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PD792 Ex ATEX Radio integrates all the benefits of digital technology with the strictest ATEX IIC safety requirements. Completely compliant to DMR open standard, PD792 Ex operates in both conventional (Tier II) and trunked (Tier III) modes. Safety can never be overemphasized, thus it proactively protects users with features like Man-down, Lone Worker and Emergency Alarm, and goes the extra miles with the most complete certification of ATEX, CSA, CQST, FM & IECEx.

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Formerly Radio Comms Asia-Pacific

Inside

January/February 2015

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www.CriticalComms.com.au/latest_issues

The Vicom RSA306 spectrum analyser features a broad 9 kHz to 6.2 GHz frequency range, 40 MHz real-time bandwidth and weighs in at just 0.59 kg. When used with Tektronix SignalVu-PC Vector Signal Analysis (VSA) software, the RSA306 offers advanced analysis capability such as general modulation analysis, pulse analysis, frequency and phase settling, radar and spectrum management.

The RSA306 is especially suitable for budget-conscious RF design and development as more and more designs are including RF components such as inexpensive Wi-Fi modules, dramatically increasing the need for spectrum analysis. The cost-effective unit means that labs working on wireless-enabled designs can afford to give everyone on the design team the RF signal analysis tools they require.

For field applications, the RSA306 offers the convenience, analysis capabilities and user-friendly operation engineers and technicians need to get a fast handle on network health. Full spectrum analyser measurement capabilities provide far more versatility than the limited pass/fail of a dedicated tester.

And with its compact size and light weight, the RSA306 easily fits in a backpack while offering the sensitivity needed to quickly discover signals as short at 100 μs. This is key for spectrum managers and regulatory agencies that need a basic spectrum analyser and interference hunter in the field.

Vicom Australia Pty Ltd
www.vicom.com.au

Transmit

How much is a radiofrequency band worth? What is its value, whether economic or social? It's hard to say, isn't it? After all, you can't see it or touch it - it's an invisible and intangible resource, yet it is also one of the most vital in today's electronically connected world.

The first study of its kind in Australia, initiated by ARCIA, has valued the spectrum used for LMR at between $2 billion and $4 billion. That's a lot of value, and around 10 times what it might be worth were it to be put to some other use. No wonder the industry is keen for government and others to be aware of this when making its deliberations on spectrum allocations.

The other question is how to blend traditional narrowband services with the burgeoning need for mobile broadband capabilities. What's the best way to achieve this? Different jurisdictions have different ideas, some in work already and others still speculative. Telstra's LANES capability is one concept that just might take off, especially now that the telco has teamed up with Motorola to provide enhanced services, as outlined in this issue.

Finally, as an old HF operator from way back, I think it's really good to see that HF is thriving so much that the ACMA is having to upgrade its DFing capability to help eliminate sources of interference. By combining HF receive resources with the Department of Defence, the taxpayer will save about $2 million. We don't often get good news like that.

Jonathan Nally, Editor
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Calendar

March 2015

What: Critical Communications Asia 2015
When: 24-25 March 2015
Where: Putra World Trade Centre, Kuala Lumpur
Website: criticalcommunicationsasia.com

April 2015

What: APCO Australasia 2015 Conference
When: 29-30 April 2015
Where: Melbourne Convention & Exhibition Centre
Website: apcoaust.com.au

What: RFUANZ 2015
When: 30 April-1 May 2015
Where: Te Papa, Wellington
Website: rfuanz.org.nz

May 2015

What: Australian & New Zealand Disaster and Emergency Management Conference
When: 3-5 May 2015
Where: Jupiters Gold Coast
Website: anzdmc.com.au

June 2015

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

December 2015

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

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

Enabling Wireless Everywhere

MISSION CRITICAL
THE VALUE OF LMR SPECTRUM

Jonathan Nally

LMR radio spectrum provides a benefit of at least $2 billion to the community.

Early last year, ARCIA commissioned Windsor Place Consulting to conduct an economic study of the value of LMR spectrum use in Australia. The study was concluded by the end of October and was officially launched at a function at Parliament House in Canberra on 26 November. In attendance were representatives from a cross-section of the LMR field - manufacturers and dealers, industry bodies and government agencies.

The 50-page report states that the "rise of mobile Internet-connected computing devices has not only increased demand for spectrum but also led to significant increases in personal and corporate productivity. The increasing sophistication of digital services provided over public cellular networks leads naturally to the question of to what extent these services now constitute a viable and effective substitute for traditional LMR services from the perspective of efficient spectrum use."

The report's authors go on to say that a related question from the spectrum allocation perspective is: should spectrum currently allocated to LMR services be, at some time, allocated to mobile cellular services and to what extent should mobile be favoured over radio in future spectrum allocation decisions?

"From the economic perspective the central question is: to what extent is mobile cellular a close substitute for LMR?" says the report's executive summary. "For this study we conducted two surveys, met with industry representatives and conducted structured face-to-face and telephone interviews. We wanted to investigate the importance that users, particularly users 'in the field', attached to LMR services and the extent to which (hypothetical) increases in costs of such services would lead to decreases in use."

The value of LMR spectrum

The authors found that users were highly committed to traditional LMR technologies and services, and their associated characteristics. "In particular, the immediacy of establishing communications using LMR was emphasised as well as its 'one-to-many' characteristic, which is regarded as indispensable in creating 'shared situational awareness' in emergency scenarios," they said.

"This was contrasted with the characteristics of mobile cellular systems: a one-to-one communications channel that requires significant user time and focus before a communications channel can be established. This gap between the intent to communicate and the establishment of communication was seen as a key disadvantage of cellular mobile as a substitute for LMR."

The authors say the focus on LMR as the core communications system for the emergency and first responder services "should not, however, presume to be indicative of a conservative attitude towards new digital technologies. Emergency services organisations are making innovative use of mobile broadband, social media and messaging services to provide information to and receive information from the public.

"In addition, public cellular services are being used to augment emergency services, creating productivity gains and improving performance (including saving lives)."

The study generated two sets of estimates of economic benefits, "one based on LMR equipment costs and one based on associated time costs", said the authors. "We believe the former estimate of economic benefit is demonstrably conservative. The equipment valuation method yields an economic benefit estimate of $1.99 billion per annum while the time valuation method yields $3.72 billion."

Windsor Place compared this with the opportunity cost of the spectrum used for LMR, which is estimated to be $39.7 million per annum. "Set against these benefit estimates, the estimated opportunity cost is relatively tiny. In order for this estimate to be comparable with the benefit estimate, however, it needs multiplied by the consumer surplus ratio that would be created were new services provided over this spectrum," the authors said. "Even if we use the highest value consumer surplus ratio used in our benefits estimates, the benefit associated with this next best use of spectrum would be in the order of $200 million per year.

"Thus, the allocation of spectrum to the current set of uses (including critical, emergency and first responder services) generates an economic benefit at least 10 times greater than the benefits that would be generated by its allocation via

Present at the launch of the economic study were (L-R): Senator Anne Ruston, The Hon. Paul Fletcher MP, Hamish Duff (ARCIA) and Simon Molloy (Windsor Place Consulting).

a market-based processes to the next best use," the report's authors concluded. "This indicates that the current use is strongly preferable from a social welfare perspective to a market-based alternative use of the spectrum."

Methodology

Simon Molloy from Windsor Place Consulting was on hand at the launch in Parliament House to discuss the firm's methodology and results.

"What we were trying to value is the social or economic benefit of the spectrum that is allocated to LMR in Australia - what social or economic value arises from the use of spectrum in that particular way?" said Molloy. "As we all know, spectrum is a very scarce resource, and it's an essential input into a whole lot of activities, not least of which are emergency and essential services.

"We used two methods. One method was based on the amount of dollars that organisations and individuals spend on mobile radio equipment and the other approach was based on the amount of time spent using that equipment," said Molloy. "Both of those things are a handle on the value, and there's nothing out there in published statistics that would help us, so we had to do some estimation, gather some survey data and then do some modelling.

"The bottom line is that with the method based on equipment valuation, we think about $2 billion is what an economist would call the social welfare benefit. Based on the time use, about $3.5 billion to $4 billion worth of benefit."

Molloy said the researchers looked at a few similar international studies and found that they came up with similar kinds of numbers. "So we're pretty confident that

those numbers are strong," he said. One of the most important questions asked of senior managers in emergency services organisations was: how critical is LMR to your organisation's ability to deliver services in the field? "We had 97.6% of respondents say LMR is critical, indispensable, extremely important or important," said Molloy.

Parliamentary interest

Present at the launch were several members of parliament, including Senator Anne Ruston, chair of the Senate Environment and Communications Legislation Committee, and The Hon. Paul Fletcher MP, Parliamentary Secretary to the Minister for Communications.

"Being from rural South Australia, it's just so terribly important that what you guys do … and the maintenance of the radio network for us in country areas, just goes without saying," Senator Ruston said.

"I'm sure when you say to people that we still need radio, they probably think we do, but it wasn't until I actually read your report [that I] realised that in situations of emergency, when maybe the power goes out or the mobile tower goes down, in a localised area all you need is your handset and the handset of the person that you're talking to and that's got live communications," she added. "All of the sudden the reliance on having a third-party infrastructure has been removed. "Coming from a rural area where you're subject to a lot of bushfires, it just really hit home to me that maybe the message needs to be sold out there of how terribly important this type of communication is," said Senator Ruston.

Parliamentary Secretary Fletcher spoke of the need to take a wide view about the various telecommunications modes.

"I think one of the other important observations in the report is the complementary nature of mobile telecommunications and two-way radio," he said. "And that complementarity is something that has been strongly brought home to me in quite a number of meetings in rural and remote Australia over the last year, where the principal purpose of the meeting has been to talk about some additional funding for providing for improved mobile communications, more mobile base stations.

"Typically at these community meetings … we're joined by local police, State Emergency Service, fire, ambulance and so on. The message that comes through very much is the importance of having all available modes of communication and the complementarity of the dedicated emergency services networks and mobile telecommunications," he added.

Secretary Fletcher went on to say, "As policymakers, the challenge we face clearly is to allocate this scarce and increasingly valuable public resource. If you'd said to people 30 years ago that for something you can't see, you can't touch, you can't smell … that people would be paying $1 billion or more for an allocation of it, you'd have been viewed with considerable scepticism I'd suggest.

"We've now all seen the market appetite for radio frequency spectrum and that is clearly a factor to be thought about as we go through this public policy process," he added. "I think one of the very clear and important messages from the report, as you think about the economic importance of this resource, [is to] understand the value to the community expressed and quantified here in economic terms of not only the emergency services but all the other uses … of LMR services.

"I want to congratulate ARCIA for pulling together this report, and I think some of its findings are obviously very constructive and informative," said Secretary Fletcher. "Clearly, putting a valuation of the LMR spectrum as between $2 billion and $4 billion is significant, and it's important to have that as a piece of information to take account of in relation to the public policy process."

The report can be downloaded from: arcia.org.au/about-arcia/land-mobile-radio-industry.html

World Cup mobile coverage passes the test

Maracanã Stadium is an icon of soccer in Brazil, and it received a facelift to house 82,000 fans for the final game of 2014 FIFA World Cup Brazil. Mobile coverage at this stadium is a matter of national pride and the Brazilian Agency of Telecommunications (ANATEL) is supervising the work of ensuring top network performance.

As part of this effort, several contractors worked on different parts of various operator networks. Both Ericsson and Alcatel-Lucent (ALU) worked with ANATEL and mobile phone providers TIM, Oi and Claro to provide the best customer experience possible.

After struggling for some time with inadequate signal coverage, poor voice quality on calls and unreliable data connections, ALU purchased handheld indoor drive-test units from JDSU to find the real causes behind these issues.

Following a structured methodology to establish root problem causes, TrueSite identified the offending issues. The JDSU CellAdvisor Base Station Analyser provided additional data not only to further diagnose the problem, but also to resolve it.

RF testing let JDSU identify and solve problems and test several aspects of the distributed antenna system (DAS) installation. First up was testing over-the-air (OTA) power levels and LTE/UMTS radio power conformance. The local ALU integration partner had some doubts about the signal power sent from the ALU radios to the DAS system. OTA power tests made with the RANAdvisor Handheld reported very low signal levels but proper transmission power level at radios was reported with a CellAdvisor. This excluded the radios as the possible cause of the problem.

High VSWR was reported with the CellAdvisor, indicating impairments in the cabling system. ALU located and replaced the reflection source at the connectors of the DAS system, solving this problem. CellAdvisor also performed LTE ID scans and UMTS scramble scans, verifying that all the cell sites were properly assigned their identifier and were transmitting at correct power levels.

Finally, the unit performed insertion loss measurements, verifying the proper signal response of RF attenuators across the transmitted frequency band of 2.6 GHz LTE. This test did not identify any issues with the attenuators, certifying their performance.

After all issues were identified and solved, another indoor test was performed with TrueSite to verify that correct PCIs for LTE were radiating the correct signal levels and that voice and data services performed well for a large audience during games.

The variety of stakeholders in this project complicated matters significantly; each used their own management system with no neutral reference as a baseline. Tests were performed for both voice and data to verify the quality of various call lengths and to ensure proper handovers. Not all tests were satisfactory, making further investigation necessary.

With the JDSU RANAdvisor Handheld TrueSite installed on popular handheld phones, ALU identified coverage issues to be a result of incorrect physical cell identities (PCI) at some locations. This was caused by the failure of small cells installed inside the stadium. Some of the cells were found to radiate with low power when they should have been outputting a greater power level.

"I would like to thank the excellent support of JDSU at the Maracanã Stadium," said Alcatel-Lucent's Pedro Oliveira. "They provided a series of very important tests such as the verification of the transmission power of our remote radio heads and VSWR reflection tests of the RF cables, validating the proper levels of RF power in our distributed antenna system. This let us quickly resolve service issues with a single quality-assurance supplier."

JDSU Australia Pty Ltd
www.jdsu.com/australia

News

DISASTER, EMERGENCY & SAR CONFERENCES

Australasia's leading emergency management conferences will be held in May, once again at Jupiter's on the Gold Coast. The Australian & New Zealand Disaster and Emergency Management Conference (May 3-5) and the Australian & New Zealand Search and Rescue Conference (May 6) joint conferences will offer delegates an extensive range of topics, with over 100 presentations including keynotes, concurrent sessions, case studies and posters.

The Australian & New Zealand Disaster and Emergency Management Conference will feature multi-agency presentations covering all phases of emergency and disaster management - prevention, preparedness, response and recovery. There will be representation by fire, ambulance, emergency, rescue, volunteer, defence and health sectors. The event will focus on natural disasters with the conference theme of 'EARTH; FIRE AND RAIN', with the program including an extensive range of topics with keynotes, concurrent sessions, case studies, workshops and posters.

The Australian & New Zealand Search and Rescue Conference brings together search and rescue practitioners to discuss challenges of preparing, deploying and operating SAR. The aim of the conference is to facilitate sharing, knowledge and experience between the different search and rescue agencies, enterprises, communities and professionals. Presentations will cover air, sea, land-based, urban, wilderness, domestic and overseas search and rescue.

The conference theme is 'Preparing - Deploying - Operating Search and Rescue'. The focus of the conference will be better integration for more effective search and rescue operations, with the program reflecting how much the SAR world has evolved, tackling issues ranging from the latest requirements for airborne SAR assets through to the latest in lifesaving training and techniques.

