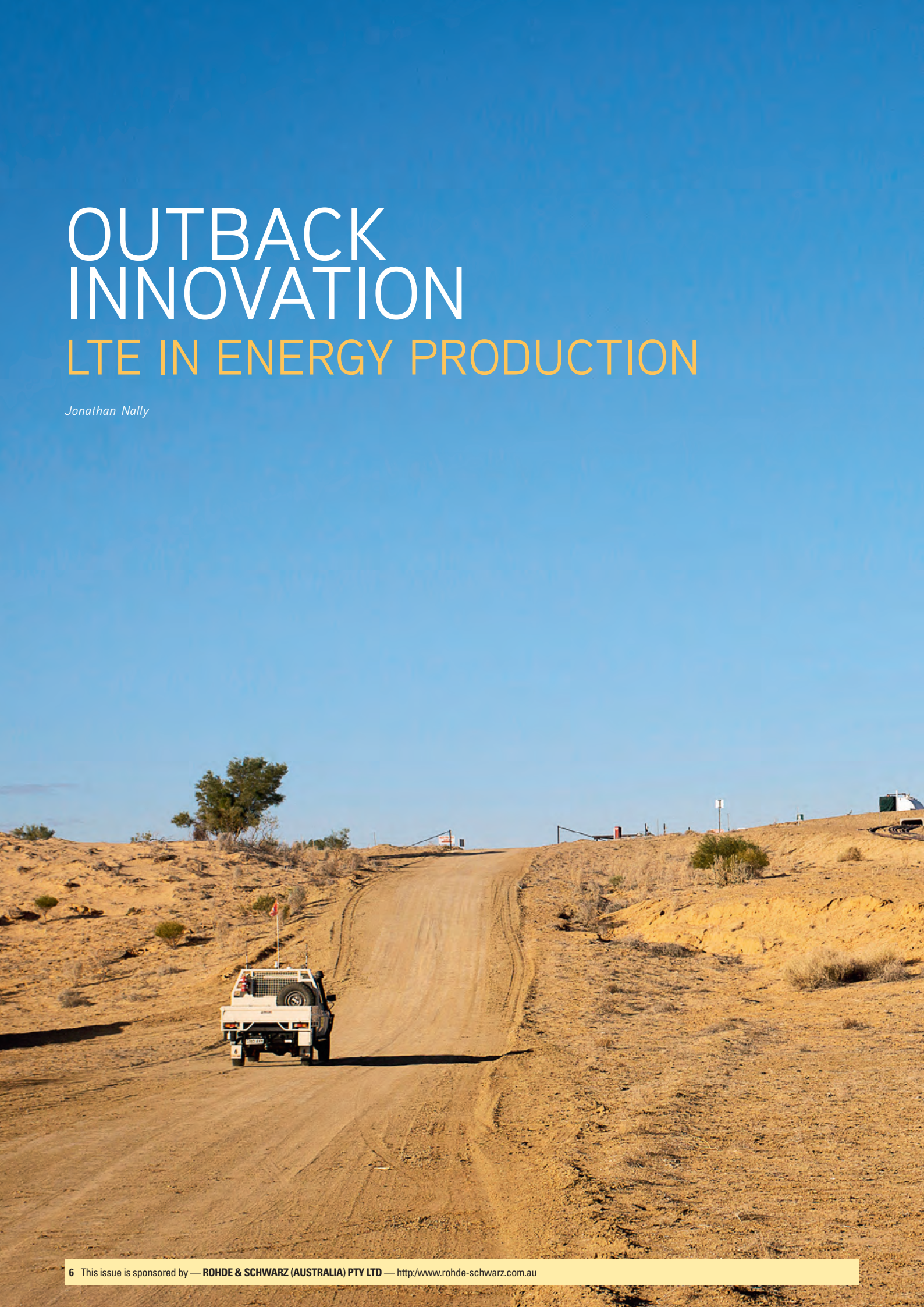
LTE IN ENERGY PRODUCTION

Jonathan Nally



Australian oil and gas producer Beach Energy has rolled out a private LTE voice and data system at its remote South Australian site.

Beach Energy is the largest onshore oil producer in Australia. Based in Adelaide, the company's core business and the majority of its operations are in the Cooper Basin in both South Australia and Queensland.

Beach Energy has been working in the Cooper Basin for about 13 years, and in terms of communications has been served by an analog UHF radio system with just a single channel.

"We were in the position where we had to upgrade our communications out there, and we looked at upgrading the radio network to either be VHF or UHF, but to go with digital," said Simon McMahon, the company's general manager IT. "And that certainly would have been an improvement on what we had out there, [but] we just thought that it really wasn't giving us a lot extra. At the end of the day, data is king, and we wanted something that could use voice but also utilise the data... because we are really pushing data out to the guys out there a lot more, requiring them to be logging into systems a lot more than they used to."

For this reason, the company has recently installed a private LTE voice and data network to cover the main areas of its Cooper Basin operation. Beach partnered with Nokia Networks, Cisco Systems and Melbourne-based telecommunications integrator Challenge Networks to build the system.

McMahon said that occupational health and safety is paramount for the company, and this includes reducing the dangers of driving on the company's roads.

"Although our roads are good — we spend a lot of money on them — there is a reasonable amount of traffic on them, from moving rigs or other equipment around," he said. "Just driving is one of the most dangerous parts of our job. So in enabling people to have access to [comms and IT] systems wherever they are, it means they don't have to drive as much. If they don't have to drive as much, they're safer. Simple as that, really."

Nokia supplied its high-capacity, scalable Flexi Multiradio 10 Base Stations plus its Flexi Zone Small Cells to provide capacity for the operation's data and voice traffic. The core backbone is based on Cisco technology, and the vehicles are fitted with Intercel modems and ZCG Scalar antennas, both of the latter being from Australian firms.

"We're really happy with the relationships we're building up with [all of] those companies," said McMahon. "We were really keen on using Australian suppliers when we could. Challenge Networks has been fantastic. But when we couldn't [use local manufacturers], we were keen on using really good providers such as Nokia and Cisco.

"It's important that the money we do spend, we spend well, because when you put this sort of infrastructure out there, it does become very important to your business and you want it to be good gear, work well and be reliable."

Another safety aspect is the use of rugged and intrinsically safe phones. "A couple of the units we have out there are intrinsically safe now, [and] any new ones we'll be sourcing will be intrinsically safe," said McMahon. "We're using Sonim equipment."

The technology

McMahon said the LTE set-up comprises two towers at present, one of which is a COW (cell on wheels). Although the phones talk directly to the towers when they are in range, in practice staff are often a long way from a tower and this is when they communicate through the vehicles, which have been set up as hotspots.

"We're using a VoIP system because we don't want the phones to be having to necessarily see the towers themselves," said McMahon. "The vehicles have high-gain antennas on the roof, with dual antennas feeding into a modem. The modem is then creating an internal Wi-Fi — it's giving out a small signal within and outside the vehicle. So when the phone's not connected directly

> ENABLING PEOPLE TO HAVE ACCESS TO SYSTEMS WHEREVER THEY ARE MEANS THEY DON'T HAVE TO DRIVE AS MUCH. IF THEY DON'T HAVE TO DRIVE AS MUCH, THEY'RE SAFER. SIMPLE AS THAT, REALLY.

to an LTE tower, it's connected back into the VoIP system through the vehicle's Wi-Fi.

And because the company operates its own phone system, if [a worker's] desk phone is ringing, it will simultaneously ring their mobile. And if they are ringing from the mobile, it gives out the number of their desk phone. "And that seems to be working really well," said McMahon.

"We don't have coverage over the whole area, but the main thoroughfare where people are travelling, and our main infrastructure, is covered," he said, adding that "the extra range we get with having the antennas on the vehicle is probably about eight or 10 kilometres.

"We're just finding with the antennas in the vehicles, they're just communicating so much better, because of the height," he said. "We had some antennas specially made up by ZCG Scalar. We wanted the antennas to be the same height or just slightly less than the dune flags on the vehicles, so they made some antennas especially for us, which gives us greater range.

"We really want to use Australian companies as much as we can; we've got a good relationship with them now."

In terms of the overall system, McMahon is a fan of sticking with standards-based equipment wherever possible.

"At the end of the day, although we're the largest onshore oil producer in the country, we're not looking at putting a thousand of these towers up. It's still a relatively small install," he said. "So we wanted to have stuff that was pretty standard; we didn't want to have to reinvent the wheel because it wasn't in anyone's interest.

"And the beauty of it is, because it's standard we can choose our user equipment at the end of the day. If we decide for one reason or another that we didn't like a particular piece of equipment, we can change [supplier]."

One of the traditional drawbacks of cellular technology has been the inability to do one-too-many PTT calls. But that's fast becoming a thing of the past. "We have the ability for PTT using Cisco Instant Connect software," said McMahon. "We're actually tying it up with our office environment here, so that we will have the ability for key personnel to be able to communicate — so I can be here in the office and communicate with the people out there through PTT groups."

Simon Lardner, director at Challenge Networks, said that his company was proud to have partnered with Beach Energy to provide a turnkey rollout. "As an organisation which specialises in delivering LTE networks, this particular implementation assumes great significance owing to the speed of the deployment (less than eight weeks from order to launch) and it being one of the first private LTE network rollouts in the world," he said.

Benefits aplenty

Summarising the benefits the LTE system has brought, McMahon reiterated that safety was always the most important consideration. "If we can make people potentially work more efficiently in the sense of not having to drive as much, the facts are that they're going to be safer," he said.

"I think one thing which is a real plus though, is that we don't have to do a lot in the way of training, because people already know how to use a smartphone," he said. "It's not like you're giving someone a piece of equipment that they've never used before. That is one thing we're finding probably even more of a plus than we really gave it credit for."

This familiarity with smartphone technology is also proving to be a confidence booster with personnel, who are now far more easily contactable — in the case of a family emergency, for instance.

"You know what it's like with a mobile phone. If you take a mobile phone away from someone now, they'd feel like you'd cut one of their hands off. It's even more the case out there [in the bush]," said McMahon.

Although Beach has not yet issued its field workers with tablet computers, McMahon said that it is coming, citing the expected benefit of all workers having access to the latest information. "If you're giving people printouts... it's very hard to know if they've been rolled out to everyone — someone might be reading off an old one," he said. "Whereas if it's all live, you know that if you make a change, it's rolled out to everyone [immediately], which is a real benefit."

There have been unexpected benefits too. "The individuals are seeing more potential benefits for how they may be able to use it in the future; they're saying, 'Oh wow, we can do this as well'," said McMahon.

