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CONNECTIVITY CHAOS
WHEN THINGS GO WRONG

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CONNECTIVITY
CHAOS

Dannielle Furness

We've enjoyed massive technological change over the last 20 years, which has undeniably connected us as individuals and delivered incalculable commercial efficiencies. But that rate of change has made it difficult to predict future demand for services and resource accordingly. What happens when connectivity fails us?

The power went out at my place recently. It was a chilly Sunday afternoon, just as dusk was falling. The outage wasn't weather related and took out a good slice of my suburb and the surrounding area. Judging by the number of anxious-sounding neighbours quizzing the emergency crew dispatched to solve the problem, I wasn't the only one taken by surprise.

Not so many years ago, power outages were reasonably common and, by my recollection at least, most households were adequately equipped to cope — a supply of candles was usually in reach and there were plenty of ways to amuse yourself during the (often lengthy) hours of unexpected darkness.

These days… not so much. I was astonished at how quickly things deteriorated to be honest. As it turns out, I'm woefully unprepared for a blackout. I couldn't rustle up more than a few decorative tea lights and a box of household tapers. It took me a solid 10 minutes to find matches and I don't even own a torch.

No power, no connection

Worst of all, my mobile had less than 5% charge and my laptop not much more. I turned them off figuring it was better to save what juice I did have in case I really needed it. My laptop and tablet connected via Wi-Fi anyway, and the modem wasn't working without power.

Ill-preparedness aside, things got ugly when I tried to find something to do. Faced with the prospect of no Spotify, Netflix or internet of any kind, I tried to remember what we did in blackouts all those years ago. For the record, candlelight isn't great for reading.

"I'll phone someone," I thought. "Thank God for the trusty landline I never use, it finally has a purpose." Nope. Not now I'm on the nbn, because landlines no longer work without power.

This was by no means a life or death situation, but I was still struck by the impact. In truth, it wasn't the lack of electricity that posed the real problem, it was the inability to connect. I've become so used to picking up a device and accessing the internet in order to perform the simplest of tasks. We all have — it's an inherent part of life in the 21st century.

No-one will deny that our lives have been made easier courtesy of technology including the internet, smartphones and other intelligent devices. But the downside is significant; when things go wrong, they go really wrong.

When things go wrong

In July this year, a major Telstra network outage caused mayhem nationwide. It took out ATMs and EFTPOS facilities across the country. The big four banks were all affected, with many branches out of operation for the duration, and retailers — including the majors like Coles and Woolworths — resorting to cash-only transactions. It wasn't the first instance of a failed network and certainly won't be the last, but the impact was substantial.

The National Retailers Association estimates that those three hours of network downtime cost retailers north of $100 million in lost sales. The telco said unusually high traffic in NSW was the root cause and, while not determined to be directly related, it's worth noting that the outage occurred on the same day that one of the highest jackpots in Powerball history was being drawn.

We've been led to believe that we live in a cashless society, yet when the underlying infrastructure fails, things get ugly. Have we come to a point where our heavy reliance on data networks can be completely undermined by something as simple as extra demand for lottery tickets? Well, maybe, as it happens.

Behind the scenes

Of course, this is the highly visible side of connectivity failure — but what about the stuff going on behind the scenes that Joe Public isn't even aware of… or realise that he's paying for?

The Australian Communications and Media Authority (ACMA) is responsible for ensuring minimum cabling requirements are in place to promote safety and maintain the integrity of our telecommunications network. In October last year, it published a con-

sultation paper titled 'Review of regulation of customer telecommunications cabling'.

The review was focused on the regulation of cabling work as performed by cabling providers in light of changes in the technical and commercial environment in recent years. ACMA wondered whether the same risks that original legislation intended to mitigate still existed, and what — if any — regulatory model was required moving forward. Comment was sought from industry members and other stakeholders — and it came in spades. ACMA received 32 submissions, the majority of which are published on its website. If ACMA was questioning whether the industry had matured enough to move towards a deregulated regime, the industry responded with a resounding 'no'.

