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Inside
Jan/Feb 2018

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Transmit

As I write this, I've not long returned from the Comms Connect conference and exhibition in Melbourne. And what a magnificent event it was. Insofar as the conference program is concerned, it would have to rank among the best — if not the best — we have seen so far. It was great to have senior leaders from several countries' critical communications authorities giving presentations, and all agreed that the opportunity to network and exchange news and views was extremely valuable.

Only days after Comms Connect concluded, the long-awaited RFI for public safety mobile broadband (PSMB) was released, with the NSW Telco Authority taking the lead on it on behalf of all state, territory and federal jurisdictions. It remains to be seen what sort of proposals industry comes back with, and how the proposed system(s) can be made to work. PSMB was much discussed in Melbourne — hopefully, by the time Comms Connect Sydney rolls around in June 2018 we'll all have a clearer idea of where PSMB is heading in Australia.

And not before time. At Comms Connect Melbourne, Peter Clemons released the Quixoticity Index, which analyses the maturity of the critical communications sectors in 10 markets across the globe. Although the Index is not intended to give scores or hand out rewards, one cannot help but note that Australia ranked second from the bottom (jointly with Canada), with Finland and the UAE coming out on top. So it looks like we have some way yet to go before taking our place among the best in the world.

Jonathan Nally, Editor
jnally@wfmedia.com.au

Calendar

March 2018
Comms Connect Perth
15 March
Aloft Hotel, Perth
comms-connect.com.au

May 2018
Comms Connect Auckland
2–3 May
SKYCITY, Auckland
comms-connect.co.nz

Critical Communications World 2018
15–17 May
Messe Berlin ExpoCenter City
critical-communications-world.com

Australian and New Zealand Disaster and Emergency Management Conference 2018
21–22 May
The Star, Gold Coast
anzdmc.com.au

June 2018
Mission Critical Technologies 2018
13–14 June
Excel, London
tmt.knect365.com/mission-critical-technologies

Comms Connect Sydney
14–15 June
Rosehill Gardens
sydney.comms-connect.com.au

September 2018
AFAC18
5–8 September
Perth Convention & Exhibition Centre
afacconference.com.au

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

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STANDARDS AND SPECTRUM FOR IMT

François Rancy, Director, ITU Radiocommunication Bureau

ITU standards development for IMT-2020 is well underway, along with the associated spectrum management aspects.

The dramatic increase in availability and accessibility of mobile communications in recent years is due, to a large extent, to the development of international standards and the identification and global harmonisation of frequency bands for the operation of international mobile telecommunications (IMT), thereby enabling interoperability, roaming and global economies of scale.

Standards

Second-generation mobile telephone systems were developed in the late 1980s and initially deployed in the early 1990s. The transition from the first to the second generation of mobile phones was certainly characterised by the change from analog to digital communications, but it was also characterised by the growing requirement for these systems to operate seamlessly on a regional, if not global, basis.

Regional/global operation of these systems was hampered by having multiple incompatible standards, as well as different frequency bands and channel arrangements, being used in different parts of the world. This in turn had a significant impact on the cost, and thus affordability, of these systems. Recognising this, the ITU membership established a group of experts to study the requirements of future public land mobile telecommunications systems (FPLMTS).

Studies on FPLMTS were conducted in the CCIR (the former ITU Radiocommunication Sector (ITU–R)) Interim Working Party 8/13, with the first substantive outcome being a decision by the 1992 World Administrative Radio Conference to identify specific frequency bands for the operation of FPLMTS. The studies then focused on developing the set of detailed radio interface specifications for FPLMTS.

ITU–R Task Group 8/1 was established to develop these 3G radio standards, which were finally approved in May 2000 in Recommendation ITU–R M.1457 — 'Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)'. The name change from FPLMTS to IMT and the principles and process for the further development of IMT were established by the ITU Radiocommunication Assembly 2000 in ITU–R Resolutions 56 and 57.

ITU–R Working Party 5D was subsequently established to continue the work on IMT. In close collaboration with the relevant national and regional standards development organisations, a yearly update process for IMT-2000 was applied to cater for the evolution and enhancement of the standard.

ITU–R Recommendations were also developed to address the implementation aspects of IMT-2000, such as global circulation of terminal equipment, radiofrequency channel arrangements and sharing studies between IMT and other radio services.

At the same time, ITU–R Working Party 5D initiated work to address the need for a global platform on which to build the next generation of mobile services — fast data access, unified messaging and broadband ›

"

NO SINGLE FREQUENCY RANGE SATISFIES ALL THE CRITERIA REQUIRED TO DEPLOY IMT SYSTEMS, PARTICULARLY IN COUNTRIES WITH DIVERSE GEOGRAPHIC AND POPULATION.

ITU's role in the path to 5G

For over 30 years, ITU has been developing, and continues to develop, the standards and spectrum arrangements to support International Mobile Telecommunications (IMT).

multimedia: IMTAdvanced. The IMT-Advanced radio interface specifications were finalised in 2012 and are specified in Recommendation ITU–R M.2012. These 4G systems are currently being deployed throughout the world, and it is expected that these systems will continue to evolve and be enhanced in the coming years.

With an eye to the longer-term requirements, in 2012 Working Party 5D commenced studies on the next phase of development: IMT-2020. It is planned to finalise the IMT-2020 specifications (5G) in the year 2020.

Spectrum

Where radio systems are to be used globally, it is highly desirable for existing and newly allocated spectrum to be harmonised. The benefits of spectrum harmonisation include: facilitating economies of scale, enabling global roaming, reducing equipment design complexity, preserving battery life, improving spectrum efficiency and potentially reducing cross-border interference.

Mobile devices typically contain multiple antennas and associated radiofrequency front ends to enable operation in multiple bands to facilitate roaming. While mobile devices can benefit from common chipsets, variances in frequency arrangements necessitate different components to accommodate these differences, which leads to higher equipment design complexity and cost.

Consequently, harmonisation of spectrum for IMT leads to simplification and commonality of equipment, which is desirable for achieving economies of scale and affordability of equipment.

As mentioned previously, it was by a decision at the 1992 World Administrative Radiocommunication Conference (WARC-92) that the first specific frequency bands for the operation of FPLMTS (now IMT) were identified in the ITU Radio Regulations, the international treaty governing the use of the radiofrequency spectrum and satellite orbits. ⟩

1970s [1G]
First generation

First generation (1G) analogue systems for mobile communications saw two key improvements to the first radiotelephone services: the invention of the microprocessor and the digitization of the control link between the mobile phone and the cell site.

1980s–1990s [2G]
Second generation

Second generation (2G) digital cellular systems were first developed at the end of the 80s and initially deployed in the early 90s.

These systems digitized not only the control link but also the voice signal. The new system provided better quality and higher capacity at lower costs to consumers.

Regional/global operation of these systems was hampered by having multiple incompatible standards as well as different frequency bands and channel arrangements being used in different parts of the world.

A historic decision was taken at the ITU World Administrative Radio Conference 1992 (**WARC-92**) to identify globally agreed frequency bands for the operation of future public land mobile telecommunication systems – now called international mobile telecommunication (IMT) systems – in the Radio Regulations.

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GME releases the CM60 Digital Series

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AUSTRALIAN MADE

2000s [3G]
Third generation

After over ten years of hard work, the ITU Radiocommunication Sector (ITU–R), in close collaboration with national and regional standards development organizations, finalized the technical standards for the radio interfaces of third generation systems under the brand IMT-2000.

ITU's IMT-2000 global standard for 3G was unanimously approved at the ITU Radiocommunication Assembly 2000 (**RA-2000**), which opened the way to enabling innovative applications and services (e.g. multimedia entertainment, infotainment and location-based services, among others).

2012 [4G]
Fourth generation

Specifications for fourth generation mobile technologies – IMT-Advanced – **were agreed** in January 2012 at the ITU Radiocommunication Assembly (**RA-12**) in Geneva.

IMT-Advanced systems include the new capabilities that go beyond IMT-2000, providing access to a wide range of telecommunication services supported by mobile and fixed networks, which are increasingly packet based.

2012-2020 [5G]
Fifth generation

In early 2012, ITU–R embarked on a programme to develop "**IMT for 2020 and beyond**", setting the stage for 5G research activities that were emerging around the world.

In September 2015, ITU–R finalized its "Vision" of **IMT for 2020** 5G mobile broadband connected society. The technical standards for IMT-2020 will be finalized by ITU-R in 2020. While enhancing mobile broadband communications, 5G will also extend the application of this technology to use cases involving ultra-reliable and low latency communications, and massive machine-type communications. In addition, the ITU World Radiocommunication Conference 2019 (**WRC-19**) will address the need to identify additional spectrum to support the future growth of IMT.

Identification of a frequency band in the Radio Regulations does not afford any priority for such use with respect to other radio services allocated to that spectrum, but it does provide a clear signal to the national regulators for their spectrum planning. It also provides a degree of confidence for equipment manufacturers and network operators to make the long-term investments necessary to develop IMT in these bands.

No single frequency range satisfies all the criteria required to deploy IMT systems, particularly in countries with diverse geographic and population density; therefore, to meet the capacity and coverage requirements of IMT systems, multiple frequency ranges are needed.

Since WARC-92, successive World Radiocommunication Conferences, in 1997, 2000, 2007 and 2015, have periodically identified additional frequency bands for IMT within the range of 450 MHz to 6 GHz to cater for the rapidly growing demand for mobile communications, particularly mobile broadband data.

While the 2015 World Radiocommunication Conference made good progress in identifying additional frequency bands and globally harmonised arrangements below 6 GHz for the operation of IMT, it also recognised a potential future requirement for large contiguous blocks of spectrum at higher frequencies for these systems. Consequently, it called for 11 frequency bands within the range 24–86 GHz to be studied by ITU–R as bands that may be identified for use by IMT at the World Radiocommunication Conference in 2019 (WRC-19). The focus of these studies is to identify a limited subset of these bands that are recommended to be identified globally for use by IMT.

Conclusion

The scope of 5G is much broader than the previous generations of mobile broadband communication systems. We are talking here about not just an enhancement to the traditional mobile broadband scenarios, but extending them to use cases involving ultra-reliable and low-latency communications, and massive machine-type communications.