For more details of the Australian & New Zealand Disaster and Emergency Management Conference, check out the web site: anzdmc.com.au The web site for the Australian & New Zealand Search and Rescue Conference is: sar.anzdmc.com.au

Tactical earplug

3M has introduced the Peltor in-ear digital Tactical Earplug for military and law enforcement applications, designed to help protect users' hearing from high levels of noise.

The device has sound-amplification capabilities for situational hearing and can help users better hear mission-critical verbal communications in quiet environments. The availability of an in-ear device provides more options to satisfy users' personal preferences and accommodate a greater range of mission demands and headborne equipment.

The Peltor Tactical Earplug is ruggedised for military and tactical environments, and helps protect hearing against sustained noises, such as loud generators and vehicle engines, and impulse noises, such as gunfire and blasts. Sound amplification settings can be activated by using a single button. Rechargeable batteries provide up to 16 h of continuous operation.

3M Personal Safety
www.3M.com/au

Microwave backhaul platform

The Cambium Networks PTP 820 is a point-to-point licensed microwave backhaul platform that enables network operators to meet accelerating demand for capacity cost-effectively under rapidly evolving conditions.

Supporting licensed frequency bands ranging from 6 to 42 GHz, the PTP 820 series delivers a wide range of configurations to offer a tailored solution for deployment scenarios. Composed of high-density multitechnology nodes and integrated radio units, the PTP 820 series offers flexibility in choosing all-indoor, split-mount and all-outdoor configuration options. Line-of-sight MiMo technology, modulation up to 2048 QAM and wider channel bandwidths ensure throughput and spectral efficiency.

The series also offers both Synchronous Ethernet (SyncE) and IEEEv2 synchronisation protocols required for large ISP and MPLS networks. Operations, administration and maintenance (OA&M) tools coupled with a full suite of network and element management systems (NMS and EMS) simplify network provisioning and monitoring, reducing operators' total cost of ownership and enabling them to meet the most stringent service level agreements.

Cambium Networks LTD
www.cambiumnetworks.com

Dynamic controller

Sepura has announced the launch of the Sepura Dynamic Controller (SDC), which connects GSM and TETRA devices to Sepura's range of covert accessories.

With noise-eliminating technology, wireless control and secure Bluetooth, it allows dynamic swapping between the devices with a single button press of the discreet remote control unit (RCU). It supports all standard induction covert earpieces, as well as off-the-shelf headphones, and can be used as a GSM-only covert solution. Operable in GSM-only mode, it supports all existing Sepura wired and wireless accessories including the NN5, Sepura's noise-eliminating solution.

Sepura PLC
www.sepura.com

IP 100H

Icom Australia has released a revolutionary new IP Advanced Radio System that works over both wireless LAN and IP networks.

The IP Advanced Radio System is easy to set up and use, requiring no license fee or call charges.

To find out more about Icom's IP networking products email **sales@icom.net.au**

WWW.ICOM.NET.AU

ICOM5000

All-in-one transport tester supporting up to 400 Gbps

Anritsu's MT1100A Network Master Flex is a cost-effective, easy-to-use, full-function multi-protocol transport tester. Combining light weight and portability with high performance - including support up to 400G (4 x 100G) - the device is equally adept in the field during installation and maintenance of optical networks, as well as in the R&D lab and on the manufacturing floor to test transport equipment.

The versatile, all-in-one modular platform supports bit rates from 1.5M to 100G, and allows for easy configuration to meet current test requirements with a cost-effective upgrade path as measurement needs change. It supports testing of emerging OTN networks, including ODU0, ODU2e, ODU4 and ODUflex, as well as legacy Ethernet, Fibre Channel, SDH/SONET, and PDH/DSn systems. A wide variety of interfaces are also supported without the need to reconfigure modules for added flexibility, and time and cost efficiencies.

Three dual-port modules are compatible with the MT1100A platform. The MU110010A is a multi-rate module for up to 2 x 10G ports, the MU110011A supports 10M to 100G, and the 40/100G MU110012A module supports CFP2/CXP for 2 x 100G ports. Up to two modules can be configured in a single MT1100A mainframe, allowing the tester to accommodate as many as four fully independent ports at all rates, including 100G. The company says this makes the MT1100A the first instrument in its category to support testing of 400G client signals currently under development.

The 25 cm touch-screen display - the claimed largest in its class - coupled with an easy and intuitive GUI simplifies operation and allow all results to be clearly seen in any environment. The GUI also supports a variety of languages other than English.

Anritsu Pty Ltd
www.anritsu.com

Digital/analog transceiver

The Icom digital/analog IC-F3103D transceiver series can receive both analog and digital mode signals on a single channel and automatically selects the received mode to reply to the received call, while the talkback timer remains.

When using the IC-F3103D series in IDAS multisite conventional mode, the IC-3103D can communicate with other IDAS radio users working with other repeater sites and/or virtual radio/PC dispatch stations on the IDAS network.

The radio stun and kill functions disable a radio over the air and the revive function restores the stunned radio. Priority scan enables monitoring of one or two priority channels while scanning other non-priority channels. The transmit channel and talkback functions enable a quick response while scanning.

Icom's IC-F3103D series can be used in an IDAS single-site trunking system. The IDAS trunking system is a distributed system (similar to the analog LTR trunking) with no control channel, so more voice traffic channels are available for increased system capacity. When used with the optional GPS speaker-microphone, HM-171GP, GPS position data can be sent to other advanced IDAS radios (PC and software required) and/or virtual radio/PC dispatch stations. The unit is ruggedly constructed to IP54 and MIL-STD-810 standards.

Icom New Zealand
www.icom.co.nz

Modulation scheme

MiMOMax M-CAM is a highly intelligent adaptive modulation scheme that works to maximise system performance by ensuring that each outstation performs at optimum throughput potential under any path condition. With in-built full duplex capabilities, up and down link throughputs are optimised individually so that each and every remote radio works at the highest possible potential at all times.

The full duplex capabilities allow modulation rates for both paths to be independent, enabling remote radios close to the base radio unit to utilise the high performance QAM256, while distant radio units may stay at QPSK. It is therefore possible to upload and download at different modulation rates simultaneously, always optimising the total system throughput under all conditions.

If a remote radio has a more substantial data payload to transfer then the radio rapidly ramps up the modulation to the maximum rate available; this can be set dynamically by the signal conditions or by the management system.

MiMOMax Wireless Ltd
www.mimomax.com

Signal generator

The Keysight N5181B 6 GHz signal generator, available to rent from TechRentals, has wider frequency coverage and greater output power than its predecessors, making it suitable for receiver and component testing, as well as R&D device applications.

Modulation options for the MXG X-Series include pulse, narrow pulse, AM, FM, phase and sweep, all with high signal purity. The unit is compatible with LAN, LXI, USB 2.0, GPIB and 1000BaseT interfaces. Features include: 9 kHz to 6 GHz; -144 to +19 dBm; fast switching; and phase noise.

TechRentals
www.techrentals.com.au

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CR017B

HF'S NEW DIRECTION

Jonathan Nally

The ACMA and the Department of Defence will collaborate on an HF system.

A fortuitous confluence of needs will see the Department of Defence and the ACMA collaborate on an HF system that will fulfil the needs of both agencies. The ACMA, the Department of Defence and the Defence Materiel Organisation (DMO) have finalised an agreement that will let the ACMA use four HF receiver sites in mainland Australia that are part of the Defence High Frequency Communications System (DHFCS).

This access will enable the ACMA to put in place a new high frequency direction finding (HFDF) and monitoring system, while closing three of its current HF receiver sites.

For decades, the ACMA and its predecessor agencies have operated a high frequency radio DF system for the purpose of locating and identifying sources of interference. Receiver stations spread across the nation are used to triangulate in on such sources, whether domestic or overseas, whereupon the regulator takes steps to resolve the issue.

The ACMA was allocated $10.5m for a new HFDF system in the 2013-14 budget, but by sharing facilities with Defence it will be able to reduce that expenditure by around $2m.

Defence is upgrading its DHFCS as part of Project Nullarbor, which will be completed by Boeing Defence Australia in late 2016.

"I welcome this historic agreement between the Department of Defence, the Defence Materiel Organisation and the ACMA," said ACMA Chairman Chris Chapman.

"At a time when we are all operating under significant financial constraints, it is an example of how the public service can innovate and do things smarter, and work across traditional boundaries to improve outcomes and reduce costs," he said.

A need for change

Faced with ageing technology and several sites that had become less than ideal, several years ago the ACMA decided it needed to undertake an upgrade process that would involve replacing equipment and possibly selecting new sites.

"We'd been conscious that we needed to do something with our HFDF for some time," said Mark Loney, the ACMA's executive manager of spectrum operations and services, who was assigned responsibility for the service in 2010. "There'd been some preliminary work done before then, but we were really getting to the point where we needed to do something. HF is a band that's actually thriving despite the fact that in some ways it's very old technology; it's still heavily in use in all sorts of things from broadcasting to military, aviation and so on."

The ACMA's extant system was 20 years old and technicians were having to scour the internet looking for spare parts. There were also issues with the sites.

"We've got one site in Birkdale in Brisbane, which is now essentially surrounded by city. Now from a strictly technical point of view, it was still acceptable for us to use as a receive site for HF, but we'd had vandalism and some other problems," said Loney. "We also weren't convinced that technically it would be a good site for the next 20 years, so we wanted to move from there."

The ACMA also has a receiver station on the Cox Peninsula near Darwin, a location which has been, and still is, used by other government agencies for radio equipment. In the 1990s it became subject to a native title claim, which is still unresolved. It's also a very difficult site to access and service, being a half-day drive from Darwin. So the ACMA decided to move. "We were originally going to move onto Defence land at the Shoal Bay receiving station. Airservices have a facility there and we were going to sublet from them," said Loney.

The third site, in Western Australia, is at Bullsbrook near RAAF Pearce. "We're actually on Defence land there. We were going to stay there, that was fine, although the curve ball that turned up with that in the last year was that the WA government is about to put a whacking great highway through it," said Loney.

"The Quoin Ridge site in Tasmania is good. It's actually between Hobart and Hobart Airport; and despite the fact there's an airport just down the hill, it's actually in a very good receiving spot," said Loney. "It meets certain ITU criteria for voice monitoring as well as DF. It's one of the few, if not the only, HF receive sites in the Southern Hemisphere that has that rating or that meets that criteria. So we always wanted to keep Quoin Ridge."

The ideal solution

"We came to the view that we needed to continue to have the DF capability and so we went and looked at ways in which we could provide or access that capability," said Loney. "The obvious one was to keep doing what we were doing, which is to have our own system. Another was to look and see if there was somebody else in Australia who could do it. And Defence were the obvious people to talk to, so we went and talked to them. What they said to us at that time, 2010-11, was no, they didn't have an HFDF capability and they had no plans to acquire one."

So the ACMA worked up a proposal to government, calling for funding to replace its DF system with a new one. "We were ultimately successful in getting that," said Loney. "We went to government and said, 'We need to have the capability, we've looked at alternatives and there don't appear to be any.' So we asked for money to do it ourselves - we got $10.5m."

That was in May 2013. The ACMA went out to market very shortly afterwards, calling for tenders for a new four-site system with receiving equipment. It was during the tender process that the agency had reason to consult with the DMO, only to realise that the DMO was in the middle of the Project Nullarbor upgrade of the DHFCS.

"When our technical guys talked with the DMO technical guys, it became obvious that they were essentially building an HF receive capability that could also be used for direction finding," said Loney.

The DHFCS has four stations - Townsville, Wagga Wagga, Darwin and Exmouth - each with separate transmit and receive sites.

Access to this network would mean the ACMA could shut down Birkdale, Cox Peninsula and Bullsbrook and not have to worry about getting new mainland sites, while retaining the Quoin Ridge site, which underwent an upgrade in late 2014. "We'd have access to four receiver sites on mainland Australia, which would actually in some cases give us better result," said Loney.

The ACMA began discussions with Defence about how all this could work and a little over a year later there was an MOU in place.

Defence is making some changes to the DHFCS to accommodate the ACMA's requirements. This will be complete in about two years, which is when the agency will shut down its mainland sites. Quoin Ridge has just been upgraded with equipment from UK company Roke. "The Roke system that we put in is a really nice piece of work. One of the things it does is give you a

Receiver equipment at Quoin Ridge, Tasmania. The ACMA's HFDF site was upgraded at the end of 2014.

great circle line of bearing back to where the interfering signal is coming from," said Loney. The advantage of the new system is that it provides the "ability to receive a signal, process it and display it in a way that assists the user".

What about Defence security considerations? "We're partitioned from them. We have no visibility to what Defence is doing," said Loney. "We can drive the receivers across the frequency range we need, which is 2-30 MHz. We can run two tasks simultaneously, and Defence has a capability to run a much larger number of tasks. We've essentially bought some capacity on their system, and they've put a 'wall' between us and what they're doing."

Complaints department

The ACMA responds to complaints from users who experience interference on their frequencies. An example is the ongoing challenge for the aviation industry posed by fishermen in Asia who buy land mobile radios, which may be front panel configurable and may have the whole band available to them, and who then go looking for quiet channels. They tend to find the aviation HF channels, which are clear most of the time. "Airservices Australia is a big customer of ours," said Loney.

The ACMA also works with its counterparts offshore; in particular, Industry Canada, Ofcom in the UK and the FCC/NTIA in the USA. "And we work with other administrations in our region, although that's less common because we're the only administration that has a real HF capability," said Loney.

"We operate on a regulator to regulator basis, so if we see a signal coming out of a particular country, we'll contact our regulatory counterpart over there," adds Loney. "Typically it'll be resolved. Regulators cooperate on these sorts of things. Most people in the HF band are well behaved because of the propagation characteristics and because HF is often used for last-resort communications."
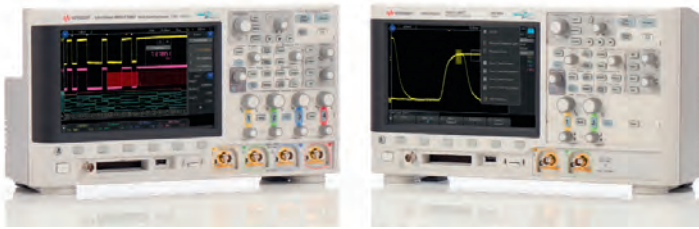
Oscilloscopes

Keysight Technologies InfiniiVision 3000T X-Series digital storage and mixed signal oscilloscopes have intuitive graphical triggering capability with capacitive touch screens and zone triggering.

The series offers upgradable bandwidths from 100 MHz to 1.0 GHz and several benchmark features in addition to the touch screen interface and graphical zone triggering capability. An uncompromised update rate of one million waveforms per second gives engineers visibility into subtle signal details. The series comes with six-instruments-in-one integration, including oscilloscope functionality, digital channels (MSO), protocol analysis capability, a digital voltmeter, a WaveGen function/arbitrary waveform generator and an 8-digit hardware counter/totaliser. Finally, the 3000T X-Series delivers correlated frequency and time domain measurements using the gated FFT function for the first time in this class, to address emerging measurement challenges.