He cites the case of an issue they were having with an engine. Beach staff needed to liaise with the manufacturer of the engine in Adelaide. Ordinarily the staff member would have had to make a phone call, then go to the engine and have some work done on it, then go back to the phone and report on the results, and so on. But with the LTE smartphones, he could conduct the liaison directly from the site of the problem, including audio and video of the engine if needed.

"It turned a half-a-day job into just a couple of hours," said McMahon. "It might sound a bit far-fetched, but it isn't — a picture can tell a thousand words, and if you can do that, it can make [the worker's] lives a lot easier."

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News

CODAN EXPANDS IN DUBAI

Codan Radio Communications has announced a strategic manoeuvre to grow its sales and customer service team in its Dubai office, a decision that should see a strengthening of its operations for its Middle East, Africa and Central Asia customer base. The company will add two regional sales managers as well as field support personnel. The Codan HF radios used in these regions are often the communication lifelines for humanitarian and peacekeeping missions, government agencies and military/security operations. "Our Dubai office is geographically located in the best position to provide customer service in these regions," said Paul Sangster, vice president of sales and business development.

More info: bit.ly/1VLUDzG

AIRBUS LANDS TETRA CONTRACT

A major maintenance contract for Hungary's Tetra network has been signed by Airbus Defence and Space and its partner Pro-M to maintain the nation's digital radio system over the next five years. The Unified Digital Radio System (UDRS — or EDR in the Hungarian language) was deployed by Airbus Defence and Space in 2006 and currently covers approximately 99% of the country. EDR plays an important role in enabling the cooperation of Hungarian public safety organisations. Olivier Koczan, head of secure land communications at Airbus Defence and Space, said the signing of the contract will ensure Airbus Defence and Space continues to guarantee the EDR networks high performance.

More info: bit.ly/1QFjcKa

Test receiver

The R&S ESW EMI test receiver from Rohde & Schwarz is designed for applications in manufacturers' EMI labs and in test houses.

It can carry out certification tests on modules, components and devices as well as on systems and technical facilities in line with all relevant commercial and military standards such as CISPR and FCC. The receiver is suitable for conducted as well as radiated certification measurements, and even meets the stringent demands placed on EMI measurements in the automotive sector, stipulated by internal company standards.

The product is available in three versions for the frequency ranges from 2 Hz to 8 GHz, -26 GHz and -44 GHz. The instrument includes as standard a very fast FFT-based time domain scan (TD scan), which reduces the time required for standard-compliant certification tests. The TD scan can also be run with two CISPR detectors to carry out parallel measurements.

For diagnostics and troubleshooting, users can use additional operating modes such as sweep, scan, real-time spectrum analysis and IF analysis, each with a spectrogram function. The spectrogram function seamlessly displays the analysed spectrum versus time, making even rapidly changing interferers visible. Real-time spectrum analysis with a bandwidth of 80 MHz, with tools such as persistence mode and a frequency mask trigger, deliver important information on critical and hidden signals.

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The intrinsically safe iPhone 6+ and iPhone 6S+ cases from SEE Forge are ruggedised mobile phone cases designed to resist shock, vibration, dust and water for professionals entering sensitive areas.

The cases are certified to ATEX Zone 2 for Europe and Class 1 Division 2 (C1D2) for US and Canadian markets, as well as UL and CSA groups A, B, C and D. The products allow users to continue securely connecting to VPN networks through Wi-Fi, 3G or 4G connectivity.

The cases also come with a sturdy belt clip that can hold an iPhone both horizontally and vertically.

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PRACTICAL RESPONSE

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CRS ACCESSORIES

RADIO RENEWAL

Ericsson to continue managing Tasmanian emergency services radio network.

Ericsson has been selected by the Tasmanian Department for Police and Emergency Management (DPEM) to manage the Trunk Mobile Radio Network (TMRN), Tasmania's mission-critical emergency services radio network, for the next four years.

The network supports Tasmania Police, TasNetwoks, Hydro and the SES in keeping the Tasmanian community safe.

The new service agreement provides for the ongoing operation, monitoring, maintenance and security of the network. Ongoing delivery of secure and reliable radiocommunications for Tasmania Police is a key component of the agreement.

"Along with our partner Harris, we welcome the opportunity to continue managing this essential public safety network to the Tasmanian Government's high performance standards," said Emilio Romeo, head of Australia & New Zealand, Ericsson.

"We look forward to maintaining our long-standing relationship with the government to ensure security, performance and reliability of the emergency services network, and to support the effective delivery of front-line emergency services."

The importance of the relationship between the Department and Ericsson as a key contributor to delivering a reliable radio network was recognised in a recent Auditor General's report into government radio networks.

An example of the effectiveness of this partnership in improving service delivery and innovation is the successful delivery of the emergency services interoperability gateway.

The gateway allowed, for the first time, the different radio networks used by Tasmania's emergency services to communicate directly with each other, and is now utilised to assist emergency services' first responders and volunteers, and the Tasmanian community.

The DPEM issued a tender for the operation and maintenance (O&M) of the TMRN, in early 2015, with the aim of letting a contract for services for a period of three years with the option of two, 1-year options. DPEM required that O&M services were to be delivered using the existing network equipment, infrastructure and reporting systems as far as is practicable.

The TMRN will continue to operate until a new Whole of Government (WoG) radio network solution has been implemented, which will be procured via a separate tender process.

With approximately 115,000 professionals and customers in 180 countries, Ericsson supports networks that connect more than 2.5 billion subscribers. The company said that 40% of the world's mobile traffic is carried over Ericsson networks.

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Five trends driving digital mobile radio (DMR) innovation

Martin Chappell, General Manager, Radio Channel, Australia, New Zealand & Pacific Islands

Listening to customers' needs and feedback is the best way to determine how technology solutions can help customers increase safety, efficiency and productivity in any industry, and digital mobile radio (DMR) is no different. As a result, customer demand is driving much of the innovation in today's DMR technology.

There are five key trends behind these demands as businesses strive to adapt to an environment that is changing rapidly and subject to numerous pressures.

1. Doing more with less

"Doing more with less" is no longer a request for all business departments, it's a prerequisite. In two ways, new DMR technology is meeting customer demand for radios to help them reach this goal.

Remote software updates

Wi-Fi technology contained within new DMR radios enables remote software updates. Previously, a system administrator would recall hundreds of radios to a central location and physically plug in every radio to download new software. Many customers delayed implementing the latest software, missing out on significant benefits.

With Wi-Fi radio management, the administrator can implement changes over-the-air, simultaneously reprogramming an entire fleet in 10 minutes. This delivers huge productivity savings with users able to continue communicating throughout the process.

Longer battery life for longer shifts

Longer shifts put extra demands on equipment as well as people. With extended life batteries, businesses can experience greater productivity as radios last two shifts instead of one and staff work without returning to base station to change over or recharge radios.

An enhanced radio with a low-voltage battery will continue to operate until the voltage drops to 5V instead of the typical 6V, making more of the battery's capacity available for use. Battery life increases to up to 27 hours, without increasing battery size or weight.

2. Applications (apps) delivering more

We use apps every day in ways never imagined before. Similarly, the days of two-way radio as a purely voice solution are well and truly over, with sophisticated apps offering advanced capabilities.

Newly released DMR radios build on existing standard apps. One recent development is Bluetooth low energy mode, which uses considerably less power but offers similar range. Indoor location-tracking can be switched on constantly without diminishing battery performance, which means better worker monitoring and increased productivity when the closest worker can be dispatched to a task.

3. Higher expectations of uninterrupted connectivity

As consumers, we expect to be connected every minute of the day. Similarly, DMR customers expect to remain connected over larger areas, coupled with superior audio performance over that extended area. Advanced sensitivity in new DMR radios increases coverage areas by 10-16 per cent and range has risen by five to eight per cent. Significantly, audio quality remains clear right to the periphery of this range.

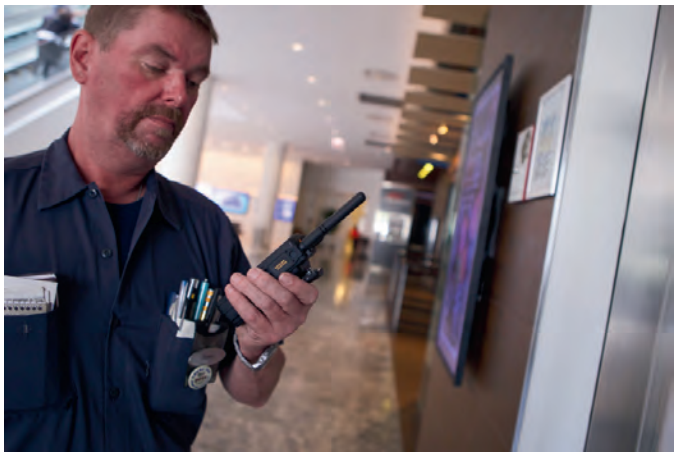
4. Convergence for streamlining

Businesses demand streamlined devices to maximise efficiency and manage costs. Customers want an increase in device convergence so they can use a single device to do everything.

This demand for convergence has led to the development of applications such as WAVE Work Group Communications, which provides broadband push-to-talk (PTT) interoperability between differing devices and networks.

New DMR radios include further convergence technologies such as Wi-Fi capability, a feature that could conceivably become standard in the future.

The growing emergence of long-term evolution



Next Generation MOTOTRBO

Motorola Solutions is pleased to announce a complete refresh of its MOTOTRBO digital two-way radio (DMR) device range. These next generation radios include:

- Integrated Wi-Fi
- Integrated low energy Bluetooth 4.0
- Significantly extended battery life
- Increased memory capacity
- Extended range
- Silent alert

(LTE) means that this too may eventually converge in the one device.

5. Everything is standard

In the consumer world of technology, more and more features have become standard due to consumer expectations. Two-way radios are no different. Even the most basic form factor has become more sophisticated with features such as the accelerometer built in instead of optional. The more that applications like these are built in, the more that radios will integrate with day-to-day business practice as they play a fundamental role in enabling productivity and safety gains.

Summary

Current trends in the marketplace are the driving factor for customers' demand of innovation in technology.

Meeting these demands with innovation in DMR technology enables businesses to do so much more. Businesses can improve the safety of their workers, increase efficiency and enhance productivity, which aids their competitiveness in an ever-changing market.