ITU's work in developing the standards for IMT-2020, in close collaboration with the whole range of 5G stakeholders, is now well underway, along with the associated spectrum management and spectrum identification aspects.

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PUBLIC SAFETY

PSMB'S FIRST STEPS

Jonathan Nally

Industry input sought on PSMB delivery models to achieve Australia's public safety communications objectives.

The long-awaited request for information (RFI) for Australia's much-needed national Public Safety Mobile Broadband (PSMB) capability has been released.

This RFI has been issued by the NSW Telco Authority on behalf of the federal, state and territory governments.

In a joint statement issued at the time of the announcement, the relevant ministers from all Australian jurisdictions reiterated "the critical role that public safety communications have in enabling law enforcement and emergency services to do what they do best — protect and help Australians in need".

"States and territories will shortly commence a market engagement exercise on a federated PSMB capability, the outcomes of which will inform advice to the Council of Australian Governments.

The statement said that New South Wales will lead the early market engagement exercise on behalf of jurisdictions and "we encourage the Australian and international telecommunications sector to participate in this important process".

"Ministers have reaffirmed a commitment to working together towards achieving an interoperable PSMB capability for Australia and agreed in principle that a preferred PSMB service delivery model for Australia would be:

- a federated system that enables states and territories to opt in and be tailored for jurisdictional differences and implementation timetables;
- deployable across the infrastructure and assets of multiple mobile network operators and states and territories to ensure reliability; and
- centred around the high-level requirements and objectives developed by jurisdictions in 2017.

"Responses to this market engagement exercise will inform Commonwealth decision-making with regards to commercial spectrum requirements."

The RFI seeks information from the telecommunications industry about:

- current, proposed and potential PSMB service delivery model(s);
- the ability of these PSMB service delivery model(s) to meet the PSMB National Objectives and high-level requirements (HLRs) developed collaboratively by Australian governments;
- how these PSMB service delivery model(s) might be implemented, including the contribution any spectrum dedicated to PSMB could make to meeting the PSMB National Objectives.

The RFI is available to registered entities at the NSW Government eTendering website.

In January 2016, the Productivity Commission released a research report on the best ways in which to provide a nationwide PSMB capability. In a statement released at the time, the Commission said that it had "undertaken an illustrative evaluation of the costs of several specific delivery options over a 20-year period. The cost of a dedicated network is estimated to be in the order of $6.2 billion, compared to $2.2 billion for a commercial option. Even the lowest-cost hybrid option is about 32 per cent more expensive than a commercial option."

It added that a "commercial option is cheaper because it requires significantly less new investment than a dedicated or hybrid option, as considerable existing infrastructure could be used or shared," and that risk factors also "influence the relative merits of different options".

The Commission found that a dedicated network would likely take longer to deliver, offer less flexibility to scale up network capacity in the short term and risks future technology upgrades being delayed. It also found that there would be risks arising from limited competition and supplier lock-in under a commercial approach, and the precise service levels that could or would be achieved are uncertain.

Overall, the Commission found that, on first principles, "a commercial approach represents the most efficient, effective and economical way of delivering a PSMB capability to PSAs".

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Industry Talking

Welcome to 2018! I hope your summer season was relaxing and that you had time to enjoy the festive season. Last year already seems like the distant past as we head full on into the New Year and a new set of challenges. The year ended with Comms Connect in Melbourne and, of course, our annual Gala Dinner. We welcomed 550 guests to the Melbourne Convention & Exhibition Centre as we recognised industry professionals and celebrated ARCIA's tenth anniversary. ARCIA would like to thank the WFevents team for putting on a fantastic year of Comms Connect shows. Melbourne Comms Connect was certainly one of the best ever and attracted industry participants from all over Australia and around the world. ARCIA is indebted to the WFevents team and their dedication to making these events as relevant as possible.

We anticipate that 2018 will see the new Radiocommunications Act come into parliament. ARCIA will continue to work with the Department of Communications and the ACMA to represent industry views. It is very important to our industry that we understand what changes will happen and how these may affect us all. ARCIA also notes what looks like a shift in policy on the value of spectrum and the relationship with economic values and innovation. At the 2017 ACMA Radcomms conference, the Chair of the ACCC (Rod Sims) presented for the first time. The ACCC stated that the value of spectrum would be better considered by the long-term economic value generated by the use of spectrum rather than as a short-term budget windfall.

ARCIA is also working on understanding the impact of new legislation in terms of equipment standards. This may become important if the new Act incorporates civil penalties for the supply and operation of equipment that may be outside typical RF specifications. The ACMA has already adjusted some assignment rules under LM8 in the absence of standards with regard to the distance between adjacent channels. There also seems be to be growing assignment of high- and low-power services on the same carrier.

The industry needs to be able to communicate what the market needs, and — regardless of all the issues that we face — it is important that ARCIA maintain a good relationship with the ACMA. There will be a huge amount of work over the next 12–24 months for ARCIA with these new rules, but what we set up now will have an impact for a decade or more.

ARCIA will start 2018 with a two-day planning meeting in Melbourne to workshop all these areas and ideas. We will welcome our committee, supporters and partners to set the tone for the year. These two days are really important for the organisation as we sort through what needs to be done and how to manage our resources.

Looking ahead, our first networking event of the year will be in Perth on Thursday, 15 March. Make a note of it in your diary now and check the ARCIA website for bookings, and also watch the Comms Connect website for conference bookings.

The theme for our 10th anniversary was that our wireless world is important and we should be proud as an industry of our achievements. More importantly, we should look forward to all the technological changes occurring across many markets and work out how to make the most of new opportunities. ARCIA will keep working to develop material that will help members publicise what the industry represents and why it will remain a vital cog in Australia's modern economy.

Hamish Duff, President, Australian Radio Communications Industry Association

High-performance signal analyser for 5G and wideband signal measurement

Anritsu has announced the release of its high-performance MS2850A Signal Analyzer targeting development and commercial production of 5G mobile communications systems.

The MS2850A supports a measurement range up to 44.5 GHz, analysis bandwidth up to 1 GHz and the evaluation of 5G multicarrier signals. Its high dynamic range and good flatness performance cut measurement times using all-at-once, high-accuracy measurements of a typical 800 MHz modulation bandwidth to be used in 5G (eg, eight 100 MHz bandwidth carriers).

With many operators currently preparing the introduction of next-generation 5G cellular mobile communications systems, with plans to start actual testing from late 2017 into 2018, leading wireless equipment makers have started transitioning from the development and verification testing phases to development of commercial models and preparations for volume manufacturing. Additionally, other non-5G communications fields will have the same bandwidth and flatness requirements as 5G when broadband communications come into use offering larger data capacity at faster speeds.

The signal analyser supports transmitter performance tests for wireless communications equipment during development and manufacturing. Installing the 5G measurement software packages in the MS2850A supports measurement of 5G uplink and downlink signal frequency error, power, EVM, etc, using CP-OFDM modulation. Additionally, downlink measurements evaluate multicarriers all at once. Noise figure (NF) and phase noise measurement functions can also be installed.

Not only does the MS2850A support all previous cellular technologies, such as LTE, W-CDMA, TD-SCDMA and GSM, it also offers futureproof support for the new 5G NR standards now being defined by 3GPP.

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- W6 devices can be setup remotely over cellular& Wi-Fi networks

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- In built GPS facility provides basic M50 device location services.

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Current indicator terminal block

The Phoenix Contact PTTB 2,5-ILA 100 current indicator terminal block simplifies the connection process with Push-in Connection Technology, which allows direct plug-in capability.

Whether working with solid conductors or conductors with ferrules, technicians can connect directly to the terminal point without any fuss.

The technician simply aligns and inserts the wire into the marked terminal points. The low insertion forces of the push-in connection terminal block enable the conductors to be inserted easily and directly, and tool-free. The installation process is fast, convenient and time-saving.

The current indicator terminal block detects interruptions or line breaks during operation to ensure good performance. The voltage drop is evaluated at a Zener diode in reverse direction and is indicated by an LED so that the technician can see the operating status of the system.

The device also features a printed circuit diagram for clear identification to help minimise faulty wiring and ensure performance.

The compact product helps users save on space with its slim design, while providing flexibility when it comes to configuration. Shock and vibration resistant, the device is robust and safe to use and operate.

The unit is suitable for use in a range of industries including systems manufacturing and machine building, process technology and process engineering, chemical and petrochemical, rail and shipbuilding, as well as in energy technology.

Phoenix Contact Pty Ltd
www.phoenixcontact.com.au

Comms-enabled DC power supplies

The Digital Series DC power supplies provide either 1350 or 675 W of output power in 12, 24 or 48 V DC, and feature a compact 1RU design with 90–93% efficiency. Power factor correction helps reduce power consumption.

It provides a DC power solution suitable for wireless communications professionals who demand high efficiency and space-saving DC power systems for LMR, broadband and network communications equipment including radios, repeaters, trunking systems, paging systems, RF amplifiers, microwave, WiMax, routers, bridges, multiplexers and VoIP.

TCP/IP Ethernet is available for remote monitoring and control of the power supply, and an available battery backup function provides float charging and automatic revert with an adjustable low-voltage disconnect.

The Digital Series offers an intelligent power control interface on the front panel that allows a user to adjust the output voltage, current limit settings and the LVD disconnect and reconnect voltage setpoints, as well as displaying system status to the user. The interface can be password protected.

With the TCP/IP option installed, the user can monitor and control all of the power supply features remotely with a standard web browser. The firmware can be flash upgraded at any future date. ICT smart parallel operation allows up to six Digital Series power supplies to provide up to 8000 W of output power.

Helios Power Solutions
www.heliosps.com.au
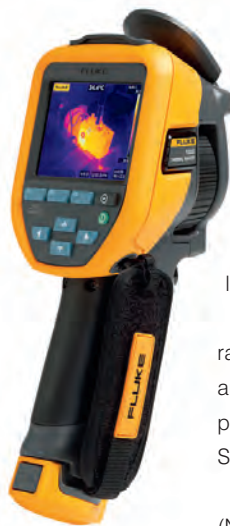
Infrared camera

The Fluke TiS55 infrared camera is designed for the quick identification of potential electrical, automotive, mechanical, HVAC/R and product development issues. It is available to rent from TechRentals.