Among the submissions, a report prepared by Robert Reid and Ian Millner (on behalf of Ian Millner) incorporated substantial photographic evidence of current cabling practices in both commercial and residential applications — and it's not pretty.

Reid and Millner assert that these images make clear a need for ongoing (and improved) regulation, additionally drawing attention to the disparate level of workmanship associated with electrical versus telecommunications cabling as evidence of output under a regulated industry versus an unregulated one. They argue that the

THE DOWNSIDE IS SIGNIFICANT; WHEN THINGS GO WRONG, THEY GO REALLY WRONG.

current regulatory environment does not adequately support the intent of the *Telecommunications Act 1997*, with respect to: (a) the long-term interests of end users and (b) the availability of accessible and affordable telecommunications services.

The authors highlight industry practices that contribute inefficiencies, add unnecessary financial burden and potentially threaten service delivery. At least part of the problem relates to the presence of both 'customer' and 'carrier' cabling in many installations, not only leading to excessive congestion and a host of subsequent issues around identification, redundancy and performance, but also representing an additional cost burden to the user.

The views put forward by Reid and Millner were echoed in other submissions, with BICSI, NBN Co, Communications Alliance and the Communications Workers Union among others, endorsing either maintenance of the status quo or a strengthening of the regulatory environment, rather than any winding back.

The report responses not only make for interesting reading, they also serve to underline the difficulties associated with a fast-burgeoning industry and what happens when it is left unchecked. Our society-wide reliance on constant connection — and the ramifications of failure we've already seen — means the stakes are high. To that end, it seems reasonable to demand a framework and methodology that supports and promotes better practices at the infrastructure level.

Fortunately, the power outage in my neighbourhood lasted only five or six hours — not long enough for food to spoil or to represent anything more than an inconvenience, really. Of course, living in a major metropolitan area means I wasn't exactly cut off from the world, but the experience got me thinking about how we've developed such a heavy reliance on permanent connection in a relatively short time frame — and just how fragile that connection is. I'll stop short of saying that it changed me, but it has definitely encouraged me to keep my devices charged. I even bought a torch.

Electrical Comms Data news

WESTERN POWER TO DEPLOY IoT NETWORK SOLUTION

Western Power will deploy network technology from solutions provider Itron to modernise its electricity delivery and metering services. The technology will connect nearly 240,000 electricity meters to improve efficiency, reliability and customer service.

The networking solution provided by Itron will give Western Power enhanced visibility into the operation of its electricity distribution network, which will enable automated data collection, remote services and the ability to proactively monitor faults and outages. The solution will also improve the management of distributed energy resources, including rooftop solar systems and battery storage.

"Western Power is committed to delivering on the changing energy needs of our customers," said Jacqui Hall, Western Power's acting Chief Financial Officer.

"With Itron's IoT network as the foundation, we will be better placed to deploy advanced meters on our grid, to improve safety performance, reliability and operating efficiency. Advanced metering infrastructure is also one of the keys that will help unlock energy options and innovations for our customers such as renewables, community batteries and microgrids."

Itron enables utilities and cities to deliver critical infrastructure services to communities. The company's smart networks, software, services, meters and sensors are designed to help customers better manage electricity, gas and water resources.

"Our proven solution complies with Australia's regulatory standards and is designed to cost-effectively improve operational efficiency for the utility's central metropolitan area and major regional towns," said Paul Nelsen, Vice President of Sales (APAC) at Itron.

"With Itron's multi-application network and smart devices, Western Power will be able to realise its energy efficiency and customer service goals today while preparing for the future."

REPORT REVEALS SMART BUILDINGS ARE OPEN TO MALICIOUS ATTACK

Forescout Research Labs has demonstrated how easily cyber hackers could disrupt the functioning of a smart building via its video surveillance systems. Established to investigate threats facing network-connected enterprise devices, Forescout researchers exploited unencrypted video streaming protocols of a surveillance camera as an example of a cyber-physical attack.

The report 'Rise of the Machines: Transforming Cybersecurity Strategy for the Age of IoT' details the research investigating how surveillance cameras, smart lights and other Internet of Things (IoT) devices within smart buildings could be attacked by cybercriminals and how to mitigate those attacks.