MOTOROLA SOLUTIONS

Visit www.motorolasolutions.com/ngMOTOTRBO

News

GERMAN SECURITY FORCES GET TETRA

German Federal security forces will be kitted out with the smallest TETRA handheld radios currently available in the world, according to Airbus Defence and Space. TH1n handheld radios will be given out to certain German Federal security forces through Airbus over the next two years, part of a framework agreement between the partners running until the end of 2017, and covering the supply of TH1n terminal equipment, software and maintenance for the devices. In addition to the conventional requirements for a Public Safety Digital Radio, this configuration offers multiple audio solutions for discreet radio communication.

More info: bit.ly/214prNH

DAMM, SEPURA SPLIT IN N. AMERICA

Damm Cellular Systems (DAMM) has announced it has terminated its exclusive agreement with Sepura for the marketing and sales of DAMM products in the US and Canada. DAMM said it will pursue new business opportunities in North America and Canada and establish local presence through authorised system partner agreements working with professional radio communication. The company said in a statement that the termination is the "natural result of the business consolidations and strategic alliances that have been taking place within critical communication". "We see a great business potential for mission-critical as well as business-critical communication in the US and Canada," said Kjeld Pharao, DAMM CEO.

More info: bit.ly/1TLqNxn

RESCUING STRANDED SPECTRUM

Brian Carney, Senior VP, Rivada Networks

In this invited op-ed, Rivada Networks responds to the Productivity Commission's PSMB report.

Should emergency services rely on commercial carriers for mission-critical communications? That's the conclusion of the Productivity Commission's recent report on public safety mobile broadband (PSMB). Count us unconvinced.

The heart of the commission's economic argument is that, one way or another, a PSMB network must be paid for. If the government built a brand-new network, reserved exclusively for the use of emergency services, the cost of such a build would be approximately $6.5 billion, according to the commission. What's more, the commission contends, the cost is the cost, regardless of how or whether that cost is defrayed or mitigated.

Up to a point, that is a sensible view. There is no such thing as a free lunch or a free network. But even so, it represents a form of single-entry bookkeeping, and so misses half the story at least.

Australia has 30 MHz of spectrum in the 700 MHz band that could be made available to public safety. Were the government to 'give' it to emergency services, it would in theory be forgoing any revenue from its sale, which would be a cost to the state and taxpayers.

But that spectrum failed to attract the minimum bid at the last auction. As valuable as it may be in theory, it is for practical purposes a 'stranded asset'.

Stranded or not, it would be an asset that emergency services could make use of. And when they are not using it, they could let it out to other users to generate revenue. This defrays the cost of owning their own network, while leaving them in possession of a valuable asset.

Consider an analogy. It is almost always cheaper to rent a home than to buy an equivalent residence. If it costs $2000 a month to rent a house or apartment, the mortgage paid to own it might be $2500 or $3000 a month. And yet most people who can, choose to own rather than rent. Ownership gives us security and stability, but also enables us to profit from the upside if our asset appreciates in value.

So it is with mobile broadband for public safety. The upfront cost of renting as opposed to building may appear lower, but it leaves our emergency services at the mercy of commercial operators. They would forever be tenants rather than owners.

There is, moreover, a crucial difference between network ownership and home ownership. A public safety mobile broadband network would go underutilised most of the time. And unlike our homes, technology allows the government to easily rent out its network to others whenever it's not being used. So the government could expect to recoup the lion's share of the incremental cost of ownership. It might even be able to turn a profit, even while providing public safety with most of the advantages of exclusive ownership.

Rivada Networks has developed just such technology, and we hoped its advantages would get a hearing before the Productivity Commission. So while we are not a neutral party, we bring a perspective that we believe deserves consideration as the government decides on its next move. We value the Productivity Commission's careful work, but hope it isn't the last word on what best serves the interests of Australia and its emergency services.

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EMAIL VIA HF

An Australian-designed HF email solution saved the day during a recent multinational communications interoperability exercise.

Over 300 military and civilian communications specialists from 21 Indo-Asia-Pacific nations came together late last year for the United States Pacific Command (USPACOM) exercise, PACIFIC ENDEAVOR.

The annual humanitarian and disaster relief event was the culmination of 12 months of planning and was designed to strengthen relationships between allies and partners by testing communications responses to a simulated natural disaster.

The 2015 event was based around the crisis response to a simulated 7.2 magnitude earthquake in the Philippines capital of Manila.

The Interoperability Assessment event included radio testing focusing on HF Automatic Link Establishment (ALE) and radio over IP. Sixteen nations volunteered to bring equipment and participate in the assessments; four of those nations used equipment from Australia's Barrett Communications.

The Interoperability Assessment stalled at the first hurdle due to interoperability issues with HF data. With each of the participating nations supplying their own equipment, multiple data waveforms were unable to interoperate.

John Rosica, president of NVIS Communications, the Barrett System Integrator for the US market, who was attending the event in his capacity as a US Army Military Auxiliary Radio System member, was called on to use his skills to help overcome the HF data issues.

By selecting a single data environment, multiple data waveforms could operate over HF. The Clover modem and Barrett 2020 email and data system installed in the Barrett equipment was used as the common environment to transmit and receive the emails, creating a local area network without the need for a connection to the internet.

"The other participating nations were not familiar with the Barrett 2020 email and data system but found it easy to operate as they were connected to it via their own familiar mail client software such as MS Outlook or Lotus Notes," said Rosica. "This benefits the operator as there is not a new 'emergency system' to use when the internet connection is no longer available, due to natural disaster or another event.

"From their perspective it is their everyday system just routed via HF rather than an Ethernet connection."

Major Mohammad Anisur Rahman of the Bangladesh Army attended PACIFIC ENDEAVOR and operated his recently procured Barrett PRC-2090 base station. "The ability to transfer email over HF with the Barrett 2020 is such an enormous and useful option of the radio," Major Rahman said. "It was a great experience of mine to exchange emails from a radio station which is not connected to the internet."

"Our equipment is designed to be intuitive to use and simple to set up, so it is pleasing to hear this feedback about how straightforward it was to interoperate Barrett equipment with the seven other OEM HF suppliers who participated at this event," said Greg O'Neill, managing director of Barrett Communications.

"We were pleased to see the initial interoperability issues with HF data were overcome with strong test results following the assessments," added Scott L Griffin, US Pacific Command Technical Director of the Multinational Communications Interoperability Program.

Barrett Communications Pty Ltd
www.barrettcommunications.com.au

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News

DISASTER & EMERGENCY CONFERENCE

The Australian and New Zealand Disaster and Emergency Management Conference will return to the Gold Coast on 30–31 May 2016 to provide an educational experience and the opportunity to network for disaster and emergency professionals.

With large-scale disasters and emergencies affecting our communities and a renewed focus on catastrophic planning, the Australian and New Zealand Disaster Management Conference is one of the most significant calendar events for the disaster and emergency community. This conference features multiagency presentations covering all phases of emergency and disaster management — prevention, preparedness, response and recovery.

Bringing together representatives from fire, police, ambulance, emergency, rescue, volunteer, defence and health sectors, the conference will discuss disaster and emergency management issues confronting Australia, New Zealand and other nations.

The conference will again go back to back with the Search and Rescue Conference (1 June) and will enable delegates to learn more about search and rescue concepts, techniques and information within the realms of land, sea and air. Special discounts are available for delegates who wish to attend both conferences.

The exhibition will see more than 30 exhibitors displaying the latest products and services available in the sector.

The conference, now in its fifth year, will provide the opportunity to share innovative practices, understand emerging research themes and discuss challenges with a view to improving the planning, responses and recovery from emergencies and disasters.

The conference is a joint initiative of four 'not-for-profit' organisations: the Bushfire and Natural Hazards CRC, the Australian Institute of Emergency Services, the Australian & New Zealand Mental Health Association, and the Association for Sustainability in Business.

More info: anzdmc.com.au

Handheld digital multimeter

The U1280 Series of Handheld Digital Multimeters from Keysight Technologies is now available from element14. Designed to deliver accurate measurements and logging capabilities to electrical engineers troubleshooting electronic circuits, the devices offer a 60,000-count dual display resolution with 0.025% basic DCV accuracy. Certified to IP67, the range provides precise measurements to users and features a robust overmould enclosure that allows users to carry out tests and measurements in harsh conditions, including water immersion.

The series is also equipped with Vsense, which provides non-contact voltage protection in dangerous electrical environments by producing audible and blinking LED light alerts when users are in the presence of AC voltage and live wires. Other features include: a square wave output; frequency counter; a low pass filter to reduce background noise while measuring AC voltage; enhanced battery life supplying users with up to 800 h of testing; and a Hold & Export button that gives users the option to measure, store or export measurement information with one click. If exported, the measurement is sent to the Keysight Meter Logger software for prolonged measurement observation.

element14

au.element14.com

Digital low resistance ohmmeter

The Megger MOM2 is a lightweight digital low resistance ohmmeter (DLRO) weighing 1 kg, which is suitable for HV test engineers working out in the field.

The micro-ohmmeter uses the DualGround method, which means that the test object will be grounded on both sides throughout the test, without affecting the results. This ensures a safer and faster workflow and shifts focus to the test rather than the equipment. The product's display offers both analog arc and a dual digital readout.

Since power losses and rising temperatures can lead to serious trouble, the device is designed to run all day without needing a recharge and measures resistance with a resolution as low as 1 $\mu\Omega$. Its auto range measures from 1 $\mu\Omega$ to 1000 mΩ, while the product can store up to 190 test values with a simple transfer to PC via Bluetooth.

The product, available to rent from TechRentals, includes Kelvin probes for a 4-wire Kelvin test.