IR-fusion blending interlaces detail from the 5 MP visible light camera directly over infrared images (in real time) for enhanced clarity. Picture-in-picture (PIP) mode is also an option, allowing for multiple analysis tools when locating problems.

Built for industrial use, the camera has a resolution of 220 x 165, a 9 Hz refresh rate and a sighting laser. The internal 4 GB memory card can be expanded with an SD card. The unit is also equipped with replaceable smart batteries that will provide more than 4 h operating time. Data management is simplified with Fluke SmartView IR analysis reporting software.

Other features include a temperature range of -20 to 450°C; thermal sensitivity (NETD) of 80 mK; and compatibility with the Fluke Connect mobile app.

TechRentals
www.techrentals.com.au

Remote speaker microphone

The BluSkye remote speaker microphone, available from Telstra Partner IMPULSE Wireless, is an ultra-rugged and user-friendly Bluetooth RSM. It provides ease of operation just like using a radio.

The BluSkye is designed and assembled by Stone Mountain in the USA. It is IP68 waterproof and rugged to MIL-810G. With a typical battery life of up to 20 h, it is suitable for all industries, and the large, tactile buttons are designed for easy and reliable use, even with gloves.

BluSkye Bluetooth remote speaker microphones provide flexibility, allowing existing smart devices to replace a two-way radio, or extend coverage of an existing system to new areas and/or users. It is designed to provide reliability, strong coverage, and the support and experience required by critical communications users.

IMPULSE Wireless
www.impulsewireless.com.au

RURAL REFRESH

Jonathan Nally

Faced with increasing equipment and network constraints, NSW Ambulance undertook a wide-ranging data terminal upgrade.

NSW Ambulance serves more than 7.5 million people across 801,600 square kilometres, making it the world's third-largest ambulance service. The service's fleet of mobile data terminals (MDT) and the supporting back-end infrastructure was more than 10 years old and required increasing maintenance to ensure ongoing critical functions including duress alarms, vehicle location information and data network coverage.

The NSW Ambulance Rural Data Radio Network (RDRN) was scheduled for closure on 16 December 2016. This potentially meant that critical incident data could not be transmitted to frontline responders.

In addition, the Mobile Data Radio Network (MDRN), provided by the NSW Telco Authority, was due to conclude at the end of 2016, with a replacement service only being introduced in late 2018–19. Along with that, the Telstra 2G GPRS network that supported the existing equipment was due to be shut down in 2017.

So a $9.3 million Rural MDT Refresh Roll-out Project was instituted to provide an interim solution for that 24- to 30-month gap by replacing the vehicles' end-of-life equipment and ICT infrastructure.

"We had to come up with an interim solution that would allow ambulance operations to continue uninterrupted in the period between the shutdown of the Telstra network and the commissioning of the new network," said Geoff Waterhouse, senior project manager for NSW Ambulance's Radio Telecommunications Capital Works Programme.

"Providing an interim communications solution was always going to require careful planning, consultation, testing and communication," said Waterhouse. "While it may not have been one of the biggest projects in the history of NSW Ambulance, the risk of disruption to services during the implementation had, understandably, enormous ramifications for patient safety and this was considered to be of paramount importance in all elements of planning and delivery."

Pilot testing informed the choice of technology, devices and bearers to be used in the project and enabled network operations to be maintained. Road tests conducted over eight weeks used four decommissioned ambulance vehicles to test a variety of new and existing technologies and devices in various configurations. Each vehicle travelled approximately 18,000 kilometres and four drivers clocked up 1800 hours of driving.
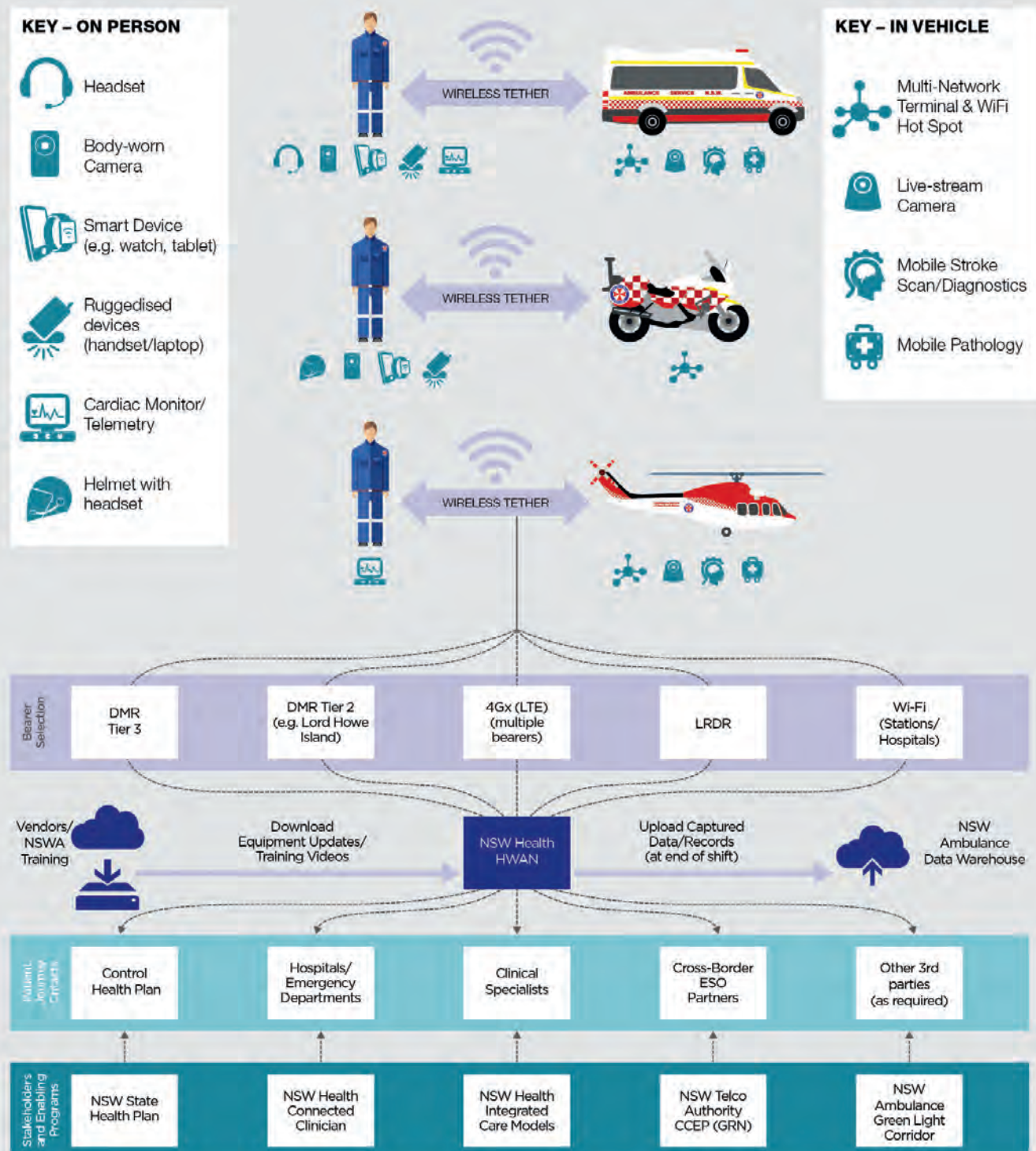
Other impressive statistics include:

- NSW Ambulance had nine weeks to upgrade 808 vehicles in rural NSW.
- Operational sectors were divided into 35 clusters, each with around five stations and 25 vehicles.
- The delivery phase involved more than 50,000 kilometres of vehicle movement and more than 2500 hours of specialised project and safety management.

"STANDARDISATION ALLOWS GREATER FLEXIBILITY AND INTEROPERABILITY TO MOVE VEHICLES WITHIN THE STATE, AND PROVIDES COST BENEFITS ASSOCIATED WITH HAVING ONE MANAGED SERVICE RATHER THAN TWO." — GEOFF WATERHOUSE, NSW AMBULANCE

KEY – ON PERSON

- Headset
- Body-worn Camera
- Smart Device (e.g. watch, tablet)
- Ruggedised devices (handset/laptop)
- Cardiac Monitor/ Telemetry
- Helmet with headset

KEY – IN VEHICLE

- Multi-Network Terminal & WiFi Hot Spot
- Live-stream Camera
- Mobile Stroke Scan/Diagnostics
- Mobile Pathology

WIRELESS TETHER

WIRELESS TETHER

WIRELESS TETHER

Bearer Selection

| DMR Tier 3 | DMR Tier 2 (e.g. Lord Howe Island) | 4Gx (LTE) (multiple bearers) | LRDR | Wi-Fi (Stations/ Hospitals) |

Vendors/ NSWA Training

Download Equipment Updates/ Training Videos

NSW Health HWAN

Upload Captured Data/Records (at end of shift)

NSW Ambulance Data Warehouse

Patient Journey Critical

| Control Health Plan | Hospitals/ Emergency Departments | Clinical Specialists | Cross-Border ESO Partners | Other 3rd parties (as required) |

Stakeholders and Enabling Programs

| NSW State Health Plan | NSW Health Connected Clinician | NSW Health Integrated Care Models | NSW Telco Authority CCEP (GRN) | NSW Ambulance Green Light Corridor |

Paramedic Area Network (PAN)
- All devices tethered back to the VAN for greater signal strength (therefore coverage)
- Capability to connect directly if the Paramedic is outside VAN coverage
- Enhanced safety through standardised duress system across NSW that provides user location
- Dynamic location-based access to local hospital/clinical support staff and services at the touch of a button.

Vehicle Area Network (VAN)
- Medical records automatically available on call out
- All data (including voice calls, telemetry, streaming video) recorded and captured locally and uploaded to the NSWA Data Warehouse when connected to a trusted WiFi network (i.e. on station or at hospital)
- Switching between networks seamless to the user
- Includes Job Status/Mgmt, Intelligent Location Services (ILS)/GPS, Onboard Diagnostics (OBD), Asset Tracking, Staff/ Paramedic ID, Printer.