Elisa Costante, Sr Director of Forescout Research Labs, said, "Today's connected world is made up of billions of devices that use a myriad of operating systems and network protocols to exchange data across industries and boundaries. We created Forescout Research Labs to explore the security implications of this hyperconnected world and research the associated threats and risks coming from these devices."

To demonstrate the cyber risks of a smart building, Forescout Research Labs set up a real-world smart building environment containing video surveillance, smart lighting and other IoT devices, and analysed how an attacker could obtain initial access to this network and some of the attacks they could implement for each subsystem.

The research revealed:
- Many IoT devices, including surveillance cameras, are set up by default to communicate over unencrypted protocols, allowing for traffic sniffing and tampering of sensitive information.
- Sensitive information could be tampered with using surveillance cameras commonly used by enterprises. Forescout Research Labs researchers successfully replaced a network video recorder's footage with previously recorded fake content.
- Compromising the video surveillance system is an example of a cyber-physical attack.
- A search on Shodan pulled up nearly 4.7 million devices that could be potentially impacted by using these unencrypted protocols.

"We are at the forefront of the IT/OT convergence that brings massive benefits to enterprises, but unfortunately it also comes with an increased level of cyber risk," said Costante.

"You can expect to hear more from our team as we set out on a mission to educate the market on how to protect businesses and infrastructures from the bad actors that leverage device, network and protocol vulnerabilities to damage or disrupt their functions."

Read the blog and the full report to learn more about the research into how IoT devices can be leveraged as an entry point to a building's network.
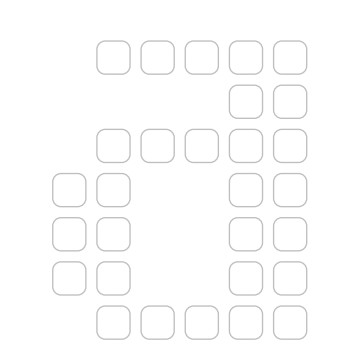
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MEA ADVANCING APPRENTICESHIPS

Master Electricians Australia (MEA) is getting behind an incentive to boost electrical industry apprenticeships to address the industry's skills shortage. The MEA has partnered with Add Staff and the Queensland Government to back the Advancing Apprenticeships program — a 12-month campaign to create hundreds of job opportunities for young people, particularly across regional Queensland.

MEA CEO Malcolm Richards said industry demand for both electricians and air-conditioning and refrigeration technicians is currently outstripping the available supply of skilled tradespeople.

"This demand comes in the face of rising consumer demand for energy conservation, renewable energy sources, battery technology, and home automation and connectivity," Richards said.

"On top of this, commercial and manufacturing industries need skilled technicians who can track energy use and find ways to reduce consumption costs as the price of power continues to rise."

As part of the Queensland-Government-funded initiative, MEA and Add Staff will be working across Queensland to target all businesses within the electrotechnology sector while also creating awareness of the opportunities available to young people.

A series of roadshows across Queensland will be staged to create awareness of the range of financial and non-financial supports available for businesses to hire an apprentice, while schools, careers fairs and job expos will be targeted to create more awareness of the opportunities available to young people and their families.

"Without the training and development of trade skills in these industries, there will be an increased shortage of tradespeople to deliver upcoming infrastructure projects, such as solar farms and the nbn," Richards explained.

"Shortages in these critical infrastructure areas could result in delays to a host of projects across all sectors, including residential, commercial, construction and industrial, with ongoing economic impacts for the state."

SMART STREETLIGHTS FOR DUNEDIN, NZ

New Zealand's Dunedin City Council (DCC) will light its streets with Telensa's smart streetlight system, connecting thousands of LEDs via smart city data applications.

Dunedin's current streetlight network consists of 15,000 high-pressure sodium streetlights that are reaching the end of their useful life. Broadspectrum has been contracted to convert these lights to LEDs, which will be wirelessly connected and managed by Telensa's PLANet system. PLANet will give DCC control of the streets' lighting levels, with the lights remotely tailored to suit each location in Dunedin.