The 3000T X-Series supports a wide range of popular and emerging serial bus applications: MIL-STD 1553 and ARINC 429, I²S, CAN/CAN-FD/CAN-Symbolic, LIN, SENT, FlexRay, RS232/422/485/UART and I²C/SPI.

The InfiniiVision 3000T X-Series includes 100, 200, 350 and 500 MHz plus 1 GHz models. The standard configuration for all models includes 4 Mpts of memory, segmented memory, advanced maths and 500 MHz passive probes.

Keysight Technologies Aust Pty Ltd
www.keysight.com

Control room solution

Motorola has launched Premium Control Room Solutions for MOTOTRBO - TRBOnet PLUS and SmartPTT PLUS - through cooperation with third-party industry experts Neocom and Elcomplus.

Developed specifically for MOTOTRBO digital two-way radio systems, TRBOnet PLUS and SmartPTT PLUS have been tested in Motorola Solutions' engineering labs to ensure seamless integration and the highest quality performance.

The solution integrates powerful voice and data communications with advanced fleet control and dispatch functionalities, helping to maximise the operational effectiveness of businesses. Through the solution, control room personnel are equipped with premium tools that allow them to organise and deliver routine tasks more efficiently, communicate better with teams in the field and make faster, sounder decisions when incidents happen. Whether sending a text message to teams carrying out road repairs or using the integrated GPS positioning module to manage a fleet of buses and trams, MOTOTRBO Control Solutions are designed to make response times more immediate, customer service more effective and operations more productive, improving business efficiency and personnel safety.

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

MISSION ACCOMPLISHED

RESTACK OF DIGITAL TV SERVICES COMPLETED

Broadcast Australia, a member of the BAI Group, has successfully completed the process of clearing digital television services within the Spectrum Restack Program from the Digital Dividend band (694-820 MHz) on behalf of the Commonwealth.

On 20 November, as the sun rose over Canberra, ABC and SBS services at Black Mountain Tower were retuned and in the afternoon all television services in Gunning changed frequency. These retunes marked the completion of the entire Restack Program and concluded the final step in clearing the spectrum for new telecommunications services as contracted by the Commonwealth to Broadcast Australia.

"This was an incredibly complex project with numerous stakeholders and very tight time frames," said Jim Hassell, Group CEO of BAI. "The original plan was for 180 sites to be retuned over three years, but it quickly expanded to 426 sites to be delivered in less than two years.

"Our world-leading team met this monumental challenge head on; I'm extraordinarily proud of them, and to have worked with the Commonwealth Government on a project of this magnitude, delivering the Restack both within budget and ahead of the official time frame," added Hassell. "I would like to acknowledge the financial and other support received from the Commonwealth along with the enormous support received from the commercial broadcast industry that made this possible."

The digital dividend

In June 2010, the government announced that a digital dividend of 126 MHz of "700 MHz" band spectrum, comprising UHF television channels 52 to 69, would be realised. Creating this digital dividend would be possible following the move to digital-only television broadcasting under the digital television switchover program (completed in December 2013).

In 2012, Broadcast Australia was appointed to be the Program Implementation Manager to plan and coordinate the implementation of the Restack. The government's 700 MHz spectrum Digital Dividend auction, which took place in May 2013, netted approximately $1.9 billion from telecommunications companies Optus Mobile and

Telstra. At this auction, the spectrum was to be made available by 1 January 2015. The Restack Program completed their clearance works six weeks prior to this deadline.

At each affected site, technicians needed to replace, retune or otherwise modify transmission equipment to enable channel changes to occur. The work undertaken equated to 346,000 hours (or 192 man years), arguably the biggest ever change in the broadcast industry in this country; put another way, it was the equivalent of delivering the 15-year DTV rollout for all broadcasters in three years.

The Restack Program of works has involved changing the frequencies of approximately 1250 national and commercial digital television channels across Australia at 373 transmission sites. These changes caused consequential input changes at a further 53 sites, bringing the total sites where work was required to 426.

Additionally, Broadcast Australia conducted safety training (to Federal Safety Commission standards), delivering Work, Health & Safety and Technical training to all workers involved in the project.

Future television

The successful conclusion of the Restack Program delivers the government's goal of freeing spectrum for use in the cellular network to provide capacity for the proliferation of data-rich mobile devices. At the same time it enhances the television experience with more channels offering greater choice and higher quality output both now with High Definition pictures and sound and for the future with technologies such as Ultra High Definition TV (also known as 4K TV).

"While the completion of this project cements our engineering and delivery expertise, at its heart this was about creating new options and opportunities for consumers from as early as next year as the cleared spectrum allows for the release of the latest telecommunications technology to support the latest communication trends," said Hassell.

Hassell noted that this is yet another success for the company which manages diverse communications infrastructure projects in the United States, Canada, Australia and Hong Kong.

Broadcast Australia
www.ba-infrastructure.com

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

Ace Communications is an Independent Two-Way Radio distributor, specialising in Motorola, Vertex, Icom, GME, Simoco, TAIT, Kenwood and Uniden. We proudly parallel import selected genuine radios and accessories, cutting out the middle men, and therefore giving our dealers the best purchase prices

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- ARCIA Member
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Po Box 3376, Victoria Point QLD, 4165
Tel: 07 3821 4111   Fax: 07 3206 0800

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EUROPE EXPANDS SATELLITE SAR WITH NEW GROUND SITES

A trio of satellite ground stations has taken shape on three islands at the far corners of Europe, ready to pick up distress calls from all across the continent and its surrounding waters.

The stations sit on Spitsbergen in the Norwegian Arctic, Maspalomas on the largest island of Spain's Canary Islands and Larnaca on the island nation of Cyprus, forming a triangle enclosing Europe. The three are coordinated and overseen from a control centre in Toulouse, France.

Each site is equipped with four antennas to detect distress calls relayed via satellites in medium-altitude orbits, so far including 14 GPS satellites, two European Galileos and one Russian Glonass.

The three stations are interlinked to operate jointly, so that all 12 antennas can track satellites together. A northern summer of testing has confirmed the heightened efficiency of this approach.

"This new search and rescue infrastructure, designed by ESA and financed by the EU as part of Galileo, is our contribution to the Cospas–Sarsat system, the world's oldest and largest satellite-aided rescue system," explains the European Space Agency's (ESA) Fermin Alvarez Lopez.

Founded by Canada, France, the USSR and the US, Cospas-Sarsat is a global satellite system for rapidly detecting distress calls to be forwarded to local search and rescue authorities. Since its inception in 1979, it has helped to rescue more than 35,000 people. Cospas-Sarsat distress beacons can be bought off the shelf, then activated by anyone in distress on land, in

Courtesy of the European Space Agency

the air or on the sea. Satellite repeaters pick up and amplify the beacon signals, then transmit them down to ground stations.

These stations identify the approximate location of the signal and then pass the information to the rescue authorities.

"Up until now, Cospas-Sarsat has relied on satellites in low and high orbits," adds Fermin.

"But medium orbits with satellites such as Galileo are better: they combine a wide field of view with strong Doppler shift, making it more likely a distress signal is pinpointed promptly and accurately."

The broad coverage also means fewer ground stations are required - just three can handle the entire European service area.

Once the stations were completed, testing began, Igor Stojkovic, ESA's search and rescue engineer explains: "We have been demonstrating the system performs as required, ahead of handing it over to its operator, part of France's CNES space agency, in December ahead of service beginning in 2016."

Distress beacons emit UHF bursts every 50 seconds. The stations are required to detect and locate all signals received to within 5 kilometres after 10 minutes.

Rental vs Purchase

TR Pty Ltd ELECTRONIC RENTALS

Why rental is more cost effective than ownership

When weighing up whether to purchase or rent, it is clear that the benefits of rental far outweigh the cost of ownership. Not only does rental save you money, but it's the smarter business option, providing you with greater flexibility and control. At the end of your rental period, simply return the equipment and upgrade to a newer version, it's that easy!

✓ Rental costs can be 100% tax deductible#
✓ Immediate replacement of faulty equipment
✓ No capex account process required

✓ Avoid obsolescence
✓ No depreciating assets
✓ Ongoing service and technical support

Keysight E5071C-260 ENA Series Network Analyser

Please see the chart below which illustrates the benefits of rental over ownership for the Keysight E5071C-260 ENA Series Network Analyser

Purchase — **$51,253**

Rental — -Tax — **$10,861**

$ 0   10,000   20,000   30,000   40,000   50,000   60,000
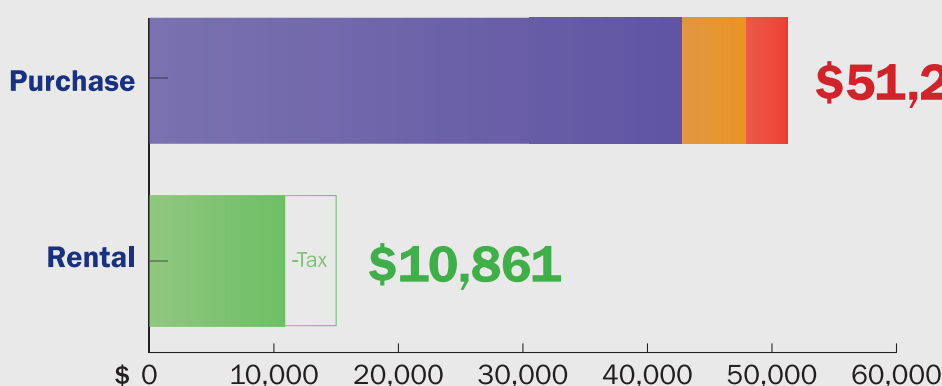
Figures displayed represent costs at the end of the first year.
All rental rates quoted are based on a 3 year period.

TR techrentals

For more info call us on 1800 632 652

Call now to receive your **FREE** TechRentals catalogue!

Legend:
- Purchase Price
- Service, Repair and Calibration (12%)
- Cost of money (8%)
- Depreciation
- Net Rental (after tax deduction of $4,655 per year)#

Rental vs Ownership for the Keysight E5071C-260 ENA Series Network Analyser

Cost of Ownership VS **Cost of Rental**

This graph illustrates the money saved when choosing rental over ownership based on a 3 year period.

Total

	Capital	Year 1	Year 2	Year 3	Cost of Ownership	Cost of Rental
Ownership	$42,711	$22,779	$22,506	$22,254	$67,539	
Rental		$10,861	$10,861	$10,861		$32,584

$
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
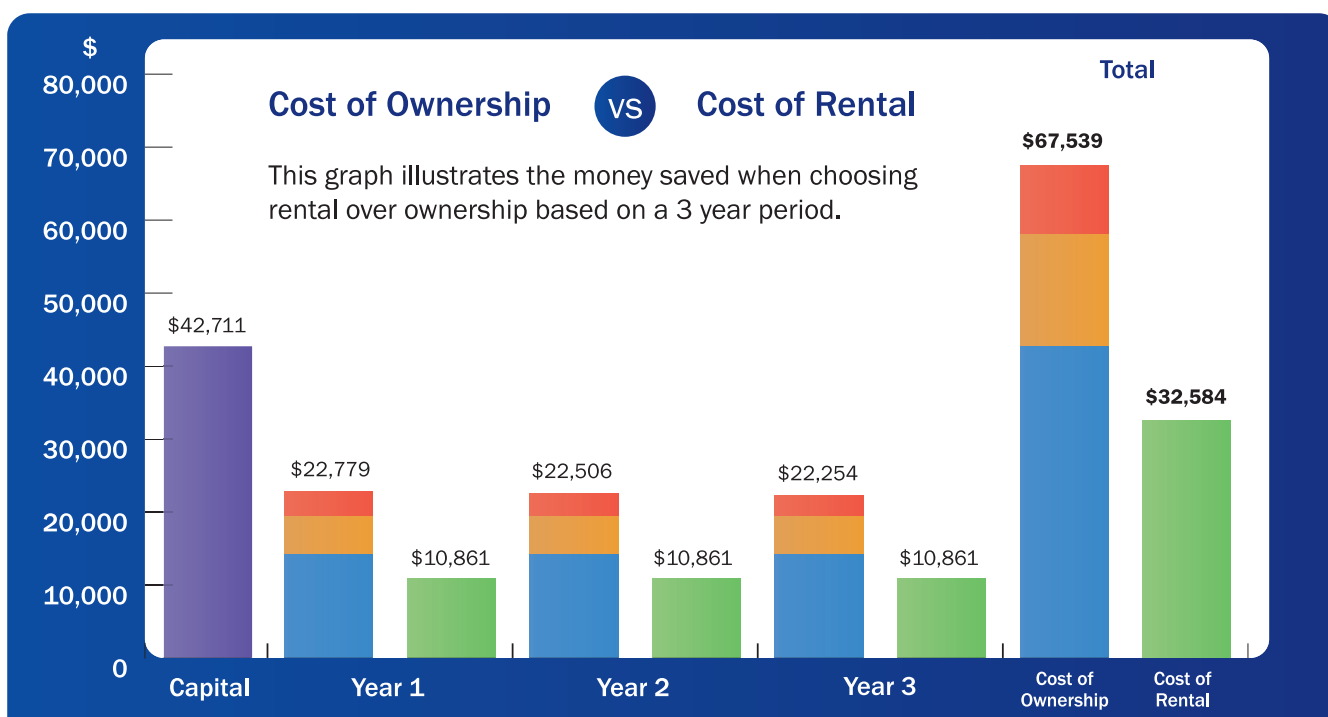
#Please ensure you obtain independent professional taxation advice. Prices shown are accurate as of date of publication and are subject to change. Terms and conditions of rental apply as shown on www.techrentals.com.au. Prices exclude GST. Figures shown have been rounded to the nearest dollar.

Industry Talking

The South Australian summer bushfires have been a stark reminder of the importance of critical communications, and it was good to see many ARCIA members participating in the firefighting effort by supporting communications networks and urgent equipment fit-outs. When you see the full logistical exercise in operation, it is a tremendous example of community spirit and determination.

Part of ARCIA's role is to ensure that reliable and timely communications is part of the picture, not only during these times of great stress but also for everyday operations in the various sectors in which our industry plays a role.

The ARCIA Economic study reinforced the very high value that public safety managers place on radio communications and, we hope, highlighted to policymakers that while broadband devices are a definite part of the future across this wide brown land of ours, land mobile radio still has an important part to play. The right mix of technologies, fit for purpose and designed to support the operational needs of the different users groups, is what ARCIA would like to see in the future.

ARCIA kicks off 2015 with a partner meeting and planning days where we set the agenda for the year and do our best to ensure that we are meeting the targets we set for ourselves. Last year the partner day was very successful and well attended, and we hope for the same level of enthusiasm in 2015. The ARCIA committee will also be calling on partners for more engagement on some projects, as we need more people to be working with us in some new and exciting initiatives.

All the major state events are already locked in, kicking off with Perth on 26 March. Make sure you get out there and support your local team. It is also very pleasing that the team from Comms Connect will be supporting regional events with seminars and workshops on the same days at the same venues. We know there is demand for more information out there, so having more horsepower to help make the events more relevant is great news.

In recent times ARCIA has also been communicating with our counterparts in the UK and NZ, the FCS and the RFUANZ respectively. We are keen to share information and ideas about our industry and I am happy to report that we have started work on vehicle installation standards and would hope to have that published by ARCIA in the near future. Although the radio markets are different, we obviously share a lot of DNA; and I certainly think we have a lot to learn from these overseas organisations.