Motorcycle
- Uses PAN and VAN tethering and functionality as described in Part A
- Device selection based on storage capacity on the motorcycle and needs of a particular response
- Majority of use is in Sydney CBD and other high-density areas
- Patient transport does not occur, therefore ther is reduced need for live streaming telemetry.

Aircraft (including Rotary and Fixed-wing)
- Uses PAN and VAN tethering and functionality as described in Part A
- Communications technology tailored within constraints for aircraft use (i.e. aircraft radio band, power requirements)
- In this scenario, PAN functionality is not as important (patient is generally brought to the aircraft), however integration with the wider NSW Health network via multiple bearers is critical.

• At the peak of the rollout, crews were completing installations on 42 vehicles per day. The maximum weekly completion rate was 212 vehicles, and at the peak, installation 10 crews were operating concurrently.

According to Waterhouse, the key factors that enabled the project to be successfully implemented were: effective change management strategy; an ongoing, open consultation with internal and external stakeholders; timely communication with all staff; and extensive pilot testing across NSW, including in border locations. The service's partners in the project were Trapeze Group and the NSW Telco Authority.

"NSW Ambulance has a comprehensive system of policies and procedures that have been proven to work very effectively," said Waterhouse. "This project drew on the foundations of these, and then adapted them to address the complex requirements and dispersed geographic nature of this project.

"The fact that this technology rollout was so time-constrained added another risk element, and the detailed methodology developed during the process can certainly be applied to other complex projects," he added.

"Historically, metropolitan vehicles were configured differently from those servicing the rural areas, and used different carriers," said Waterhouse. "Standardisation allows greater flexibility and interoperability to move vehicles within the state, and provides cost benefits associated with having one managed service rather than two. Now, MDTs can communicate across all regions of the state and operational procedures are the same for all vehicles."

There is a measure of innovation in the technology and systems adopted, too.

"Communications failure is mitigated by multilayer redundancies and functionalities; vehicles can now connect to the most current commercial prioritised data networks available — Telstra, Optus, Satellite, LTE — as the primary networks for information exchange," said Waterhouse. "Futureproofing is enhanced through the scalability of the technology and the Wi-Fi hotspot capability of the MDT hardware. Firmware and software upgrades can take place remotely."

With the rural refresh completed, NSW Ambulance is now in the process of completing the $2.8 million metro rollout. It's "all part of a bigger vision of delivering a converged communications solution by combining different technologies, ie, creating a network of networks", said Waterhouse.

"Our ultimate vision is about delivering the 'connected clinician', which is based on the ICT concepts of any device, anywhere and at any time," added Waterhouse. The aim is to achieve "intuitive systems and reliable platforms that eliminate barriers to information, systems and processes; high-level engagement through 'smart' technologies; mission-critical, voice, video and data; and high-capacity, 'self-healing,' real-time, pre-emptive networks delivering the right data to support timely emergency care."

When asked what lessons have been learned from the project that would have ongoing or wider application within NSW Ambulance or other services, Waterhouse emphasises communications of a different sort. "Listen to the organisation; understand the business drivers and operational environments," he said, adding that "technology is [simply] a structural platform to provide benefits and efficiency in a healthcare service and emergency service organisation".

As a sign of the high regard in which the sector holds the Refresh Rollout Project, it was listed as a finalist in the hotly contested Council of Ambulance Authorities 2017 Awards for Excellence.

SEAMLESS TRANSITION
TO COMPLETE COVERAGE

An upgrade of Annex's Wi-Fi network is saving the packing specialist some serious time and money.

Annex Foods is a dry food and contract packing specialist that partners with some of Australia's leading food, fast-moving consumer goods, pharmaceutical and retail companies. The company provides innovative solutions for food systems, including single-serve portion control, sourcing and product development capabilities — complementing its extensive experience in contract packing and assembly.

Annex operates from a 20,000 m² facility in Clayton South, Victoria. The facility uses state-of-the-art automation and relies heavily on communications infrastructure. There is an average of 40 to 60 mobile users using the Wi-Fi network at any one time, with applications supporting 24/7 connectivity for mobile computers, laptops/PCs and automatic guided vehicles (AGVs). The entire facility requires complete coverage, with the capacity to support the needs of all personnel and connected equipment. Any gaps reduce efficiency and cost time and money.

"We were experiencing slow network speeds and dropouts around our facility with our existing Wi-Fi network while using mobile devices," said the warehouse manager, Rik Crowder. "With the new deployment of our automatic guided vehicles we needed to consider our network upgrade options to rectify any issues with the Wi-Fi that would impact the AGV's performance and reliability."

Annex reached out to Southern Rework. Formed in 1995 and based in Melbourne, Southern Rework specialises in point of sale, scanning RF technology, hardware installation and maintenance.

Solution

Southern Rework proposed replacing the existing Wi-Fi network with a new cnPilot indoor and outdoor connectivity solution. In addition to the capacity and coverage increases, cnPilot solutions work with the cnMaestro management system from Cambium Networks.

"Annex could not afford downtime, and they needed clear and uninterrupted communication between inline PLC and AGV while rectifying the coverage and speed issues they were experiencing," said Evan Boyack, wireless architect at Southern Rework.

Annex also had budgetary parameters to consider. "The expense of rectifying the existing network was outweighed by the cost and benefit of moving over to the Cambium cnPilot and cnMaestro platforms," said Crowder. "What we needed to do was prove the technology's potential by measuring the results."

Results

Twenty-two Cambium cnPilot e500 outdoor access points were deployed across two sites as a direct replacement of the legacy Wi-Fi network.

"The installation was done over two days with negligible impact to the production network," said Crowder. "All hardware was pre-staged and tested with our legacy Wi-Fi settings as well as the new WLANs to allow for a seamless migration. We now have RF Scanners connected to our WMS, the AGVs are connected to inline PLCs and all PCs throughout the building are connected to the server. In addition, there are now more options for us to leverage on the new Wi-Fi deployment."

Equally important, the transition was completed without interrupting operations. "We had zero loss of transactional data that results in inefficiencies (no time loss investigating and searching for stock). We also had zero dropouts, which improves user satisfaction," said Crowder.

"Our previous system was expensive to maintain and management of the hardware/software was becoming an issue. The cnPilot technology recommended and backed by Cambium Networks and Southern Rework is so easy to deploy and manage with cnMaestro that changes can now be made remotely — sparing costly site visits and downtime."

Land mobile radio

The Omnitronics RediTALK-Flex Lite land mobile radio is optimised for users with smaller numbers of channels and operators in the field.

It is feature-rich, supporting location services, call history and playback, SIP telephony and more.

The open DMR Tier 2 standard of mobile radio is designed for users who need spectral efficiency as well as digital voice features and integrated data services.

As a package, the product and Tait DMR Tier 2 can be quickly and efficiently set up. Exhaustive interoperability testing between the providers means users can be confident of a smooth switchover and that all network elements will work together seamlessly.

The product has been endorsed for use on Tait DMR Tier 2, DMR Tier 3 and P25 land mobile radio systems.

Tait Communications
www.taitradio.com

Ethernet tester

The Viavi SmartClass Ethernet Tester is a compact and battery-operated instrument which provides 1 G electrical and optical interfaces. It is available for rent from TechRentals.

It is an easy-to-use Ethernet/Internet Protocol (IP) tester that is suitable for frontline technicians who support Metro Ethernet networks. The Viavi SmartClass tester is used by technicians for the installation, turn-up and maintenance of Ethernet and IP services in the field.

This SmartClass tester is suitable for basic physical layer cable testing, Layer 2 (L2) and Layer 3 (L3) traffic generation, and full RFC2544 Ethernet testing. It also determines maximum throughput, latency, frame loss rate, back-to-back frames and jitter.

Applications of this tester include performance assessment of Carrier Ethernet services, activation and maintenance of metro Ethernet networks, deployment of active Ethernet (point-to-point) access services, switched networks and quality of service (QoS) verification.

TechRentals
www.techrentals.com.au

MICROWAVES IN THE MOUNTAINS

TasNetworks' new radio links reduce costs, increase throughput and provide better visibility and performance.

A major upgrade of TasNetworks' microwave radio network was recently completed. In addition to operating and maintaining Tasmania's electricity transmission and distribution network, TasNetworks is responsible for a statewide radio communications network.

Working together, Fujitsu Australia and TasNetworks implemented a quick, cost-effective and safe upgrade of the backbone radio network, which involved commissioning 18 of Fujitsu's FRX-3 microwave radio links.

The upgrade has brought in a number of key functional outcomes for TasNetworks, including a fivefold increase in throughput and better visibility of service levels which, in turn, will aid the swift resolution of future issues.

TasNetworks can now better deliver critical protection and control services alongside next-generation IP services, which can be rapidly deployed and will facilitate a fast time to market for its customers.

The implementation methodology used simplified the upgrade process, reduced the number and duration of upgrade-related outages and significantly reduced rollout costs. On the back of this, TasNetworks awarded Fujitsu a five-year support contract to reduce risk and ensure the upgraded network's reliability.

TasNetworks' collaboration with Fujitsu followed a competitive tender process undertaken after it recognised that its 10-year-old radio backbone network was no longer fit for purpose. Fujitsu's turnkey solution included its FRX-3 product, which has the capability to carry legacy services and fully IP-based services. Fujitsu also worked with TasNetworks in the pre-implementation stages of the project.

The methodology TasNetworks had proposed led to a significant reduction in the time required to work outdoors during the system upgrade, in part as it circumvented the need to install

large temporary antennas. Testing in the controlled conditions of the laboratory decreased the number of network outages required for the upgrade and reduced the amount of time the teams would have to spend outside.

TasNetworks' telecommunications network covers mountainous, inhospitable terrain and the radios are situated largely in remote locations that are exposed to challenging weather conditions. Over the course of the project's late-winter/early-spring timeframe, those locations experienced heavy snow and strong winds. Reducing the time required to work outside and lift heavy objects into place in such conditions reduced risk and meant that, despite the teams being snowed in on occasion, the upgrade stayed on schedule.

The upgrade was completed with fewer required outages than would normally be required, within a tight timeframe, and came in under budget.

