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Warren Ryder, Chief of Police, Boxborough Police Department

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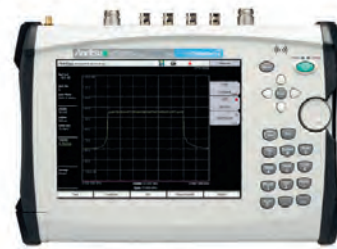
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www.CriticalComms.com.au/magazine

ON THE COVER



The CM60 Extended Control from GME is an analogue/P25-ready mobile using the GME high-end User Interface Control model UIC600B in black or UIC600G in high-visibility green. The controller is a full keypad device using OLED screen technology to provide multiple line, high-visibility characters, which are easily seen in all lighting conditions. The unit is fitted with a 1.5 m heavy-duty curly cord and powerful 2 W of onboard audio. The active bollard and special mounting cradle enable unique user functions to be activated by the hang-up action, and add to the in-vehicle mounting security.

CM60 Extended Control models are available in VHF 136–174 MHz, UHFL 403–480 MHz and UHF 450–520 MHz bands, with a dedicated 5 W model in the UHFL and UHF bands. The VHF and UHF models are both CAP and interoperable compliant, and all models are backward compatible with analogue signalling features including MDC1200, multi-tone selective call and CTCSS. The CM60 series has 1072 (optional 1500) channel capacity programmable in 50 zones. Incremental software licence keys are available for P25 conventional, trunked and AES-256/DES encryption. An optional FIPS 140-2 encryption module is also available with publicly listed APIs for third-party integrators.

CM60 models are available as dedicated P25 data and telemetry models using an AT terminal interface. Extended Control models are compliant to AS/NZS 4295, AS/NZS 4365 (UHF models), FCC Parts 90/15 and conform to TIA-102 Standards.

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Why aren't business- and mission-critical communications considered to be part of Australia's national critical infrastructure? That's the question Geoff Spring poses in this issue, and it's an important one. While these systems have become more capable, they've also become more vulnerable to cyber attack, major IT systems failures and other risks. It's high time governments recognised this, and added

such communications systems to the list of infrastructure that must be protected and strengthened.

It was great to be able to take a peek inside VicTrack's Network Management Centre. The NMC handles numerous voice and data systems for multiple transport modes, right across the state. Control centres such as these are the focus of the TCCA's new group, the International Critical Control Room Alliance, which is profiled in this issue by its chair, Peter Prater. Another new TCCA group is the Broadband Industry Group, which aims to "advance market adoption of LTE and 5G technologies for the benefit of critical-communication users and organisations".

And speaking of the TCCA, we're sure you'll join with us in bidding its outgoing CEO, Phil Kidner, a fond farewell, and a hearty welcome to the new CEO, Tony Gray. The TCCA and its local division, the Australasian TETRA and Critical Communications Forum, are vital industry bodies that do great work to promote the needs of the communications community.

In this issue, we preview November's Comms Connect conference and exhibition in Melbourne. It's shaping up to be the best yet, with an impressive array of international and local speakers. As always, coinciding with the event will be ARCIA's annual gala dinner and industry awards night, at which the association will mark its 10th anniversary. Make sure you come along to help celebrate.

Jonathan Nally, Editor
jnally@wfmedia.com.au

September 2017

Critical Communications MENA 2017
25–26 September
Dubai World Trade Centre
tmt.knect365.com/critical-communications-mena

October 2017

5G Asia 2017
2–4 October
Marina Bay Sands Hotel, Singapore
tmt.knect365.com/5g-asia/

Communic Indonesia 2017

25–27 October
Jakarta International Expo
communicindonesia.com

November 2017

MilCIS 2017
14–16 November
National Convention Centre, Canberra
milcis.com.au

Comms Connect Melbourne

21–23 November
Melbourne Convention & Exhibition Centre
melbourne.comms-connect.com.au

December 2017

Critical Control Rooms
5–6 December
Kempinski Hotel, Geneva
tmt.knect365.com/critical-control-rooms

May 2018

Comms Connect Auckland
2–3 May
SKYCITY Auckland
comms-connect.co.nz

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



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VicTrack is the organisation that owns Victoria's transport land, assets and infrastructure. With much of its asset portfolio dedicated to transport — land, infrastructure, trams and trains, and telecommunication networks — its focus is on strategic asset management and supporting the delivery of better transport solutions.

As asset manager and a provider of core services to the transport sector, it fulfils various roles and functions to ensure the assets serve Victoria now and into the future. It has three specialist delivery groups — Property, Telecommunications and Project Delivery — which are supported by Communications & Engagement and Business Services.

and emergency repair and maintenance, to ensure the highest standards of reliability for the transport system," he added.

Central to the Telecommunications Group's mission is its Network Management Centre (NMC), located at Docklands in the heart of Melbourne. VicTrack established the NMC towards the end of 2008 — with staff operating the centre from Monday to Friday, 9 am to 5 pm — and transitioned to a 24/7 fully manned operational centre by December 2009. More recently, an opportunity arose to upgrade the centre and its facilities.

"We were expanding our office space at VicTrack's headquarters in Docklands, incorporating another level of the building into our tenancy," said Moore. "This gave us the opportunity to relocate the NMC into a



INSIDE VICTRACK'S NMC

Seven days per week, 24 hours per day, Victoria's transport infrastructure is safeguarded by a state-of-the-art management centre.

Jonathan Nally

VicTrack provides telecommunication infrastructure and services to many customers, such as Public Transport Victoria, Metro Trains Melbourne, Yarra Trams, V/Line and NTT-DATA (myki ticketing system), as well as other government agencies and some non-government entities.

"As a licensed telecommunication carrier, with network infrastructure that spans the state of Victoria, we provide a full suite of telecommunications services to the transport and government sector," said Bruce Moore, general manager of VicTrack's Telecommunications Group.

"We design, deploy and deliver network infrastructure solutions to support telecommunication outcomes, and provide business communications, security surveillance including data services and hosting for our customers.

"We provide 24-hour network management and monitoring, including planned

new location in the building and incorporate updated technologies."

Communications systems

The NMC is responsible for monitoring power failures, communication line alarms (such as bit errors, framing errors, line coding errors and circuits down) and other performance issues that may affect the network and have an adverse effect on VicTrack's customers and users.

The NMC currently provides 24/7 network monitoring of all of VicTrack's telecommunications network, including data storage and data monitoring. Some of the infrastructure and technologies monitored and managed include:

- fibre and copper networks
- SDH (synchronous digital hierarchy) and PDH (plesiochronous digital hierarchy) networks





*VicTrack's Network
Management
Centre controls
numerous systems
covering the whole
of Victoria.*



CONTROL ROOMS



“THE NEW NMC HAS ENABLED AND ENHANCED VICTRACK’S ABILITY TO MANAGE MULTI-AGENCY INCIDENT AND OPERATIONS MANAGEMENT SYSTEMS, THEREBY IMPROVING NETWORK EFFICIENCY AND SAFETY.”

– BRUCE MOORE, VICTRACK

- DWDM (dense wavelength division multiplexing) network
- UHF radio
- IP/MPLS (Internet Protocol/ Multiprotocol Label Switching) networks
- cloud technology
- unified communications
- other legacy systems.

Some of the services monitored are:

- data WAN
- voice (analog and digital)
- point-to-point and point-to-multipoint
- wireless
- radio services
- internet
- cloud
- managed storage
- unified communications
- security access monitoring.

And the customer applications supported are:

- passenger information displays
- red (emergency) and green (information) platform buttons
- public announcements
- train radio communications (DTRS & RRCN)
- myki ticketing system
- SCADA
- voice platforms
- CCTV
- signalling
- station lift monitoring.

Inside the centre

The NMC brings in views for managing the live status of VicTrack’s telecommunication infrastructure network, and NMC staff are responsible for monitoring networks for conditions that may require special attention to avoid degraded service.

The centre is laid out with several rows of desks, all facing a video wall, which typically shows details of highly significant alarm status, ongoing incidents and general network performance. A corner of the wall is used for showing a news or weather TV channel, as this can keep the staff aware of current events which may affect the network or systems they are responsible for. NMC personnel have multiple monitors on their desks, with which they supervise the systems or networks.

The side wall is glazed, with the attached room used as an incident response room by members of the team responsible for managing major incidents, while still allowing them to watch events unfolding within the NMC. The incident response room is equipped with audio and video conferencing capability.

The NMC also has a train driver simulation unit known as the In-Cabin Equipment (ICE) unit, which is used for driver and field simulation fault finding and testing. Also located within the NMC are primary servers and other equipment essential to running the transport infrastructure network, plus an equipment room/test area that is used

for the provisioning testing and configuration of critical spares.

The NMC drives incident resolution either remotely — with a first-in fixed rate at 80% — or through specialised field teams and Tier 3 support engineers, who are available 24/7. It deals with around 80 incidents and 3000 calls per week, and handles approximately 495 planned work activities per month.

The centre is replicated at a disaster recovery site (DRS) at a geographically diverse location. The DRS facility has been commissioned as a hot standby site with no network/services switchover required.

“The NMC managing and monitoring is operated fully from the DRS facility to ensure total redundancy is available at any time, as it provides the same functionality as the Docklands NMC although not at the same scale,” said Moore. “This set-up has proven to be very efficient and timely in emergency events where a relocation of the team is required.”

As with the introduction of any major new or upgraded system, dealing with the consequences of change was crucial. “With the introduction of the VicTrack NMC, VicTrack realised the importance of the change management processes to control network changes and minimise impact on the operational network,” said Moore. “The NMC has reviewed and technically assessed all network changes, with the number of changes averaging to 495 per month compared to 276 changes per month five years ago.”

“The impact of technological change was a major driver in the consideration for requirements and systems [in the new NMC],” added Moore. “This included integrating and enabling new functionality as new surveillance and control options become available, as well as considerations for changes in the way people will travel.

“The new NMC has enabled and enhanced VicTrack’s ability to manage multi-agency incident and operations management systems, thereby improving network efficiency and safety,” he added.

The In-Cabin Equipment unit is used to simulate fault finding and testing.



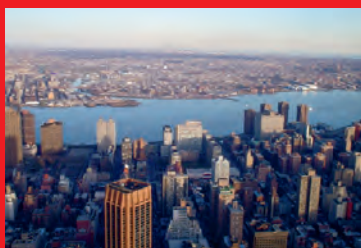
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CAPACITY TO THE MAX

Jonathan Nally

Australia's largest commercial two-way radio network is expanding with Motorola DMR Tier III technology.

The Orion Network has announced the next phase of its network expansion plans with the rollout of Motorola Solutions DMR Tier III Capacity Max technology Australia-wide to meet growing customer demand for radio voice and data services.

Capacity Max is the latest extension to the Motorola DMR portfolio.

The Orion Network, established in 2010, is the largest commercial two-way radio network in Australia, operating Motorola DMR around the nation in critical business environments such as airports, ports, stadiums, major events, local government and transport sectors.

The Tier III expansion is expected to help meet demand for outdoor and indoor location services, data integration applications and business compliance tools.

According to Hamish Duff, managing director and founder of the Orion Network, customers will enjoy increased capacity, greater capabilities and application innovation.

"We continue to enhance the Orion Network to deliver the best possible voice and data experience working with our partner Motorola, the global leader in DMR technologies," said Duff.

"By deploying this cutting-edge technology from Motorola, we will continue to actively boost network performance and

deliver a host of additional services and business benefits to our customers."

"Our strategic partners and customers are keen to take advantage of the additional Orion products and services provided by our investment in Motorola's third-generation DMR system and terminal offering," added Martin McLeod, director of the Orion Network.

The Orion Network DMR Tier III solution includes planning, optimisation and implementation services together with hardware and software services across the network, as well as a multivendor compliance program to ensure subscriber terminal access is 'fit for purpose'.

Motorola Capacity Max is fully compliant with the DMR Tier III mode of operation and supports a wide range of added-value features to support customer needs across different markets.

"Many existing customers will be able to migrate to the next-generation network by having updated software installed into their terminals," said Duff. "Orion will work with customers on a case-by-case basis to determine suitable time frames for changes to occur. The existing network will remain operational to support Orion customers into the future."

The Orion Network is owned and managed by Mastercom, Gencom and CSE Crosscom.

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BATON CHANGE AT THE TCCA

Phil Kidner to be succeeded by Tony Gray as CEO of the TCCA.

Phil Kidner, CEO of the TETRA and Critical Communications Association (TCCA), has announced his retirement after 11 years at its helm. During his time as CEO, Kidner steered the association through a period of significant change. While the market for TETRA and other standardised, PMR, mission-critical, narrowband technologies continues to grow, critical broadband is now on the horizon. Under his leadership, the association has become fully engaged, on behalf of its members and all end users, in ensuring that broadband bearers deliver a fit-for-purpose service for business- and mission-critical communications.

Under Kidner's guidance, the TCCA has become a respected expert body on critical communications and has grown immensely in stature, supporting the ongoing development of the multivendor TETRA standard and helping to ensure the strength of the TETRA and critical communication market around the world.

Kidner's work included support for the 3GPP as market representation partner, and earlier this year worked with ETSI to deliver the first mission-critical Push to Talk Plugtests.

He has also been an active speaker at many international conferences, and participated in a number of Australia's Comms Connect events over the years in support of the Australasian TETRA and Critical Communications Forum (ATCCF).

"The ATCCF thanks Phil for all the support he has provided to the ATCCF over the past 11 years, in growing the stature and ongoing success of the multivendor TETRA standard in Australasia and the support for critical broadband," said Anton Abrahams, chairman of the ATCCF.

Kidner will be succeeded as CEO by Tony Gray, founder and first chair of the TCCA's Critical Communications Broadband Group (CCBG). Gray has worked in the mobile communications industry for more than 40 years and has been a TCCA board member for six years, sponsored by P3 Group, a highly regarded German communications engineering and consulting services provider. As

well as extensive knowledge of PMR technologies, Gray's background brings significant commercial cellular expertise, as P3 has more than 15 years' experience in the testing and optimisation of mobile networks worldwide.