I think that 2015 will be another very busy and challenging year but I look forward to speaking with members and partners around Australia. Our workload is increasing and we hope the initiatives we undertake are relevant to our members. If you have ideas on what we should be looking towards in the future, please talk to us and let us know. After all, ARCIA is your association.

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

Simulation software

With μWave Wizard 7.11, users can now define variables for maximum field strengths, resonant frequencies and unloaded Q factors, enabling optimisation, tuning and yield analysis on those parameters and derived quantities.

The 3D-FEM mesher has been greatly improved and now allows efficient long-term optimisation of highly complex structures and at critical areas of the model. External 2D geometry files support vertex coordinates and radii equations. This allows a much easier set-up of user-defined shapes and apertures for step discontinuities, planar and quasi-planar structures and general cavities.

Improvements of the 3D-Viewer include mouse wheel zoom, date and time stamps for mesh, field plot and 3D pattern files, port numbers in field plots, direct visualisation of FEM solution files without net list and optional triangle outline for externally loaded files. Improvements of the element library include the introduction of new quasi-planar elements for user-defined ridged waveguide, square coaxial structures and new flexibility for the 3D FEM cavity elements.

Delta Gamma Consultant
www.delta-gamma.com
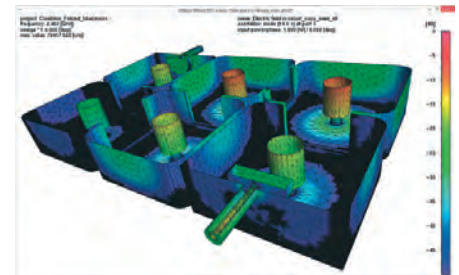
MiMo antenna

Panorama Antennas' WMM8G-7-27 is a fixed MiMo antenna for 2G, 3G and 4G networks. Capable of operating at between 700 MHz and 2.6 GHz, this tough weatherproof unit is designed for wall, mast and desk mounting.
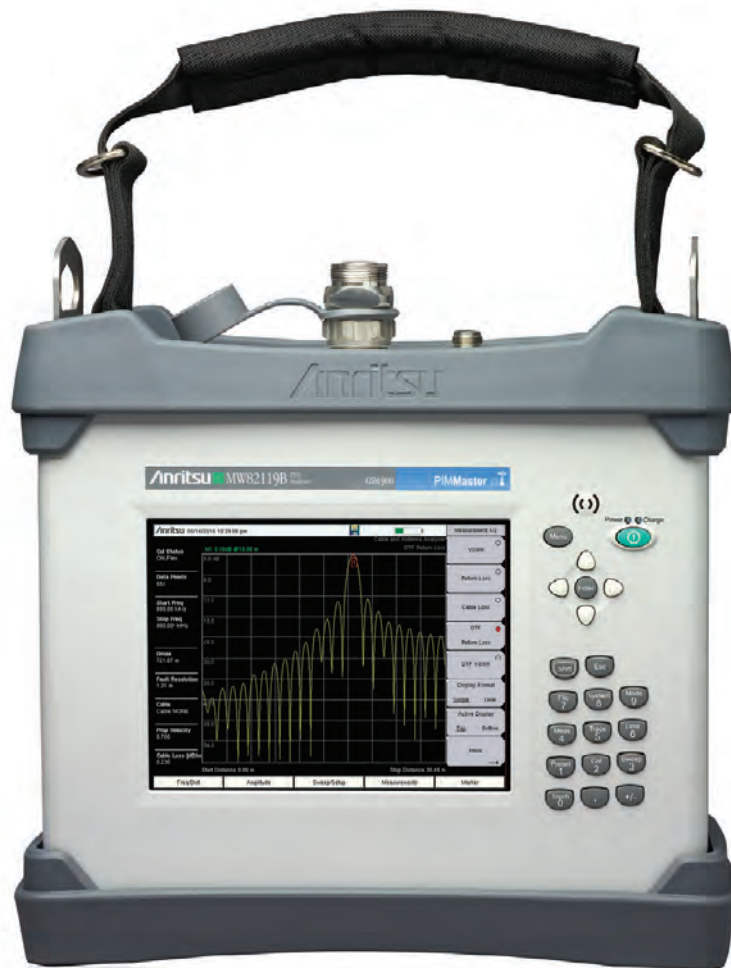
The WMM8G-7-27 is designed to give high-directional client side gain for the next generation of networks, with two separately fed wideband elements housed in a single casing. With an inconspicuous outer shell, the WMM8G-7-27 blends in with its surroundings while giving 6 dBi of peak gain at 698-960 MHz and 9 dBi at 1710-2700 MHz.

The antenna comes complete with a low-loss, double-shielded twin cable and the design minimises connector joints to simplify cable management for swift and easy installation. Also included are wall- and mast-mounting brackets to maximise the installation options for users. Suitable for optimised transmission throughout offices, homes or to anywhere a portable or isolated internet connection is valued, the WMM8G-7-27 helps assure the integrity of networks.

Panorama Antennas Australia
www.panorama-antennas.com

INCREASE COVERAGE AND CAPACITY IN HARD-TO-REACH AREAS
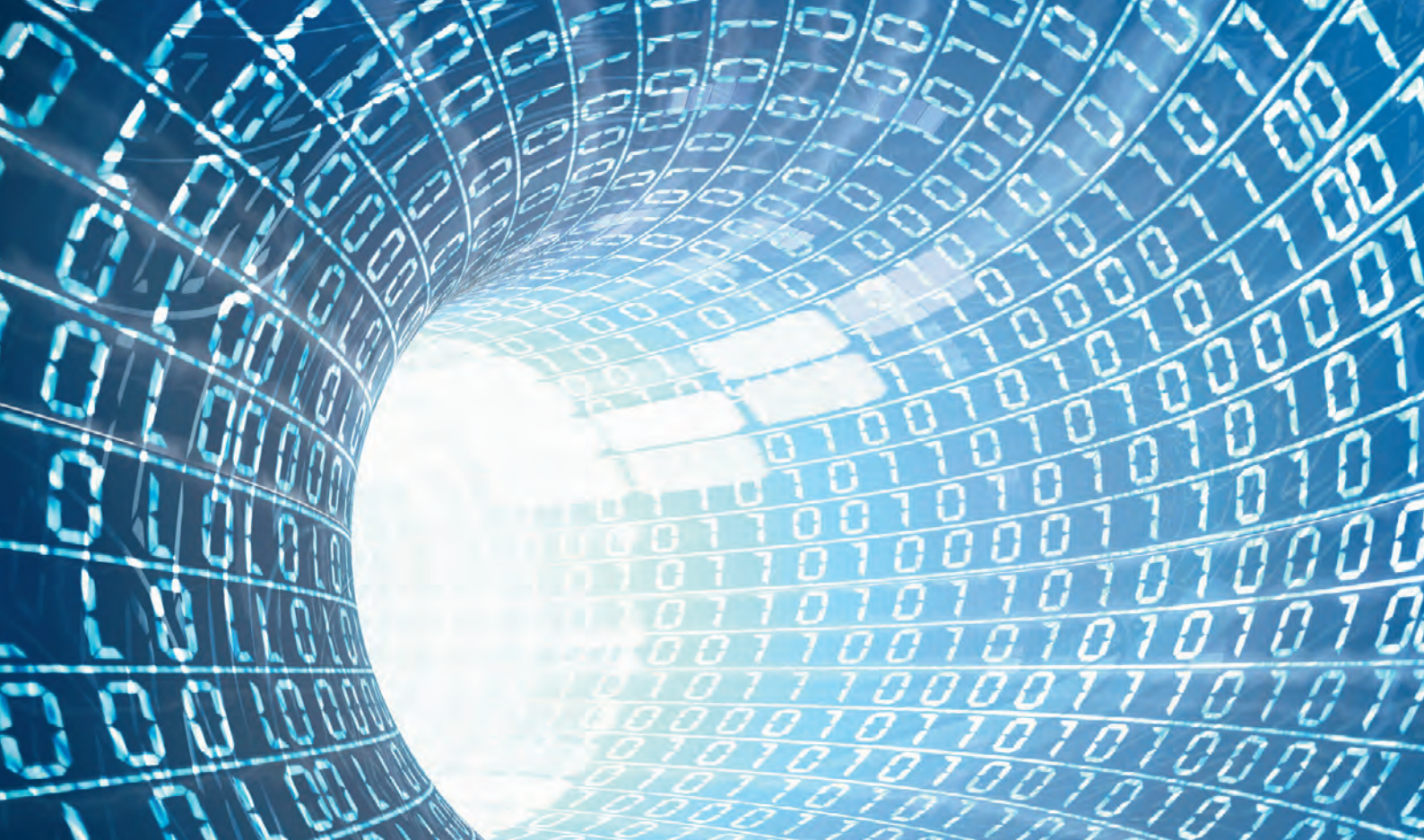
DISTRIBUTED
ARCHITECTURE

Andy Grimmett, Simoco Group

IP is the ideal technology to deliver a distributed architecture suited to mission- and business-critical radio systems.

The benefits of reliable communications are well understood by operators of business- and mission-critical radio networks: as are the consequences should those networks fail to perform. To public safety, utility, natural resources, government and transportation providers the world over, radio is a key component in ensuring that operations are safe and effective.

The distributed architecture model is well suited to the deployment of mission- and business-critical radio systems. Its key benefits of simplicity, reliability, scalability and cost-effectiveness are recognised by telecommunications users worldwide.

IP is the ideal technology to deliver these benefits. By following a set of clearly defined rules, system architects can design high-capacity, secure, resilient radio communications networks required to support mission-critical operations.

Given the significance of radio in so many working environments, it is perhaps surprising that fully IP connected radio systems are not more common. We employ IP connectivity to support our businesses every day to conduct everything from a simple telephone call through to secure financial transactions. In our private lives, personal mobile devices, utility services and even household appliances are nodes in vast IP-connected communications networks.

But often it seems, when it comes to mobile radio, the line is drawn. Voice over IP for your desk phone? Of course. Corporate LAN for email and business systems? How else? But for licensed mobile radio, some argue IP is a step too far. When considering the next evolution of radio system infrastructure, Simoco's early

thinking was influenced by the rapid advances in IP-based telecommunications networks at that time. Three key points stood out:

- The advantages of using a standard hardware platform with functionality controlled by software.
- The potential of well-designed TCP/IP networks to remove single points of failure.
- A realisation that voice over IP was rapidly replacing fixed-line circuits.

When combined, these elements - already in everyday use in other systems - were ideal for intersite radio links.

IP networks: is there a downside?

Is it the internet? While the communications technology and protocols used are the same, a private IP network for radio communications systems differs from those of the internet. The main distinction being that the devices on a private IP network are visible only to each other, while all devices on the internet are potentially visible to each other.

What about reliability? We use IP networks, directly or indirectly, for most of our voice and data communications. The flow control mechanism inherent within TCP/IP ensures the reliable flow of data and manages its movement between devices, as well as monitoring and dynamically aligning transmission and reception to ensure effective transfer.

Is voice quality affected? Within IP networks all traffic is data - voice is simply divided into packets for transmission in the same way as all other information. Bandwidth, however, is an important

Radio systems are designed to be frequency efficient, with regulators around the world keen to see channel bandwidths reduce with the advent on new TDMA technologies such as DMR and P25 Phase II. As a result, radio systems are a narrow bandwidth proposition compared with most IP networks, which are designed to deliver high bandwidth data. It is important that the IP backbone is designed to support the requirements of the radio system but contention within the IP network is rarely an issue.

Arguments

Switch-based architecture is a logical concept that employs a central switching unit to manage the interconnections between two or more nodes (see Figure 1).

When applied to multisite radio systems, a node is a radio site generally comprising a series of base stations with a site controller exchanging control data with a central switch. The site controller brings its base stations into calls as needed and, where intersite calling is required, each base station has a dedicated landline for call audio. The central switch is then responsible for routing call audio to dispatching, telephone extensions or other sites.

There are several drawbacks to this architecture:

1. The central switch is vital - if it stops working then no intersite calls can take place. It is possible to double-up by adding a second, redundant switch at each central node but this also doubles the cost. In addition, some means of automatically managing the changeover between switches is required.

2. Complex radio site equipment is required to interface base stations with the site controller and audio connections. This series of discrete units is costly and setup requires a high degree of technical expertise. Furthermore, a greater number of separate components increases the size and cost of the spares holding.

3. Having a dedicated landline for each base station means providing a lot of resource just in case it is needed (see Figure 2).

Linking sites with IP

As IP-based telecommunications networks became more prevalent, it was not always possible to get fixed telecommunications circuits at all sites. An alternative was available in the form of IP-based circuits and some manufacturers took advantage of this by introducing IP-to-serial/analog converters that allowed current radio infrastructures to utilise IP-based intersite links.

Figure 3 shows how some of the links between radio sites started to be provided by IP backhaul rather than dedicated leased lines. While this began to move radio systems onto IP networks, it had the disadvantages of the additional cost of converter hardware and, more significantly, it retains all of the disadvantages of switched-based architecture.

The distributed radio system architecture employed by Simoco emerged from a critical review of the switch-based system and the desire to incorporate advances in IP-based telecommunications into its radio infrastructure products.
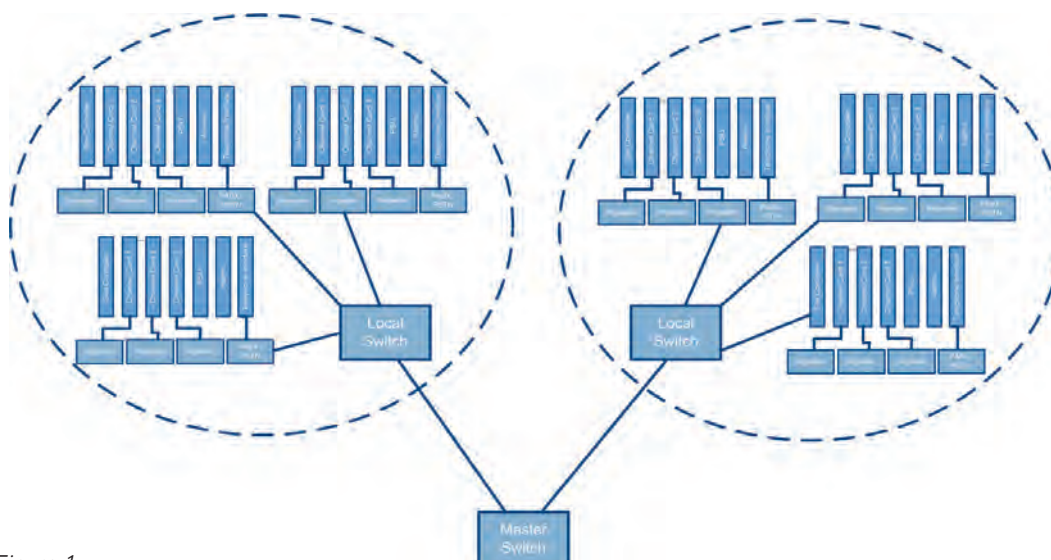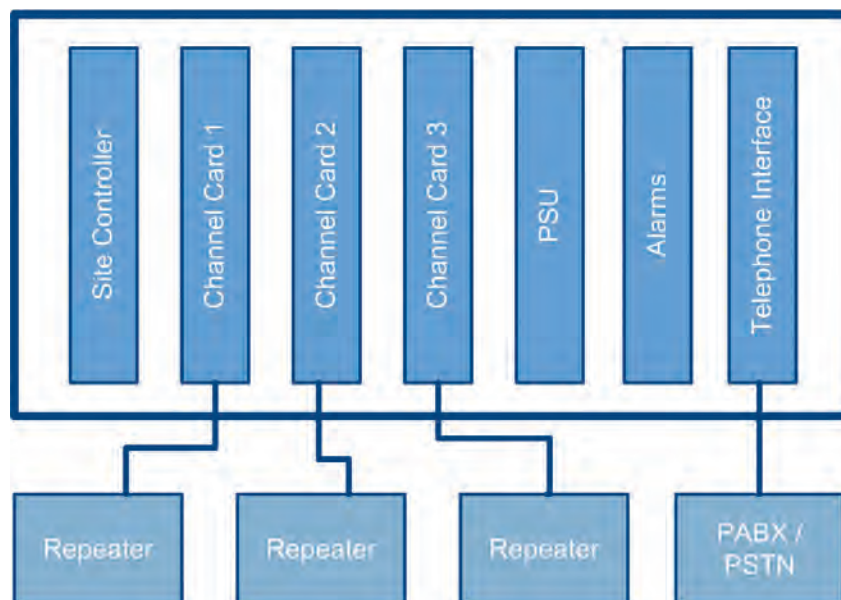
factor, and therefore there is a trade-off between data compression to reduce the bandwidth required and maintaining voice quality.