Fujitsu Australia called upon expertise from its counterparts in Japan and North America to implement the project full circle from design to manufacture, testing to execution.

"This network implementation was a large investment for Tas-Networks," said Robert Clerk, senior telecommunications engineer.

"Our partnership with Fujitsu facilitated innovation. Their solutions-focused attitude helped in bringing our ideas into completion and demonstrated why opportunities to innovate should continue to be explored at every step of a project's life cycle."

"It's no small feat to embark on upgrading a major statewide system," added Mike Foster, Fujitsu Australia's CEO.

"The team's determination and grit, even in challenging weather and terrain, has resulted in TasNetworks being able to offer a robust network platform for its customers across Tasmania."

CONSOLIDATED COMMS

Jonathan Nally

NSW Telco Authority board members at a radio site near Dubbo.

NSW's Critical Communications Enhancement Program pilot project is nearing completion.

The NSW Telco Authority's pilot project for the Critical Communications Enhancement Program (CCEP) is steaming ahead in north-western New South Wales.

The pilot project aims to consolidate and enhance coverage of the shared Government Radio Network (GRN) in the region.

To witness the work of the program firsthand, the Authority's board conducted a site visit in mid-November to one of the GRN's new telecommunications towers north of Dubbo.

"These impressive towers are the lifeline of first responders in emergency service organisations," said Beth Jackson, the board's chairperson.

"The increased coverage within the north-west region supports first responders to more easily share information and coordinate responses to critical incidents with better outcomes for the public and the frontline.

"The pilot has increased shared radio coverage from under 60% to over 90%, equating to more than 20,000 km² of in-vehicle coverage in the region."

Kate Foy, the Authority's managing director, said the pilot established a blueprint for the expansion of the CCEP across the state.

"We've gained a lot of valuable insight and learnings from the pilot," she said.

"We've laid a solid foundation and we're looking at ways to integrate our learnings into the wider state rollout of the CCEP."

The board also held its first regional meeting at the Rural Fire Service (RFS) facility in Dubbo, where members of the Authority's leadership team met with local RFS volunteers.

Network developments

The CCEP was one of a number of topics covered in a presentation at Comms Connect Melbourne by Terry Daly, the Authority's program director for public safety mobile broadband (PSMB).

Daly told the audience that the purpose of the CCEP is to combine around 70 state radio networks into a single, shared network.

"We have a fair way to go before we can achieve that," said Daly. "We're collaborating actively with the agencies in getting that. By doing that we aim to reduce the amount of infrastructure from about 2600 radio sites across NSW to somewhere closer to 800 refreshed sites."

While the Authority does currently operate a network that is shared with multiple agencies, it covers only 35% of the state. By the end of the program, the aim is to have 80% of the state's landmass covered.

"Obviously we're looking for cost savings there, but the major
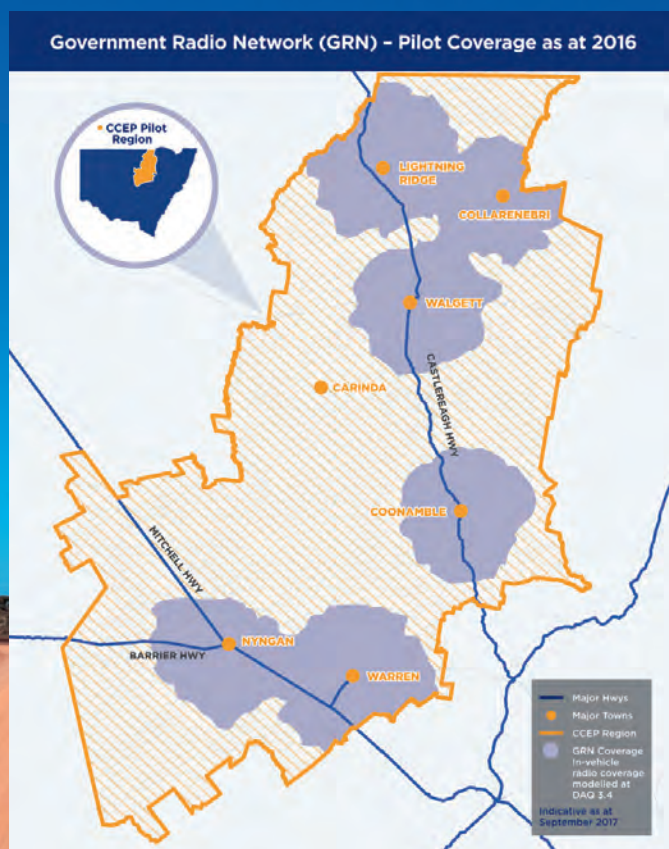
These maps illustrate network coverage before (left) and after (right) the introduction of the pilot Critical Communications Enhancement Program in north-western NSW.

benefit will be a major increase in interoperability between the agencies," said Daly.

The CCEP's pilot stage covers 57,000 km^2 and is "very close to completion", said Daly.

"We've managed to reduce the 73 sites in that area down to 25 shared sites. We've had a dramatic increase in the shared coverage available that can be shared by all agencies."

The next phase of the program will tackle the north coast of NSW, which — while traditionally seen as a very challenging radio environment — is a high-priority area as it is prone to natural disasters such as floods and severe storms.

Mobile broadband

Daly also mentioned the mission-critical narrowband network that the Authority has operated since 2002 in support of NSW Ambulance's dispatch processes. That technology and equipment has reached its end of life and is to be retired. At the same time, NSW Ambulance is increasing its demand for broadband capability to support what it calls the 'connected clinician' strategy, which will increasingly see demand for more data to be transmitted both to and from ambulances.

Regarding PSMB, Daly said that until it comes along, the Authority is working with mobile carriers on what is called enhanced data services to provide an interim step before getting to PSMB. "We've had some success with that," he said.

"It's also important to note that we don't see PSMB as being implemented in a 'big bang' approach, which some jurisdictions have been fortunate to do," he added. "What we do see is a series of phases that gradually evolves the capability towards true mission-critical standards."

While the UK will migrate from its narrowband voice system and onto LTE by 2020–21, "in the Australian context we certainly see the migration taking a lot longer period, with both of those technologies operating in parallel for some time", Daly added.

"The way we explain this migration is, we talk about it on a risk-calibrated basis," he said. "We see some agencies with lower-risk operations migrating to a PSMB for their voice services sooner, and being able to demonstrate [its usefulness] to the higher-risk agencies over a number of years" — giving the latter agencies comfort that the technology can replace LMR.

"But we're not setting a time frame for when that will occur; it'll be up to the agencies to determine that based on their confidence," Daly added.

"But to be clear, the national PSMB specification does include a requirement for PTT with mission-critical voice equivalent to what we have today."

PTT over cellular

The Authority had been trialling PTT-over-cellular services, and has now made the solution operational. It has implemented two PTT solutions, one based on Harris's BeOn system and the other on Motorola's WAVE technology. These highly scalable solutions support both Android and iOS operating systems and are currently in use by more than 20 agencies across NSW.

Because the system relies upon conventional business-grade services as well as the mission-critical GRN, it is considered a non-mission-critical service.

"The objective of the PTT capability is [that] it allows secure access to the shared Government Radio Network via a standard mobile phone," said Daly.

"There are obvious benefits to this," he said, such as when a major incident occurs and officers may not have access to their radios.

"For example, a senior officer can immediately get in contact and assist first responders from home if the need requires."

DISPATCH DEVELOPMENTS

Jonathan Nally

Dispatch systems are keeping up with the challenges of the latest technologies.

Perth-based Omnitronics has built a world-wide reputation for excellence in dispatch system solutions. We spoke with the company's CEO, John Florenca, to get an update on the company's latest activities.

Critical Comms: *Your solutions are used all around the world. Are there any particular installations that you're especially proud of?*

John Florenca: There are two in recent months that we are particularly proud of, because they show the broad scope of markets and applications that we operate within. In June 2017, Omnitronics won a contract to build and deliver a large-scale DX-Altus dispatch system for a project in the UAE. The time frame for delivery was very tight; however, we were able to meet the delivery date. This was to a large degree attributed to the high levels of flexibility and interfacing options offered by DX-Altus' modular design, enabling us to build, test and deliver straight from our factory. The system was delivered to Motorola Solutions, which is working with the giant UAE telecommunications company Etisalat.

Also in June, NSW Ambulance decided to upgrade its existing dispatch sites with the DX-Altus. The customer has been served well by the DX64 since 2006 so it was no surprise that the DX-Altus should be selected as a key part of its future plans. Omnitronics

will be partnering with Sydney-based Mastercom, which will be installing and commissioning eight systems across seven sites, with more than 100 operator positions.

NSW Ambulance has a vision for a world-class communications platform that will improve healthcare services across the state and increase the health and safety of first responders. With its ability to accommodate a wide range of digital technologies for both voice and data, we're confident that the DX-Altus will help NSW Ambulance achieve its goals, and we're thrilled that we will be supporting them on their journey.

CC: *Are you seeing any particular trends in dispatch, eg, are location services becoming more important?*

JF: Certainly, locations services are becoming a huge part of dispatch applications, but this is right across the industry, not just emergency services. Omnitronics now offers three levels of functionality, from basic GPS locations on a map to sophisticated asset management with reporting, to address the varying needs of the industry. We are also finding that many applications (mainly in the business sector) are predominantly location services based with less demand on the voice communications side.

Several years ago, the GPS type of applications that we were involved with used cellular modems. Now, all of the digital radios support GPS. This is a great thing for the radiocommunications industry as it is providing technology that is increasing the safety of individuals out in the field whilst enabling organisations to manage and optimise the services they provide.

We are also seeing a trend within location services to not just display positions, but to assess the information that is received,

MANY ORGANISATIONS MAY NOT BE WHERE THEY SHOULD BE IN TERMS OF ADDRESSING SECURITY VULNERABILITIES.

generate automated alerts or present information to a dispatch operator that will enable them to make timely decisions.

CC: *Cybersecurity is of prime importance these days. Is the critical communications sector keeping ahead of the bad guys?*

JF: Cybersecurity has become a vital consideration for the LMR sector. Increasingly, operations networks that were isolated from the internet are being opened up to access cloud-based resources. While the various LMR sectors are making an effort to improve their response to these issues, more resources and effort will be required to address these problems. At this stage, it seems that many organisations may not be where they should be in terms of addressing security vulnerabilities and ongoing testing to ensure known issues are addressed.