TechRentals

www.techrentals.com.au

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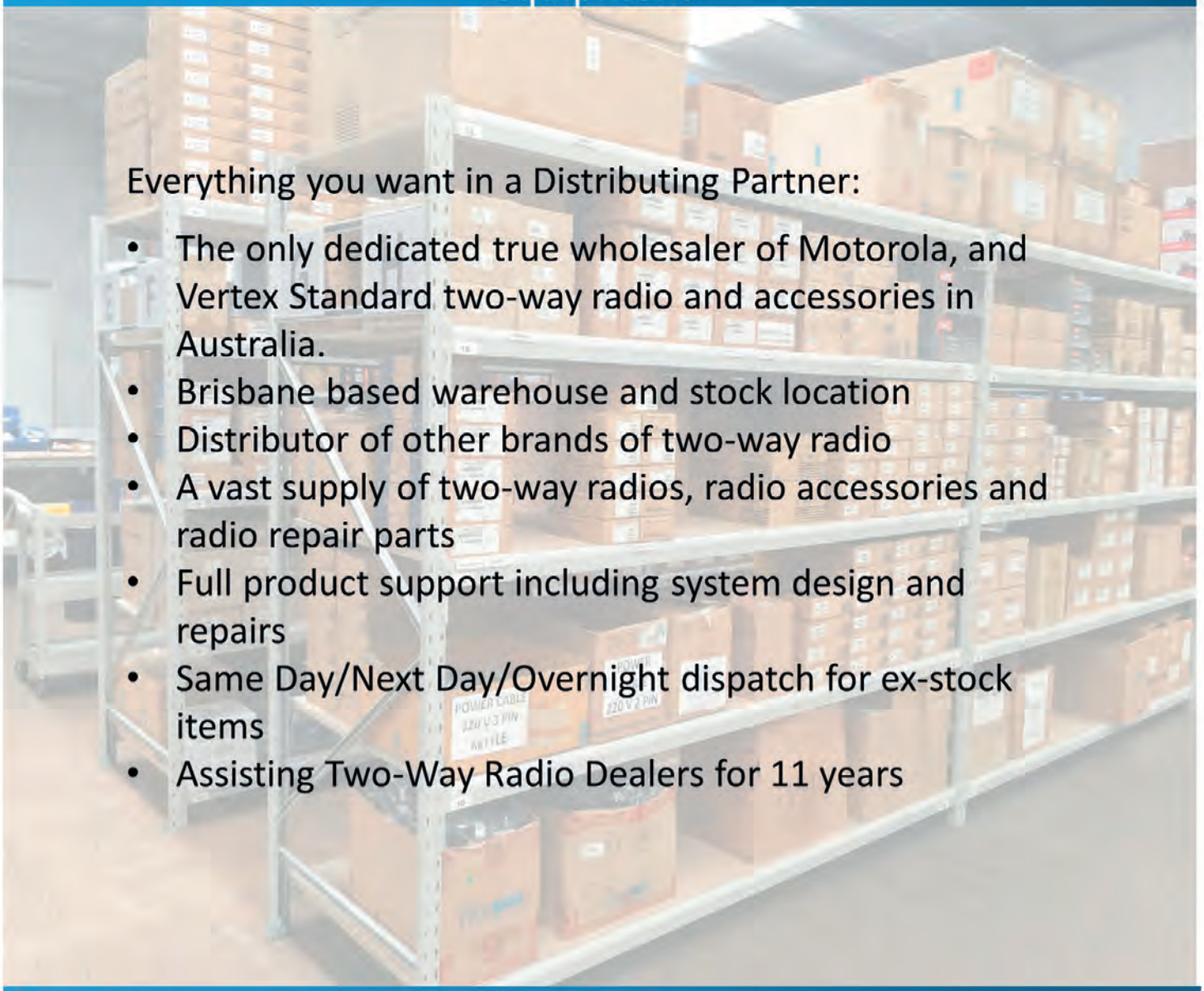

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COMMS CONNECT WELLINGTON

14–15 APRIL 2016

COMMS 2016 CONNECT

Since 1990, the Radio Frequency Users Association of New Zealand (RFUANZ) has held a highly successful annual conference that has helped bring radio and wireless communications industry users, dealers, consultants, manufacturers and other stakeholders together in order that they can network, learn, share ideas and do business together.

In 2016 the event continues, but for the first time it will be called Comms Connect Wellington, as the RFUANZ begins to work with WF Media and the team behind the Comms Connect brand and *Critical Comms* magazine. This partnership is seen as the next stage in the development of the Wellington event, with the aim of further building on the success of this well-established and very well-respected conference and exhibition.

Comms Connect Wellington (comms-connect.co.nz) will be a must-attend event if you are: a first responder; work in public safety, transport or utilities; operate in the mining, oil and gas or the wider resources sector; work in security, defence, a commercial enterprise or government department; or work in any other sector that uses radio and converged communications.

Conference program

The conference will include technical presentations, case studies and workshops presented by a line-up of 40-plus local and international speakers and subject matter experts. Here's just a small selection of the presentations scheduled:

- Update from Radio Spectrum Management *(Chris Brennan, Compliance Manager, RSM)*
- Public safety interoperability and information management *(Inspector (Ret.) Lance Valcour O.O.M., Strategy Advisor, Canadian Association of Chiefs of Police Information & Communications Technology Committee)*
- Innovation in disruptive technologies — putting mission-critical safety information into the hands of decision-makers *(Michael Hallowes, Director, Government, Enterprise & Emergency Management, Early Warning Network)*
- Forest fatalities increase safety demands *(Simon Coles, Channel Manager, NZ, Pacific Islands & PNG, Motorola Solutions)*
- Building a national digital LMR network of networks *(Laurie Colvin, Push Wireless Limited)*

AT A GLANCE

What: Comms Connect Wellington

Conference: 14 April (9.00 am–5.30 pm), 15 April (9.00 am–3.40 pm)

Exhibition: 14 April (9.00 am–5.00 pm), 15 April (9.00 am–3.30 pm)

Where: Museum of New Zealand Te Papa Tongarewa, 55 Cable St, Wellington

Who: More than 300 delegates and 40-plus exhibitors

Web: comms-connect.co.nz

- The Health & Safety at Work Act: what does it mean for the radio industry? *(Stephen Bray, HSNO Health and Safety Inspector)*
- Can we leap from 2G to 5G in as few steps as possible? *(Peter Clemons, Founder & Managing Director, Quixoticity)*
- Three years on: the past, present and the future of new police innovation *(Superintendent Jevon McSkimming, National Manager, Mobility and Innovation, NZ Police)*
- The cybersecurity challenges of software-defined radio in critical infrastructure environments *(Chris Blunt, Director/Consulting Partner and Ahmed ElAshmawy, Senior Consultant, Axenic Ltd)*
- Securing NZ's airports: how DMR is being used to improve safety, security and efficiency *(Logan Caulfield, General Manager, Genesis Communications)*
- The emerging role of LTE in public safety *(Roger Kane, Managing Director, Vicom)*

There are many more presentations and case studies on the program, the full list of which can be found at comms-connect.co.nz/conference-program/.

The exhibition

The Comms Connect Wellington exhibition will cover 1000 square metres and comprise more than 40 exhibitors, including all the big names in the Australasian comms market, including many dedicated New Zealand firms. You can see a full list of exhibitors and sponsors at comms-connect.co.nz/whos-exhibiting/.

RFUANZ AGM and Gala Dinner

The RFUANZ is a non-profit organisation whose membership ranges from local government authorities to transport operators, consultancies to radio dealers, and network operators to private individuals. Its mission is to protect, promote and preserve the rights of organisations and individuals who require access to the radio spectrum.

The association's annual general meeting will take place on 14 April at the Museum of Te Papa, followed that evening by the RFUANZ Industry Excellence Awards and Gala Dinner at the Te Wharewaka Events Centre on the Wellington waterfront (a short walking distance from Te Papa and hotels). For ticketing and other enquiries, contact events@rfuanz.org.nz, visit rfuanz.org.nz or call +64 21 146 2380.

An essential event

It's important for all users of radio and converged communications in business- and mission-critical working environments, as well as dealers, manufacturers or suppliers in this sector, to seek out the very latest information, technologies and solutions and to cement relationships. Comms Connect Wellington will deliver the opportunity for you and your colleagues to achieve these objectives. See you there!

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

Case study

On the buses (and trams)

One of New Zealand's largest transit organisations operates a busy fleet of over 1100 buses and trams in New Zealand's two largest cities, transporting thousands of people every day. A New Zealand systems integrator was tasked with the project of upgrading the company's old analog system to a brand new digital radio solution.

Working with the systems integrator, RFI was chosen as the partner to supply a suitable bus/tram antenna solution.

To facilitate driver communications and tracking applications, the systems integrator selected high-quality mobile radios for the project, with GPS functionality for system monitoring and vehicle location tracking.

The customer needed a mobile antenna solution that would be compatible with the mobile radio and GPS requirements. RFI's TLA600 series was chosen as it met the three main requirements:

- Low profile for height restricted applications without compromising antenna performance.
- Constructed in a 'hard hat' style to ensure longevity and ability to handle automated vehicle washes.
- UHF mobile and GPS in a single package.

While the antennas were of an off-the-shelf design, RFI customised its internal construction according to the roof type of the bus or tram. For instance, some vehicles had metal roofs and some had fibreglass. To ensure the best performance, the metal roofs needed a ground-dependent version of the antenna (using the ground plane) while the fibreglass roofs needed a ground-independent version (completely independent of needing a ground plane).

The delivery and installation schedule was aggressive, with a requirement for all 1100 antennas to be supplied within a space of eight weeks, which RFI successfully achieved for the customer. Additional antennas were needed over the following six months as the company rolled out a new fleet of vehicles.

The trams, with their overhead catenary system, were an added complexity, and were one of the reasons the TLA600 was chosen. The antenna is only 7.8 cm high, making it suitable for height-restricted applications such as trams, while still performing as strongly as a whip-style unity gain antenna.

As an additional element, pre-terminated cable leads for connection to the radios were included to enable a simplified installation process.

RFI
www.rfi.com.au

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Signal analysers

Keysight Technologies has launched the X-Series of signal analysers, which includes five models: the N9040B UXA, N9030B PXA, N9020B MXA, N9010B EXA and the N9000B CXA. The series includes a multitouch user interface (UI) that streamlines measurement set-up in two touches or less, while support for gesture-driven controls, such as pinching, dragging and swiping, makes analysis more intuitive.

To help developers create next-generation devices, the UXA offers frequency coverage to 44 or 50 GHz and integrated 1 GHz analysis bandwidth. The PXA offers benchmark phase noise performance of -136 dBc/Hz at 1 GHz, 10 kHz offset and real-time bandwidth of 510 MHz with spurious-free dynamic range greater than 75 dBc over the full span. To characterise signal interactions in dense radar environments, these two models also support real-time data streaming at up to 255 MHz bandwidth with 16-bit resolution at 300 MSa/s. When coupled with a data recorder from X-COM Systems, the analysers support real-time acquisition with up to 15 TB (>3 h) of capture memory.

X-Series applications with multitouch simplify complex operations with ready-to-use measurements for pulse analysis, analog demodulation, noise figure, phase noise, LTE/LTE-Advanced and W-CDMA. The pulse application accelerates the development and verification of chirped wideband signals, such as those used in advanced radars. Updates to the LTE/LTE-A application simplify characterisation of systems that use carrier aggregation by supporting 256 QAM and providing visible configuration of all component carriers.