PLANet is an end-to-end intelligent street lighting system consisting of wireless nodes to connect individual lights, a dedicated network owned by the city and a central management application. The system will support the LEDs in reducing energy and maintenance costs, while improving maintenance efficiency via automatic fault reporting. In addition, streetlight poles will be turned into hubs for smart city sensors.

Telensa founder and Chief Commercial Officer Will Gibson said, "Cities across New Zealand are increasingly adopting wireless control systems for their streetlights — reaping significant environmental, cost and maintenance benefits as well as providing a platform for future smart city applications.

"Following our projects with Whakatane and Wellington, we are delighted to now also be working with Broadspectrum and Dunedin City Council to bring these capabilities to yet another city in New Zealand," he said.

DCC Transport Group Manager Richard Saunders said, "This project shows our commitment to intelligent infrastructure and how we're delivering a safer, more cost-effective service environment. We're excited to be working with Telensa and Broadspectrum to make our streetlights smart and to create a platform to deliver smarter, more joined-up services to our residents in the future."

Domenic De Fazio, Urban Infrastructure Chief Executive at Broadspectrum, added, "With more than 1.7 million lights already connected, we are confident that working with Telensa will help us to achieve world-class lighting for the city of Dunedin."

The project is 85% funded by the New Zealand Transport Agency, which is fast-tracking co-investment with local authorities in LED street lighting and controls. Following policy changes in 2015, local authorities can replace existing road lights with LEDs and controls immediately rather than wait until they reach the end of their useful life. As a result, several conversion programs have already started including those in Wellington, Whakatane and Upper Hutt.

The Dunedin smart lighting project is expected to reach completion in 18–24 months.

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news

DEMAND-MANAGEMENT SYSTEM PROPOSED FOR ENERGY MARKET

A proposal by the Australian Energy Market Commission (AEMC) will open up the wholesale electricity market to allow easier payment to large consumers reducing their demand on the power system. The wholesale demand-response mechanism draft rule, released for consultation, would allow non-retailers to offer demand response directly into the wholesale market.

AEMC Chairman John Pierce said changes would be put in place as quickly as possible to help take the pressure off the power system by meeting electricity needs through the lowest cost-mix of demand response and supply.

"This draft rule is all about large commercial and industrial consumers in the wholesale market who can now participate directly in the wholesale market by offering in-demand reductions. These are times in which those consumers have agreed not to consume electricity or consume less or later," Pierce said.

"Taking demand pressure off the power system is a substitute for generation and helps tackle rising wholesale prices at peak times, reducing electricity costs for everyone.

"Most simply, demand response is a consumer choice to turn down or turn off their electricity use in response to a signal to do so.

"So if wholesale prices are higher, there is more incentive for demand response. It makes sense to manage demand for electricity if we are going to deliver reliable energy at the least possible cost," he explained.

Implementation of the proposed system would enable new businesses to work with consumers to sell their demand reductions into the wholesale market in a similar way to scheduled generation, and be settled in the market at the price available at that time.

"Right now, only retailers can offer this service," Pierce said.

"New businesses wanting to enter the market, and some consumers, say retailers haven't done enough to encourage demand response. On the other hand, retailers say change is underway and that adding new players will end up costing consumers more.

"We are addressing both of these concerns while promoting innovation and protecting small consumers from being put at risk.

Pierce provided a snapshot of how wholesale demand response will work:

• Commercial and industrial electricity customers can reduce their consumption at peak times and sell this demand reduction into the grid via a third-party demand resource service provider.
• As prices peak, customers will be told to turn off and the aggregator will bid their demand reduction into the market.
• If generation is more expensive than the demand reduction available, the demand reduction would be 'used' first in place of generation.

Demand response service providers would have largely the same obligations as scheduled generators in terms of providing information to the wholesale electricity market. AEMO would set a baseline against which the value of demand would be calculated and paid.

"Technology is developing fast and changing the economics of the market. It won't be long before digitalisation gets to the point where a truly two-sided market is possible. That's a market where consumers actively manage their decisions to consume or not consume.