The good news though is that the digital nature of IP networks means that there is no scope for the network to introduce noise, no requirement to adjust line levels or match impedances. Therefore, the data compression can be controlled to suit the needs of the customer and voice quality remains consistent regardless of the physical backbone and geographical distances. It reaches its destination through IP addressing, no matter where on the network that address is.

The use of IP enables voice quality to be maintained consistently across the network whereas other backhaul technologies can introduce voice degradation and can require complex engineering to set up and maintain.

What about security and contention?

While no network can be 100% secure, with the requirements driven through the widespread adoption of IP networks in industries such as finance, public safety and government security, IP networks are the most secure backbones available today when implemented with the necessary features.

Any private network should include a correctly implemented and maintained security policy. Router security features should be employed at all sub-net boundaries, where parts of the network are shared with public Generic Routing Encapsulation (GRE) tunnels that can be employed. When remote access is required, a secure VPN can be used.

Figure 1.

Figure 2.

Figure 3.

Figure 4.

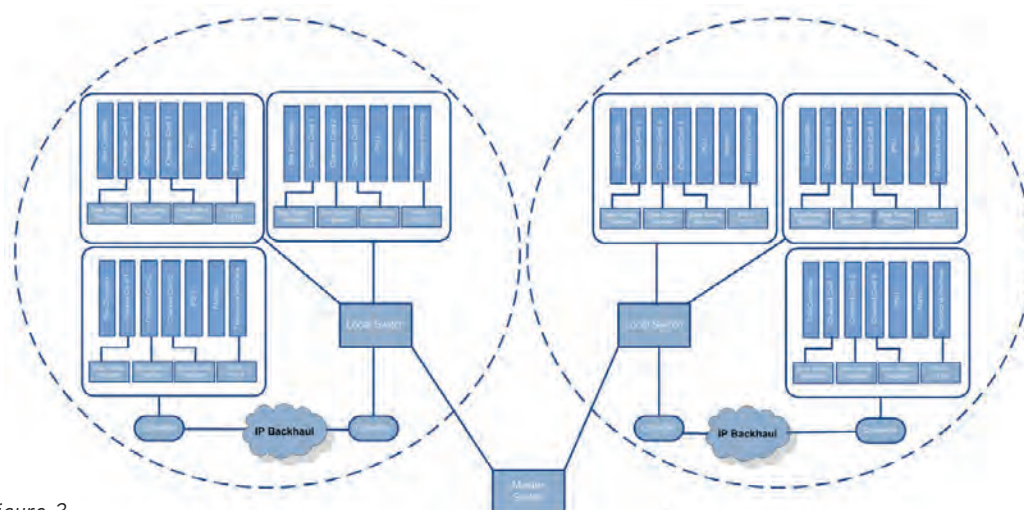IP-CONNECTED TELECOMMUNICATIONS NETWORKS ARE BECOMING COMMON IN ALL SECTORS AND TODAY'S RADIO STANDARDS ARE WELL POSITIONED TO EXPLOIT THEM.
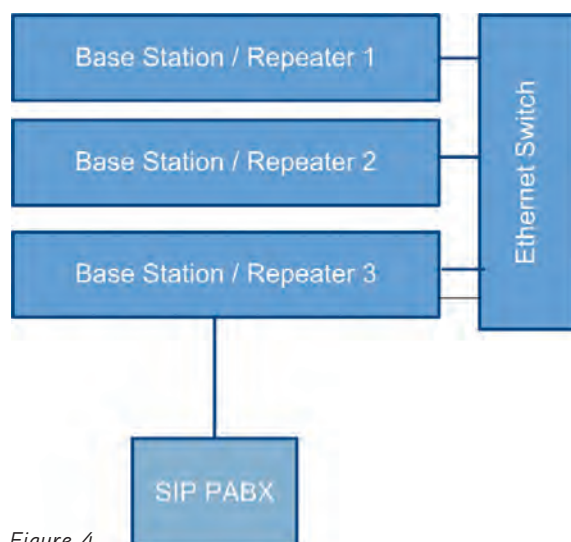
Before the benefits of the architecture itself can be realised, it is first necessary to develop equipment capable of operating on IP-based networks.

- Commonly available processors have sufficient capacity to take on the central switch function and come at a low enough cost to enable them to be used on every base station.
- Digital signal processing (DSP) techniques replaced custom integrated circuits, lowering costs and ensuring that current and future signalling techniques could be supported. This also enabled single PCBs to be designed that were capable of combining the functionality found in the site controller, channel card, alarms card and telephony card into a single repeater.
- Software configurable input/output, for integration with other site equipment, was introduced and industry standard VoIP and telephony protocols were adopted to enable an all-IP intelligent base station to provide all the functions of the previous generation of switch-based systems. When combined with radiofrequency modules, this produces a highly flexible hardware platform that can be configured to meet the needs of a large number of radio system users.

The integration of all of these functions into a single unit results in a base station that has all the capabilities of site controller within it (see Figure 4). Since all units are identical then any of them can manage the radio site and this greatly reduces the risk to the system should any unit fail. When this is deployed within a well-designed IP network that has the necessary bandwidth, quality of service and switching capacity to support mission-critical communications, it results in a fully distributed architecture and extremely resilient.

The resulting system has several key advantages:

- No single point of failure. Central switch functionality has been migrated from hardware to software. This 'virtual switch' can reside on any base station. Should the unit acting as the switch fail, then the remaining base stations arbitrate and one becomes the new virtual switch assuming control of the system.
- Simplification of site equipment. Each base station is identical. Site controller, channel controller, telephone interconnection, alarm generator and radio base station are all contained within the same unit. Spare equipment holding is lowered and sophisticated management software reduces complication and staff training requirements. Ethernet connectivity and IP addressing greatly enhance functionality and enable the unit to operate on IP networks.

- Voice over IP makes effective use of IP backhaul, not only enabling audio packets to be automatically routed around any issues within the backhaul network, but also enabling sites and management applications to interface at any point on the IP network (Figure 5).

Radio technologies

Whatever the merits of dedicated telecommunications links were a decade ago, they have now been overtaken by advances in the design and availability of IP-based networks. The result is IP backhaul networks which provide higher bandwidth and more resilience but at a lower cost.

IP-connected telecommunications networks are becoming common in all sectors and today's radio standards are well positioned to exploit them. APCO P25, Tetra, NXDN and DMR are all able to employ IP networks for interconnection. These open standards, each with their common air interface, are the core communications technologies for many of the world's mission- and business-critical radio systems.

Manufacturers moving away from the conventional switch-based model can exploit the principles of distributed architecture and produce reliable radio systems that deliver greater benefits than digital radio alone.

By adopting a distributed architecture for IP-connected radio systems approach it is possible to realise the following benefits:

Simplicity. A single intelligent base station that replaces a number of discreet system components significantly reduces the complexity of the system, making it easier to deploy and maintain.

Scalability. The protocols and hardware used in IP networks enable them to be scaled up to meet changes in system requirements. This is matched by a distributed radio system architecture which, due to its switchless design, is able to be ultimately scalable.

Resilience. Good system design combined with the inherent reliability of IP and the right equipment enables the deployment of robust, fault-tolerant networks without the need to duplicate high-cost hardware equipment.

Open standards. Use of IP connectivity means the same principles apply anywhere in the world and system architects are free to choose whatever vendor equipment they wish to develop a distributed architecture radio system.

Security. By applying IP security at the boundaries of radio system sub-nets, implementing network security policies and maintaining control over remote access is made easier and more
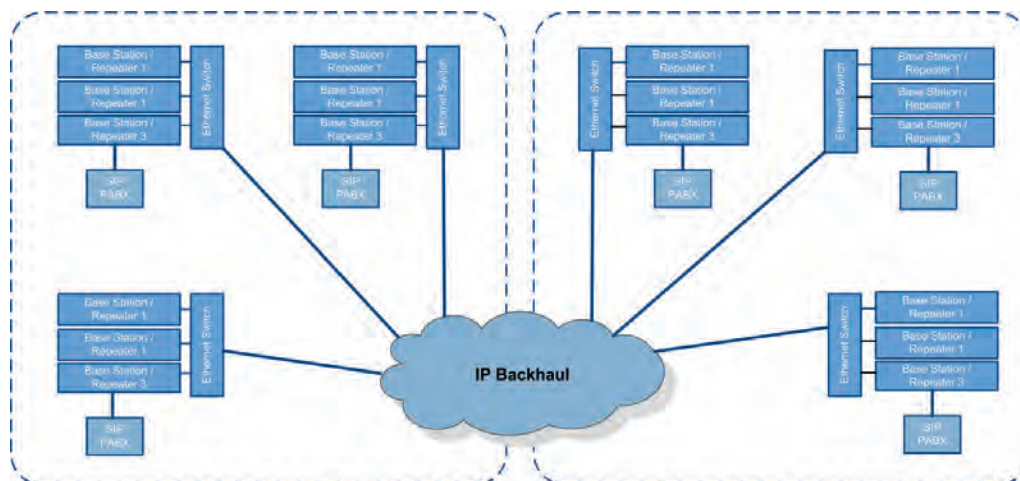
Figure 5.

effective. The security of an IP-based radio network can be equal to or, it might be argued, greater than those deployed using discreet telecommunications circuits.

Management. Use of a single protocol throughout the system architecture for both core process and radio system operation enables control data, voice traffic and statistical data to share the same network. One notable point is that IP networks allow rapid and reliable software updates, meaning that new features can be introduced without service visits.

Cost. Global adoption of IP networks and the transition of central switching from dedicated hardware unit to software functions have driven down the cost of deploying and maintaining a distributed architecture radio system.

Having all of the above elements combined into a robust, high-availability communications system gives radio users peace of mind, allowing them to focus on their operational tasks without worrying about their radio system.

Conclusion

Creating a true distributed architecture radio system involves more than simply linking sites with IP. To be able to take full advantage of its properties requires the use of generic and identical system components resulting in radio systems that are simpler and significantly more resilient than their switch-based predecessors while at the same time holding down cost.

A genuinely distributed radio system has no central component(s) and therefore failure of any piece of equipment within the network will result in the overall system continuing to operate seamlessly. The emergence of IP backhaul has enabled this change in approach to happen and is the perfect vehicle to provide secure and reliable interconnections to radio sites.

Simoco Australasia Pty Ltd
www.simocogroup.com

Surge protector

The Novaris SL1-CAT6 surge protector is designed to provide the highest levels of protection for shielded twisted pair (STP) and unshielded twisted pair (UTP). The unit offers the same level of protection as the company's older models but with the ability to have one device used for three applications.

The SL1-CAT6 is designed for protection of and to be fully compatible with 10/100, Gigabit, PoE, 802.3 at high power profile and non-standard powered applications such as high power PoE, Ultra PoE, PTZ+ etc, with up to 1 A per two pairs for a total of 100+ W applications utilising all pairs for power.

Flying lead and DIN rail options come standard; EC90 option for field end STP installations must be ordered as an extra. The curved design with adaptable base slot enables ease of mounting in any application. The unit is also available in 19″ rack 2RU 8-, 16- and 24-way, SL8-CAT6, SL16-CAT6 and SL24-CAT6.

Novaris Pty Ltd

www.novaris.com.au

Circuit software

Altium has announced a partnership with element14 to distribute CircuitStudio, an easy-to-use PCB design tool based on Altium technology.

The product will provide users with an interface that will make it easy for the user to get up to speed and, at the same time, deliver functionality powerful enough for professional use. The benefits for the users will be based on straightforward schematic capture and project management tools as well as a powerful PCB design engine that supports 3D PCB editing. The tool is suitable for professional design engineers who demand a simple yet powerful EDA tool with the features and functionalities to complete a complex PCB design.

Altium Limited

www.altium.com

Desktop controller

The Zetron Model 390 is a desktop controller designed to work with the Motorola MTM700, MTM800, MTM800e and MTM5400 TETRA radios and is suitable for use in public or private systems.

The radio can be placed up to 600 m away from the controller and up to 15 controllers can be connected to one radio. This enables the radio to be placed in the best coverage area, away from computers and other equipment that could be disturbed by the radiation of the radio or could interfere with the reception of the radio.

The Model 390 is suited to radio operator dispatchers and where office personnel need access to a radio system without wanting to have a radio placed into the office environment.

Each unit has an individual rotary volume control, a numeric keypad and function buttons. The keypad is designed to provide fast access to all vital information. The function buttons mimic the radio, making the operation simple and intuitive for any operator familiar with the TETRA radios. LED button indicators show which functions are activated and the presence of incoming messages in the stack.

Typical information displayed includes operating mode, current call information, alarm symbols, status and data information, speed call names and received signal strength from the radio system.

The handset includes a PTT press bar and a single PTT key to activate the transmit on the radio. A separate built-in speaker and microphone allow hands-free operation. Hands-free intercom between all controllers is possible in a multiple controller system. Up to 15 parallel controllers share one radio.

Zetron Australasia
www.zetron.com

Data radios

Schneider Electric has launched the Trio Q data radios, advanced high-speed licensed digital data radios that provide both Ethernet and serial communications for the most complex and demanding applications in point-to-point and point-to-multipoint (multiple address radio) telemetry and remote SCADA systems.

The Trio Q data radios suit a wide variety of applications such as water and wastewater, oil and gas, and electrical utilities. They provide a transparent data pipeline between multiple physical sites (control centre, remote pumping station, etc), providing reliable transportation of most serial and Ethernet SCADA data protocols including MODBUS and DNP. Using private licensed spectrum ensures the user has total ownership and control of the data radio network.