Keysight Technologies Aust Pty Ltd
www.keysight.com

CLEAR COMMS

Auckland's Howick and Eastern Buses hits the road with an Icom NXDN digital radio solution.

New Zealand's Howick and Eastern Buses has operated in Auckland for over 95 years and prides itself on providing a dependable service to the public. In order to support Auckland Transport's goals of improving the city's public transport network, as well as continuing the company's focus on service improvements, Howick and Eastern last year invested in a new dispatch and radio system — based on Icom gear — for its entire fleet of buses.

Troy O'Dea, Howick and Eastern's Operations Manager, said it was a major purchase for the business, with the health and safety of its drivers at the top of its list of priorities.

The company had not had success with a previous system installation (from a different supplier) less than 18 months earlier. "We [had] endured frustration after frustration as the system failed time and time again," said O'Dea. "We had to put up with interruptions to our business, complaints from staff and the union... It seemed like it would never end. We had installed a new system that was just not fit for purpose."

Howick and Eastern turned to Signals NZ for help. Signals NZ had recently installed a Bury phone system for Mana Bus — a sister company of Howick and Eastern (both are under the Souter Group umbrella) that runs a city-to-city bus service — so it was familiar with Howick and Eastern's requirements.

"Signals NZ, along with Icom New Zealand, provided a new NXDN digital radio and dispatch system that was off the shelf and amazing from day one," said O'Dea.

After bringing in its technical team from all across the country, Signals NZ was able to change over the entire bus fleet over the course of six days.

"These guys worked around our day-to-day operations with no interruption to our operational work — it was if they weren't even there. Our only clue was when the words 'signals radio test' kept coming over our new dispatch system," said O'Dea. "The general manager of Icom NZ popped in at the end of each day of the changeover to see how it was going, which gave us peace of mind that behind the Signals team [was] a manufacturer willing to stand by their product."

Digital delivery

The mobile radio chosen was Icom's IC-F6063D NXDN digital model. The IC-F6063D offers multimode operation, scanning and flexible installation. The system can call individuals, preset groups or all buses at once to deliver important updates, changes to routes and driver welfare checks.

According to O'Dea, communications have become more efficient. The radios have provided an enhanced coverage area over the previous DMR digital system, drivers receive clear and loud audio thanks to the preset volume on the front-mounted speaker and the built-in audio compander improves signal to noise.

The health and safety issue that was a priority for O'Dea has been met by both the system's reliability as well as by the radio's escalating alarm. When a driver pushes the emergency button programmed on the front of the radio, a direct alarm is set off at the Howick and Eastern base along with the bus number it came from.

Howick and Eastern also purchased Icom IC-F4263DT NXDN digital handheld radios for its ground crews. In addition, the base gates are operated via the radios, providing hassle-free entry into and exit from the yard, as well as added safety and security.

Fleet expansion

Auckland's public transport system has recently been bolstered by a fleet of 53 new double-decker buses, each of which can carry about 100 passengers instead of the usual 45 to 70. Enviro500 buses have been purchased by Howick and Eastern and NZ Bus, while Ritchies Transport Holdings has invested in new BCI vehicles. Howick and Eastern's Enviro500s have the same Icom NXDN digital radios, installed by Signals NZ Ltd.

"We are extremely happy with our new Icom NXDN digital radio system and network. It was simple to use, cost effective and reliable," said O'Dea. "From day one we had crystal clear communications."

Icom New Zealand
www.icom.co.nz

Handheld oscilloscope

Rohde & Schwarz has introduced the Scope Rider, a handheld oscilloscope with the functionality and touch and feel of a lab oscilloscope.

The device combines five instruments in a compact format, suitable for mobile installation and maintenance work, and features isolated input and communications interfaces. It comes equipped with a large-format capacitive touch-screen, allowing it to be operated as a tablet PC, along with large buttons for use with gloves and a practical multifunction wheel for convenient parameter adjustment.

The product also features an acquisition rate of 50,000 waveforms/s, a 10-bit A/D converter developed by Rohde & Schwarz and a maximum bandwidth of 500 MHz for the analog input channels. It is based on a high-performance oscilloscope with a precise digital trigger system, 33 automatic measurement functions, mask test and XY diagram mode. It can also function as a logic analyser with eight additional digital channels, as a protocol analyser with trigger and decoding capability, as a data logger or a digital multimeter.

It meets CAT IV standards and can carry out measurements on low-voltage installation sources up to 600 V and meets CAT III standards up to 1000 V. It also has an IP51-certified housing offering protection from environmental hazards such as dust and dripping water.

Rohde & Schwarz (Australia) Pty Ltd

www.rohde-schwarz.com

Intrinsically safe mobile speaker microphone and x-ponder

The X10DR offers wireless communication with a fixed or vehicle radio between 60 and 300+ m allowing users to be mobile in most operational environments. The lightweight and rugged product enables users to communicate with enhanced clear duplex audio with the power and range of a mobile radio, while not being tied to the vehicle.

The device will soon be available in an Ex ia IIc T4 intrinsically safe model, complying with International and ATEX requirements for use in hazardous oil and gas environments, meaning oil and gas workers do not need to be offline when approaching possible explosive atmospheres while maintaining pipelines. The device is also a suitable communications tool for firefighters who need to attend situations that could become explosive and therefore require communications equipment that meets the IECEx/ATEX standard.

Other features include: 1450 mA Li-ion battery with up to 10 h battery life; rated to MIL-STD 810C/D/E/F for shock and vibration; antenna; operational range of 10 to +45°C (extreme -20 to +60°C); integrated belt clip; magnetic latching mobile X-Ponder; Hirose 6 pin connector for headset connection; and 3.5 mm earpiece jack.

RFI

www.rfi.com.au

Industry Talking

As the summer heat leaves us it is time to focus on the coming year, with all the opportunities and challenges this will bring.

During February we held our annual planning day in Melbourne with the committee discussing detailed plans for 2016. I am pleased to report that 2016 will see a program further expanded to provide even more value for all supporters.

Firstly we welcome Geoff Spring to the executive of the association to assist with policy work. Geoff has long experience with critical communications and I am looking forward to working with him on all facets of the association.

We continue to work with Westwick-Farrow and Comms Connect to bring content, subject matter experts and training subjects to our industry events around Australia. These events worked well in 2015 and we want to give our members more reason to invest their time in them. Many members need to travel long distances to the major centres and we must provide good reason to do so.

ARCIA will also be producing best practice white papers on subjects that we believe are need to educate the market. The most recently released paper is on IECEx Intrinsic Safety standards and why they matter, but, more importantly, how to recognise where they are appropriate. This white paper is available on our website, www.arcia.org.au/intrinsicsafety.

Further papers are under development on the operations of UHF CB radios and radio site management and installation guidelines.

ARCIA will also be improving how we communicate to industry members and users via website improvements and social media. I would encourage all of our readers to seek out ARCIA on Twitter to keep up to date about what the association is doing.

Looking forward to seeing you around Australia during 2016

Hamish Duff, President
Australian Radio Communications Industry Association

DMR solution

Simoco has launched Pulse, a portfolio of products including integrated RTU, data modems and gateway for the electricity, water and gas sectors, which enable operators to manage and control smart grids and networks across large operational areas.

Pulse allows SCADA telemetry applications to be quickly deployed over DMR Tier III trunked networks to deliver reliable communications, including voice. The solution, which uses a fully integrated IP network to connect information sent from data modems or RTUs to SCADA masters, is designed to be effective in remote areas where cellular coverage is intermittent and installing wired networks is costly.

The portfolio consists of the Pulse AIR and AIR Pro data modems, suitable for organisations that already have RTUs either integrated into their equipment or have existing RTUs deployed over unreliable unlicensed channels, or public networks such as 3G or GPRS. Also included in the portfolio is the Pulse ELITE Integrated RTU for in-field deployments, which features digital and analog outputs for the collection of data and status information from plant equipment such as actuators, meters, switchgear and programmable logic controllers.

The gateway products also enable SCADA to seamlessly interface with the digital radio infrastructure. This makes the radio infrastructure transparent to the SCADA application and requires no customisation or integration in order to deploy SCADA over radio. Systems can either be fully deployed over PMR or can be used to form part of mixed technology telemetry solutions.

Simoco Australasia Pty Ltd
www.simocogroup.com

GROUND CONTROL

Europe's tracking station in Perth has closed, but its New Norcia station has been expanded.

New Norcia is also home to a 35-metre-diameter antenna, which communicates with deep-space missions, typically at ranges in excess of two million kilometres. Credit: ESA/S. Marti

The European Space Agency (ESA) has commissioned a new tracking dish in Western Australia. The antenna — which is located at ESA's ground station at New Norcia, 140 kilometres north of Perth — will be used for communicating with launch vehicles and newly launched satellites, taking advantage of the site's location under the flight paths of launchers departing from Europe's spaceport in Kourou, French Guiana.

Since 2002, ESA has also operated a much larger 35-metre-diameter deep space tracking antenna at New Norcia. Its size and technology are not ideal, however, for communicating with rockets or satellites that are just entering orbit and still very close to Earth.

In contrast, the new dish, just 4.5 metres across, will quickly and precisely lock onto and track satellites during their critical first orbits, up to roughly 100,000 kilometres out, as well as launch vehicles such as Europe's Ariane 5, Vega and Soyuz.

It can also 'slave' the larger dish, which can then be accurately pointed to receive tracking information and telemetry at higher rates than the small dish.

The overall effort to design, build and install the antenna, provide the infrastructure and upgrade the existing station was valued at 6 million euros.

"We are delighted to inaugurate ESA's new antenna at New Norcia, where we have benefited for over a decade from both the hospitality and support of the local community as well as the expertise of Australian industrial partners," said ESA's Juan Miró.