In other news from the TCCA, the association has formed an international broadband manufacturer co-operation group. Known as the Broadband Industry Group (BIG), its membership is aimed at category 1, 3GPP broadband technology manufacturers. BIG's main objectives are to:

- promote 3GPP standard technologies (LTE and 5G) in mature and emerging critical communication markets;
- seek ways to advance market adoption of LTE and 5G technologies for the benefit critical-communication users and organisations; and
- promote an evolutionary approach towards future critical communications solutions based on the achievements of TCCA — including, but not limited to, driving and supporting open standards and successful interoperability as well as a real understanding of professional users' requirements — so that customers' investments are protected over the long term.

More information on BIG can be obtained by emailing ccbgsec@tandcca.com or Tero Pesonen, chairman of BIG, at tero.pesonen@tandcca.com.



Phil Kidner, outgoing CEO of the TETRA and Critical Communications Association.

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- Body Worn Camera with PoC available



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W60

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• PT 6500



• PT 8200



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COMMS CONNECT MELBOURNE

21-23 NOVEMBER 2017

Don't miss this world-class line-up of speakers, workshops and exhibitors.

Jonathan Nally

The international Comms Connect conference and exhibition is on again in Melbourne, from 21 to 23 November 2017. Now in its 11th year, it is expected to draw more than 1400 attendees from a broad range of industry sectors, including utilities, public safety, government (local, state and federal), transport, mining, oil and gas, security, defence, IT, backhaul and telemetry, and the wider commercial environment.

The conference will feature individual presentations, panel sessions, keynotes and workshops covering a myriad of topics of interest to everyone in the critical communications field: latest technologies; regulation and government policy; case studies; cybersecurity; public safety; the Internet of Things; and many more.

This year, all exhibits and presentations will be in the same place — the Exhibition Halls at Melbourne's Convention and Exhibition Centre. With 90+ exhibitors, 80+ speakers and delegates from around 20 countries taking part, Comms Connect Melbourne will be the place to be in November.

Preconference training workshops

The event will begin with a series of industry workshops on Tuesday, 21 November, the day before the main conference program commences. This year there will be seven workshops, and the topics and presenters/moderators will be:

- LTE 101 — Its strengths, weaknesses and application (Simon Lardner, Challenge Networks) and Private networks in the Gold Fields (Rodney Nebe, Gold Fields).
 - Delivering project and engineering excellence on converged network upgrades (Andrew Smith, Tait Communications).
 - Public safety mobile broadband: global trends, national decisions (moderated by Inspector (Ret.) Lance Valcour O.O.M. and Ian Miller, ARCIA).
 - M2M & IoT — The impact on public safety (Jon Goudge, RFI Technology Solutions).
 - Building a radio network from the ground up: an independent workshop on planning components required to deliver a private land mobile network (Chris, Surf Life Saving Australia).
 - Improving situational awareness in emergencies using social media (Caroline Milligan, Crest Advisory).
 - Back to the future — digital LMR and business-critical broadband (Australasian TETRA & Critical Communications Forum).
- Places at these workshops will fill up quickly, so make sure you get your registration in as soon as possible. And keep checking the Comms Connect website for information on additional presenters and panellists as it comes to hand.

Conference program

The organisers always secure very high-profile speakers, and this year will be no exception with leaders from industry and govern-



Where:	Melbourne Convention & Exhibition Centre
When:	21 November (preconference workshops), 22–23 November (conference and exhibition)
Web:	comms-connect.com.au
Speakers:	80+
Exhibitors:	90+
Training workshops:	7
Conference streams:	Public Safety & Emergency Management, Industry, Technology

ment from around Australia and the world coming to Melbourne. The conference will begin on Wednesday, 22 November and will be split into three streams — Public Safety & Emergency Management, Industry, and Technology — with dozens of presentations spread over the two days. The full list of keynote and technical speakers will be available closer to the date, but here are just some of those already confirmed:

- Kate Foy, Managing Director, NSW Telco Authority
- Michael Doucet, Executive Director, Security Intelligence Review Committee, Canada
- TJ Kennedy, President, First Responder Network Authority, USA
- Jinhong Sim, Chief Manager of Safe-Net Project Division, Ministry of the Interior and Safety, South Korea
- Craig Stolte, A/Superintendent, GWN Executive Manager, Queensland Fire and Emergency Services
- Garry Kerr, Project Manager, Queensland Public Safety Business Agency
- Geoff Spring, Senior Industry Advisor, Centre for Disaster Management & Public Safety, University of Melbourne
- Geoff Waterhouse, Senior Project Manager, Radio Telecommunications Capital Works Programme, NSW Ambulance
- Johnson Tay, APAC BDM Validation Systems, Cobham Wireless
- Kate Feros, A/g Assistant Secretary, Spectrum Branch, Department of Communications and the Arts
- Matteo Mascherpa, Area Manager, GEG Telecommunications Italy

- Murray Wales, Principal Consultant, CSC Australia
- Ross Spearman, Chief Technology Officer, Tait Communications
- Tapio Mäkinen, Director, Airbus Defence and Space

For updates on more speakers as they are added, sign up for updates via the Comms Connect website, comms-connect.com.au.

ARCIA Gala Dinner and awards ceremony

All Comms Connect attendees are invited and encouraged to register for the Annual Gala Dinner of the Australian Radio Communications Industry Association (ARCIA), which will be held on the evening of Wednesday, 22 November. This festive occasion will include presentation of the national industry awards, and will also be the official celebration for ARCIA's 10th birthday.

The Annual Gala Dinner is always a fun and enjoyable event... a chance to let your hair down after a busy first day at the conference/exhibition and to network with colleagues in a relaxed and friendly atmosphere. Full registration details are available on the ARCIA website (www.arcia.org.au).

So there you have it — a very impressive line-up of local and international experts, exhibitors and activities for Comms Connect's 11th year. Make sure you take advantage of this opportunity to take part in Australasia's leading critical communications conference and exhibition, and mingle with a who's who of experts from industry, government and academia.

Industry Talking

As the summer heat leaves us it is time to focus on the ARCIA's 2017 elections have been held, and I am delighted to report that we have a full team of people on the committee to keep up the head of steam we have achieved. I am honoured to be able to once again be elected president of the association. We also made a small change to the constitution by adding the positions of second vice president and immediate past president. As ARCIA continues to grow and advocate across the country, the committee believes that it is important to be able to share the load around for some activities. I have been in the fortunate position to attend nearly all Comms Connect and ARCIA networking dinners over the last couple of years, but that won't always be the case. It is also very important that ARCIA has enough people to engage with stakeholders in each state, including other associations or groups.

Our last major event was the mini Comms Connect and ARCIA networking dinner held at Rydges Southbank, Brisbane. It is fair to say that numbers were slightly down from 2016; nevertheless, the enthusiasm shown by all the Queenslanders in attendance was tremendous. The host for the evening was none other than Cairns local radio legend John La Cava, who kept the crowd entertained throughout the evening ... which included a pop radio history quiz that brought up some very interesting questions and sparked furious debate amongst the tables. We also enjoyed another excellent presentation — Jeff Miller, CEO of the Civil Contractors Federation of Western Australia, discussed the likely trajectory for the Queensland economy.

The next ARCIA regional event will be in Adelaide, and for 2018 the committee has decided to go with an ARCIA networking event without Comms Connect happening during the day. Naturally we are keen to engage with the biggest audience possible and we are reviewing all options to make these events successful. We don't necessarily judge success on a purely financial basis; nationally, we have been investing in these events from some years. However, it is vital that we have good levels of local industry engagement. So get involved and support your local industry members, partners and customers. The ARCIA committee is happy to hear about topics of interest that will help bring people together for these networking events.

The annual gala dinner in Melbourne will be held on 22 November 2017, and it is shaping up to be the biggest yet. We will be celebrating 10 years of the association and recognising industry excellence, so make sure you're there to be a part of it. The Comms Connect program is shaping up to be very comprehensive and there will be lots of subjects of interest. The debate around public safety mobile broadband will be a hot topic. As Australia begins to understand how we will deal with this and other critical changes in technology, ARCIA encourages all industry representatives and users to be part of the debate.

Finally, over the last few years the association has essentially spent what we have earned through the support of members and partners. So I am also pleased to report that our financial status is stable and has never been better, under the excellent management of our executive and the treasurer, Andrew Wyborn.



*Hamish Duff, President
Australian Radio Communications
Industry Association*



Signal analyser

The Keysight N9030A PXA signal analyser has a built-in pre-amp (+20 dB) and electronic attenuator (24 dB), both of which operate at up to 3.6 GHz. It is available to rent from TechRentals.

This high-performance analyser comes with real-time spectrum analyser capabilities that enable users to see, capture and understand fleeting, close-in signals even at extreme levels.

Along with the real-time spectrum analyser capability, the PXA offers wide analysis bandwidth and dynamic range to ensure maximum probability of intercept (POI). Compared to its predecessors, the PXA is claimed to offer improved speed and performance, leading to improved yields and reduced measurement uncertainties. Included software comprises N9051A-Pulse Measurement, N9036A-Analog Demodulation Measurement and N9064A-VXA Signal Analysis, running on Windows 7.

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High-power transmitters

The Barrett 4075 HF high-power transmitters are rugged, liquid-cooled, solid-state RF power amplifiers, providing long-term reliability and low-maintenance operation with minimum space requirements. The systems are suitable for civil aviation and coastal applications.

Readily interfaced with many third-party VCCS systems and applications, the product offers high-quality systems in a cost-effective manner to users and integrators alike.

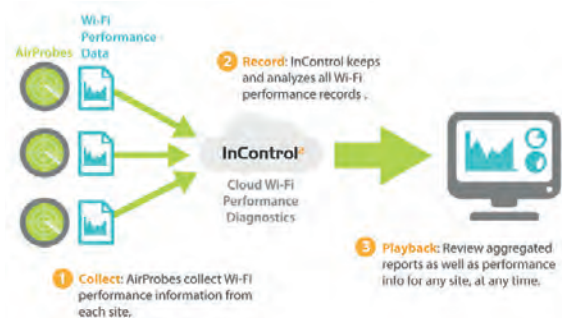
The transmitters come packaged with a 4050 SDR transceiver/exciter, offering a comprehensive range of options from remote control, fault detection and management features over IP; MIL STD 188-141B/C (2G/3G) ALE, 4- and 6-digit CCIR based Selcall derivatives, ARINC ICAO Standard Annex 10 Selcall encode, and multiple data transmission waveforms including MIL STD 110 and CLOVER 2500 with IMAP email over HF capability.

The transmitters are available with either 500 W or 1 kW output power and rated for continuous operation from 1.6 to 30 MHz in all modes and at 100% duty cycle in FEC, ARQ and voice.

Key features include liquid-cooled, solid-state; small form factor (PA and PSU only 5RU); available in transportable configuration; low-noise operation; remote control via legacy RS232/485 and IP; meet CCIR specifications; and FCC certified.

Barrett Communications Pty Ltd

www.barrettcommunications.com.au



Cloud Wi-Fi performance diagnostics

AirProbe cloud Wi-Fi performance diagnostics can analyse Wi-Fi signals and perform automated testing, while the InControl cloud Wi-Fi diagnostic platform aggregates and stores the information, enabling the user to view the Wi-Fi environment on any site, at any point in time.

This product works with any Wi-Fi infrastructure. Air Monitor enables visualisation of Wi-Fi utilisation, channel utilisation, packet distribution and signal strength for each Wi-Fi device. Users can find out which devices are connected to which hotspots at a glance.

The InControl cloud Wi-Fi diagnostic platform lets the user survey what is going on. They can easily view the status of all networks on one screen. In addition, users can examine reports from all AirProbes, all presented in one place. They can play back the Wi-Fi performance info for any probe at any point in time. If any device gets reset, the Wi-Fi performance records remain on the cloud for up to 30 days, giving users information to assist in their troubleshooting.

Wireless Tech (Australia) Pty Ltd

www.wirelesstech.com.au

Wireless microphone

The Wireless Pacific X10DR Elite wireless microphone provides 'out of vehicle' coverage performance. It was created for mission-critical, utility and professional radio users.

Features include AES encryption, an in-car monitor, a headset port, waterproofing (IP67) and Loneworker. The product allows secure microphone connectivity of two devices to the one vehicle gateway, allowing two operators to freely communicate privately off-network while still having instant radio system access for up to 500 m.

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CONNECTIVITY IS A CRITICAL COMPONENT OF
VEHICLE AUTOMATION BECAUSE IT ENHANCES
THE SENSING RANGE OF VEHICLES.

AUTONOMOUS CAR CONNECTIVITY

Robert Heath* and Abhay Samant^

Software-centric platforms are helping engineers and scientists to better understand how autonomous car communication systems will work.

Emerging wireless and cellular 5G technologies are bringing a new level of connectivity to cars and enabling many applications to support safety, efficiency and internet access. Connectivity is a natural complement to other kinds of automotive sensors that are also being integrated in vehicles. Communication enables vehicles to exchange what they see and to expand their sensing range, thus making better automated decisions.

While state-of-the-art radar and communication technology is quickly making its way to the validation and production test floors, engineers and scientists are actively working on innovative ideas to: better understand how automated cars will better interact with non-automated objects on the road; drive synergy between vehicular radar and communications; and design wide-bandwidth radars capable of resolving very short distances.

To bring these technologies to market, the automotive industry needs to leverage a software-centric platform-based approach that helps accelerate the design, characterisation and test phases.

Connected car trends

Vehicular connectivity has been investigated for at least 20 years. The de facto approach is dedicated short-range communication (DSRC). This technology is envisioned primarily as a means for exchanging basic safety messages, though it also has some applications in traffic management. DSRC supports both V2V (vehicle-to-vehicle) and V2I (vehicle-to-infrastructure). After nearly 20 years of development, DSRC is now available in some US cars, though wide use will probably not be seen without a government mandate.