Trio Q data radios are often deployed in challenging critical infrastructure data communications where: there are long distances to cover (up to 50 km); public communications (such as cellular) are too expensive, unreliable or unavailable; redundant communications technologies are mandatory; operation in licensed UHF spectrum is required; and data throughput of up to 56 Kbps is adequate.

Schneider Electric Pty Ltd
www.schneider-electric.com

Headset

The 3M Peltor ComTac XPI headset is specifically designed for military personnel to help reduce exposure to hazardous levels of noise, improve situational awareness and at the same time enable two-way radio communication in noisy environments. This product is compatible with other military gear like helmets and protective vests.

The ComTac XPI is a fully independent dual earphone system for talk through and external radio signal. It is designed to be worn comfortably under a helmet, be used with different kinds of weapons without being in the way, and at the same time protect effectively against harmful noise levels. The headset can be modified depending on the user's application.

Bone conduction or flexible boom microphones may be added. The system can be standard- or NATO-wired and the option of olive green or black cups is available. As well as the standard folding headband design, the ComTac XPI also comes in a neckband and helmet-attached rail system design.

3M Personal Safety

www.3M.com/au

TETRA radio asset manager

GMG's DAAM TETRA radio asset manager (RAM) enables a fleet of radios to be dynamically assigned when a radio terminal is used as a shared resource, thereby substantially lowering the number of radios a company would need to keep in the asset pool. Radio users are assigned a dedicated 'user number' so that monitoring who is talking or contacting this individual user becomes easy. The user number also becomes the TETRA phone number, a unique number depicting that user.

BEA's anti-aliasing protocols enable radio users to perform the following tasks: Log In, which has the effect, if successful, of associating the terminal with the user; Log Out, which has the effect, if successful, of disassociating the terminal with the user currently associated with it; and DGNA, whereby the successful login can associate the user with a predefined talk group list. This list can be dynamically allocated to the user's terminal number in Dynamic Group Number Assignment.

The user will receive responses from the above actions to indicate success or failure. The reassignment of terminals to the user is indicated by the user number and user name reference appearing or removed from the terminal screen accordingly. The reassignment of a terminal will also apply a specific name and user profile in the network subscriber database. Subscriber profiles contain a list of features and functions each user has on the TETRA network. Management can now assign specific profiles to users that get applied to the radio terminal they are using.

Profiles include (but are not limited to): access list of talk groups; access list of sites (geographic); access to make or receive individual call services; access to make or receive telephone call services; access to SDS messaging services; priority level controls (low, medium, high, pre-emptive); and access to Packet Data services.

GMG Solutions

www.gmgsolutions.com.au

UHF two-way radio

At 110g, Kenwood's 5″ PKT-23 Protalk UHF palm-sized two-way radio provides up to 1.5 W transmit power across 4 channels in the 440-480 MHz range and allows up to 15 h of operation. Specially designed for those who want a compact way to communicate, this small but powerful radio is simple to operate and durable, meeting or exceeding MIL-Spec standards 810 C/D/E/F/G (11 items) and IP54 (dust/water intrusion).

With ultrafast charging, the PKT-23 can be ready to go in 3 h when connected to a standard micro USB charge port or the included charging cup. Users also have the freedom to choose between the built-in speaker or the 3.5 mm audio jack for more private communications.

This PKT-23 Protalk is built for restaurants, hospitality, retails stores, warehousing and other such operators who want reliable discrete radio communications without sacrificing features. The radio comes with VOX, radio cloning for fast easy programming, voice announcement, bell tone alert, 2 PF keys and LED battery status indicator.

JVC KENWOOD Australia Pty Ltd

www.kenwood.com.au

Bluetooth Test Set with v4.2 BLE Data Length Extension

Anritsu is introducing an option for its MT8852B Bluetooth Test Set that supports the Data Length Extension associated with Bluetooth Low Energy (BLE) as part of the latest Bluetooth Core Specification version 4.2.

With this option fitted, designers and manufacturers of Bluetooth Smart and Bluetooth Smart Ready devices will be able to use the MT8852B test set to conduct radio layer tests in full compliance with the newly adopted Bluetooth 4.2 standard to improve product throughput and speed time to market.

The measurement option has been specifically developed to support the extension of the data packet length in BLE from 37 to 255 octets. The test cases in the Data Length Extension option can be run as part of a test script to simplify the development of test programs and reduce test times. For example, the MT8852B will complete a test script implementing Bluetooth Basic Rate, Enhanced Data Rate (EDR) and BLE measurements in under 15 s by pressing one key or sending a single remote command, greatly simplifying production test programs.

The MT8852B BLE Data Length Extension option will be available from mid-February, 2015.

Anritsu Pty Ltd
www.anritsu.com

USB-powered PC oscilloscopes

PicoScope 3000D MSO Series USB-powered PC oscilloscopes are small, light and portable. The devices can easily slip into a laptop bag while offering a range of high-performance specifications.

The oscilloscopes offer two or four analog channels, plus 16 digital channels and a built-in function/arbitrary waveform generator. Key performance specifications include: 200 MHz analog bandwidth; 1 GS/s real-time sampling; 512 MS buffer memory; 100,000 waveforms/s; 16-channel logic analyser; USB 3.0 connected and powered; serial decoding and mask testing.

Supported by the PicoScope 6 software, the devices offer a suitable package for many applications, including embedded systems design, research, test, education, service and repair.

element14
au.element14.com

VIRTUAL
VIDEO

The NSW RFS has implemented a virtual video collaboration system to connect staff and members across the state.

The NSW Rural Fire Service (NSW RFS) has selected the Polycom RealPresence One video collaboration solution to enable seamless, real-time communication between 900 staff across the state and thousands of volunteer members.

The subscription-based video solution provides uninterrupted communication in life-critical situations, enabling the NSW RFS to make faster decisions in planning and emergency situations and drive increased preparedness around disaster recovery.

The deployment has also brought significant reductions in travel time and cost, helping the volunteer organisation save tens of thousands of dollars in transport allowances and accommodation.

The NSW RFS is the world's largest volunteer fire service, responsible for 95% of the 800,000 km² of the state's fire and emergency services. Headquartered in Lidcombe, it has 87 offices and more than 70,000 members, including volunteers, firefighters, operational and managerial staff, located across NSW.

As an existing Polycom customer, the NSW RFS previously used traditional, hardware-based video solutions to communicate and collaborate across the state. To further enhance these solutions, the decision was made to take advantage of the flexibility and scalability of the virtualised Polycom RealPresence One solution.

Polycom RealPresence One is a comprehensive offering that combines the complete Polycom RealPresence Platform on a subscription-based model.

"We were attracted to the Polycom RealPresence One solution because of its scalability, high availability and redundancy. Given the highly critical nature of our organisation and what we do, we need to have 100% uptime, 24/7. If the system goes down, people could be stranded and lives could be at risk," said Ashley Van Amstel, manager, IT, at the NSW RFS.

"The virtual nature of the solution increases agility and resilience,

providing us with better disaster recovery and easier backups for business continuity in the instance something was to go wrong. This provides us with the assurance that we will always have real-time visual communications between our teams, no matter what emergency situation that we face."

The introduction of the virtual solution has enabled the NSW RFS to extend its video capabilities to mobile devices, such as tablets and smartphones, significantly increasing the organisation's ability to offer video to its entire member base.

Further, the availability of 'bursting packages' enables the NSW RFS to easily scale up their number of licences as required, particularly during emergency situations when more people require video capability.

The interoperability of the solution means the NSW RFS can seamlessly interact with other emergency services who may have different unified communication solutions, such as the SES and NSW Fire.

In addition to emergency planning and response, the NSW RFS actively uses video to provide members with training. Instead of travelling to headquarters in Lidcombe, members can remain out in the field, ready to take action if needed in the event of an emergency.

Polycom Global Pty Ltd
www.polycom.com.au

Analog testers

The Rohde & Schwarz CTH100A/CTH200A handheld analog testers are versatile tools for the verification of analog FM radios. Designed for outdoor usage and rough treatment, the models ensure reliable maintenance and verification of FM radios in the field.

These units are simple to use - simply connect the radio and start the receiver and transmitter measurements. Power measurements and frequency counts provide information of the radio's transmitter and the antenna, while a sub-audio squelch tone is generated as well as an audio tone to verify the radio receiver. High accuracy and repeatability of the measurements ensure high-quality service and maintenance of all kinds of analog FM radios.

The instrument is ruggedised and performs according to the MIL-STD 28800F. A backlit display informs about selected measurements, results and device status. The backlight can be adjusted in several steps for convenient operation and measurement reading. With a weight of around 500 g and its small dimensions, it fits easily into pockets and backpacks, which is important for those involved with in-field service and verification.

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

Ethernet switches

Available in Fast Ethernet and gigabit versions, the IE200 series Industrial Ethernet switches are suitable for applications in challenging environmental conditions such as elevator engine rooms and external or harsh environments.

The series meets the high reliability requirements demanded by industrial applications such as IP video surveillance, intelligent transport systems and building management integration for both indoor and outdoor use. The switches have been developed to support a broad range of critical infrastructure applications and environments where a highly reliable, feature-rich solution is required.

The series is available in 6- or 12-port models, with or without Power over Ethernet Plus (PoE+) support, and includes a broad range of features and functionality. Both models are DIN rail mounted, resulting in reduced space and mounting complexity when compared to a standard rack.

As many new applications today are IPv6 ready, and with the number of connected devices expected to increase, the IE200 series will feature native IPv6 support, in a future release of firmware, to ensure support for the largest number of devices across a broad range of applications.

Along with support for more traditional features such as port-based VLANs, IEEE 802.1p QoS, 802.1x port security, link aggregation and port mirroring, the series also supports innovative features such as Ethernet Protection Switched Ring (EPSRing) and Allied Telesis Management Framework. EPSRing provides greater ring resilience in comparison to traditional technologies, ensuring network functionality is restored in the event of failure with negligible impact on users or applications.

Allied Telesis International (Aust) Pty Ltd
www.alliedtelesis.com.au

Mobile access controller

NEC is releasing its next-generation Mobile Access Controller (MAC) communications product to provide enhanced connectivity at more affordable prices.

The NEC MAC solution enables organisations to comply with health and safety obligations and increase business efficiency by aggregating all available (eg, P25, MPT, 4G/LTE) communications bearers into a single, simple and easy-to-use in-vehicle user interface. This, coupled with integrated AVL technology, enables organisations to always be contactable by their employees and vice versa, leading to significant decreases in field-based safety issues. The next-gen MAC lowers total cost of ownership through a more compact and rugged platform which is quicker and simpler to install and configure.

NEC Australia
www.nec.com.au
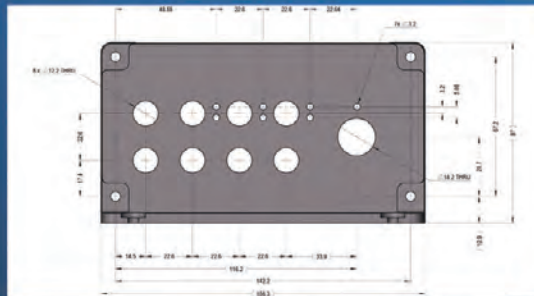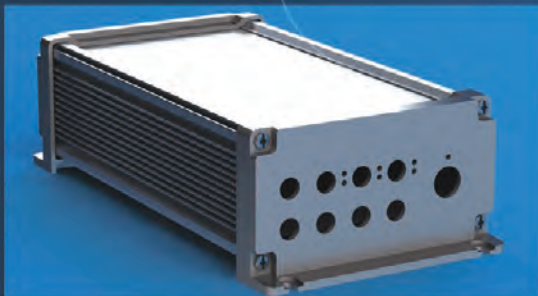
CLEARWAY
LANES' BROADBAND AIMS

Jonathan Nally

Telstra and Motorola have joined forces to promote an enhanced version of LANES'.

Globally, there is an aspiration by public safety and security agencies to arrange the provision of a mobile broadband capability, with different endeavours underway in the USA, the United Kingdom and elsewhere in the world. In Australia, Telstra has demonstrated how a carrier could potentially provide a public safety mobile broadband capability, via a technology that it calls LANES - the LTE Advanced Network for Emergency Services.

The federal government has announced that the Productivity Commission will be undertaking a business case review of a public safety broadband capability, and there are various options available for its consideration. LANES is one of them. It harnesses Telstra's extensive carrier assets by providing a capability for a dedicated 'lane', solely and exclusively for the police and emergency services. But at the same time, if congestion occurs on that dedicated PPDR (Public Protection and Disaster Relief) spectrum, LANES has the capacity to scale up and get priority on the commercial spectrum allocation available on the Telstra mobile network.

Last November, during the G20 meetings in Brisbane, Telstra demonstrated the capability in what it said was a world first.

"We wanted to demonstrate how a carrier capability could provide mobile broadband for emergency services, and for the purposes of the demonstration we used our own 900 MHz spectrum," said Telstra National General Manager, Government and Public Safety and Security Alex Stefan. "We set up the capability for the G20 and we made it available to the Queensland Police Service for that event. The QPS has extensively deployed iPads and other mobile technology into the field to access their crime reporting system and other services. We made available a number of devices that had access to the LANES capability."

Stefan says LANES embraces the best of the various endeavours that are appearing globally. In North America, there has been a dedicated PPDR spectrum allocation for FirstNet; LANES makes a similar provision by having a dedicated lane within the carrier's network.

"In the event that a dedicated PPDR mobile broadband spectrum allocation is provided [in Australia], for the purposes of LANES we've simulated that using our own 900 MHz spectrum," said Stefan. "And at the same time it embraces some of the best elements of the UK model, which is utilising carrier infrastructure and capabilities to enable that service.

"And as part of that, of course, in Australia we've taken the unique decision that if the dedicated PPDR spectrum itself becomes exhausted, we've demonstrated how it can utilise carrier spectrum capabilities to augment the operational needs of the police and emergency services," added Stefan.

In some ways, LANES can be said to operate on a similar basis to the priority system for voice calls. "These services already exist on the voice dimension on our network," said Stefan. "Triple Zero gets priority, followed by the Wireless Prioritisation System Service. That service was enabled on the Telstra mobile network in the post-London bombing environment, so that authorised govern-

Image: Paul Cunningham/Flickr/CC 2.0

"What Motorola has added and what we call Enhanced LANES offers a level of dynamic prioritisation that takes it down to a really fine and granular level, down to a user and/or an application level as well," said Motorola Solutions, Australia and New Zealand Managing Director, ANZ Steve Crutchfield.

"So you can imagine during an extreme incident when things get extraordinarily busy, some agencies are looking for that extra level of granularity around prioritisation down to a specific user or group of users or a specific application they may require to be absolutely available during those highly critical, peak incidents that have very specific requirements. And that's a level of prioritisation that we bring by working very closely with Telstra from a technology integration standpoint."

Ultimately, said Crutchfield, it's the customer's choice as to who gets what priority when. "That's essentially what they're paying for," he added. "If they're managing an incident and they say, 'No, it's only this team of 10 people who need access at this time using this particular application', that will be entirely their choice. The customer will have complete control over managing those specific needs."

The changing nature of comms

The world of communications is seeing a proliferation of different devices, with more tablet and smartphone devices being used for everyday requirements in the emergency services sector.

"Importantly, I think what we're seeing in the marketplace right now is a real need to have the right device in the hands of the right person so that they receive the best information needed to manage their specific role," said Crutchfield. "Clearly for operational police, voice will continue to be the default way to communicate for many years into the future, and for these users it's probably going to be a P25 voice radio.