However, we are seeing a greater interest from our customers about the types of security features available in our products and the level of testing for security vulnerabilities. Of course, this goes beyond security of data and voice transmission and starts to include things such as cross-site scripting vulnerabilities, authentication and access protection.

Omnitronics Pty Ltd
www.omnitronics.com.au

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INDIA'S COMMAND-AND-CONTROL ECONOMY

Jonathan Nally

India is powering ahead with plans to leverage technology to modernise its major cities.

Zetron Australasia has won a contract to provide comprehensive mobile command-and-control systems for a major smart city project in India.

India is urbanising at a rapid pace, with the speed of growth posing huge challenges but also offering big opportunities.

The Indian government has launched the 'Smart Cities Mission', an urban renewal program with the goal of modernising almost 100 cities all over the country by making them citizen friendly as well as safe and secure.

"Zetron is privileged to be part of this important new project in India; its cities are expected to grow from 340 million people in 2008 to 590 million by 2030," said Zetron Australasia Vice President and General Manager Ranjan Bhagat.

"It's a testament to Zetron's reputation for providing reliable, mission-critical-grade applications based on our highly scalable and interoperable architecture which not only provide business value but improves citizens' quality of life."

Headquartered in Brisbane, Zetron Australasia's remit is the entire Asia–Pacific region, spanning from northeast to southeast Asia, to China and Mongolia in the north, and all the way west to the Indian subcontinent.

According to Bhagat, good relationships with local partners in each country provides the company with a head start. "It is very relationships based," he said. "Besides local cultures and customs, there are also local ways of doing business and local regulations."

Bhagat emphasises that Zetron's solutions are easily customisable for different countries and cultures. "For us that's a deliberate thing," he said. "For all of our console solutions [and] integrated communications systems, the GUI is localisable. The screen localisation does not require expert engineering — we can do it or we can train our local partners to do it as well."

Zetron has more than 35,000 operator positions globally, in the main verticals — public safety, transportation, utilities and resources.

"The key factor in all of this is, there is no 'one size fits all'," said Bhagat. "For each of these verticals, you have to do custom integration with those subsystems that are relevant for that particular customer's operation. And I see more and more of that happening."

Bhagat credits the ability of customers to pair commercial off-the-shelf (COTS) hardware with Zetron's scalable AcomNOVUS software and APIs for a lot of the company's success globally. Gone are the days of customers being locked in to a vendor's unique hardware.

"[Our customers] love the fact that what we provide is the highly "intelligent mission-critical-grade" software," he said. "The market wants open standards-based solutions and not more custom hardware."

Insofar as smart cities are concerned, Bhagat said there is a clear pattern emerging. "In our market, voice is and will remain important, but the innovation in data, messaging and video services is growing," he said. "But from our perspective, we're still committed to providing mission-critical integrated voice and data applications to the end customer [and] leveraging technology to make citizens' lives certainly safer, as well as more efficient. The goal is to provide a fabulous user experience each time and make a meaningful difference.

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Spectrum analyser

The R&S FPL1000 spectrum analyser is designed to make measuring fast and simple. The intuitive touchscreen is straightforward and easy to use. With its solid RF performance, light weight and small footprint, the R&S FPL1000 combines the functionality of a benchtop instrument with the portability of a handheld instrument.

In an RF lab, the R&S FPL1000 is said to be as indispensable as an oscilloscope or multimeter. It is a single measuring instrument for a variety of measurement tasks. It supports not only spectrum analysis, but also highly accurate power measurement with power sensors and analysis of analog and digitally modulated signals.

The solid RF performance makes the R&S FPL1000 suitable for use in the lab, production and service. The 1 dB attenuator step size (R&S FPL1-B25 option) allows users to perform measurements at the instrument's maximum dynamic range. The preamplifier (R&S FPL1-B22 option) extends the sensitivity level. Thanks to its high sensitivity and low phase noise performance, even small interfering signals next to the carrier can be analysed.

Using the R&S FPL1000 is as intuitive as using a smartphone. Simple swiping gestures adjust the centre frequency or the reference level. Two-finger gestures change the span or the displayed power level, while the 10.1″ screen with 1280 x 800 pixel resolution provides a clear display of the signal.

For transport, a protective hard cover is available as well as a padded carrying bag that allows the instrument to be operated while in the bag.

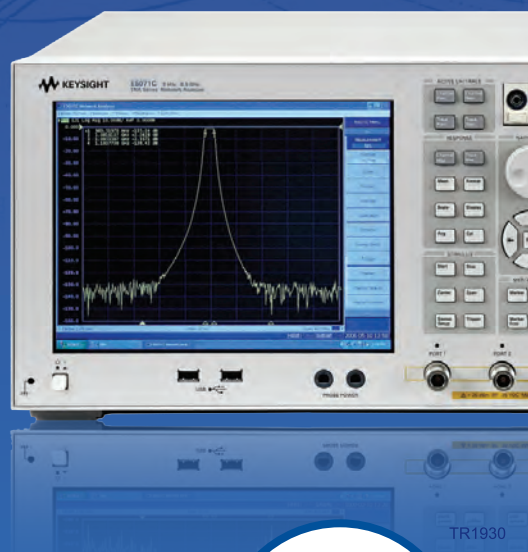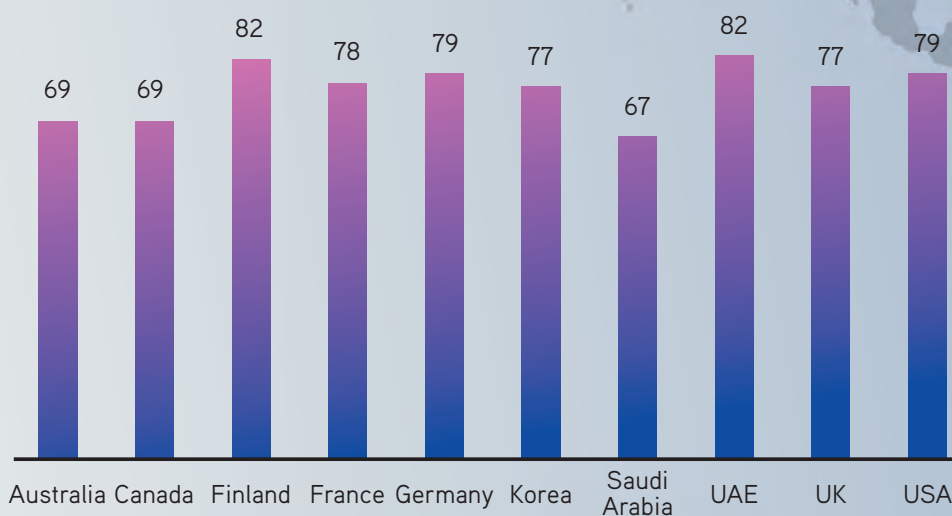*Rohde & Schwarz (Australia) Pty Ltd*

www.rohde-schwarz.com.au

WORK IN PROGRESS

Jonathan Nally

Australia scores poorly in international communications index.

Total Scores by Country

Australia	Canada	Finland	France	Germany	Korea	Saudi Arabia	UAE	UK	USA
69	69	82	78	79	77	67	82	77	79

Highly regarded international communications expert Peter Clemons has released the first edition of the Quixoticity Index, a report that among other things ranks various countries according to the maturity of their critical communications systems.

"I founded Quixoticity back in 2012 with the ambitious goal of developing a new philosophical, analytical and prescriptive framework for explaining complex modern systems," writes Clemons in the introduction to the Index, which was launched at the Comms Connect conference in Melbourne in late November.

"This first edition of the Quixoticity Index, dedicated to identifying and promoting best practice in the world of public safety and critical communications as we move towards a new era for humankind — the so-called 5G Era (until we find a better term) — is a first attempt to present the findings of studies I have been undertaking now for decades."

Clemons notes that "TETRA and P25 will continue for many, many years in a large number of global markets, together with other lower-cost PMR technologies that deliver in a simple, cost-effective way exactly what they promise, better than any other solution currently available", but that future clearly belongs to 5G.

"As it is being conceived and designed, 5G will very clearly be much, much more than just another generation of mobile communications. The consolidation, enhancement, convergence and constant evolution of a wide range of advanced technologies, some of which have been around for decades and some that have only appeared recently… will drive forward a new industrial revolution,

whose full consequences we can only imagine today," he writes in the report.

"This revolution will probably not even be complete by 2030, but its direction and probable destiny should be much clearer to us by then. In a physical world driven by greater digitalisation, cloudification and virtualisation of everything, security, privacy and trust in such complex systems will require all communications to be critical."

Interestingly, Clemons says he believes the United Nations' Sustainable Development Goals (SDGs) offer a template for the way forward.

"In Quixoticity's model of a future society, mission-critical service levels, a full deployment of all three corners of the 5G triangle and adherence to the SDGs all combine to move us towards a better world by 2030," he writes.

"These three components are at the very heart of the Quixoticity Index: core requirements to be adopted by the most progressive markets hoping to achieve the highest scores for social cohesion, national security, public safety and general well-being of digital citizens."

Country rankings

Clemons is well placed to conduct such an analysis of the current state of critical communications worldwide, being a former director and board member of the TETRA + Critical Communications Association and former director of communications at Spanish TETRA manufacturer, Teltronic S.A.U.

"THIS REVOLUTION WILL PROBABLY NOT EVEN BE COMPLETE BY 2030, BUT ITS DIRECTION AND PROBABLE DESTINY SHOULD BE MUCH CLEARER TO US BY THEN." — PETER CLEMONS

At the Comms Connect Melbourne 2017 conference, Clemons organised and moderated an expert panel discussion on the steps that need to be taken by the critical communications industry/community to place its requirements at the core of future converged networks. He also was a leading participant in the 'Back to the future — Digital Land Mobile Radio & Business Critical broadband' workshop.

For the Quixoticity Index, Clemons looked at 10 different markets: Australia, Canada, Finland, France, Germany, South Korea, Saudi Arabia, the United Arab Emirates, the United Kingdom and the USA.