Automated vehicles come in many flavours, depending on the level of automation. At one extreme is no automation, where the driver is in full control. At the other extreme, the vehicle is in complete control and there are no controls for any human assistance. At levels in between, certain driving functions are automated but the human may still be in charge.

For example, in a lower level of automation, the driver might be warned about a potential forward collision. In a higher level of automation, the car might automatically apply the brakes and might also take evasive action to avoid the collision.

While fully automated driving is often called 'autonomous driving', it is unlikely that full automation can happen simultaneously with full autonomy, which implies no communication. The reason is that fully automated high-speed driving is difficult without communication of high-resolution map data.

Connectivity is a critical component of vehicle automation because it enhances the sensing range of vehicles. Sensors being deployed

for automation including automotive radar, visual cameras and LIDAR. Radar is used for automatic cruise control, forward collision warning, lane change assistance, parking and pre-crash applications. Visual cameras are used for safe backups, monitoring blind spots, nap prevention and lane keeping. LIDAR provides high-resolution 3D map information that can be used for autonomous navigation, as well as pedestrian and bicycle detection.

All three technologies are important for fully automated vehicles. For example, Tesla uses visual cameras for automated highway driving while Google cars make heavy use of LIDAR and 3D map data for accurate driving and navigation, plus several radars to aid in the detection of other vehicles.

The range of each technology depends on its configuration and the deployment scenario. For example, in rural areas, radar may achieve 200 m, LIDAR 35 m and visual cameras 30 m, but in urban areas, the range of all these technologies diminishes to a few metres due to obstruction by other vehicles.

Essentially, these external sensors are limited by what they can see. Communication allows vehicles to expand their sensing range by leveraging what can be seen by other vehicles in the front, back or sides.

Mixed-use environments where vehicles have different levels of automation and communication remains a challenge. One approach is to deploy sensing at the base station; for example, radar, visual cameras or LIDAR. Then the information derived from sensors can be broadcast to connected vehicles, giving them situational awareness about non-connected vehicles and non-vehicular users of roadways.

This infrastructure-based approach has the advantage that it works well even if most other vehicles do not have communication capability. Infrastructure will also make higher levels of automation more effective; for example, to coordinate interactions of vehicles through intersections without the need for traffic lights. This infrastructure-based sensing will likely be built around 5G cellular communication, since it aims to provide much higher data rates.

At present, there is tremendous interest in the automotive use case for 5G. Applications include vehicular automation, transportation planning and operations, and of course infotainment. 5G will support 10x lower latencies and 10x higher bandwidths than 4G solutions, making it especially suitable for automotive applications. In particular, millimetre-wave 5G is especially attractive because of very high data rates, which can be used for the exchange of raw sensor data.

Millimetre wave for automotive applications is one of several ongoing research topics at The University of Texas at Austin. Other topics include the co-design of communication and radar; the use of low-frequency communication signals as a low-cost means of



automotive radar; and the use of sensing-based infrastructure to aid millimetre-wave communication.

A platform-based approach

Engineers and scientists are exploring different connectivity and sensing technologies at a variety of carrier frequencies and with different bandwidths. Exploring synergies between vehicular radar and communications requires understanding design trade-offs made at the media access control (MAC) and physical (PHY) layers. To enable rapid prototyping for radar and communications systems, a platform must provide extremely high data transfer and processing capabilities, especially to enable a prototype that operates in real time in real-world conditions.

Typical engineering projects go through phases of design, characterisation and test. These phases are typically disjointed, with different tools and techniques used in each. To drive development efficiency in each phase and rapid transition to the next, National Instruments (NI) provides a platform-based approach, which reduces barriers between each phase with a unifying environment based on common, well-integrated hardware and software components. At the heart of NI's platform is LabVIEW software. This platform-based approach accelerates productivity and reduces time spent in each phase.

Radar systems play a critical role in the reliability and safety aspects of autonomous vehicles. Additionally, carmakers and radar sensor manufacturers will need to continuously innovate on features to maintain their competitive edge in the marketplace and meet the evolving regulatory landscape. Unfortunately, the traditional approach of creating a fixed-function instrument crafted to measure and test a specific category of scenarios is not scalable.

To truly increase the scope of coverage, one cannot only rely on simulation, but rather directly with real-world hardware and real-world signals. NI LabVIEW and the NI PXIe-5646R vector signal transceiver provide this flexibility through software designed architecture. Engineers can program the FPGA on this device to emulate different types of static and mobile single and multi-point targets using the integrated RF and off-the-shelf millimetre-wave radio heads.

New York University recently announced a 5G prototype and channel sounding system based on an NI LabVIEW-based software-defined radio platform for the development and validation of mmWave systems.

The automotive industry also needs to invest and build a mm-Wave channel sounding system to fully characterise and understand channel impacts on vehicular communications. This includes but is not limited to the impact of blockage by vehicles, especially if the receive and transmit vehicles are in different lanes, and the study of whether rays reflected off other neighbouring cars can provide good secondary path alternatives to the blocked line of sight path.

If such reflectors can be used, traditional sensing technologies could be used to provide locations of potential reflectors and used for targeted beam formation.

Testing

Because automated driving, and the components that enable it, is a safety-relevant function, these systems undergo mandatory and complex test and validation processes. To meet the challenges of such processes, an engineer must have the ability to evaluate a wide variety of scenarios throughout the design and implementation phases of the communication application and electronics. An open, modular platform is essential to provide flexibility and adaptability to meet the myriad conditions that may be encountered.

As commercially available 802.11p stacks do not easily allow failure injection on protocol level, or do normally not provide access to internal logic, S.E.A. Datentechnik has developed an extended 802.11p protocol stack (MAC and PHY) based on the NI platform. This protocol stack provides a full software interface (API) for LabVIEW.

Beside live communication, the S.E.A. 802.11p provides extensions for testing and manipulation purposes, especially required for development, verification and validation test on signalling level. The protocol stack is implemented as FPGA code within the NI VST hardware to provide real-time signal and data processing with precise timing and synchronisation abilities.

The system provides processing of raw packets with exact timestamps containing all data that is sent on the MAC layer. The transmission of data packets through the air to the device under test can be controlled at precise points in time. This enables excellent synchronisation with other signals synthesised by the test system, such as GPS, radar or LIDAR sensor signals, or vehicular data. Received data packages from the device are timestamped and available in LabVIEW for further processing.

The Danlaw Mx-DSRC product offers interoperability and conformance testing of a DSRC module in an integrated vehicle environment (simulated or real), including vehicle bus and 802.11 physical layers; DSRC communication testing to IEEE1609.4, 1609.3 and 1609.4; and performance level testing such as J2945/1. The key to testing DSRC operation is confirming the quality of the RF link and the adherence to the various standards that define it.

Summary

Emerging wireless and cellular 5G technologies are bringing a new level of connectivity to cars and enabling many applications to support safety, efficiency and internet access. Engineers and scientists are actively working on innovative ideas to better understand how automated cars will interact with non-automated objects on the road, drive synergy between vehicular radar and communications, and design wide-bandwidth radars capable of resolving very short distances. A software-centric platform based on highly integrated software and hardware accelerates design, characterisation and test phases, and helps engineers to bring innovative ideas to market faster.

**Dr Robert Heath is the Cullen Trust Endowed Professor in the Wireless Networking and Communications Group, Department of Electrical and Computer Engineering, University of Texas at Austin.*

^Abhay Samant is Section Manager, RF and Wireless Communications, National Instruments.



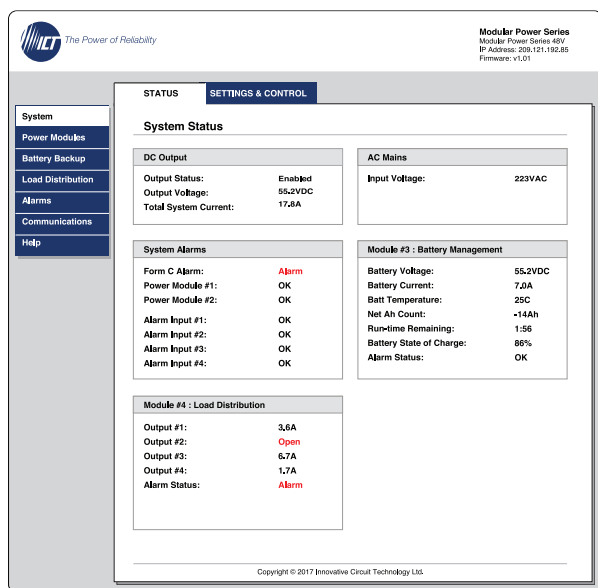
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TECHNOLOGY TRENDS

Motorola Solutions invests in vital technologies to meet critical communications users' ever-evolving needs.

As the critical communications industry continues to evolve, Motorola Solutions is investing in voice and data technologies to drive innovation and enable better operational outcomes for its public safety and enterprise customers. To find out more, we spoke with Iain Clarke, Corporate Vice President and General Manager for Motorola Solutions Asia Pacific.

CC: What are the big challenges facing the industry today?

IC: It's an interesting time of change for the industry. Professional mobile radio (PMR) technologies continue to provide the essential backbone for mission- and business-critical communications. This is reflected in the size of the installed base throughout the Asia Pacific region, which is projected to grow to almost 20 million devices by 2020. At the same time, the market is evolving, with increasing demand for broadband technologies, mobile apps, next-generation command and control, and advanced security solutions.

I think the biggest challenge for our industry is also its biggest opportunity — that is, ensuring there is sufficient scale across all of these technology areas to continue to deliver the best outcomes for our customers. Although the technology landscape is changing, our customers' needs for the most reliable, secure and robust technologies remain unchanged. Continuing to meet those needs is a great opportunity for the industry and companies including ours.

CC: How is Motorola Solutions preparing for these challenges?

IC: We are balancing our own evolution as a business with remaining flexible to meet our customers' expectations — regardless of the mix of technologies and platforms they use.

As part of that we continue to invest in our core radio business as well as capabilities to extend the bridge between PMR and broadband. This provides secure radio network access to people working in different roles who don't typically carry radio handsets. Bridging these two technologies also provides a richer user experience, with more apps to enhance situational awareness.

Globally, Motorola Solutions is investing in a range of specialised software and managed services capabilities through our acquisitions. This includes acquiring Gridstone in Australia to bring new mobile app development capabilities inside our business. Recently, we also announced plans to acquire Airbus DS Communications, a provider of next-generation command centre software in North America; and in March this year, we announced the acquisition of Interexport, a managed and support services provider in Chile.

We are also building a new, global software enterprise to further accelerate software innovation for our public safety and commercial

customers. This is being led by Andrew Sinclair, whom we recruited from Microsoft's Skype division. In addition to driving our software strategy, this group is focused on user experience design, cloud computing, analytics and artificial intelligence solutions.

In the future, you will continue to see us investing in a range of other areas which complement the ongoing management and distribution of intelligence to our customers. This will involve a combination of information sources including voice communication, text, images and video.

CC: What lessons have been learned from extreme events?

IC: When you look at the impacts of natural disasters over the last 45 years, you see that almost 90% of people affected by them worldwide live in the Asia Pacific region.

Natural disasters within this region continue to take a huge toll in terms of lives lost and damage to critical infrastructure. The





Coffee talk: Iain Clarke discusses Motorola Solutions' future plans with colleagues at the company's new regional headquarters in Singapore.



"THE MARKET IS EVOLVING, WITH INCREASING DEMAND FOR BROADBAND TECHNOLOGIES, MOBILE APPS, NEXT-GENERATION COMMAND AND CONTROL, AND ADVANCED SECURITY SOLUTIONS."

— IAIN CLARKE, MOTOROLA SOLUTIONS ASIA PACIFIC

In any disaster, emergency services need communications technology which is robust, resilient, can handle surge capacity and perform in times of stress. In the aftermath of a disaster, you also need to be able to rapidly restore and deploy temporary communications to support recovery operations.

Motorola Solutions' legacy in technology innovation has delivered products and services that are robust and can perform in the most extreme circumstances. We will continue to provide this level of resiliency in new solutions we develop for our customers.

CC: How do customers' needs influence your technology development?

IC: For many years we have followed and applied an approach known as High Velocity Human Factors to develop our technology. Basically, that means we create technology that will be easier for first responders to use when they are under immense stress — for example, completing a rescue operation inside a burning building.

We also participate in 'ride alongs' to better understand how our customers interact with technology, and we work with the wider software industry to deliver 'hackathons' to rapidly develop new technologies. We will continue to apply these approaches to innovation as we increase our investments and capabilities as a software-focused business.

One example of our future R&D investments was displayed at Critical Communications World in Hong Kong earlier this year. We showcased a future concept called the 'Future Fire Commander' which brings together mixed reality, sensors, video feeds and other information to add software capabilities to a foundation of mission-critical voice technology.

It's designed to keep fire incident commanders and firefighters safe and connected at the scene of an incident. Today, incident commanders have to work with manual systems and record notes by hand to form a mental image of their fire crews because they often can't see where they are.

The increasing availability of broadband technology can help to ease the mental strain on people in these roles. Video and other intelligence sources can be used to form a more complete, visual picture of what's happening at the scene — enabling faster and more accurate decisions to be made in critical situations and improved results in terms of protecting lives and property.

No-one can accurately predict exactly which technologies will be most needed in the future. That's why we will continue to immerse ourselves in the customer user experience and invest our R&D resources in a combination of traditional technologies and future capabilities that can help us to anticipate our customers' needs as they continue to change.

We owe it to them to continue designing and developing solutions that will enable them to overcome their most complex challenges so they can work more safely and productively than ever before.

*Motorola Solutions Australia Pty Ltd
www.motorolasolutions.com.au*

Nepal earthquake in 2015 and Typhoon Haiyan in the Philippines are two tragic examples that collectively accounted for more than 14,000 lives.

The severe storms experienced in South Australia over the 2016 New Year period were another event that highlighted how important mission-critical radio communications are for our customers. Those storms were among the worst experienced in the state for 50 years and caused dramatic damage to power supplies and cellular infrastructure. Events like that place a heavy strain on emergency services, which have to respond to a massive upsurge in demand from the public at these times.