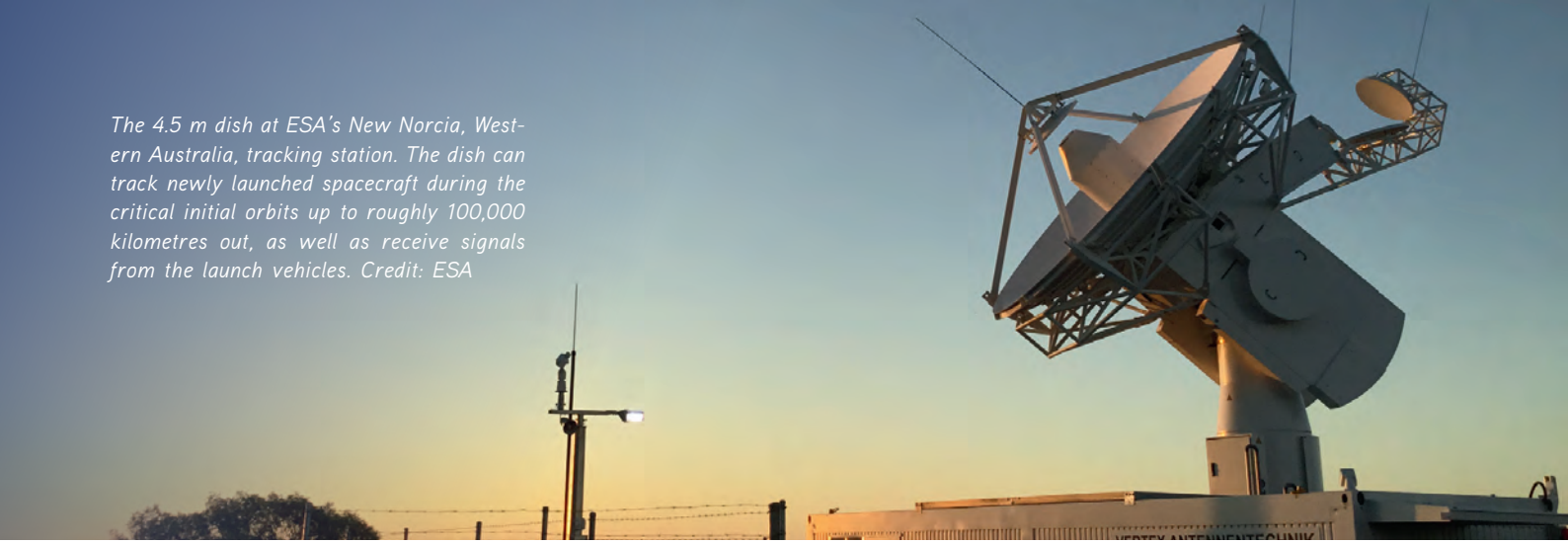
"The new antenna is another link in the decades-long cooperation between Europe and Australia for space exploration, science, engineering and technology development."

In the coming years, the new antenna will track launches from Kourou, as well as high-profile missions such as Galileo navigation satellites, the BepiColombo probe to Mercury and ExoMars going to the Red Planet. It has already proven its technical fitness for operational service, having been used to track the LISA Pathfinder spacecraft in December 2015.

Both New Norcia antennas are part of Estrack, ESA's global network of ground stations in seven countries that provide the link between satellites in orbit and flight control teams at ESA's mission control centre in Darmstadt, Germany.

Old antenna retired

Development and construction of the new antenna was prompted by the need to relocate the tracking capability that, until the end of 2015, had been provided by another ESA station in Perth.



The 4.5 m dish at ESA's New Norcia, Western Australia, tracking station. The dish can track newly launched spacecraft during the critical initial orbits up to roughly 100,000 kilometres out, as well as receive signals from the launch vehicles. Credit: ESA

The Perth antenna was decommissioned in December 2015 after 30 years of operation.

"With the closing of Perth station, ESA would have lost its capability to support newly launched satellites from Western Australia, which is a critical location for most European missions," said Manfred Lugert, head of ESA's Ground Facilities Operations Division.

Ironically, the retirement of the antenna came about not due to any technical obsolescence, but rather through a very human factor— Perth's expanding population and the conflicting needs for radio spectrum.

The ever-growing metropolitan area of Perth is encroaching on the station's compound, the Perth International Telecommunications Centre, making it increasingly difficult to ensure an interference-free environment for the most-used frequencies.

The growing demand of Perth's citizens and businesses for wireless internet access, and in particular the needs of outside TV broadcasting, led the ACMA to withdraw permission for the use of certain frequencies by the Perth station as of 31 December 2015.

"[The] Perth antenna retirement provides an opportunity to consolidate ESA's Australian tracking facilities at our existing New Norcia station... while deepening our partnership with local Australian telecommunication companies, all of which have strong technological expertise that we can tap," said Lugert.

The decommissioned Perth antenna's routine tracking and telecommanding will be largely taken over by commercial service providers, including SSC Australia, which operates the Western Australia Space Centre near Dongara, 400 kilometres north of Perth.

Information courtesy of the European Space Agency.

NEXT-GEN COMMS ARE COMING

5G mobile communications are less than five years away, and the ACMA wants to make sure we're all ready.

It has become a truism in recent decades that a new generation of mobile communications has come along every 10 years or so. The current state of the art is 4G, or LTE. But the next step, 5G, is racing towards us, with the Next Generation Mobile Networks Alliance (NGMNA) aiming to have it operational by 2020.

According to the NGMNA, 5G networks will provide services far beyond those offered by 4G, and specifically will need to meet the following requirements:

- Data rates of tens of megabits per second for tens of thousands of users.
- 1 gigabit per second available simultaneously to many workers on the same office floor.
- Several hundreds of thousands of simultaneous connections to be supported for massive sensor deployments.
- Spectral efficiency should be significantly enhanced compared to 4G.
- Coverage should be improved over that provided by 4G.
- Signalling efficiency should be enhanced.
- Latency should be reduced significantly compared to LTE.

There are many technological developments in the pipeline that will work together to achieve these goals, including massive MIMO, cognitive (or smart) radio and network virtualisation, to name just a few.

In February, ACMA released a discussion paper — 5G and mobile network developments: Emerging issues (acma.gov.au/theacma/5g-and-mobile-network-developments-emerging-issues-occasional-paper) — that "looks at 5G mobile developments and the opportunities that this evolution in mobile technology offers to the Australian community through increased use of mobile broadband and machine-to-machine communication".

The paper examines:

- the ongoing development of mobile networks in Australia;
- expected consumer and business drivers of demand for the next generation of mobile services;
- the technological developments that will underpin 5G network deployments;
- use cases that will require 5G in order to be deployed;
- the existing regulatory arrangements that may be useful in facilitating the next stage of mobile network developments.

The ACMA has called for input into the discussion, and has posed the following questions to industry and the wider community:

- Are there any additional demand drivers supporting 5G network deployment in Australia not identified in the paper?
- Are there any additional significant enablers or major inhibitors to 5G network deployment in Australia that are not identified in this paper?
- Are there additional regulatory issues around 5G network deployment, relevant to the ACMA's responsibilities, which are not discussed in this paper?

Public-private partnership

At the Mobile World Congress 2016 in Barcelona, the European Commission and the 5G Infrastructure Association launched a 5G Public-Private Partnership white paper, 5G Empowering Vertical Industries, which outlines how 5G network infrastructures will enable the digitalisation of society and economy, leading to the fourth industrial revolution, especially in the automotive, transportation, healthcare, energy, manufacturing as well as media and entertainment sectors.

The white paper depicts use cases from the most important vertical sectors and details how the resulting requirements will shape the 5G system design. Among its main conclusions are:

- 5G will transform networks into intelligent orchestration platforms and pave the way for new business models and value propositions by cementing strong relationships between vendors, operators and verticals.
- 5G will also integrate seamlessly different enabling technologies (eg, mobile, fixed, satellite and optical).
- Latency (below 5 ms), reliability (5 nines and beyond), density (up to 100 devices/m^2) and peak terminal data rates are among the most important performance targets 5G needs to achieve, along with tight constraints on territorial and population coverage.
- Requirements derived from use cases for vertical markets should be considered with high priority and covered in the early phases of the 5G standardisation process.
- Vertical use cases should be duly considered when identifying spectrum priorities.

Australian trials

In February, Optus and equipment vendor Huawei completed a live trial of 4.5G wireless networking technology, achieving peak data rates of 1.23 Gbps over the air in live network conditions. Huawei is developing 4.5G technology as a stopgap between 4G and 5G.

During the field trial in Newcastle, the company also achieved download speeds of 1.41 Gbps in a cabled scenario.

The tests involved combining technologies including carrier aggregation — which involves combining spectrum from multiple frequency bands — and 4x4 multiple input multiple output (MIMO), the next evolution of the technology involving using multiple antennas to transmit and receive wireless data.

The companies aggregated five 20 MHz spectrum carriers for the trial. Current commercial LTE-Advanced networks typically only aggregate two or three carriers.

Dennis Wong, Optus Networks acting managing director, said the trial forms part of Optus's preparations for the arrival of 5G technology, which is expected to deliver data rates in the 10 Gbps range.

Telstra is also looking to lay the groundwork for 5G. The company has announced that it plans to work with Ericsson to trial 5G technologies at the 2018 Commonwealth Games on the Gold Coast. The company announced ahead of the Mobile World Congress trade show that it plans to start testing 5G technologies in Australia this year ahead of the trial at the Games.

Recent trials of 5G with Ericsson in Sweden achieved speeds of more than 11 Gbps in real-world indoor settings.

Satellite modem

Newtec has added the MDM5000 Satellite Modem to its Newtec Dialog multiservice platform, designed for the high-end mobility, trunking and HTS markets.

The VSAT modem supports wideband DVB-S2X and is capable of receiving forward carriers of up to 140 MHz, and processing over 200 Mbps of throughput. On the return channel, it supports SCPC, TDMA and Newtec's Mx-DMA technology, up to 75 Mbps. Mx-DMA delivers the efficiency of SCPC with bandwidth allocation capabilities of MF-TDMA, offering more than 50% efficiency gains.

With forward symbol rates from 1 to 133 Mbaud and coding up to 256APSK, the device will boost efficiency and performance on legacy satellites while utilising the potential of next-generation high-throughput satellites (HTS). It is capable of handling a range of IP services, including internet and intranet access, VoIP, mobile backhauling and trunking, as well as video contribution and multicasting.

As with previous models, the device incorporates Layer-3 routing, advanced quality of service (QoS), TCP acceleration, pre-fetching, compression and encryption. It also supports a new Layer-2 mode, facilitating integration with various networking topologies and routing protocols, like MPLS and BGP. The modem comes equipped with dual demodulators for future seamless beam switching on HTS networks.

Newtec Asia Pacific

www.newtec.eu

Handheld portable radios

Sepura has released the SC20 series of hand-portable radios, designed from mission-critical user feedback, to offer resilient, intelligent and durable operation in tough conditions.

Broadband ready, the series includes the SC2020 (380–430 MHz) and the SC2040 (403–470 MHz) which combine TETRA with an optional second high-speed data bearer capability. The radios come with a Class 3 TETRA engine paired with a receiver surpassing the ETSI specification, which extends operational range and stretching coverage, allowing users to place and receive calls where it was previously not possible.