"However, for the occasional user or someone who needs to plug in during an incident, they may do that from their smartphone and over a broadband environment integrated into that P25 environment, which is a capability that we can offer today," he added.

Initially, most of the applications that will be running over the broadband environment will be data-based applications, whether that's video or other information that requires them to consume information in different ways. Over time, voice will become much more predominant in the broadband environment. "As we go through that transition over the next 5-10 years, the interoperability between the two environments will be key, and we have very strong domain knowledge in both areas so the ability to offer them interoperability is a significant capability we can bring to bear today," said Crutchfield.

Could the Enhanced LANES concept be used beyond the PPDR sector? "In the initial formation of Enhanced LANES, we were very focused on the emergency services space. But clearly there is real opportunity outside of that for commercial sectors," said Crutchfield.

"We talk about mission-critical communications often in the context of emergency services, but communications in an environment such as an oil refinery, or an LNG plant, or a mine, are just as critical," he

ment officials have pre-emption for voice calling on the network. So in essence we're taking a model that already exists on the voice dimension, and applying it for the first time to the data domain.

"I think police and emergency services have embraced mobile broadband since its inception in 2006," added Stefan. "If you look at ambulance officers, they've been able to utilise the service for capture of patient information; the fire services have been using it for real-time video streaming from fire fronts; and police have been using it for real-time crime capture.

"My observation is that they've been embracing these services for a number of years, and they're now looking at greater surety of service during times of major incidents or events," said Stefan. "So I believe that in fact, Australia, and the police and emergency services here are leaders in the adoption of technology and they'll be looking to the evolution of greater surety of provision."

Enhanced LANES

In October last year, Telstra and Motorola Solutions Australia signed an MOU "to further develop public safety broadband solutions based on the LTE Advanced Network for Emergency Services (LANES) capability, products and services developed by Telstra", according to the press release put out at the time. Under the MOU, the LANES capability will be "enhanced by Motorola Solutions' dynamic prioritisation, smart public safety applications, interoperability solutions and public safety optimised devices".

Image: Paul Cunningham/Flickr/CC 2.0

added. "If communications go down, it could mean shutting down the plant, ending production entirely or put the safety of workers at risk. Communications are just as critical in these environments.

"So down the track we can definitely see the application of these mission-critical technologies in the commercial environment."

Teamwork

"Telstra and Motorola have had a very long and positive relationship in relation to public safety critical communications," said Stefan. "As an example, we've worked collaboratively around the new solutions for the Queensland GWN, a P25 LMR network, and also for the CFA radio network. "We've now taken that partnership into the public safety mobile broadband domain, where we're looking at bringing the strengths of both organisations - Telstra with its large mobile broadband network capabilities and LANES' technology, coupled with Motorola Solutions' ecosystem of devices and applications - to create a more holistic critical communications capability for the police and emergency services," he added. "I believe that's another unique world first.

"We have a world-leading development being pioneered and developed out of Australia in partnership with our partners Ericsson and Motorola Solutions, and it's wonderful to see Australia once again leading in providing options for providing mission-critical communications," said Stefan. "Our aspiration has been to contribute to the policy considerations of government, and we look forward to supporting whichever direction is taken in that regard."

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

Mobile interference hunting system

Anritsu has announced a revolutionary mobile interference hunting system helps field engineers and technicians locate sources of interference more accurately, efficiently and economically. Integrating an easy-to-use interface, fast set-up times and numerous features to effectively hunt a variety of signal types in multiple RF environments, the comprehensive solution provides wireless carriers, regulatory agencies, and broadcast and satellite operators with a tool that saves time and money.

The system consists of advanced software featuring patent-pending algorithms, an off-the-shelf magnet mount omnidirectional antenna, along with a handheld spectrum analyser and Windows-operating tablet/laptop. With the open source mapping software, arrows are positioned on the map directing the driver to the interference source. Supplementing the arrows are voice prompts that facilitate one-person operation. Compatibility with non-proprietary off-the-shelf antennas allows the hunting system to operate over the entire frequency range of the system's handheld spectrum analyser, including the 9 kHz up to 43 GHz coverage of the MS2720T Spectrum Master. The interference hunting algorithms in the Mobile InterferenceHunter software (MX280007A) employ channel power measurements to facilitate hunting a variety of signal types, from wideband modulated signals to narrowband or CW sources. Users can easily configure the channel power bandwidth for settings appropriate for the interfering signal. Channel power measurements also enable the tracking of signals whose frequency drifts over time. For signals hidden in LTE uplink bands, the mobile interference hunting system uses a 'min hold' algorithm to capture the interfering signal while eliminating the LTE traffic signal from measurement consideration. To locate pulsed signals, a 'max hold' algorithm captures intermittent signals only when transmitting, eliminating the chance of erroneously measuring a pulsed signal when not active.

The system features a multi-emitter mode that is suitable for finding multiple leakage sources, such as cable television signals. Additionally, a full-screen Spectrum View allows easier examination and analysis of the spectrum trace data. The solution also has the ability to capture and store interference hunt log files for later playback and analysis, and can recall various software/analyser settings for use in future hunts. Further simplifying operation is an extensive help menu for on-site assistance.

Anritsu's Burst Detect mode can be used as part of the mobile interference hunting solution to locate extremely fast signal pulses. Using FFT technology, Burst Detect enables the handheld spectrum analyser to capture and process intermittent signals at receiver-like speeds. The mobile interference hunting system is designed for the company's Spectrum Master, Site Master, BTS Master, Cell Master or LMR Master handheld analysers. A GPS receiver internal to the spectrum analyser is required. No firmware upgrades are necessary.

Anritsu Pty Ltd
www.anritsu.com

Power supply

The CRS Accessories CRS-AC1210 switchmode power supply features input voltage of 240 VAC and produces an efficiency of 68% minimum at 25% load and 75% minimum at full load. Output specifications are 13.8 V and 10 A (10 A continuous), with overvoltage and short-circuit protection.

Two built-in temperature-controlled cooling fans ensure cool operation, high reliability and long life. Dimensions are: L 210 x W 180 x H 55 mm, making it suitable for desktop installation.

CRS Accessories
www.crsaccessories.com.au

Command post

Exelis's Communications On The Move (C-OTM) provides a standalone command post for multi-agency operations. The powerful touch screen-based operator position enables real-time command and control via an entire existing communications infrastructure. It provides access to multiple local and remote radio channels (digital and conventional) allowing the centrally located command centre to monitor on-site communications via the satellite or IP WAN.

Lightweight and transportable, C-OTM is easily deployed in the field to integrate disparate technologies including IP and analog phones, radios and cellular equipment. The system allows these different communications sources to be automatically routed, patched and conferenced to provide a truly interoperable communications solution.

The C-OTM provides the user with a huge array of built-in communications connectivity including: Ethernet (IEEE 802.3 10/100 Base-T), Wi-Fi (802.11 b/g/n hotspot or client), 2-way radios (P25, Tetra, conventional, CNR), GSM (LTE 2/3/4G), telephone (SIP and analog), GPS and AC and DC power. All in a package that fits into the overhead bin on most aircraft.

EXELIS C4i Pty Ltd
www.c4i.com

MODULAR MANAGEMENT

RADIO MANAGEMENT SYSTEMS FOR ROIP

Ralph Becker,
Managing Consultant, Testadvance

A modular RMS platform gives operators much greater control and opportunities.

The principle purpose of radio communications is the timely exchange of relevant and useful information. The value radio communications provide to the organisation is determined by how well they meet that purpose – yet no two organisations or businesses are the same. For example, a public services provider has different goals and strategies than a mining company. Unsurprisingly, they implement and operate radio communications differently. Organisations must also consider implications of growth, change and risk.

We can summarise the above in three key criteria:

1. Clearly define context and constraints, requirements and objectives (technical and organisational).

2. Design and implement a 'system' that meets current requirements and at good cost benefit.

3. Quantify how changing or future needs will be met (technical and organisational).

In other words, the overriding goal for an organisation must be to implement a radio network or system that fits its unique needs, objectives and constraints. As these evolve, so too must the radio network or system be able to evolve. Yet versatility and fit must be balanced against cost efficiencies and availability.

A modular radio management system (RMS) based on radio over IP (RoIP) provides the 'best of both worlds'. It combines cost-effective, proven devices (nodes), ubiquitous transport (channels) and purpose-built 'platform modules'. The ability to configure and

reconfigure modules, nodes and channels provides versatility and ensures long-term adaptability. Indeed, an excellent level of 'fit' can be achieved with minimum engineering.

Stakeholders have from the outset a high level of confidence in the system's ability to meet requirements within a clearly defined and predictable cost framework. Organisations can manage change within the system architecture and without having to re-engineer requirements, better mitigating risks and furthering security of investment and long-term ROA.

Why a modular RoIP platform?

Modularity has been successfully applied in a wide range of fields, from furniture to space exploration. The challenge lies in balancing capability and adaptability, and of course cost benefit. Good 'fit' traditionally involved costly custom design and implementation. Most radio networks and systems today are built using commercial-off-the-shelf (COTS) hardware and software. COTS solutions are cost effective and have some inherent modularity. Their disadvantage is that commercially available products are designed for a wide range of needs and interests. How they fit a specific organisation's needs and objectives is always a compromise.

Yet making compromises here limits how well radio communications can be aligned with the functions of the organisation they need to support. To overcome this dilemma, organisations typically look to implement a radio 'platform', for example a common system

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for command or dispatch. Arguably few platforms provide the flexibility and adaptability needed for an organisation to build a system that fits their specific needs and objectives, budgets and timelines.

Similarly, few commercial radio platforms support seamless integration across radio formats and manufacturers. Indeed, we need to take care not to mistake 'configurable' for 'modular'. Configurability is the ability to select from existing capabilities and features. Modularity goes much further.

A radio system or platform can be said to be modular where:
- Functionality as a whole is deconstructed into discrete functions assigned to individual modules.
- The functional system as a whole can be re-created by reassembling these modules.

A modular radio platform or system combines cost-effective COTS equipment, particularly radios and console devices, within a highly flexible and adaptable 'integration platform'. How equipment is added and combined can be changed across applications and over time.

Key benefits

Building on a RoIP backbone provides excellent integration, versatility and cost efficiencies. Clearly defined RMS modules connect COTS radio and console equipment (nodes) via common IP networks. Constraints that unnecessarily limit a customer's ability to build an integrated system are removed. Organisations are given greater

control over how to configure and implement radio communications using both existing and new assets.

Indeed, an organisation can implement a radio system that meets current and future needs without having to predict all possible future requirements.

Using a modular RMS, organisations can build up complex radio systems and networks starting from the most basic configuration - a single RoIP interface/radio node and one console. Engineers can design and implement subsystems concurrently. Areas that are uncertain, eg, custom applications, can be isolated and addressed separately without delaying the system build or upgrade. Existing installations can be enhanced, extended and reconfigured. Assets can be re-used and costs and returns are clearly defined. Budgeting and development cycles are shorter and uncertainty and risks are lower.

A simple example of a modular system is a wardrobe system. It may comprise a standardised frame, doors in different sizes and finishes and various internal 'modules'. The system architecture governs how these are assembled. Specific design rules define the individual modules. Capabilities are realised within tried and proven modules. Clear design rules govern how modules can be configured, changed, added and augmented without needing to change the system architecture. Functional integration is largely seamless.

For example, RoIP channels can be added and reconfigured. Different radio formats can be integrated, eg, to integrate airband (HF) and trunked (eg, TETRA) radio communications. Radio subsystems can be configured for different IT networks and geographies, for example to integrate remote locations. Consoles can integrate different communication channels such as IP phones for a single point of access. System tools such as voice or status logs can be used side by side with the customer's own systems and applications.

And all the above can be implemented when and where 'it makes sense'. The result is a highly integrated, ie, 'fitting', two-way radio platform. It combines the fit of a custom-designed system with the ease and cost-efficiency of off-the-shelf components.

'Know-how' without prescription

Distributed intelligence is a key design principle of a truly modular RMS. No central platform software or application is required - each node, RoIP interface unit (RIU) and console can operate independently. Such an RMS platform allocates capability and 'machine intelligence' purposefully across the modules of the system. Substantial 'know-how' is built in to the system - technological expertise (radio standards, RF and protocols, devices and interfaces), but also knowledge and experience across a variety of 'real-life' applications.

Arguably one of the greatest benefits of a modular RoIP system is that it is highly efficient in incorporating learnings from operations, a prerequisite for continual optimisation. This can be as simple as reorganising nodes and resources to optimise workflows or as complex as realising targeted and hence cost-effective inter-
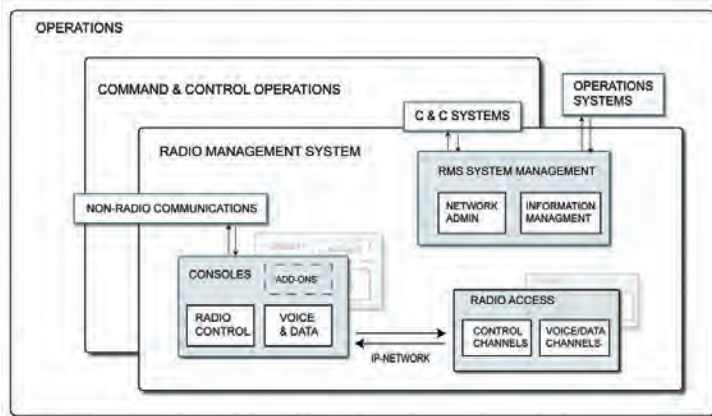
Figure 1.

Figure 2.

Figure 3.

> ORGANISATIONS CAN ADAPT RADIO COMMUNICATIONS AND SYSTEMS WHILE MAXIMIZING THE USABLE LIFETIME OF ASSETS.
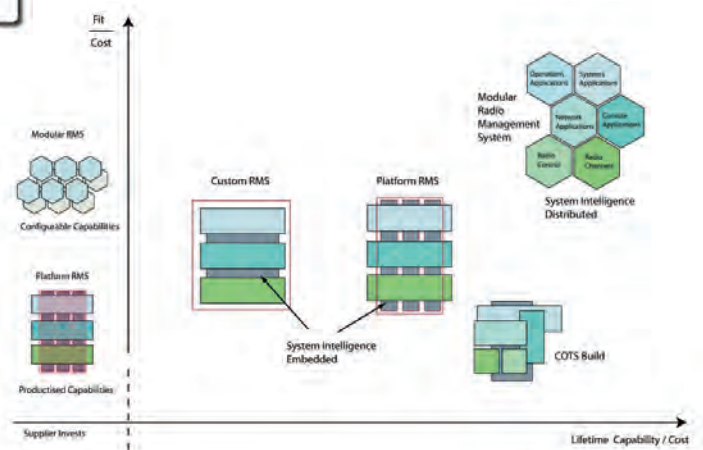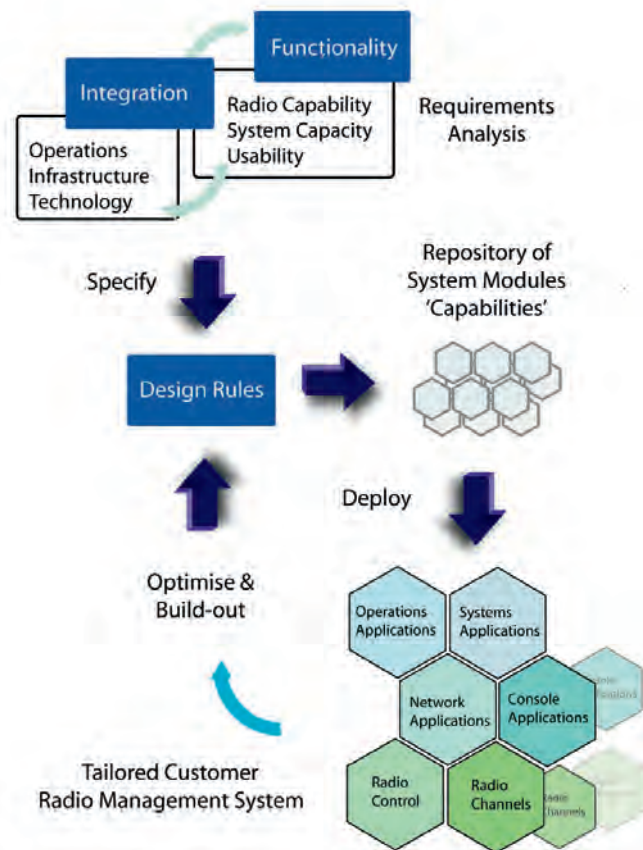
operability across formats and geographies - all while maintaining current operations.