When carrier networks go down, mission-critical radio services may often be the only form of communication available. We work extremely hard in the field and at our 24/7 control centres to ensure those services are not disrupted for our customers when they need them most.



MAKING THE GRADE

Jonathan Nally

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For public safety mobile broadband to be a success, all stakeholders must agree on the key goals and definitions.

After 9/11, the United States recognised that the communications systems used by emergency agencies and services responding to the event were not sufficiently interoperable. One of the key steps to tackle the issue has been the launch of the First Responder Network Authority, or FirstNet.

FirstNet has established the foundation for an interoperable public safety mobile broadband (PSMB) capability. It will enable public safety agencies to exchange information with each other — information which may mean the difference between life and death in an emergency.

Yet during a US Senate hearing in July, an executive from AT&T, the commercial carrier operationally responsible for the new PSMB network, questioned whether or not 'public safety grade' had been clearly defined. This was despite 16 public safety-related associations jointly publishing a 115-page definition of what constitutes public safety-grade systems.

There are some clear lessons that can be taken from this by Australia's public safety agencies (PSAs) as they consider which delivery models might be suitable to support a future mission critical-grade PSMB capability for Australia.

The situation in the US reinforces the need for Australia to develop requirements that clearly differentiate the PSMB service from commercial-grade mobile data services. Key stakeholders and industry require this to be clearly defined as a key part of the strategic decision-making process.

What's at stake

At present, PSAs such as ambulance, law enforcement and fire-fighting rely on conventional radio communications to support their

operations. Yet mobile data — considered a necessity by many people as they go about their day — is likely to become a critical tool in enhancing a PSA's ability to respond in an emergency situation. Having complete and accurate information — whether it is a photo, video, medical records, a situation report or other data — may make all the difference in a life or death situation.

Currently, there is not a mobile broadband data network maintained at the required level of availability and reliability as the land mobile radio networks that PSAs have traditionally relied on.

Most Australians would assume the existence of a nationwide sharing of public safety-related digital data during an incident which required the interaction of agencies and jurisdictions. Those responding to an emergency must have priority access for their data, information and multimedia telecommunications. They also need to be assured that those communications are secure and available anywhere, anytime.

First responders to security incidents, cyclones, floods, bush-fires and other emergencies should have their communications needs prioritised, even over those of concerned relatives of those who may be involved in the incident. The importance of dedicated spectrum to meet these needs has also been widely recognised globally, with some countries already well advanced on developing the capability.

If a national allocation of spectrum is dedicated for PSMB in Australia, a massive step forward will have been taken towards making the vision of a seamless exchange of voice, data and video by public safety agencies become a reality. Getting all the stakeholders to agree to the high-level requirements is the present challenge, but is an important first step on a journey well worth making.

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SOLAR SAVINGS

A remote radio site was burning the midnight diesel.
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The Sinuoso site is located on the edge of the Sonora desert in north-west Mexico, and is a fully off-grid site with both 2G (with air conditioning) and 3G cellular loads in self-contained cabinets. The site had approximately 7 kW of solar already installed and was supposed to be running in a hybrid manner, cycling the batteries. But the control system never worked properly and the generator was running 24/7. As a result, the client requested a replacement system that could be proven to operate in a hybrid charge/discharge manner, with the necessary logging to verify its performance.

The site parameters and requirements were: average load of 3.5 to 4 kW; re-use of the 43 solar panels with approximately 7 kW of solar power output; re-use of the existing generator (25 kVA standby/20 kVA prime, three-phase); and use of the 1500 Ah/48 VDC battery provided. The bulk of the hybrid system output was required to be AC, with minimal 48 VDC load. The shelter is free-air cooled only, with average daily temperatures in the shelter of 35°C and often over 40°C.

Enatel's SYNERGi provided the solution with a configuration of five 2 kW Enatel solar converters, nine 2 kW rectifiers (phase balanced) and six 1.2 kW inverters to be deployed for efficiencies and cost savings.

The system being replaced was a mix of rectifiers, solar

converters and inverters, all from different manufacturers. A PLC was acting as the controller. The extant generator was retained, as a replacement would cost US\$25,000. The 1500 Ah AGM lead-acid battery was supplied by the customer. It was a low-cost reconditioned battery and provided with the acknowledgement that it was not actually appropriate for this application and would likely last much less than 12 months. Long term, a more fit-for-purpose battery is to be provided and would likely be a high-cycle, sealed, lead-acid battery. LiFePO₄ batteries are also being considered for the trial.

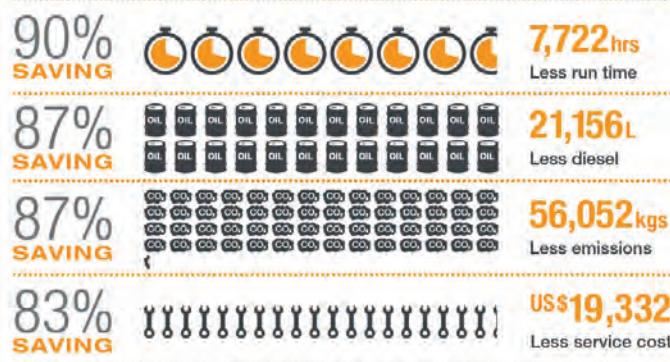
The SYNERGi solution is a single modular design that takes up about a quarter of the space, presenting a harmonised, single-controller solution where all the power modules work in a unified and coordinated manner.

By dynamically detecting conditions, the SYNERGi hybrid power system cycles the batteries, saving diesel and maintenance expenses by operating the existing generator in its optimum efficiency power range for longer periods. Enatel's 'solar optimisation' feature also ensures that the genset does not run if solar power is available. SYNERGi incorporates its own self-learning algorithm to track sunrise through the seasons, thus giving well-defined stop conditions to the generator to ensure it does not run unnecessarily during the solar day. Operating autonomously, it does not require connection to external date or time references and does not require links to weather forecasting websites. These efficiencies significantly extend the life of the generator as well as giving the obvious benefits of fuel and service cost reduction.

The logs show the average power of the generators during hybrid operation to be 11 kW. This operates the generator at approximately 55% of standby (61% of prime) power.

The diagram shows the estimated annual savings for the site in terms of diesel fuel, emissions and dollars. At these rates, payback for the SYNERGi system would be less than one year.

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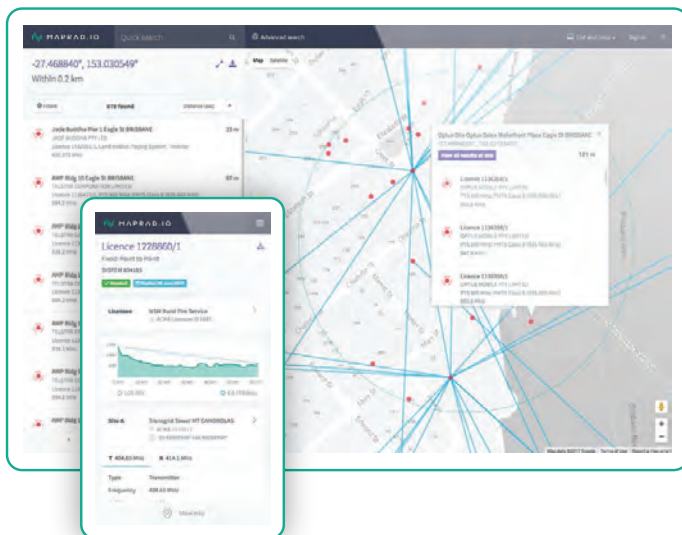
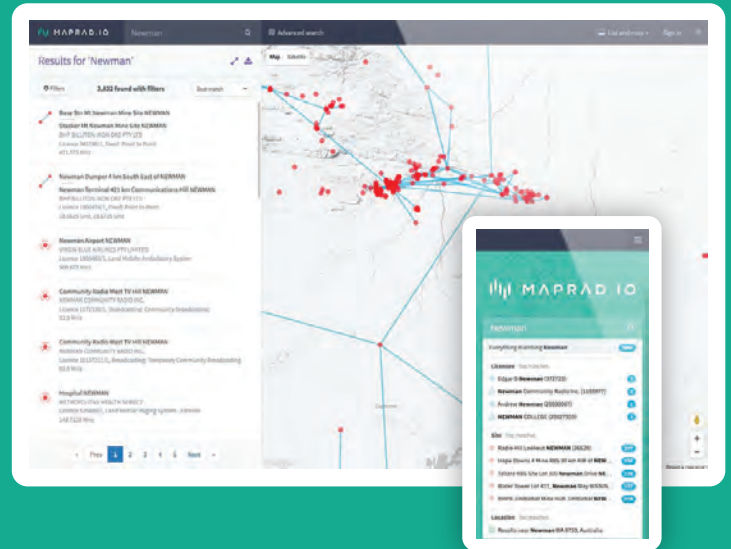


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AI FOR SPECTRUM AUCTIONS

HOW ARTIFICIAL INTELLIGENCE HELPED AUCTION OFF US\$19 BILLION WORTH OF RADIO SPECTRUM

When mobile phone carriers in the US paid US\$19 billion to scoop up spectrum no longer needed by television broadcasters, they used an auction process designed by University of British Columbia (UBC) and Stanford University researchers. While spectrum auctions are nothing new, this one was so complex and involved so many moving parts that computer science was used to solve the problem. A paper published in the *Proceedings of the National Academy of Sciences (PNAS)* outlined the complexity of the problem and explained how the economists and computer scientists worked together to design the solution.

Past radio auctions were not limited by the amount of spectrum, and this was the first time that the US Federal Communications Commission (FCC) had asked television stations to auction off their unneeded airwaves directly to mobile providers.

The auction repurposed 84 MHz of spectrum. Broadcasters made US\$10 billion and, after covering costs, the government's US\$7 billion earnings were put toward the national debt as was required by legislation.

The success of the auction is the result of a clever reverse auction solution where the price wasn't set by the highest bidders, but by how low broadcasters were willing to go to turn over their spectrum. This solution was developed and designed by the team of computer scientists and economists.

"Auctions work when we don't know what things are worth," said Kevin Leyton-Brown, a UBC computer science professor. "In this case, we were asking television stations to decide how much it was worth for them to stop broadcasting."

“

“IN THIS CASE, WE WERE ASKING TELEVISION STATIONS TO DECIDE HOW MUCH IT WAS WORTH FOR THEM TO STOP BROADCASTING.” — KEVIN LEYTON-BROWN, UNIVERSITY OF BRITISH COLUMBIA

This meant that in densely populated regions, like New York and Los Angeles, broadcasters made more money from their sales. Meanwhile, broadcasters in regions like the Midwest were paid less for their spectrum.

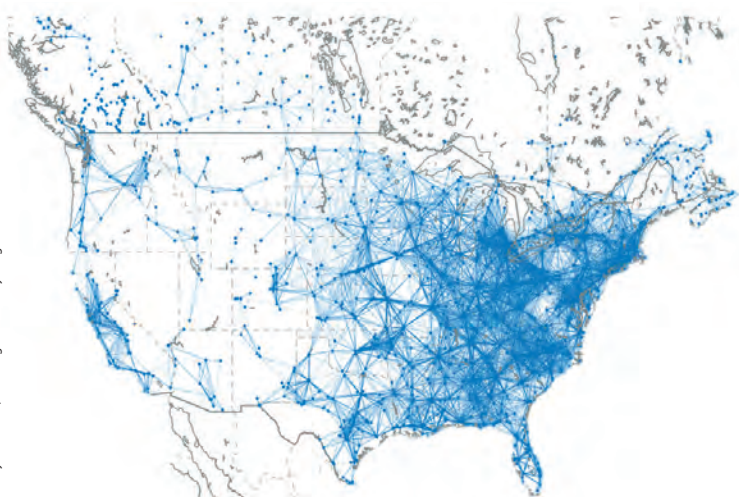
“The auction paid billions of dollars to television stations to stop being broadcasters, which is good for struggling stations that had no other way to sell broadcast rights,” said Leyton-Brown. “People will be happier with faster phones and the government achieved its goal to make better use of the spectrum, which strengthens the economy and widens the tax base.”

Remarkably the system also factored in a number of other considerations at the same time, such as the number of trades happening at once and property rights. For example, some broadcasters were willing to sell channels in a number of different places around the US, provided certain conditions were met in each of those different regions.

The auction system may come in useful as countries prepare to sell bandwidth for the future 5G mobile network. Leyton-Brown says the design could also be used as a template for similar auctions on a much smaller and simpler scale. For example, some conservation groups will pay farmers along migration routes to delay harvesting their crops to give birds a place to stop.

The auction is also an example of how computer science and artificial intelligence are now necessary to handle the day-to-day processes and demands of our world. In the past, with less complex products to sell, governments and economists could have made an auction work on their own.

“When economic designs get complicated enough, it becomes a computer science problem,” said Leyton-Brown. “This is a relatively new phenomenon.”



A visualisation of the incentive auction's 2.7 million pairwise interference constraints.

ICOM

Wideband
Communication
Receiver

Multiple Digital
Mode Decode



Introducing Icom's newest wideband receiver, the IC-R8600. Capable of receiving between 10kHz and 3GHz, the IC-R8600 will decode diverse digital communication signals and the advanced FPGA processing technologies will ensure clarity and accuracy.

The fast moving, real-time spectrum scope and waterfall function on the large TFT screen allows the user to search for unknown signals whilst scanning the bands.