The radios feature a large, high-resolution screen, viewable in all light conditions, including direct sunlight. They offer 2 W audio capability enhanced by water-porting technology, which allows for good audio clarity, even in continuous heavy rain. With IP66, 67 and 68 environmental protection ratings, the radios are also completely dustproof, submersible to a depth of 2 m for 1 h and resistant to jets of water. Its design enables it to be easily cleaned by simply rinsing dust and dirt off under a tap.

Sepura PLC

www.sepura.com

Spectrum analyser with tracking generator

The Agilent N9344C Handheld Spectrum Analyser with Tracking Generator, available to rent from TechRentals, is said to offer accurate and reliable field measurements for technicians.

The compact, lightweight design (3.6 kg) allows users to automate routine tasks to ensure consistency when capturing test results and generating reports. The portable instrument has a frequency range from 9 kHz to 20 GHz, and a resolution bandwidth of 1 Hz. Other features include: flexible remote control via USB/LAN; -144 dBm displayed average noise level (DANL); ±1.3 dB amplitude accuracy; channel standards for LTE/Wi-Fi/WiMAX; and <0.95 s sweep time for 20 GHz full span.

In addition to the spectrum analyser, the device offers a built-in tracking generator, which measures a two-port transmission of filter and amplifiers to validate that the system is working correctly before users begin evaluating sources of interference. The tracking generator offers a 5 MHz to 7 GHz range and output level of -20 to 0 dBm.

TechRentals

www.techrentals.com.au

Multimodule synchronisation for wideband digital receiver

Keysight Technologies has introduced multimodule synchronisation for its M9703B AXIe high-speed digitiser/wideband digital receiver, which increases the total number of streaming and recording channels available with the device.

The new bundles options (-CB1/-CB2) enable multichannel phase coherent digital down conversion (DDC), which has applications in 5G, radar and satellite communications, as well as aerospace and defence. In dense urban RF environments where an interoperability and compatibility challenge may exist, the functionality of the -CB1 and -CB2 options allows users to capture and record a long duration of large frequency bands on multiple phase coherent channels.

It also allows users to quickly characterise the channel behaviour in these frequency bands and enables researchers to develop the necessary channel models for designing and validating air-interface alternatives.

With up to 320 MHz instantaneous bandwidth (IBW) with tunable intermediate frequency, the high-speed digitiser meets the needs for new technology development in 5G wireless mobile broadband. Used with the recommended host computer configuration, the new options allow guaranteed recording time, storing all I/Q samples for later analysis. A command line software application is included for a simple launch and control of the streaming and recording.

For other applications where gapless streaming and recording is not required, but there is a need to simultaneously read while acquiring, the new signal processing firmware (-TSR option) enables simultaneous capture and transfer of triggered acquisition data to the host computer.

Keysight Technologies Aust Pty Ltd

www.keysight.com

Stationary P25 repeater with LTE/3G

Codan Radio Communications has launched the Stratus Fixed Site, a stationary P25 repeater offering LTE/3G cellular backhaul capabilities.

The device provides rugged and reliable communication solutions for public safety agencies with fixed P25 base stations and/or repeaters. With the LTE/3G capability, the product allows organisations to use publicly available LTE/3G cellular networks for backhaul of their P25 radio traffic into dispatch, replacing the need for costly leased lines and T1 connections. A key feature includes an upgrade path to 4G LTE backhaul interface (with fallback to 3G).

The product can be integrated into existing Codan infrastructure and has the capacity to connect up to four Codan base stations and/or repeaters over a single cellular link. It is also interoperable with all P25-compliant subscribers and consoles, utilising existing P25 equipment for operational and cost efficiency.

Codan Limited

www.codan.com.au

Intrinsically safe certified radios

The latest generation of intrinsically safe portable radios from Tait Communications has achieved IECEx/ANZEx certification for safe use in hazardous areas.

The TP9361 is a full display, full keypad, quad mode radio that can operate in conventional analog, MPT1327, DMR Tier 2 and DMR Tier 3 modes. It is built for demanding environments and comes with an IP67 rating as well as exceeds MIL standard specification. The radio also supports worker safety with man down alerts and built-in GPS positioning.

In comparison, the TP9461 is a full display, full keypad, quad mode radio that can operate in conventional analog, P25 Phase 1 conventional, as well as P25 Phase 1 and P25 Phase 2 trunking modes. It offers AES encryption, voice and data, preset status messages and internal GPS to ensure safe and efficient operations. The radio is also engineered for demanding environments and comes with an IP67 rating and a water-shedding grille.

Each of these radios is available in either a full- or low-power variant. The full-power variants (5 W VHF, 4 W UHF) are marked as IIA. They provide good coverage and are suitable for Zone 1 and 2 propane and methane hazards. The 1 W low-power variants are marked as IIC and are suitable for Zone 1 and 2 where more volatile acetylene and hydrogen hazards can occur.

Tait Communications

www.taitradio.com

MOBILITY MANAGEMENT

Virtual private networks can help organisations achieve greater productivity and deliver improved customer service, while improving security and reliability.

With more and more enterprises such as local councils, transport operators, logistics companies, security firms and others turning away from traditional two-way radio and embracing smartphone and tablet technology, it's important that they do not overlook the back-end systems that tie these communications solutions together.

Delivering applications and data to mobile workers is a key initiative among organisations with critical communication requirements. In a 2015 Aberdeen Group survey, 83% of companies reported that implementing fully connected mobility (real-time access) was either extremely or very important to them. Among the reasons cited were worker productivity (60%), faster service resolution (41%), cost control and reduction (32%), better resource visibility (24%) and revenue opportunities (21%).

A mobile virtual private network (VPN), such as that delivered by NetMotion Mobility, is the key to achieving best practices in a deployment and realising the full benefit of mobile communications investment. A VPN provides secure, reliable network connections for mobile workers; builds worker acceptance to overcome common change-management issues; and allows greater span-of-control for field managers and IT staff.

Enhanced customer service and improvements in worker productivity have corresponding benefits for customer service levels. Solving problems on initial service calls is both a cost saving for the company and a convenience for the customer. Giving field personnel more timely access to CRM, support and other customer data allows them to handle a wider range of service issues face to face, deepen the customer relationship and earn loyalty. Service information such as parts availability or repair tips can be checked at the customer's site for faster problem resolution.

Updating service tickets in the field also allows call centre-based service reps to give real-time status reports. This improves the customer experience and lays the groundwork for web-based, customer self-service initiatives.

The role of a mobile VPN

Implementing a mobile-computing system can be a challenge because it typically involves significant organisational change and new work habits. Selecting the right VPN — an often overlooked yet vital piece of the infrastructure — is essential to facilitating a successful rollout.

NetMotion Mobility is a mobile VPN widely used by critical communication organisations. Like a conventional VPN, it secures enterprise data across public networks through encryption and protects corporate networks by ensuring that only trusted users and devices gain access.

However, it does much more: it is a key to delivering the full promise of the entire mobile deployment. Mobility is expressly designed for the unique characteristics of mobile environments, where workers roam and use computing devices constantly, while expecting uninterrupted use of open applications throughout the workday. Mobility is the essential 'glue' that ties together multiple networks including various cellular data services and Wi-Fi, aggregates disparate mobile devices and manages them as a single virtual network and deployment.

High-profile users of the NetMotion system in Australia include public safety agencies and utilities such as NSW Police and South Australia Water, with the local provider being Wireless Data Solutions.

The following are some common challenges organisations face in field deployments and the role NetMotion Mobility plays in achieving best practices.

Secure, seamless user experience

The most common reason for failed mobile deployments is lack of user acceptance. If field tools are cumbersome or difficult to use, workers will not embrace them.

As many organisations have discovered, connectivity problems are the most common source of frustrations. Workers often lose connections and need to re-log in; and when applications are running during those interruptions they often crash, requiring workers to not only log in again, but re-enter the data they lost.

NetMotion Mobility handles logins automatically as field workers transition between various cellular networks and access points, and

keeps the applications and connections alive as they traverse those boundaries and encounter coverage gaps.

Workers only need to log in once at the beginning of their shift. This single sign-on also supports two-factor and multi-factor authentication via RSA SecurID (used by many telecommunications service fleets) smart cards, user or device certificates, or common Radius servers. Workers freely use their devices without having to manage connections. Plus they can suspend or hibernate applications throughout the shift without having to re-authenticate or risk data loss. Data connections remain secure without hindering users.

In mobile deployments that begin with conventional VPNs and are subsequently replaced with Mobility, this simplified user experience leads to significant productivity gains. In new deployments, it delivers a positive user experience that facilitates change-management and speeds adoption of field tools.

Management control

Managing mobile devices across a dispersed workforce is a challenge, and more so in large deployments. Securing and maintaining hundreds or thousands of field-based devices, miles from the corporate data centre, is much easier with Mobility. Giving the IT team and field managers control over remote devices enables them to:

- set and enforce policies to manage user and device access to networks;
- improve security and protect users from inadvertently taking action that bogs down devices or connections;
- set rules to limit access to specific applications, prohibit web browsing or restrict access to intranets or specific sites;
- enforce restrictions based on connection speed or time of day;
- prioritise users by line-of-business applications, so critical traffic has the highest priority.

This policy-management capability is especially useful for keeping file synchronisations and other large data transfers off cellular networks, where they might interfere with customer-related business applications. Workers carrying laptops, handhelds or smartphones can all have different policies, or supervisors may have policies separate from the workers they manage.

Visibility into usage patterns and problems

Monitoring performance across multiple networks is a challenge, especially when networks are outside of IT's direct control. Mobility Analytics measure and report on device, application and network usage. Administrators can spot coverage or connection problems, determine high bandwidth consumers, drill down to monitor traffic patterns, verify version details, monitor battery life and much more. In addition, proactive notifications based on adjustable thresholds can dramatically decrease help-desk calls. Staff are alerted to potential device or network problems so they can be resolved before they disrupt workers or impact service quality.

In environments where safety is a top-line concern, such as for utility crews or other potentially dangerous work environments, a mobile VPN can provide an added level of safety. An active device indicates that all is likely well at the work site, and the mobile device also provides a reliable communications link.

Enforcing device security

Mobility Network Access Control software verifies that devices have required security precautions in place — such as patches, operating system updates and active antivirus with current signatures — before allowing a connection. Depending on the severity of the issue, administrators may choose from a variety of actions, ranging from simply warning the user, to requiring immediate remediation, to quarantining the device. This gives administrators the flexibility they need to protect the corporate network without hampering worker productivity. They can also automatically remediate the device, at a time and in a way that doesn't interfere with its productive use.