"Each country possesses a unique history and geography; differentiated legal, political, economic and financial systems, upheld by a particular set of institutions and agencies, shaping its unique identity," writes Clemons.

The Index goes into detail about the state of play in each country and gives an overall score for each, broken down into 20 sectors such as governance, interoperability, infrastructure and disaster preparedness.

The graphic below shows the results, with Australia attaining a score of 69, putting it equal second-last along with Canada.

On Australia, Clemons writes, "Federal Government lack of action regarding spectrum, final broadband strategy and longer-term clarity regarding 5G remains a major issue, as does the country's need to work harder on some of the UN SDGs. It is also struggling to deliver a nationwide broadband services delivery project that is behind schedule and over budget."

The 52-page report should be downloaded (it's free from the Quixoticity website) and read by everyone in the critical communications field. It gives a lot of food for thought and, in some cases, should generate some soul searching from those in positions of power around the world. And its emphasis on the societal need for and social benefit to be obtained from critical communications is a welcome antidote to the purely technical approach that is typical of this market.

"This first edition of Quixoticity Index is a work in progress; a first attempt to explain the critical communications world to a wider audience, start a debate and move us all — leaving no-one behind — towards a better, smarter, safer world in 2030," concludes Clemons.

TECHNOLOGY TRENDS IN MICROWAVE BACKHAUL

Jonathan Nally

Microwave backhaul is an ever-changing field that's keeping up with digital developments.

Wireless Data Solutions services the utility, telecommunications and emergency services sectors, and specialises in backhaul, microwave wireless networking and network data products such as mobile data, SCADA, telemetry and last-mile connectivity. It offers turnkey solutions throughout Australasia and the Asia–Pacific.

To find out more about trends in the microwave field, we spoke with the company's Business Development Manager, Alan Paddison.

Critical Comms: *What are the basic differences in short-haul metro vs long-haul rural backhaul solutions?*

Alan Paddison: Short-haul is normally on higher frequencies, say, above 11 GHz, with larger bandwidths and data speeds that are generally higher. Typically it uses smaller antennas with reduced wind loading. Long-haul uses larger dishes, say, 11 GHz down to 1500 MHz (although 1500 MHz can also use grid packs). Data speeds are generally at 500 Mbps and below, although with higher modulations faster speeds can be obtained.

CC: *What are your wireless backhaul clients telling you about the need for security features?*

AP: Point-to-multipoint wireless systems are very susceptible to attack; one reason is the use of omnidirectional antennas and remote access points with antennas that have broad beamwidths. However, microwave radio and backhaul systems use antennas that have very small beamwidths. This, plus standard encryption methods built in, make point-to-point (PTP) and backhaul digital more difficult to intercept.

Even if an eavesdropper could find a place from which to intercept signals from a microwave link, decoding them would be very difficult. Each vendor uses unique modulation and data-framing techniques, so the attacker would need to have the same radio model, tune it to the specific frequency and position the intercepting antenna within the beam of the transmitting antenna.

Today's radios are provisioned with an identification code (link identifier) to allow communication only with its paired unit at the far end of the path. Therefore, an attacker can only capture the raw transmitted signals and cannot access the network from within the link.

CC: *What are some of the biggest changes you've seen in the last 10 years?*

AP: There have been changes in spectrum allocation, advances in modulation techniques (to achieve greater data speeds) and improvements in antenna design. Higher demand for data has driven the need for backhaul and PTP links to carry more data, forcing additional changes in the design and the use of different frequencies. There's been the deployment of more than one radio on different frequencies, but groomed into one link.

CC: *What sort of new capabilities are on the horizon?*

AP: Ethernet-based radio is taking over the industry, paving the way for most products to be IP in the way they deliver their data payload. We see even faster data speeds, carrying more data. There'll be even better, more efficient system designs with improved security features, and advanced data digitising and compression schemes.

OPENING UP 5G

SDN/NFV will help achieve the vision of a truly converged, next-generation mobile infrastructure.

Marc Cohn, Vice President of Network Strategy, The Linux Foundation

The next mobile generation (5G) is not just redefining mobile services — it is also ushering in an era of open technologies that are transforming the telecommunications industry.

Software-defined networking (SDN) and network functions virtualisation (NFV) represent the future in telecommunications, by virtualising the infrastructure and services to offer unprecedented agility, intelligence and openness.

For the past five years, SDN and NFV have been progressing due to unique collaboration between standards organisations and open-source communities that together are reshaping how new technology may be adopted.

Innovative industry groups such as the ETSI NFV ISG and the Open Networking Foundation established the reference architectures, validated use cases and reshaped the requirements for open-source building blocks integral to NFV and SDN.

In response, in 2012, The Linux Foundation introduced the first large-scale, open-source networking platform, OpenDaylight. The open SDN Controller Framework has since established a broad technical community; over 900 developers contributed to the current release. OpenDaylight has spawned commercial offerings supporting hundreds of millions of subscribers around the globe.

SDN and NFV have emerged as critical technologies for 5G to enable a wide range of data-driven applications that have been written about extensively on OpenDaylight, including mobile broadband, the Internet of Things (IoT), mobile-to-mobile (M2M), etc.

To enable such a diverse range of end-user applications, the SDN/NFV management and control model must become much more highly scalable, intelligent, flexible and open than ever before.

Many of the telecommunications industry's most innovative and proactive operators and solution providers have undertaken the challenge to redefine the service delivery life cycle as a result. This requires unique collaboration among the network management standards bodies, SDN/NFV industry organisations and the open source community.

Over the past year, there have been a number of open-source initiatives announced to address the challenges of network orchestration and automation, including the ETSI Open Source MANO (OSM) project, Linux Foundation OPEN-O project, AT&T's open source ECOMP (Enhanced Control, Orchestration, Management, and Policy) project (also with The Linux Foundation), among others.

Groundbreaking collaboration with ONAP

While having multiple alternatives offers the potential for competing approaches that the market will select based on their individual innovations and merits, the potential for fragmentation and dilution of investment looms. That is why the principals in the OPEN-O and open-source ECOMP communities announced a groundbreaking

SOFTWARE-DEFINED NETWORKING (SDN) AND NETWORK FUNCTIONS VIRTUALISATION (NFV) REPRESENT THE FUTURE IN TELECOMMUNICATIONS.

Creates a competitive supply of innovative applications by third parties

Open Innovation

Software Defined Networks

Enables a highly intelligent, virtualised, and open infrastructure

Networks Functions Virtualisation

Enables agile, differentiated, high value-added services leveraging general purpose hardware
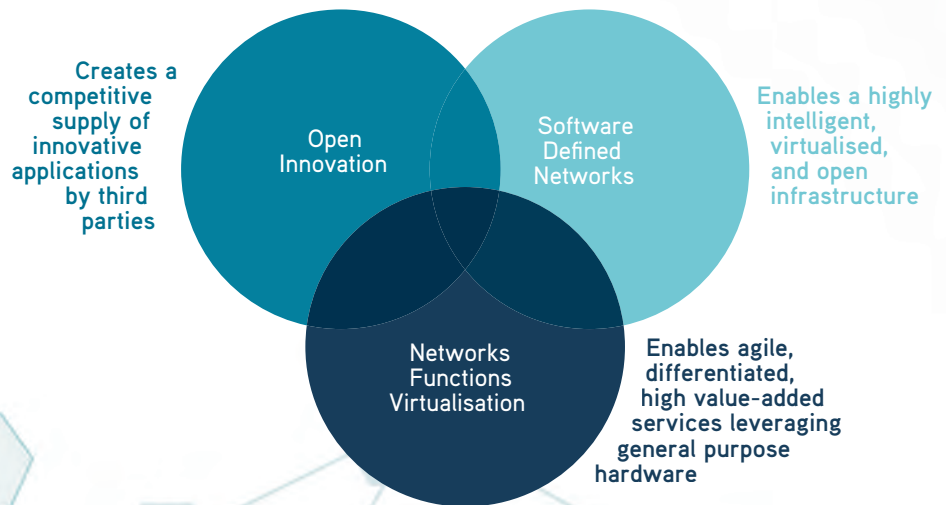
effort to converge, resulting in the introduction of the Open Network Automation Platform (ONAP), under The Linux Foundation.

On Day 1, ONAP founding members represented just under 40% of the world's mobile subscribers, and virtually all of the leading solution providers. Such critical mass is essential, considering the need to forge a common, industry-wide, open platform for service automation and orchestration.

ONAP intends to address the entire service-delivery life cycle, including:

- Service Design — A model-driven approach that minimises software development for new and derivative services.
- OSS/BSS/UI Integration — Open orchestration raises an industry debate about which OSS functions will be captured in the platform, versus existing back-end approaches.
- Virtualised Network Function (VNF) Orchestration — VNFs represent the building blocks for composite services; ONAP is participating in an industry-wide effort to streamline VNF onboarding, establishing a common packaging format to enable many to participate in the emerging open SDN/NFV ecosystem.
- Connectivity Services Orchestration — For end-to-end service delivery, a flexible set of capabilities is needed to achieve orchestration across a wide range of network domains and technologies.
- Service Management — Rounding out the platform includes a

rich set of policy management, analytics and related functions to enable a more intelligent service delivery life cycle.

The ONAP project leverages The Linux Foundation's best practices refined by over 25 years of enabling some of the world's most important open-source projects. ONAP is a truly global project, featuring an open governance model forum to discuss architecture initiatives. It makes for a healthy blend between operators and vendors and top-down/bottom-up decision-making.

The project was announced in February 2017, and is currently in the process of release planning and initial ramp-up.

As 5G rapidly approaches reality, it is imperative for standards bodies, industry groups and the open-source community to undertake a highly collaborative approach for a pragmatic technology adoption life cycle for SDN/NFV. By working together, use cases may be prioritised to guide development, requirements and implementation may be validated and the many trade-offs that arise may be thoroughly considered.

Working in a neutral and open forum, an inclusive and open community will catalyse the cultivation of the open ecosystem that enables many to benefit.

The future of telecommunications is currently being reshaped by SDN/NFV, with 5G among the first projects to realise the vision of a truly converged, next-generation mobile infrastructure. *Republished from ITU News magazine.*

Vector network analyser

The R&S ZNL vector network analyser provides spectrum analysis and power meter measurements, unified in one single, compact instrument.