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

WWW.ICOM.NET.AU

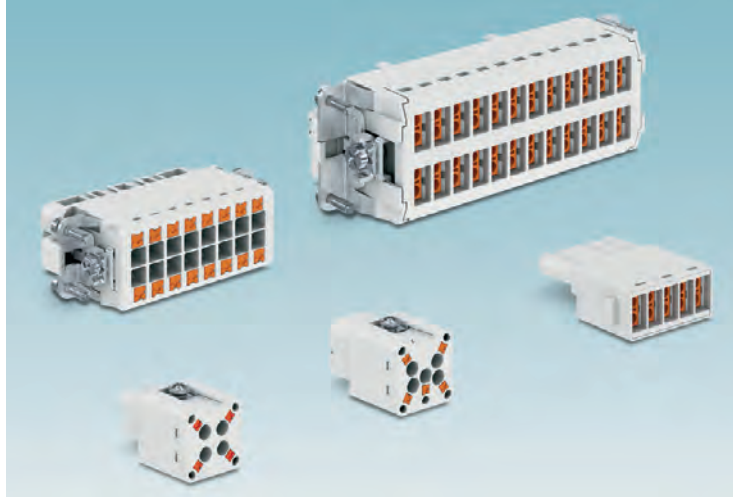
Multiprotocol digital radios

The JVCKENWOOD NEXEDGE NX-3000 Series multiprotocol digital radios are capable of operating in NXDN or DMR Tier II, as well as FM analog. The radio has built-in GPS and Bluetooth and features KENWOOD audio, enhanced with active noise reduction (ANR) using built-in DSP and advanced AES, DES and DMR ARC4 optional encryption.

The product meets the IP67 standard for dust intrusion and immersion and is capable of UHF operation from 400–520 MHz. Both the portable and NX-3720/3820 have a bright multiline, full dot-matrix LCD display.

A 7-colour light bar indicator on the top of the portable can be programmed by the user to light or flash, making it easy to silently identify calls by channels or zones and facilitating easy visual alerting, even in low light or high noise situations. The radios also feature a built-in motion sensor (man down, stationary and motion detection) and users have the option of expanding up to 1000 channels.

JVCKENWOOD Australia Pty Ltd
www.kenwood.com.au



Heavy-duty push-in contact inserts

Phoenix Contact has released the PT-TWIN push-in contact inserts for heavy-duty connectors. In addition to offering push-in connection technology, the devices come with a double conductor connection. This feature provides additional user convenience as two conductors can now be wired into one contact point quickly and easily to save time. The double conductor connection also eliminates the need for an additional marshalling level, further simplifying the installation process and minimising the time required.

The double conductor connection capability, together with the PT-TWIN's push-in connection technology, not only simplifies the connection process for the user, it also ensures greater choice. The option expands the existing range of contact inserts with push-in for heavy-duty connectors of common housing lines, and adds to the wider portfolio which includes crimp and screw connection technology.

Created for fast assembly, the device features tool-free installation. The technician simply pushes the wires in, thereby setting up the connection, and then places the PT-TWIN push-in contact insert into the connector, making the process hassle-free and quick.

Suitable for control and power transmission, the unit also provides user flexibility, as it is available with a fixed number of positions and in a modular design for series B housing.

To ensure a high level of performance, the push-in contact inserts are shock and vibration resistant. They are also safe to use and operate, meeting all required standards.

Phoenix Contact Pty Ltd
www.phoenixcontact.com.au



Vector signal generator

The Keysight E4438C ESG vector signal generator incorporates a broad array of capabilities for testing both analog and digital communications systems. It combines good RF performance and sophisticated baseband generation to deliver calibrated test signals at baseband, IF, and RF frequencies up to 3 GHz. It is available for rent from TechRentals.

The product offers an internal baseband generator with arbitrary waveform and real-time I/Q capabilities, ample waveform playback and storage memory, and a wide RF modulation bandwidth. The multifunction calibrator is said to deliver a high level of accuracy, which makes it a suitable tool for testing today's complex wireless systems and their components.

Features include: a frequency range from 250 kHz to 3 GHz; 17 dBm output power; a high-stability timebase; and an 8 MSa internal baseband generator.

TechRentals
www.techrentals.com.au

Analysers software

Anritsu continues to address the emerging test requirements associated with 4G base stations with the introduction of OBSAI RF Analyser software to complement the existing CPRI RF analysis capability of its handheld analysers. With the software installed in the handheld analysers, wireless carrier engineers, technicians and contractors responsible for solving interference and PIM issues can identify interference sources on the radio uplink from the ground, thereby lowering OpEx (operational expense) by reducing the use of tower climbing crews.

The CPRI/OBSAI Analyser allows users to conduct RF-based measurements over a fibre-optic link to locate interference affecting an RF module (RFM) by tapping into the fibre link between the RFM and baseband module (BBM). The Anritsu handheld instruments will decode the CPRI/OBSAI protocol IQ data and convert it to RF data. Bandwidths of 5, 10, 15 and 20 MHz are supported.

Among the measurements available with the new option is a spectrum mode that can be used to test the link in real time. Additionally, field technicians and engineers can monitor for intermittent interference over a specifiable recording time using the Spectrogram mode. All CPRI & OBSAI Analyser measurement functions can be performed from ground level. After testing and reviewing the results, a determination can be made on the need for a tower crew.

The software can be integrated into the latest BTS Master and Site Master models. It supports the most recent radios from Ericsson, Nokia/ALu, Huawei and Samsung.

Anritsu Pty Ltd
www.anritsu.com

DC power system

Available through Powerbox Australia, the Enatel PSX16 and PSX24 Micro-Compact series DC power system is a -48 VDC power solution that meets the requirements of small telecommunications applications up to 2.4 kW.

The MicroCompact is available in models configured with up to three rectifier modules (800 W–2.4 kW) for increased load power requirements and/or to provide system redundancy.

The MicroCompact series front-accessible DC distribution can be easily customised and configured according to a customer's individual requirements. Models can be configured with up to six load circuit breakers (6–30 A) and two battery circuit breakers (30 A max).

At the core of the MicroCompact series is the SM36 supervisory module. The SM36 platform provides the system with full remote monitoring via TCP/IP, ensuring fewer site visits and reductions in operational and service costs, according to the company.

Powerbox Australia Pty Ltd
www.powerbox.com.au



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EMONA



Point-to-multipoint and point-to-point SCADA radios

The Aprisa SR point-to-multipoint and point-to-point SCADA radios provide high-speed communication with no compromise to the coverage area, helping you get more out of your network. The product has a good MAC, as well as an adaptive coding and modulation (ACM) feature.

The product comes with a comprehensive security suit, advanced IP capabilities and QoS. It has fully integrated leading NMS options to make managing a network easier.

The radios are now available in the 50 kHz channel, providing a higher over-the-air speed of more than 200 Kbps. This helps the user get more information where it needs to go and when it needs to get there. Enhanced security features include RF CCM authentication, preventing man-in-the-middle attacks, so information is safer than ever.

4RF Ltd

www.4rf.com

Digital wireless ad hoc repeater

The Hytera E-pack100 digital wireless ad hoc repeater is designed for fast and flexible communication system deployment.

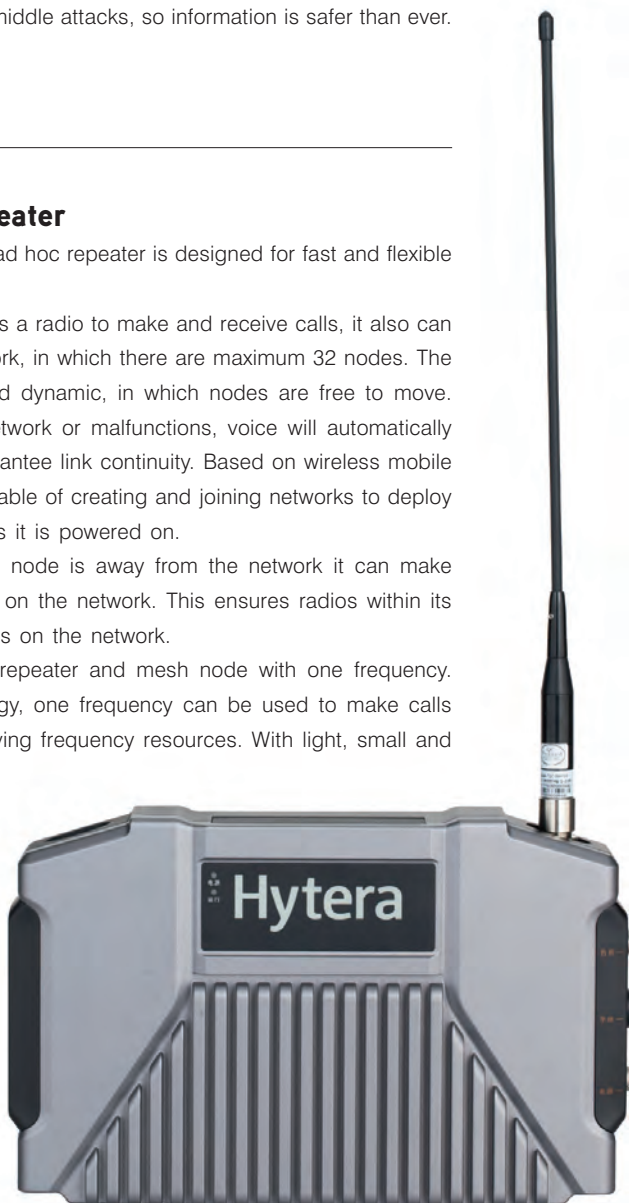
The product can not only be used as a radio to make and receive calls, it also can create a wireless mobile ad hoc network, in which there are maximum 32 nodes. The ad hoc network is self-configuring and dynamic, in which nodes are free to move. If one node moves away from the network or malfunctions, voice will automatically route to another node in order to guarantee link continuity. Based on wireless mobile ad hoc networking, the product is capable of creating and joining networks to deploy the communication system as soon as it is powered on.

With an embedded GSM card, if a node is away from the network it can make a call via public network to any node on the network. This ensures radios within its coverage can communicate with radios on the network.

The product functions as a radio, repeater and mesh node with one frequency. Based on TDMA and FDMA technology, one frequency can be used to make calls and route voice at the same time, saving frequency resources. With light, small and IP67 design, the product can be installed in a vehicle, carried by a backpack, pole mounted or wall mounted. It is suitable for temporary communication or indoor coverage. It is strictly compliant with MIL-STD-810 C/D/E/F/G standards and IP67 water- and dust-proof rating, which ensure good performance even in a harsh environment.

Hytera Communications Co. Ltd

www.hytera.com.au



Two-way radios

The MotoTRBO DP4601e digital two-way radios are suitable for the mining industry, where rough terrain, harmful fumes and other difficult environmental conditions inside the tunnels of mine sites pose a risk to the safety of the workforce. The two-way radios are dustproof and waterproof to IP68 and have been tested to military standards. They are available to rent from TR Hirecom.

The radios have a range of safety features, including a brightly coloured emergency button, indoor location tracking, GPS and an integrated accelerometer that detects when a worker has fallen and initiates a call for assistance. They also feature industrial noise cancellation, text messaging, 4-line display, extended battery life and a customisable voice announcement.

TR Hirecom

www.thirecom.com.au

Integrated communication system

The AcomNOVUS integrated communication system can be used for complex dispatch operations.

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

The system is able to interoperate across equipment, departments, agencies and jurisdictions. This gives the user vital connections during large-scale events and emergencies.

Users can also use a laptop or tablet PC with just a USB headset to set up remote, temporary, backup, mobile and training positions quickly and securely. Their mobile and remote operations have unlimited access to the full resource capabilities of the console system.

It can be used in conjunction with radio technologies such as TETRA, P25 and DMR.

Zetron Australasia Pty Ltd

www.zetron.com



Repeater

The Motorola Solutions MOTOTRBO SLR 1000 repeater enables users to extend their coverage to remote locations, as well as eliminating dead zones.

The product is compact, easy to install and designed to work both indoors and outdoors. It is IP65-rated for dust and water protection, meaning it can be deployed on campuses, in parking garages and across other outdoor locations.

The product's compact size gives it more installation options, such as mounting on walls or poles. A low-power, fanless design uses less space and energy, saving money for the user.

It works with both conventional and trunking systems supporting voice and data.

Motorola Solutions Australia Pty Ltd

www.motorolasolutions.com.au



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rfi.com.au

Vector network analyser

The Pico Technology PicoVNA 106 vector network analyser is a USB-controlled, professional and laboratory-grade 300 kHz to 6 GHz vector network analyser.

The analyser has a full-function, minimal-error, Quad RX four-receiver architecture. This supports both 8- and 12-term calibration without the uncorrectable switching errors and delays of traditional three-receiver designs. The instrument supports convenient calibration methods such as enhanced isolation correction and unknown thru.

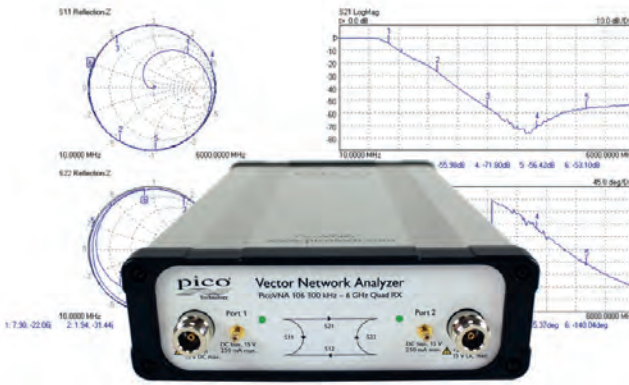
The product has a range of up to 118 dB at 10 Hz and only 0.005 dB RMS trace noise at its maximum bandwidth of 140 kHz. It can gather all four S-parameters at just 190 μ s per frequency point; in other words, a 500-point, 2-port S2P Touchstone file, compatible with test, math, view and EDA simulation tools, in less than a tenth of a second.

It is suitable for classrooms, small businesses and even amateur workshops. The product's small size, weight and high performance also make it suitable for field service, installation test, embedded and training applications. Its remote automation interface enables it to test automation, perhaps as a reflectometry or transmission measurement core for embedded roles.

The product is supplied with Microsoft Windows software to support a full range of plot formats for scalar and vector view of dual- or single-port parameters. These can be saved or exported in various graphic and tabular formats, including Touchstone. The software includes Fourier transformation to the time domain, adding convenient distance-to-fault capability and pulse response determination. Nominal impedance transformation (10 to 200 Ω) is available, mathematically or using port-matching pads, with limit tests on the Cartesian plot formats.