Both external 'drivers' such as technology developments or developments in end-customer use models and internal drivers such as efficiency initiatives are readily accommodated. As intelligence is distributed in a modular system, meeting these new needs does not require comprehensive changes or upgrades - often all that is needed is updating the firmware of the relevant modules.

Sustaining long-term value

A truly modular RMS platform is designed such that its individual modules can interoperate under a wide range of circumstances. As the architecture is based on design rules rather than specific functional requirements, changes and enhancements do not require comprehensive requirements engineering. Instead, engineers can focus on making changes or additions that further their and the organisation's objectives. A 'build requirement' can be as simple as adding a radio or as complex as designing a custom application. Yet even complex enhancements follow the same 'plug & play' approach, minimising risk and maximising fit and hence ROI and ROA.

As capabilities are added in increments, costs can be managed in 'increments of capability'. Budgeting and cost-benefit analysis are clear and straightforward. Overheads are minimised and organisations can plan and execute to clearly quantified budgets and schedules. Organisations can adapt radio communications and systems while maximising the usable lifetime of assets.

A modular RMS platform provides many functions, features and benefits. Yet arguably most important is that it gives organisations much greater control and opportunity to meet their unique priorities and objectives.

TestAdvance Pty Ltd
www.testadvance.com
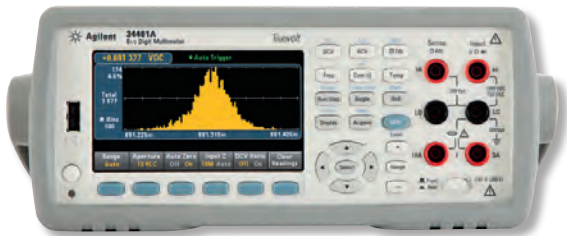
Digital multimeter

The Keysight 34461A is a precision 6½-digit multimeter with 11 cm high-res colour display. Truevolt technology implements an analog-to-digital converter with a metrology-grade architecture to compensate for line noise, environmental noise, input bias current and injected current from the meter itself.

The product will measure AC RMS voltage (3 Hz to 300 kHz), DC and AC voltage (100 mV to 1000 V), resistance (100 Ω to 100 MΩ), frequency, period, continuity, diode (5 V), current and temperature.

Features include: graphical view of results with histograms and long-term trends; Truevolt technology for quality measurements; the ability to save data to PC via USB or LAN; 100% drop-in replacement for 34401A.

Keysight Technologies Aust Pty Ltd
www.keysight.com

Wireless video

Moxa has unveiled a complete series of high-bandwidth wireless solutions for enabling video-over-wireless networks in industrial automation applications. The products feature low latency, seamless mobility and a rugged design.

The high-bandwidth wireless product portfolio includes both 802.11n for WLANs and HSPA for WWANs, making it easy for bandwidth-hungry systems, such as are used for IP surveillance, to transmit video data over a wireless network. The AWK and OnCell series offer end users a comprehensive solution that fulfils all these demands.

Features such as dual-radio redundancy technology and GuaranLink technology are designed to achieve zero packet loss transmission. Turbo Roaming delivers good wireless communication, even when connected to vehicles moving at high speed. A variety of industrial-grade design features and certifications ensure that the user's wireless network can provide reliable video-over-wireless transmission.

Moxa Tech Australia
www.moxa.com

Intrinsically safe radios

The Sepura STP8X series intrinsically safe hand-portables meet the highly demanding V6 of the IECEx/ATEX standard. Comprising full-keypad and reduced-keypad variants, the series offers an array of features and a full range of accessories. The dustproof STP8X offers ruggedness and robustness. With its IP67 rating making it able to withstand submersion in up to 1 m of water for 30 min, it is suitable for harsh and challenging environments.

Sepura claims the STP8X is the loudest TETRA intrinsically safe radio on the market. That, together with its clarity of audio, enables users to communicate quickly and efficiently in noisy environments where heavy machinery or protective headgear and clothing is used.

The STP8X series features an enhanced user interface, with a choice of presentation styles that users can select according to their personal preference or operational requirements. This choice of user interface helps to minimise training costs. Both variants in the series also feature a highly tactile keypad, designed for use with gloved hands. The reduced-keypad version is specifically intended for users who require swift access to specific functions.

Sepura PLC
www.sepura.com

Power supply

The CRS Accessories CRS-AC1228R switchmode power supply features input voltage of 240 VAC and produces an efficiency of 68% minimum at 25% load and 75% minimum at full load.

Output specifications are: 13.8 V (9 to 15 V adj.); 28 A (25 A continuous), with overvoltage and short-circuit protection. Two built-in temperature-controlled cooling fans ensure cool operation, high reliability and long life.

The unit features removable rack wings for rack or desktop installation. Dimensions are: L 180 x W 223 x H 45 mm (without 19″ rackmounting wings).

CRS Accessories
www.crsaccessories.com.au

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BODY-WORN VIDEO

Local mobile video streaming company m-View has signed an exclusive distribution agreement with US developer of ruggedised wearable cameras Fire Cam in a deal expected to fuel adoption of live video streaming and recording for front-line police and emergency services officers in Australia.

The announcement comes amid an increase in interest in live video streaming via wearable field cameras locally, while recent controversial events in the US have further highlighted the technology's importance, prompting President Barack Obama to declare recently more public funds should be allocated to expedite its deployment.

For years, m-View has counted Australian emergency services, including the Queensland, NSW, Victorian and West Australian fire services, as well as several state law enforcement agencies, as its customers.

m-View's streaming software will form a central component of Fire Cam's recently announced OnCall Live Video System. The cloud-managed service or licensed server lets users stream live video, audio and GPS location data to a command post, dispatcher or another team member enabling real-time situational awareness. As a part of the deal, m-View has also delivered a secure chain-of-custody solution that meets the stringent requirements of law enforcement agencies.

Trials to begin

NSW Fire and Rescue will soon commence trials of m-View's video streaming solution and body-worn Fire Cam cameras in a bid to improve the responsiveness of field officers and command managers battling fires in the state.

The organisation has been using m-View technology for several years to gain better awareness of emergency situations; capabilities enhanced by the improved sophistication of mobile devices and applications, according to Graham Tait, operational communications systems officer with NSWFR.

"We are looking to trial the use of body-worn cameras to further enhance this capability, and to provide our incident managers with live point of video directly from the firefighters," Tait said.

"The views available from both inside and outside an incident scene help to provide enhanced intelligence from the emergency event and can assist in resolving the incident faster and more efficiently."

m-View will also soon begin trials of the solution for Wilson Security, which hopes to improve security outcomes for its clients as well as ensuring better safety for security officers.

"The ability of Wilson's on-site security officers to conduct live video streaming of events occurring within and around our clients' premises allows us to deliver better levels of responsiveness while giving us rich video data to inform ongoing strategic planning," said John Mc-

Mellan, CEO, Wilson Security Asia Pacific. m-View is also in advanced discussions with several other organisations, including logistics and service companies looking to begin trials over December and January.

IT systems integrator CSG is looking to equip its field technicians with body-worn cameras in an effort to improve service outcomes for its customers, especially by providing better real-time visibility of projects and problem solving.

"We are interested in exploring the real-time video streaming technology with our field service technicians, so that customers can gain rapid assistance from our experts," explained the company's managing director, Julie-Ann Kerin.

"As CSG has a number of customers in regional Australia, we are hopeful that the technology could also support our customers by increasing their access to some of our most highly skilled technical specialists," Kerin added.

Live streaming the difference

Matt Cameron, global partnership manager and CTO at m-View, said the partnership with Fire Cam brings together two companies with extensive expertise to deliver the next generation of wearable wireless cameras that stream live video.

"There are many examples of wearable cameras that record to SD card, but with our live streaming solution we are changing the game by bringing a proven live capability - in a secure cloud or private managed service system - to a whole range of customers who have been crying out for such a solution," Cameron noted.

At one end of the system is the Wi-Fi Pro camera, which attaches to any shirt, vest or coat. Capable of recording in high-definition 1080p, the camera sees everything with its 150° wide-angle lens. The camera features both a powerful LED light and an infrared light for optimal night-time stealth.

m-View CEO Andre Obradovic said: "We have built the software and the application that enable the wearable cameras to stream high-quality video live. Our applications intelligently look at the network quality and ensure video streams are delivered with low latency and reliability, providing optimal situational awareness for front-line law enforcers and emergency responders. We also provide a flexible environment where the video is recorded in standard formats and we work with the customer to respond to their needs.

He added that m-View is planning a global release of new hardware and streaming solutions for January next year, while flagging the announcement of several new innovations to further empower officers in the field.

m-View
www.mview.com.au

Backhaul

25 YEARS AGO. The cover of the February/March 1990 issue of *What's New in Radio Communications* featured a whole slew of Ni-Cad batteries, produced by Alexander Manufacturing and distributed in Australia by RF Industries. Feature stories included the results of Melbourne City Council's decision to add Sigtec Automatic Number Identification to its fleet of mobile radios, and the advantages to be gained from using DTMF in two-way radio comms. Other news included the delivery of $400m worth of Australian-made Plessey RAVEN combat radios to the ADF, and a $4.5m contract for AAP Reuters Communications to supply Hughes satellite comms to the then Civil Aviation Authority.

10 YEARS AGO. The cover of the January/February 2005 issue of *Radio Comms Asia-Pacific* featured the Icom IC-F43G, one selling point for which was its Li-ion battery … no more 'difficult' Ni-Cads to worry about. The feature articles seemed mainly to be about antennas, with Dr Daniel Wojtkowiak describing the problem of increasing interference from the proliferation of microwave devices and mobile networks, and Andrew Emmerson from Alan Dick explaining the growing trend of disguising antennas as trees and other odd shapes. For the tech heads there was also an in-depth look at the monitoring and sequencing of supply voltages.
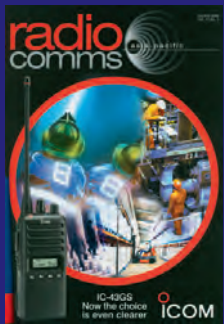
Elsewhere in the magazine: We helped celebrate the 85th birthday of Sir Angus Tait, founder of Tait Electronics; we warned students at the Uni of WA that parking inspectors were now equipped with radio units to send infringement notices to the uni's central office in real time; and we revealed that the RAAF had installed a 60-tonne turntable at its base in Edinburgh, SA, for use in radar testing of aircraft.

Spectrum

What happens if public cellular networks fail?

Smartphones and tablets have become a key technology for many first responders, but these devices offer little value if they fail during an emergency. Critical cellular networks must continue to operate even in emergency situations.

As mobile networks mature, congestion management has essentially become a question of economics. Each network provider must make its own business decision about how much spare capacity needs to be allocated to cater for peak loads. However, providers understandably struggle to deal with unexpected peaks of unknown magnitude in unplanned locations. This is exactly what happens in times of disaster.

As public networks become clogged with loved ones trying to call each other, network modelling goes out the window. If emergency workers are sharing the same mobile network as the general public, all these carefully procured advanced capabilities slowly grind to a stop.

Given Australia's vast distances and the frequency of natural disasters, there are some particularly complex and unique issues to consider. Fulfilling an earlier election promise, the Australian federal government has initiated a formal cost-benefit analysis of allocating spectrum to a dedicated national emergency services network.

Globally, each nation is considering its options. With the experience of 9/11 still resonating in the minds of government planners, the US Government has already opted for an ambitious solution based on a separately constructed network. This is a massive project that will take until 2022 to deliver. FirstNet is essentially a completely separate (4G LTE) wireless broadband network covering all US states and territories, running separately from the commercial mobile broadband across the country. FirstNet also owns a valuable piece of mobile spectrum real estate with 20 MHz within the 700 MHz band.

In Australia, three possible alternatives have emerged in industry submissions:

1. A dedicated first responder network based on exclusive spectrum, similar to the US solution.

2. Exclusive spectrum allocation, which could be leased back from a commercial provider through what is essentially an outsourced arrangement.

3. Telstra's LANES solution, which is essentially a spectrum-as-a-service offering. Spectrum can be either dedicated or dynamically allocated based on changing requirements. Recently, LANES was successfully deployed for the 2014 G20 Leaders Summit.

However, it would be a mistake to only consider mobile spectrum allocation in terms of the direct needs of emergency workers.

In times of emergency, reliable public mobile facilities not only provide a valuable channel for government to inform the community, but also a valuable channel for the community to inform government. Today, emergency services agencies receive better intelligence because they have ready access to first-hand observation from members of the community. Mobile apps are also driving greater community resilience in new and unexpected ways.

Public network communication is now core business, not an optional extra. The challenge for contemporary government is to find new ways of engaging with an increasingly sophisticated and digital society. First responders have legitimate requirements for priority infrastructure and these must be addressed. However, consideration must also take account of the community at large, rather than just facilities for the public sector vertical.

Kevin Noonan is a Research Director in Ovum's Australian government practice and author of a recent report - Priority Mobile Broadband for Police and Emergency Services. Prior to joining Ovum, Kevin was Head of Consulting at an industry research firm, working with executives from more than half the top 100 IT companies. Before moving to the private sector, he spent more than 28 years in various government management roles.

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Events for critical communications users and industry

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Sydney Showgrounds

Melbourne
1-3 December 2015
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- Industry-focused case studies and technical presentations

- Half-day training workshops
  - Radio over IP
  - Addressing ICT migration and integration with evolving digital mission- and business-critical wireless technologies.

- Extensive exhibition – 50+ exhibitors, displaying the very latest in critical communications and unified communications solutions.

- ARCIA industry dinner and networking drinks

Registration and full conference details will be available in February.

Comms Connect Melbourne

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The full conference program will be released mid-year.

For further conference information or enquiries, please contact Lisa Crossley on 02 9487 2700 or lcrossley@westwick-farrow.com.au.

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