Patch management and upgrades

Mobility allows field-based devices to be managed 'over the air', through third-party systems management software, as easily as the organisation manages desktops and laptops on the wired corporate network. Application updates and patches may be pushed out while the unit is still in the field, but when users aren't actively logged on, between shifts. This eliminates the need to dock a unit or wait for a wired connection and can provide significant labour and cost savings for IT staff.

Mobile initiatives have great promise for field organisations. Deploying a VPN built for mobility such as NetMotion Mobility is essential to realising the full benefits of the investment and achieving best practices. These include delivering secure, reliable network connections, promoting user acceptance and gaining management visibility and control. In this way, organisations can ensure that they achieve greater productivity and deliver exceptional customer service.

Wireless Data Solutions Pty Ltd
www.wirelessdata.com.au

TAKING AUSTRALIAN TECHNOLOGY TO THE WORLD

Jonathan Nally

ZCG Scalar has successfully carved out a specialist niche in both the domestic and export markets.

Antenna manufacturer ZCG Scalar was founded at Lindenow in Gippsland, Victoria, in 1970 by Gregor Cox, a ham radio enthusiast with the call sign VK3ZCG. Cox had identified a gap in the market for amateur radio antennas, but the business soon expanded its scope, supplying users such as the police force and emergency services, and essentially anyone else in the region who needed an antenna.

The business was bought by Garry and Sally Kelly in the mid-2000s. At that stage it still had a heavy focus on mobile antennas for land and marine vehicles, but Garry's experience with broadcast and base stations meant that the company started getting a lot of work from the broadcasters. Although the business today still has a niche within the mobile antenna market, it is no longer reliant on it, having long since broadened is remit to cover broadcast television and radio, telcos, marine, backhaul, military users and other sectors.

Lindenow is located near Bairnsdale, about three hours' drive from Melbourne. "It's rural — if you came down here, we're in the middle of Victoria's veggie bowl," said Trevor Small, ZCG Scalar's general manager. "One of the reasons we're here is that we get 'clean air' for antenna design and development and testing. We don't get radio interference.

"Our test range fires out over 100 acres of vacant land," he added. "We can spin the antennas and see what they do on a 360."

As well as the manufacturing base and head office in Lindenow, the company has warehousing and sales offices in Perth and Brisbane. It also has a technical services division at Lindenow, responsible for research and development, site coverage predictions and radiation exposure testing.

Despite its rural location, the company has built up an enviable reputation in the export market. "We're certainly not exporting our mobile antennas; the market's so flooded with cheap Chinese [antennas]," said Small. "But our specialised antennas are being used in South-East Asia, and we send products to Africa, Afghanistan and many other countries. Some of it gets used for military purposes, but it also gets used for mining communications, transportation fleets, tracking, taxi fleets and so on."

Closer to home, Small said the company sells a lot of antennas into the agricultural sector, for instance for telemetry in vineyards. Vineyards are very sophisticated these days, with moisture sensors in the ground, taps that need to be turned on and off at certain times

and so on. Data and commands are collected and sent wirelessly.

An unusual job was contributing antenna technology to a radio device that can counter the kind of improvised explosive devices found in hotspots such as Afghanistan. The two variants — Greengum for soldiers and Greygum for fitting to light vehicles — are seeing service on the frontline.

According to Small, one of the biggest constraints on antennas in this day and age is transportation. "Long, thin tubes are expensive and difficult to transport, so we're always looking at how to make [our antennas] more compact for shipping," he said.

When asked about where ZCG Scalar sits in the market, Small said, "We're big enough to handle high-volume builds, but we're small enough to do custom builds and do flexible designs for customers' particular needs.

"A lot of companies can't do that," he added. "They'll do it if you're going to order 10,000, but if you don't need 10,000 then [they're not interested].

"[For instance] we did a custom antenna for a US warship. They needed it to 'fit here', and they needed it 'this long', and 'this particular bandwidth'... and it bolted straight in, so they were pretty happy," he said. "We've [also] made some prototypes for the ANZAC frigates. That's the sort of thing we're capable of, and that's where ZCG's niche is."

"We have one customer who wanted an antenna that was just pretty much bulletproof, to put on the survey buoys that are around the top of Australia for tsunami warning and surveillance and tracking," said Small. "And he said, 'I can't afford to have it fail. I've got a 50-nautical-mile journey out there in a boat, so I need an antenna that's really bulletproof [and] I need a custom mount to fit on the buoys. Can you help me out?' Two weeks later we had a design for him, and he said 'You beauty!' He said no-one else was going to be able to do that for him.

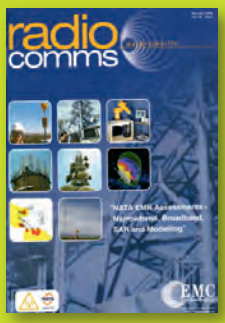
"We get a lot of those kinds of requests, and in most cases we can help them out."

ZCG Scalar
www.zcg.com.au

Backhaul

25 YEARS AGO. The cover of the April/May 1991 issue of *What's New in Radio Communications* featured RAND Version2 Data Link Controller, developed by Transcom Australia, that enabled "small and large radio users to transmit full eight-bit ASCII data via any HF, VHF and UHF radio system ... with total privacy, total accuracy and no transmission costs". Elsewhere in the magazine, Spiros Nikolakopolous and Martin Cahill (Motorola Communications) opined on the importance of performance in trunked networks, and Andrew Mowat (Expertech) describe a scheme for using programmable logic controllers and simple radio data interfaces in developing remote control and data acquisition systems. And, if you were in the market for a 76-metre-high transmission tower at Eastern Creek in Sydney, it's too late now — expressions of interest closed in June 1991.

10 YEARS AGO. The cover of the March/April 2006 issue of *Radio Comms Asia-Pacific* featured the services of EMC Technologies; specifically, NATA-endorsed assessments for EMR compliance under ARPANSA standards. Elsewhere in the magazine we had a case study on the use of GPS to improve a community bus service, where passengers could book via the internet and the GPS system would select the optimal route for each bus. We also covered a humanitarian aid HF network established in East Timor, PNG and the Solomon Islands. David Cox (Pacific Wireless) contributed an opinion piece on the perils of outsourcing too much comms knowledge to providers who might then lock you in to their own ecosystem. Ian Miller let rip about some of the problems facing dealers and the need for everyone to help grow the market. And we also published a profile of Sir Angus Tait, who began his career in the electronics business in 1969 and by 2006 had built it up to be Christchurch's largest commercial employer.



Spectrum

Building a public safety broadband network

With overwhelming support from the public safety community, the US Congress passed legislation in 2012 to establish the First Responder Network Authority (FirstNet). Signed into law by President Obama, the legislation tasked FirstNet with ensuring the building, deployment and operation of the first high-speed, nationwide wireless network dedicated to public safety. This was a huge win for first responders in the US and for the communities they serve.

As Australia moves forward with plans for a public safety broadband network, you will undoubtedly face many tough decisions on the best path forward in your country. Regardless of which way you go, I believe there are at least three success factors that can be universally applied to any public safety network, in any country: the public safety community must remain unified in its support for the network; the network must provide first responders with priority access; and the public safety community must be involved in all facets of the network.

A unified public safety community. The FirstNet network came into focus thanks to a unified public safety voice. In the years leading up to passage of the law, an advocacy group called the Public Safety Alliance (PSA) brought together the full spectrum of public safety interests to advance support for the network in the states and the US Congress. Today, thanks to the PSA's contributions, the public safety community continues to be actively involved in the development of this network. Through forums such as the Public Safety Advisory Committee and the FirstNet consultation process, they continue to articulate their needs for the network and provide FirstNet with advice and expertise.

Priority and preemption. Public safety personnel will be the primary users of the FirstNet network. Given the importance of their mission, it will be critical for them to connect to the network when they need it most — during emergencies. Currently, commercial networks do not offer this type of priority access to public safety users. With that in mind, FirstNet is building priority and preemption into the network, ensuring public safety users are first in line to access the network during times of heavy usage, and that there is ample bandwidth to support their voice, video and data needs.

Public safety outreach. Public safety stakeholders aren't just a group to FirstNet; they are our partners and customers. Their lives and the communities they serve will be impacted by the success of the network. To that end, public safety outreach has been a top priority since day one, and we have worked to involve first responders at all levels of government every step along the way. We have worked hard to create opportunities for public safety stakeholders to help shape the network and we will continue to do so even when the network is up and running.

These and other factors have enabled FirstNet to make considerable progress. We recently achieved a major milestone with the release of the Request for Proposals (RFP) to form a public-private partnership to build the network. This puts public safety stakeholders an RFP-award-and-construction cycle away from having their own network. While we still have much work to do, getting to where we are today could not have been possible without our commitment to, and the involvement of, the public safety community.

On behalf of FirstNet, we wish Australia much success with its network and stand ready to assist you along the way.

Chief Jeff Johnson has been a member of the FirstNet board since its inception in 2012 and was appointed FirstNet Vice Chair in December 2014. Prior to that, he led the US Fire Service's legislative advocacy for the creation of a public safety broadband network. He is CEO of the Western Fire Chiefs Association and former president of the International Association of Fire Chiefs.

COMMS CONNECT 2016

Events for critical communications users and industry

Important dates for your diary ...

Sydney
22-23 June 2016
Sydney Showground

Melbourne
22-24 November 2016
Melbourne Convention and Exhibition Centre

NEW for 2016 — Comms Connect WELLINGTON

14-15 April — Te Papa Museum

In association with the *Radio Frequency Users Association of New Zealand* (RFUANZ), Comms Connect Wellington, a two-day conference and exhibition, takes place at Te Papa Museum on 14-15 April, 2016.

A series of case studies, technical presentations and workshops are supported by an extensive exhibition of local and international suppliers and manufacturers. Day one sees networking drinks on the exhibition floor followed by the very popular annual RFUANZ Gala dinner and awards night.

By registering to attend this year's conference and exhibition in Wellington, you'll hear what the experts have to say, advance your understanding of critical communications and the land mobile unique industry event — do not miss this once-a-year opportunity!

Registration Open — visit www.comms-connect.co.nz to register or for more information.

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In conjunction with the RFUANZ Gala Dinner and Awards Night
14 April – Te Wharewaka Events Centre, Wellington
Visit www.rfuanz.org.nz to book your tickets

For further information regarding speaking or sponsorship at Comms Connect events in 2016 please

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