Emona Instruments Pty Ltd

www.emona.com.au



Antennas

The ZCG Scalar BLKR antenna range has a sleek and stylish all black design. It combines black chrome and electroplated components to the design.

Features of the SGDB-BLKR include frequency range of 825–960 and 1710–2190 MHz at <1.6:1 VSWR; 6.2 dBi gain; all black Radom; 90 cm tall; black stainless steel beehive spring; 5 m RG58 low loss cable; FME female crimp fitted; and 30 W.

Features of the SGLDB-BLKR include frequency range of 825–960 and 1710–2190 MHz at <1.6:1 VSWR; 6.2 and 3 dBi gain; black fibreglass radome; 75 cm tall; 30 W; black stainless steel spring; 5 m RG58 low loss cable; and FME female connector fitted.

ZCG Scalar

www.zcg.com.au

Push-to-talk radios that connect you Australia-wide



The ToooAir platform is a PTTc (Push-To-Talk over Cellular) Australia wide area dispatch radio system offering enhanced benefits comparable to any commercial LMR/PMR radio system.

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AUSTRALIAN-FIRST V2P TRIAL

Vehicle-to-pedestrian safety technology has been trialled for the first time in Australia over a 4G network.

Telstra and Cohda Wireless have conducted the first Australian test of vehicle-to-pedestrian (V2P) technology over a mobile network in Adelaide, demonstrating that vehicles can interact directly with pedestrians' and cyclists' mobile phones to improve safety on the road network.

The technology provides an early-collision warning to the driver and also alerts the pedestrian or cyclist via an application on their mobile phone.

The technology was tested using common scenarios, such as a car and a cyclist approaching a blind corner, a car reversing out of a driveway, and a car approaching a pedestrian crossing.

The tests have shown that safety between vehicles and vulnerable road users can be improved simply by broadcasting safety signals from smartphone technology through the cellular network.

Telstra's vehicle-to-everything (V2X) project, which includes vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) in addition to V2P, seeks to make Australian roads safer, more efficient and better prepared for the future of autonomous vehicles.

"This is the first time V2P technology has been trialled in Australia on a 4G network and is an important step on the

journey to fully autonomous vehicles on Australian roads," said Telstra Chief Technology Officer Håkan Eriksson.

"This follows our successful trials of V2I in October 2016 and V2V in February 2017, also completed in partnership with Cohda."

Since it was founded in Adelaide in 2004, Cohda Wireless has become one of South Australia's most impressive success stories, creating products now used in more than 60% of connected-car field trials worldwide and launched in publicly available vehicles in the United States earlier this year.

"What Cohda and Telstra have achieved highlights the impact V2X technology can have on our community," said Cohda Wireless CEO Paul Gray. "Giving vehicles 360° situational awareness and sharing real-time driving information is the only way we can create safer roads for the future."

"Cohda's ongoing partnership with Telstra also demonstrates Cohda's ability to deliver Cellular V2X (C-V2X) solutions, an important part of the complete V2X system."

The trial was funded in part by the South Australia government's \$10m Future Mobility Lab Fund to boost local testing, research and development of connected and autonomous vehicle technologies.

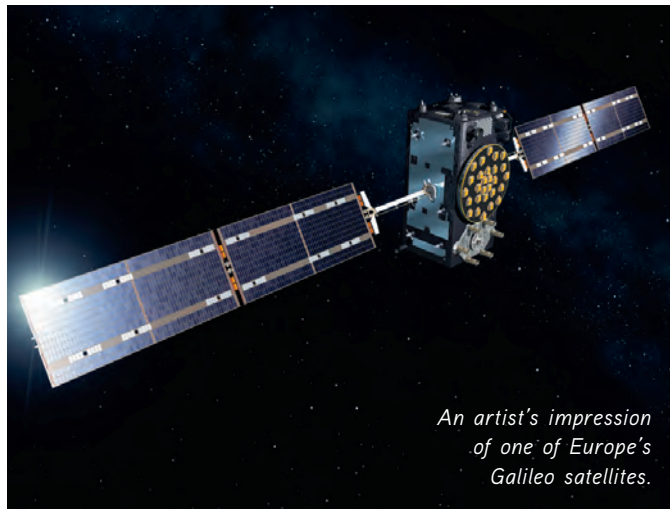
The Future Mobility Lab Fund was announced in November 2016. So far, \$5.6m in funding has been issued, including \$500,000 from the state government towards this \$3m, Telstra-led project.

The state government, Telstra and Cohda Wireless are all partners of the Australian Driverless Vehicle Initiative — a collaboration of government, industry and academic partners working together to bring driverless vehicles safely and successfully to Australian roads.

"With the driverless car industry expected to be worth \$90 billion worldwide by 2030, it's vital that we encourage and support businesses locally to get involved on the ground floor," said Transport and Infrastructure Minister Stephen Mullighan.



Image courtesy Telstra



*An artist's impression
of one of Europe's
Galileo satellites.*

SBAS TRIAL GATHERS PACE

Jonathan Nally

A multimillion-dollar trial of a second-generation, space-based positioning technology system is underway in Australia.

As we reported in *Critical Comms* earlier in the year, Australia is undertaking a world-leading trial of technology that could dramatically boost the precision of satellite navigation systems. According to Gary Johnston, head of Geoscience Australia's geodesy and seismic monitoring section, the widespread adoption of improved positioning technology has the potential to generate upwards of \$73 billion of value to Australia by 2030. With that in mind, in January 2017 the federal government announced \$12 million in funding for the trial of a second-generation satellite-based augmentation system (SBAS), with the aim of vastly improving the accuracy of location systems. The New Zealand government will also contribute \$2 million towards the testbed and trial program.

To find out more the trial program, we spoke with Rod Drury, Managing Director–Australia for Lockheed Martin Space Systems.

What is the SBAS project and what is it expected to achieve?

This innovative research project will show how augmenting signals from multiple Global Navigation Satellite System (GNSS) constellations can enhance positioning, navigation and timing for a range of applications across multiple industries. For the first time, a second-generation SBAS testbed will use signals from both the Global Positioning System (GPS) and the Galileo constellation, and dual frequencies, to achieve even greater GNSS integrity and



accuracy. Over two years, the testbed will validate applications in nine industry sectors: agriculture, aviation, construction, maritime, mining, rail, road, spatial and utilities.

Which parties are involved in the project, and what are they doing?

Geoscience Australia is leading the project with Lockheed Martin. The Australian Cooperative Research Centre for Spatial Information will coordinate the demonstrator projects that test the SBAS infrastructure. Land Information New Zealand is coordinating New Zealand participation. Lockheed Martin will provide systems integration expertise in addition to the Uralla radio frequency uplink. GMV-Spain will provide its 'magicGNSS' processors. And Inmarsat will provide the navigation payload hosted on the 4F1 geostationary satellite.

Who will use SBAS, and what improvements will it bring to the economy?

Many sectors — such as the aviation and maritime industries — rely on GNSS signals for accurate, safe navigation. Users must be confident in the position solutions calculated by their GNSS receivers. The term 'integrity' defines the confidence in the posi-



Lockheed-Martin's satellite ground station at Uralla on NSW's mid-North Coast.

tion solutions provided by GNSS. Industries where safety-of-life navigation is crucial want assured GNSS integrity.

Ultimately, our testbed will broaden understanding of how this technology can benefit safety, productivity, efficiency and innovation in Australia and New Zealand's industrial and research sectors.

Is SBAS unique to Australia, or are other countries doing the same thing?

There are four first-generation SBAS systems worldwide: the US's Wide Area Augmentation System (WAAS), the European Geostationary Navigation Overlay Service (EGNOS), Japan's Multi-functional Satellite Augmentation System (MSAS) and India's GPS Aided GEO Augmented Navigation (GAGAN).

Australia will host the first second-generation SBAS system. This is the first time an SBAS will use signals from multiple GNSS, on two frequencies — the L1 (1575.42 MHz) and L5 (1176.45 MHz) GPS signals, and their companion E1 (1575.42 MHz) and E5a (1176.45 MHz) Galileo signals — to provide integrity data and enhanced accuracy. This SBAS is not dependent on one GNSS.

Australia is the perfect place to make this demonstration, with much of the ground station infrastructure already existing.

What is the timeline for the trial stages?

Since announcing this project in February, we have completed construction of the SBAS testbed and begun testing. In early June, our testbed began broadcasting the L1 signal in the same format and capability as the legacy WAAS and EGNOS. In September, the testbed will add data to the L1 signal, enabling receivers configured to receive it to make very precise position solutions, with accuracy below 10 centimetres (typically 6–8 cm). And later this year, we expect the testbed will begin broadcasting on L5, the first ever dual-frequency, multi-constellation SBAS signal.

Finally, tell us more about your Uralla ground station — what is it used for?

Lockheed Martin Australia has operated and maintained its ground control station at Uralla on the north coast of NSW since 1998. It is the primary back-up Telemetry Tracking and Control (TT&C) for Lockheed Martin and provides Transfer Orbit Support Services (TOSS) and Initial Orbit Testing (IOT) for satellites after they have been launched for a wide range of commercial and government customers.

MAKING MMWAVE WORK FOR PUBLIC SAFETY

The quest begins to bring ultra-high-speed wireless connectivity to first responders.

Researchers are beginning work on technology that could enable first responders to relay video in moving ambulances, employ virtual reality in emergencies, receive high-definition images from drones in real time or control robots in restricted indoor environments too dangerous for humans.

Although 5G wireless communication is nearing its first public deployment, such millimetre-wave (mmWave) technology for public safety communications is less understood and presents unique challenges.

Earlier this year, the US Commerce Department's National Institute of Standards and Technology (NIST) awarded US\$2.3 million over three years to the NYU WIRELESS research centre at the New York University Tandon School of Engineering, which will work with Italy's University of Padova, the Austin Fire Department and NYU WIRELESS industrial affiliates to create a research platform for public safety communications using frequencies above 6 GHz, in the mmWave spectrum.

The researchers immediately convened to begin executing their plans to greatly reduce the time to bring mmWave technology to public safety communications.

Within three years, they aim to develop fundamental research on the behaviour of the radio waves, channel measurements and models, and public safety-specific findings for technology such as antennae and testing equipment, as well as an end-to-end system simulation of a complex public safety scenario.

The researchers plan to develop the first free and open-source channel sounding, emulation and simulation tools for designing and testing public safety communications equipment.

"Our team is grateful for this NIST grant, which will allow us to expand the knowledge we have been building about millimetre wave technology into a new area that is not just intellectually challenging but one that will ultimately save lives," said Sundeep



Rangan, who leads the project, directs NYU WIRELESS and is an associate professor of electrical and computer engineering at NYU Tandon.

Marco Mezzavilla, an NYU WIRELESS research scientist and program director for the NIST project added, "We plan to apply the lessons we learned at NYU WIRELESS in accelerating the pace of 5G cellular technology to this new project and demonstrate novel use cases not

possible with earlier 4G systems."

In the first phase of their work, the researchers will develop special channel soundings for emergency systems, including peer-to-peer and aerial and vehicular links not required for cellular and Wi-Fi systems, as well as signal blockage and mobility issues that are not yet fully understood.

Other research will develop software-defined radio systems to deliver ultra-reliability. Complex channel emulation will be needed to scale to the bandwidth and for the large number of antennae required for mmWave. Based on their experience with commercial mmWave modelling, the researchers hope to vastly simplify channel processing.

NYU WIRELESS is home to pioneering mmWave research including the propagation measurements, radio channel modelling, system simulation and antenna technology that are the foundation for 5G. National Instruments, an industrial affiliate of NYU WIRELESS, will provide much of the equipment and

Images courtesy FirstNet



"THERE IS STILL A LOT OF WORK TO BE DONE WHEN IT COMES TO MAKING 5G READY FOR PUBLIC SAFETY COMMUNICATIONS." — JAMES KIMERY, NATIONAL INSTRUMENTS

software, and NYU students have worked extensively at NI to develop key components.

"As 5G gets closer to becoming a commercial reality, there is still a lot of work to be done when it comes to making 5G ready for public safety communications," said James Kimery, director of RF research and SDR marketing at NI.

Theodore (Ted) S Rappaport, the founding director of NYU WIRELESS and NYU Tandon's David Lee/Ernst Weber Professor of Electrical Engineering, is a co-principal investigator, along with the noted wireless researchers Michele Zorzi and Andrea Zanella of the University of Padova. Post-Doctoral Research Fellow Aditya Dnanhanjay will supervise much of the hardware development.

The Austin Fire Department's (AFD) Robotics Emergency Deployment Team is at the forefront of the use of robotics in emergency incident management. AFD was the first metropolitan fire department in the US to receive a Certificate of Authorisation from the Federal Aviation Administration to use drone technology in real-time, public safety capacities. The team is already testing air, ground and maritime robotic platforms to establish an industry standard for the first rescue-specific robots.

For this project, the Austin Fire Department will consult on the design of test scenarios and may even test prototypes. The city's hilly geography poses a difficult mmWave challenge.

The grant to NYU and its partners was the largest of 33 NIST grants announced for research and development projects aimed at advancing broadband communications technologies for first responders. The grants are part of the Public Safety Innovation Accelerator Program funded by NIST's US\$300 million allocation from the 2015 auction of advanced wireless service licences.



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Push-in equipped M12 connector

Phoenix Contact's push-in equipped M12 connector ensures greater choice for the user, while simplifying the connection process.

The product complements the existing M12 connector portfolio which includes QUICKON, Crimp, Screw and Piercecon connection technology.

Designed for easy assembly whether on-site or out in the field, the connector offers suitable connection technology for the transmission of data, signals and power.

The direct plug-in capability of the connector means installation can occur quickly and efficiently. Whether working with solid conductors or conductors with ferrules, the connector allows technicians to connect directly to the terminal point, making the process simple and hassle-free.