Offering frequency ranges from 5 kHz to 3 GHz or 6 GHz the R&S ZNL is well suited for various RF component measurement applications in industrial electronics and wireless communications. Ever-changing measurement tasks in research laboratories can be demanding. The R&S ZNL is designed to help to reduce investment costs due to its unique concept of options. The base unit can be extended with a fully integrated spectrum analyser option and can be used as an RF power meter.

Instead of investing in different instruments, research labs, service centres, universities and production facilities can use one single instrument that, according to the company, offers even higher measurement speeds and RF performance than other instruments in comparable classes. Vector network analysis and spectrum analysis measurements can be displayed on the 10.1″ multi-touch screen in parallel.

Although the R&S ZNL unifies a variety of different functionalities, it is a compact instrument weighing only 6–8 kg and offering a carrying handle and a battery option. The R&S ZNL is fully portable and can be operated wherever needed.

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

Rugged network firewall

The Crystal Group RCS5516FW rugged network firewall is designed to secure and protect networks deployed in harsh environments such as those found in defence, transportation and energy sectors.

The product is a commercial off-the-shelf (COTS) firewall based on the Cisco 5516 Adaptive Security Appliance and is encased in a military-grade rugged chassis. The firewall provides eight integrated Ethernet 10/100/1000BASE-T(x) copper ports; supports Cisco FirePOWER services; and offers 1.8 Gbps maximum throughput. The product provides up to 250,000 concurrent sessions and handles up to 20,000 new connections/s.

The product features an all-aluminium chassis and is available in either a standard 19″ rack mount or transit case EIA form factor. The 1U firewall can be mounted using Delrin glides or as a fixed mount (front and rear). The unit measures under 33 cm deep, weighs 6.35 kg and is engineered to MIL-STD-810 and MIL-STD-461 with EMI, humidity, vibration and shock kits available.

The product is specifically designed to provide reliable, high-performance connectivity for cybersecurity protection, secure communication, remote monitoring and maintenance in situations where security, quality, reliability, low power consumption and long-term availability are important.

Metromatics Pty Ltd
www.metromatics.com.au

Ethernet router

Unimax technology is fast, with more efficient control and command of remote industrial applications.

The Unimax4GX Ethernet router boasts faster download and upload speeds for applications. Unimax is designed specifically for a range of up-to-date industrial applications.

Unimax4GX with its Band 28 connectivity is capable of covering wide areas to enable users to manage, control and command data both efficiently and effectively.

The Unimax4GX router is an essential tool for wireless telemetry requirements. The versatile device can provide solutions for a wide range of industrial applications.

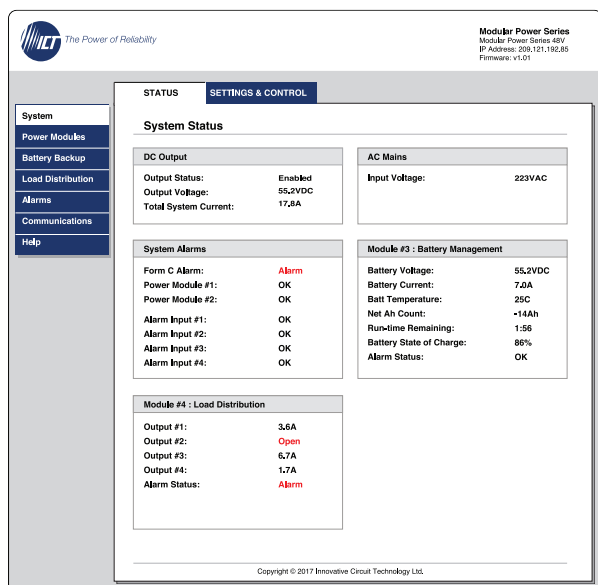*RFI Technology Solutions*
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Battery Backup
Load Distribution
Alarms
Communications
Help

System Status

DC Output

Output Status:	Enabled
Output Voltage:	55.2VDC
Total System Current:	17.8A

AC Mains

Input Voltage:	223VAC

System Alarms

Form C Alarm:	Alarm
Power Module #1:	OK
Power Module #2:	OK
Alarm Input #1:	OK
Alarm Input #2:	OK
Alarm Input #3:	OK
Alarm Input #4:	OK

Module #3 : Battery Management

Battery Voltage:	55.2VDC
Battery Current:	7.0A
Batt Temperature:	25C
Net Ah Count:	-14Ah
Run-time Remaining:	1:56
Battery State of Charge:	86%
Alarm Status:	OK

Module #4 : Load Distribution

Output #1:	3.6A
Output #2:	Open
Output #3:	6.7A
Output #4:	1.7A
Alarm Status:	Alarm

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The optional Intelligent Controllers on Modular Power and Digital Series include a secure, easy to use web browser interface that provides remote monitoring, alarm reporting, and control of the system over an Ethernet link. SNMP support allows integration of the power systems into your wireless network management infrastructure.

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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 February/March 1993 issue of *What's New in Radio Communications* featured the Philips Mobile Data Control Unit, designed and manufactured in Australia and compatible with the Philips PRM8030 mobile radio. The unit had a four-line, 40-character display and could store 160 lines of text. Elsewhere in the magazine, we reported on Ericsson Australia being awarded a $38m contract to supply mobile equipment for AOTC's analog mobile network, with most of the gear to be manufactured at the company's Broadmeadow's plant. Nokia Telescommunications was handed a contract from OTC Maritime to supply Actionet trunked mobile radio for its Victorian Public Sector Trunked Mobile Radio Network, including seven mobile exchanges, a system exchange and equipment for more than one hundred 160 MHz base station sites. And Philips was awarded a $10m contract with the State Rail Authority of NSW to supply a statewide voice and data network for its locomotives.

10 YEARS AGO. The cover of the January/February 2008 issue of *Radio Comms Asia-Pacific* featured the GME TX4800U 25W UHF waterproof portable radio, fully designed and manufactured at the company's (then) facility at Gladesville. Elsewhere in this issue we reported on Brett Smythe being appointed managing director of Tait Oceana and WCDMA reaching 70% market share of commercial 3G networks worldwide. GME's Neil Johnson wrote about the use of UHF for telemetry in remote water management, and we had a case study on Sydney Water using 900 MHz frequency-hopping, spread-spectrum radio to carry pump control signals along a 9 km-long effluent pipeline. Another case study described a VoIP system supplied by Omnitronics for an offshore oil rig 200 km off the coast of Malaysia. We also reported on the inaugural Radio Comms Connect conference, held in late 2007 in Melbourne, at which two themes were prominent. The first theme was 'Who said two-way radio was dead?' and the second was the pressing need for new talent in the industry. Déjà vu all over again.

⟨⟨ Spectrum

Changes coming for our control rooms

Control rooms are an essential component of an organisation's or industry's operation. In some sense, critical control rooms are the actual heartbeat of an enterprise and they have to function 24 hours per day, seven days per week. During this process humans and machines combine to provide an operational function(s) that benefits a broad range of stakeholders. However, given the rapidly changing information and communications technology environment, key decision-makers are facing a growing challenge dealing with the digital revolution. As a result it is essential that current and emerging technologies, including the impact on personnel working in a control room, are fully considered when designing the next generation of control rooms. In part, this has been a key driver in establishing the International Critical Control Room Alliance (ICCRA).
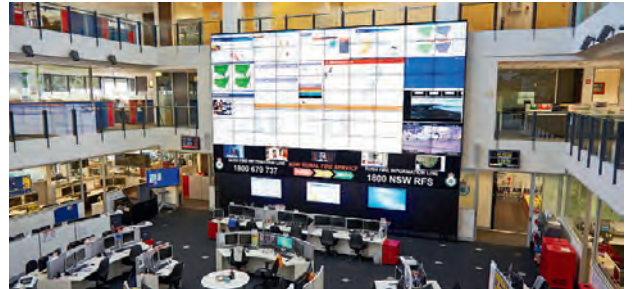
The first ICCRA Congress was held on 5–7 December in Geneva. This was a highly successful event with delegates from across the globe coming together to share their knowledge and thoughts on the potential future direction of control rooms. Key themes emerging from the discussions included the increasing use of data within this environment, and the emerging role of machine learning and machine-to-machine communications.

These trends provide an opportunity to automate a range of functions. For example, Liam Caldecott of the Derbyshire Constabulary explained how it is moving towards an automated tasking environment to improve the efficiency of its control rooms. This is an interesting initiative, especially when considered against George Rice's (Industry Council for Emergency Response Technologies) presentation which detailed how broadband is threatening to increase a telecommunicator's workload. As a result we need to consider new roles, additional staff and a broader range of analytic capability within a control room. Jeffrey Cohen (APCO International) reinforced this concept of a changing environment when he provided an overview of APCO's recent Project 43, which has found that broadband-based developments are leading to a paradigm shift in the role and functioning of the public safety answering point.

Cybersecurity continues to be a critical issue of concern to all control room operators, although it is unclear if there is enough capacity within existing control room arrangements to manage this key vulnerability. Similarly, the importance of having a well-developed business continuity plan that is regularly tested was reinforced by Theodoros Alexandridis (Greek National Natural Gas System Operator).

A key feature of the ICCRA Congress was a strong focus on people, not just the technical aspects. Russell Ockendon (Control Centres Australia) provided an enlightening presentation on the effectiveness of good ergonomic design, showing that it needs to start early with an understanding of the operational and task needs before going anywhere near designing an actual workspace.

Despite changing technology, it was evident that all delegates foreshadowed a long and continuing role for LMR within this changing landscape. The key test will be determining how we can achieve optimum efficiency and effectiveness through the combination of LMR, broadband and advanced computing capabilities. No doubt this will be a continuing conversation at the next ICCRA Congress (which should be held in London towards the end of this year) and the forthcoming range of Comms Connect/ARCIA conferences.

Ged Griffin is an Inspector in the State Emergencies and Security Command of Victoria Police. He is also manager of the Centre for Disaster Management and Public Safety at the University of Melbourne.

Image courtesy NSW Rural Fire Service.

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