In addition, the device delivers convenience because it does not require the use of tools. The technician simply lifts the coloured lever on the terminal point to connect or release the corresponding colour-coded conductor. Tool-free, the installation process is fast, convenient and time-saving.

The product helps keep human error to a minimum. As no soldering is required to connect conductors to the connector, the opportunity to damage the connector or for human error to occur is significantly reduced.

Shock and vibration resistant, the product features a spring-cage connection to secure the conductor to the M12 even under harsh conditions. The SPEEDCON fast-locking system provides maximum contact reliability to deliver a high level of performance.

Phoenix Contact Pty Ltd

www.phoenixcontact.com.au

Dispatch console system

The Omnitronecs RediTALK-Flex dispatch console system builds upon the original RediTALK application to provide flexibility and customisation. It provides integration of major radio technologies including DMR (Tier II and III), MotoTRBO, P25, Tetra and NXDN, making it suitable for all organisations regardless of whether they are migrating to new digital networks or using a combination of digital and analog technologies. RediTALK-Flex can be expanded and updated as required.

The entry-level package starts with two channels, GPS monitoring and full digital call functionality. This can be expanded and enhanced with additional channels, geofencing, historical GPS tracking and radio patching.

Omnitronecs Pty Ltd

www.omnitronecs.com.au



Push-to-talk over cellular LTE smart device

The Telo Systems TE580 push-to-talk over cellular (PTToC) LTE smart device supports Band 28. It is suitable for wide area group communications, delivering a combination of robust hardware, powerful software and broadband connectivity.

The product has a dedicated PTT button for simple push-to-talk operation and an emergency button for duress. The industry-standard two-way radio audio interface enables users to combine cellular broadband capability with a broad range of cost-effective two-way radio accessories.

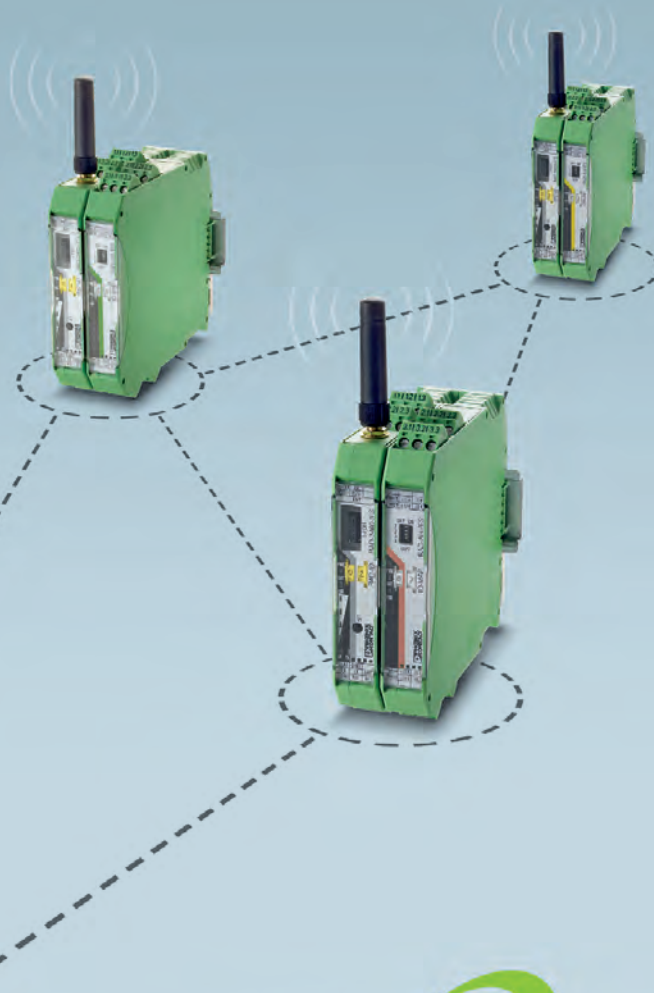
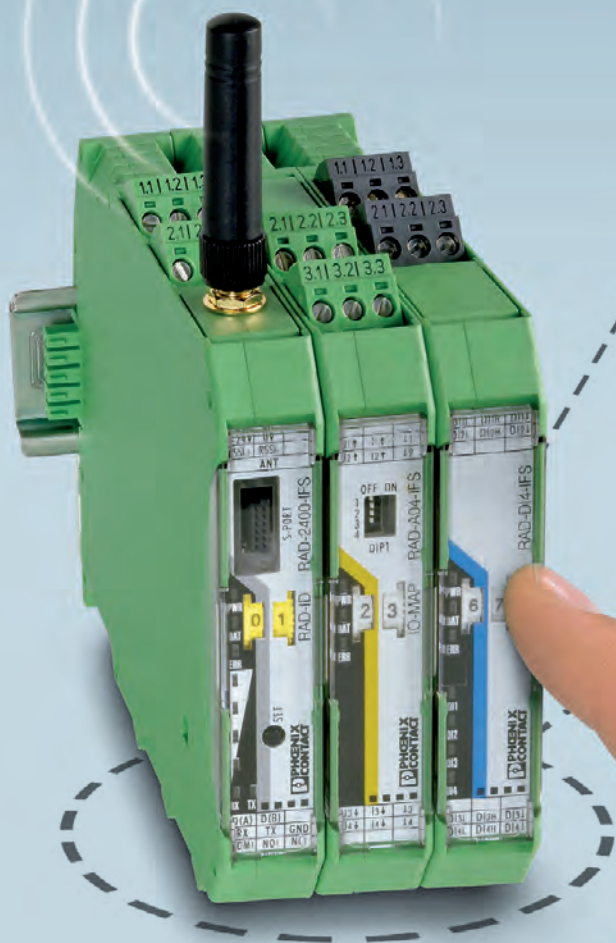
Other features include Google Play, Google Services, Google Maps; supports GSM, 3G, 4G/LTE — bands 1, 3, 5, 7, 8, 20, 28; ChatterPTT push-to-talk client pre-installed — the product supports other PTT services; Android 5.1 allows other applications to be installed; Bluetooth, Wi-Fi and GPS built in; SOS/Emergency key to enhance worker safety; audio interface fits a variety of traditional two-way radio accessories; 2 W speaker provides loud, clear voice; and IP67 rating to withstand dust, rain and water immersion of 1 m for 30 min.

Logic Wireless Limited

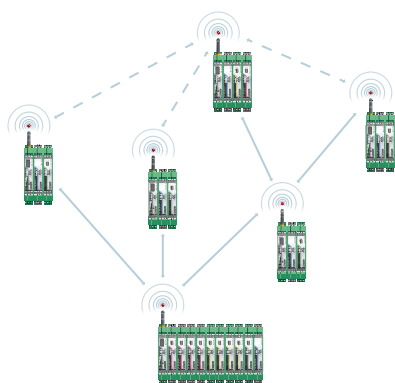
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For additional information visit phoenixcontact.com.au/radioline
or call 1300 786 411

Vector network analyser

The R&S ZNLE vector network analyser is suitable for users looking to perform RF measurements to characterise components such as antennas, attenuators, filters and PCBs.

The stand-alone instrument weighs only 6 kg and has a footprint of just 408 x 235 mm, saving space on the work bench.

The two-port vector network analyser provides quick measurements due to its easy-to-use S-parameter wizard. The product performs bidirectional measurements of the S11, S21, S12 and S22 S-parameters. An optional GPIB interface is available for remote control of the analyser. The instrument comes in two models with frequency ranges from 1 MHz to 3 GHz (R&S ZNLE3) and to 6 GHz (R&S ZNLE6).

The product provides good RF performance with a wide dynamic range of typically 120 dB and measurement bandwidths from 1 Hz to 500 kHz. Measurement time is just 9.6 ms for 201 points at 100 kHz measurement bandwidth, for a 200 MHz span, with two-port TOSM/SOLT calibration.

For stable, repeatable measurements, the product produces low trace noise of typically 0.001 dB. The product features a large 10.1" WXGA touch screen, providing good visibility of all traces. The touch screen supports zooming in and out of traces using multitouch gestures. The well-structured user interface makes it possible to access every function with the minimum number of steps. Undo/Redo softkeys are available to cancel and restore user entries. Context-sensitive help menus for the diverse functions and parameters facilitate interactive operation.

Calibration of the instrument is just as straightforward. The 'Start Auto Cal' function delivers automatic calibration at the touch of a button.

Rohde & Schwarz (Australia) Pty Ltd

www.rohde-schwarz.com.au



PCB printer

Nano Dimension has developed the DragonFly 2020 3D PCB printer for printing professional multilayer circuit boards.

The printer produces professional multilayer printed circuit boards (PCBs) and 3D circuitry, making it a rapid prototyping tool for electronics professionals. It brings together a precise inkjet deposition printer, high-performance silver nanoparticle conductive and dielectric inks and dedicated software in order to bring the benefits of 3D printing to electronics professionals.

The printing platform is dedicated to the production of professional multilayer PCB prototypes and other circuitry in-house, within hours. This means there is no need to wait days or weeks for a custom PCB prototype that has to be fabricated off-site. The innovative hardware, dedicated nano-inks and novel software offer virtually limitless design flexibility to a wide range of research and development, prototyping and custom manufacturing projects.

The 3D printer offers the flexibility to print an entire board or just part of a circuit. Users can develop the RF and digital sections of the board in parallel, test and iterate on the fly. The printer thus encourages innovation, lessening development risks and enabling faster time to market.

The product deposits two materials, one conductive and one dielectric, in order to build a complete multilayer PCB from the bottom up. Each pass of the printhead deposits dielectric and conductive material at the exact location specified by the design file. Starting from the underside conductive traces, the materials are built up to finish with the topside conductors.

This process means that vias are built up, drop by drop, either as blind, open or complete vias. Plated and non-plated through-holes are created by repeatedly leaving a space at a particular XY coordinate, thereby building surrounding materials up around a void. The dielectric ends up as a solid piece within which the conductive traces are positioned at the precise XYZ coordinates specified.

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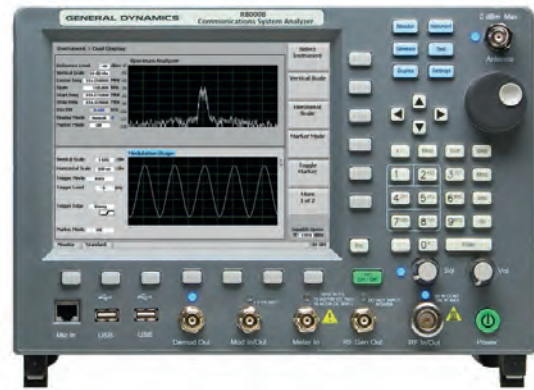
www.emctech.com.au


4G Ethernet router

RFI has released the Datamax4G Ethernet Router, suitable for wide-ranging connectivity and intelligent track control applications. The 4G router has diverse connectivity options including RS232, Wi-Fi and GPS to manage M2M applications over high data speeds. The Wi-Fi connectivity gives the router local wireless capability, creating an effective industrial hotspot. Failover between 4G and fixed-wire WAN or Wi-Fi makes configuring redundant links easy.

The modem is LTE CAT6 Band 28 supported, has 4-port Ethernet connectivity and supports WAN port and PPPOE protocol that can be connected directly to ADSL. The modem also supports low-power consumption mode, including sleep mode and scheduled online/offline mode. It has a rugged, robust metal casing, making it suitable for just about any industrial M2M application. These benefits can be further advanced with tracking available via its GPS feature for an all-rounded and intelligent M2M router.

RFI Technology Solutions
www.rfi.com.au



Compact communication system analyser

General Dynamics' R8000B is a compact communication system analyser which is designed to monitor and service radio communications equipment. It also generates and receives signals and measures modulation and frequency. It is available to rent from TechRentals.

The product performs a variety of tests on AM, FM, PM and optional digital standards P25, DMR, NXDN and TETRA radio transceivers. It is a full-featured instrument which acts as a spectrum analyser, signal generator, sensitive measurement receiver, oscilloscope and much more. With high spectral purity, it is a lightweight and portable solution to effective communications system analysis.

The power handling capability without an external attenuator is 50 W for 5 min, up to a time-limited 150 W. Featuring an 8.4" colour LCD screen and weighing less than 6.4 kg, the product has a frequency range of 250 kHz to 1 GHz. DANL is -140 dBm (50Ω input termination).

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Multichannel power probe

The R&S RT-ZVC multichannel power probe offers up to four voltage and four current channels with 18-bit resolution for high dynamic range current and voltage measurements.

With up to two R&S RT-ZVC probes supported on a single R&S RTE or R&S RTO oscilloscope, it is possible to analyse eight high dynamic range voltage and eight high dynamic range current signals in parallel with signals captured by the oscilloscope.

With up to four current and four voltage input channels, each with 18-bit ADC resolution, the R&S RT-ZVC02/-ZVC04 multichannel power probe provides the dynamic range needed to analyse current consumption in all mobile device activity phases.

Three built-in shunts and an external shunt mode in combination with switchable gain factors allow users to optimise the input current range. Differential inputs provide floating measurements within an input voltage operating window of ± 15 V. Settings are fully controlled from the oscilloscope user interface.

A bandwidth of 1 MHz and a sampling rate of 5 MS/s allow the user to capture fast current pulses. To analyse the overall power consumption of battery-powered devices, the very low sleep-mode currents have to be captured at the same time. For very high dynamic range measurements, the integrated low-pass filter reduces the bandwidth down to 5 kHz and minimises overall system noise.

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Call-taking software

The Zetron MAX call-taking software supports RapidSOS's enhanced location services.

Through this integration, PSAPs using the software have the ability to query the RapidSOS NG9-1-1 Clearinghouse when a wireless call is received. In return, the Clearinghouse transmits device-based hybrid location obtained from all smart-phone location sensors through NG9-1-1 delivery mechanisms.

Locations transmitted to the RapidSOS NG9-1-1 Clearinghouse are not only more accurate, but also faster than traditional ALI location information using device-based hybrid location tools.

The product can help call takers using these systems speed up response times and improve emergency outcomes.

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LASER LINK WILL BOOST SPACE DATA

*Artist's concept
of NASA's
Orion crewed
space vehicle.*

An 80-megabyte-per-second deep space laser communications system will be tested aboard NASA's Orion spacecraft.

Credit: NASA

NASA aims to boost the data rate of space communications using an advanced laser system called LEMNOS, or Laser-Enhanced Mission and Navigation Operational Services.

The project was named for the island, Lemnos, where the mythical hero Orion regained his sight, according to Greek lore. Similarly, LEMNOS will provide sight for NASA's next-generation Orion crewed spacecraft.

"Laser communications will revolutionise data return from destinations beyond low-Earth orbit, enhance outreach opportunities from outer space and improve astronauts' quality of life on long space missions," said Don Cornwell, director of the Advanced Communication and Navigation division at the Space Communications and Navigation program office at NASA Headquarters.

"As we strive to put humans on Mars for the first time, it's imperative that we develop a communications system to support these activities at the highest level possible."

While the Apollo program's radiocommunications system 50 years ago supported 51 kilobytes of data per second, LEMNOS will be able to support communications at rates of at least 80 megabytes per second. This means, for example, that astronauts could send and receive ultrahigh-definition video from the surface of Mars.

The Exploration and Space Communications (ESC) projects division at NASA's Goddard Space Flight Center in Greenbelt, Maryland, has been tapped to build LEMNOS in collaboration with

the MIT Lincoln Laboratory in Lexington, Massachusetts. They worked with other NASA centres to determine specific needs the system can fulfil.

"As we started thinking about the possibility of laser communications on Orion, I spoke with the flight controllers at Johnson Space Center who are developing the communications plan for Orion's deep space missions," said Mark Brumfield, deputy program manager of implementation for ESC.

"They were talking about enabling communications capabilities that we take for granted, but that are so foreign in space, from streaming scientific data and video in real time to allowing astronauts to watch the Super Bowl or keep up with an election.

"Being able to connect with society could have great impacts to astronauts' mental health during the mission. Right now, they wouldn't be able to make those connections in a meaningful way, but optical communications will give us that capability," he added.

The project is underway at Goddard, with a goal to test LEMNOS for the first time on the second flight of Orion beyond the Moon. Scheduled for one week with the option to extend for a longer mission, it will be the perfect opportunity to test the laser system, operating it continuously for up to an hour a day.

After the initial mission, Brumfield speculates NASA could add more laser communications terminals on future Orion exploration missions. This would increase communications capability because of LEMNOS's need for line-of-sight.



Image courtesy US Department of Defense

CONTROLLING FOR CHANGE

Pete Prater, Founder and Chair, International Critical Control Rooms Alliance

The International Critical Control Rooms Alliance aims to foster collaboration and discussion among the world's 80,000-plus control rooms.

Mission-critical control rooms are complex places — a delicate balance of people, process, technology and environment drawn together to deliver vital services to the organisation and its customers. Often, the control room is the front door to the organisation and so establishes the service user's experience and expectations, which will directly reflect their confidence in the organisation.

Critical control rooms support many types of operations — oil and gas, rail, maritime, air traffic, emergency services, defence and many more — but what we have learned is that they share many similarities. You could say they are the same, but different. This is a particularly interesting reflection as we see a growing trend for multi-operation control centres such as could be required for safer city initiatives.

As with most things in life, change is inevitable and that is particularly true in the case of critical control rooms. Over the last 20 years the expectations we have all placed on technology through our daily experience has grown enormously, and as consumers we often fail to understand why critical operations find it difficult to keep pace with those expectations.

But keep pace they must, and that means change. It's not just

hardware development that affects our critical control rooms; new concepts such as instant messaging, FaceTime, social media and so on alter citizens' expectations. All of this must be balanced against an organisation's evolving requirements and pressures, such as budgets and performance management, as well as other factors such as procurement rules, outsourcing and ownership of control room staff, standardisation, collaboration and interoperability.

Few people enjoy such change, which is a challenge when change is ever-present. How often have you heard a boss say, "Our biggest asset is our people"? Well, boss, if you fail to appreciate the pressures of working in critical control rooms, and the effects of change, then the one thing you will surely face is low morale and associated high staff churn — and staffing makes up a very significant proportion of the critical control room provisioning budget.

The International Critical Control Rooms Alliance (ICCRA) — an independent working group of the TCCA, bringing together critical control room professionals — believes that mission-critical services must continually adapt to the many changing factors affecting them in order to deliver consistently high service in the most cost-effective manner.



*Peter Prater,
ICCRA*

Image courtesy FirstNet under CC BY-NC-ND 2.0



THE ICCRA BELIEVES THAT MISSION-CRITICAL SERVICES MUST CONTINUALLY ADAPT TO THE MANY CHANGING FACTORS AFFECTING THEM IN ORDER TO DELIVER CONSISTENTLY HIGH SERVICE.



Fostering collaboration

ICCRA offers members the opportunity to network and to learn (in part through webinars), providing an environment for international collaboration, discussion and influencing the wider critical control room stakeholder community.

Over a period of many years, those in the leadership of ICCRA have individually had vast experience of control rooms. We recognise that there are already many associations and organisations that focus on niche areas of critical control rooms and are primarily technology focused (eg, TCCA, NENA, EENA), while some (such as PSCE and APCO International) focus on specific market verticals.

What ICCRA intends to do is to deliver to the agents and operators of critical control rooms all they need to know about what is happening around them, in order to help them be the best they can be. For instance, a typical control room director does not need to know the technicalities of how a next-gen Triple Zero call is made, but they certainly need to know that there is a thing called NG000 and the opportunities and challenges it presents to them.

So ICCRA's goal is to become the focus and platform for critical service control room discussion, learning and best practice development globally. We will cover all aspects of control rooms across all vertical markets, from public safety to utilities, from airports to border protection to banking. We will target operations and technology, but also personnel and environmental issues such as ergonomics, staff retention and control room construction. With

an estimated 80,000 critical control rooms out there, there is a lot that we can talk about.

We have identified four special interest groups (SIGs) that will develop agendas involving operations, technology, environment and ergonomics, and people and performance. George Rice, executive director of the US-based Industry Council for Emergency Response Technologies (iCERT), will lead the technology group. Ged Griffin, visiting fellow at the Australian Institute of Police Management, is the operations SIG lead. David Watts, managing director of CCD Design and Ergonomics, is the working environment SIG lead. And Sarah Wilson, a UK-based fire and rescue services control room director, will lead the people SIG.

The highlight of our first year of operation will be the International Critical Control Rooms Congress, to be held in Geneva from 5-7 December 2017. The event will focus strongly on the emerging topics of interest to our four special interest groups; we will also have a keynote presentation from the UK's Metropolitan Police Service and a visit to the CERN control facility. Delegate registration, sponsorship and exhibition opportunities can be found at www.iccraonline.com.

In summary, ICCRA serves critical control room operators, managers and directors and those who support them in fulfilling their important work (eg, ICT, HR, operations, finance and business teams, suppliers and consultants). Membership of ICCRA is open to any person or organisation engaged in the provision or support of a mission-critical control room service. If you think you provide such a service, you probably do, and you should consider ICCRA membership.

\$7M CAD UPGRADE FOR DFES

Western Australia's Department of Fire & Emergency Services (DFES) will acquire a new, \$7 million computer aided dispatch (CAD) system from Motorola Solutions.



© iStockphoto.com/VanderWolf Images

The PremierOne CAD integrates critical information between agency databases, command centres and frontline officers.

DFES now joins Western Australia Police (WAPOL) in using the same PremierOne CAD technology platform, creating more opportunities for collaboration between the state's fire and emergency services and police for coordinated incident response in the future.

WAPOL invested \$11 million in 2015 to upgrade its CAD platform to PremierOne.

The CAD system will provide DFES with many enhanced features to enable greater visibility of its resources for better decision-making and resource management, such as mobility technology to provide instant and precise mapping, dispatch and premise hazard information to crews working on emergency response vehicles.

The Western Australian government's State ICT Strategy aims to align technology and business functions to improve service delivery to the community by:

- simplifying technology platforms, systems and standards as part of a unified government
- connecting agencies and the community through digital services and system integration

- informing decision-makers, frontline staff and the public with quality data and analysis.

Steve Crutchfield, vice president and general manager for Motorola Solutions Australia and New Zealand, said the CAD systems would provide full support for daily operations for DFES and WAPOL and can be ramped up to support peak events and emergencies.

"Placing the right information into the hands of first responders leads to better, faster and more accurate decision-making in critical moments," Crutchfield said.

"The PremierOne CAD technology platform will help DFES to manage their resources more efficiently so frontline officers can be deployed quickly and effectively to protect their communities.

"In the future, having fire and emergency services and police agencies using the same CAD technology means they can collaborate more effectively during peak events, including major bushfires. This creates a clear, common operating picture of what is happening in real time, helping response agencies to protect lives and property," Crutchfield said.

The CAD platform can also support the addition of further agencies over time, as well as future technological advancements, to further enhance efficiency and frontline support.

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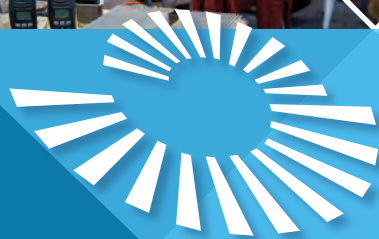
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Backhaul

Backhaul takes you on a trip down memory lane as we look at what was happening in the comms field of yesteryear.

25 YEARS AGO. The cover of the October/November 1992 issue of *What's New in Radio Communications* featured Exicom's Midland range of intrinsically safe portable VHF and UHF transceivers, designed to operate in the 148–174 and 450–520 MHz ranges. With a current limiter that folded back at 1.2 A, and a filling of Polyol AU20 expanding foam, the units were considered state-of-the-art intrinsically safe radios. Elsewhere in this issue we reported that Radio Frequency Systems had won antenna export contracts for Indonesia and Mexico worth \$0.5m; Codan had been awarded the AS3902 (IS 9002) quality standard; and OTC had launched a WeatherFax service that broadcast weather information to ships at sea via VHF. In a feature article, Peter Hilly (Spectrum Engineering) gave us an overview of frequency planning and the role of the then regulator; Graham Hicks (Rohde & Schwarz) updated us on something new called GSM; and Barry Dropping (Hewlett-Packard) explained the use of modulation-domain analysers.



10 YEARS AGO. The cover of the September/October 2007 issue of *Radio Comms Asia-Pacific* featured the Pacific Wireless RDX3588, a weatherproof, lightweight, self-contained P25 digital suitcase repeater that provided more than 24 hours of internally powered, code-transparent tactical operation at a 20% duty cycle. Inside the magazine, we reported on the upcoming 2007 Radio Comms Connect show (now simply Comms Connect), which was to be a one-day seminar for technicians and dealers! We also reported on ComGroup winning a contract to the supply the PNG Police Constabulary with a new P25 radio systems, John Florenca (Omnitronics) opined on the coming rise of VoIP and its application for unified communications, and Andrew McDonald of IPS Radio and Space Services gave us an overview of the effects of 'space weather' on radio systems. We also reported on the passing of Sir Angus Tait, founder of Tait Electronics, who had died at the age of 88.

Spectrum

Putting the 'critical' in mission-critical

Most people in the connected world in which we now live would reasonably assume that Australia's public safety agencies (police, ambulance, fire services and state emergency services) have the ability to capture and share multimedia data. To find out that this is not the case is met with amazement, incredulity or just plain disbelief. Even more unbelievable is that the 'mission-critical' communications used by these agencies are not actually considered 'critical'.

This was recognised by the House of Representatives Committee on Infrastructure, Transport and Cities in its 'Smart ICT Report on the inquiry into the role of smart ICT in the design and planning of infrastructure'. In its report in March 2016, the committee made the following recommendations, among others:

"The Australian Government recognise public safety communications systems as critical infrastructure, and continue to support the development of these systems, including funding research, promoting implementation, and providing national coordination.

"The Australian Government continue to support the development of disaster planning and emergency response systems, including funding research, promoting implementation, and providing national coordination."

So what is meant by 'critical infrastructure'? The Trusted Information Sharing Network provides the following definition:

"Those physical facilities, supply chains, information technologies and communication networks, which if destroyed, degraded or rendered unavailable for an extended period, would significantly impact on the social or economic wellbeing of the nation, or affect Australia's ability to conduct national defence and ensure national security."

The Prime Minister has said that the number one priority of the federal government is to keep Australians safe, and he has announced a number of machinery-of-government changes to support this statement. In this context, mission-critical public safety communications should be recognised within these changes and public safety and security agencies should also be added to the sectors already recognised as comprising the critical infrastructure community, ie, telecommunications, finance, transportation, energy, health, water, aviation and maritime. When Australia's public safety and security agencies finally achieve a public safety mobile broadband (PSMB) capability, the need for their presence within the critical infrastructure community will become even greater.

PSMB will provide the agencies with a data-carrying and -sharing capability that will need at least the same level of protection and resilience as the other sectors ... probably more so, as national security has now become a part of local communities — the very places where police, ambulance, fire and state emergency services officers are doing what the Prime Minister has promised: keeping Australians safe. They need critical communications capabilities that enable them to do this while at the same time keeping themselves safe.

At the time of writing, the Minister for Communications and the Arts had just announced that the Senate has passed the Telecommunications and Other Legislation Amendment Bill 2016, which aims to significantly enhance the security of our critical telecommunications infrastructure. This is the ninth significant tranche of national security legislation the Coalition government has passed since 2014.

Let's hope that the next announcement about critical infrastructure will be government's acceptance of the House of Representatives Committee's recommendations recognising mission-critical public safety communications as critical infrastructure, paving the way for the long-awaited PSMB capability and beyond.



Geoff Spring is Senior Industry Advisor in the Centre for Disaster Management and Public Safety at the University of Melbourne.



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