"The mechanism we have designed takes advantage of these technological advances. We want to start opening up the system so when technology is mature enough there is a clear runway for widespread demand side participation to take off."

DUNEDIN TO BEGIN NZ$15M LED UPGRADE

Broadspectrum New Zealand has won a seven-year contract to install LEDs in Dunedin's streetlighting network, with work expected to begin this year.

"The seven-year contract covers design and installation of the new LED lights, installation of a Central Management System, and operation and maintenance of the network," said Dunedin City Council (DCC) Group Manager Transport Richard Saunders.

Current high-pressure sodium streetlights in Dunedin are coming to the end of their lifespan, according to DCC. The installation of LEDs aims to increase road safety and reduce energy use.

Broadspectrum Chief Executive of Urban Infrastructure Domenic De Fazio also said the LED network "will allow DCC to tailor lighting levels street by street".

Work to replace existing streetlights and install the central management system is expected to take 18–24 months and will cost approximately NZ$15–20 million.

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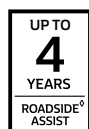
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RISK OF BATTERY-POWERED DEVICES NEAR ELECTRICAL EQUIPMENT

Queensland's Electrical Safety Office (ESO) has issued a warning that failure to maintain battery-powered devices such as energy monitoring systems, time clocks or communication equipment can create a potential electric shock hazard and may cause damage to electrical equipment. This safety hazard can occur if a battery-powered device leaks an alkaline substance onto electrical equipment located below.

Industry professionals should be aware of and control this risk when working on switchboards and meter panels near unmaintained battery-powered devices.

The ESO has advised that if batteries have leaked, the extent of the leakage should be noted and workers should ensure suitable controls are in place to eliminate the shock hazard and chemical exposure. This may include advising the owner to have the device and associated cabling removed.

To avoid the risk to equipment and people, unused battery-powered devices should have their batteries removed, be located so that battery leakage does not endanger other electrical equipment, or be removed (including any associated cabling).

The ESO is currently advising electricity meter installers and retailers they should not install meters below battery-powered devices.

TEAM DEVELOPS TOOL FOR ROOFTOP SOLAR POTENTIAL

Computer scientists from the University of Massachusetts Amherst have developed a tool that automatically estimates rooftops' potential to generate solar energy.

The Clean Energy Council reported that at the end of 2018, 2 million Australians had a rooftop solar system, with an average of six solar panels installed every minute. The Australian Energy Market Operator estimates that this average will increase to 10–20 panels per minute if large-scale solar projects continue to be implemented.

Scientists at the University of Massachusetts Amherst College of Information and Computer Sciences (CICS) have suggested that the progress of rooftop installations is often slowed by a shortage of trained professionals who must use expensive tools to conduct labour-intensive structure assessments one by one.

According to the researchers, led by Prashant Shenoy and Subhransu Maji, current methods to automate the process require expensive three-dimensional aerial maps using LIDAR (light detection and ranging) technology, which is not widely available. The team is proposing a new, data-driven approach that uses machine learning techniques and widely available satellite images to identify roofs that have the most potential to produce cost-effective solar power.

Shenoy, Maji and colleagues will present their 'DeepRoof' tool at the 25th Association for Computing Machinery's Special Interest Group on Knowledge Discovery and Data Mining (ACM SIGKDD) conference in Anchorage, Alaska.

"Solar potential estimation of a roof can substantially benefit home owners deciding to adopt solar," said lead author and PhD student Stephen Lee. "But current automated tools work only for cities and towns where LIDAR data is available, thereby limiting their reach to just a few places in the world."

The data-driven DeepRoof approach takes advantage of recent advances in computer vision techniques and uses satellite imagery to accurately determine roof geometry, nearby structures and trees that affect the solar potential of the roof.

"DeepRoof estimates can be used to identify ideal locations on the roof for installing solar panels," Lee added.

Lee explained that the team trained DeepRoof using different roof shapes and sizes from six different cities to recognise and extract planar roof segments. Results show that the technology can identify the solar potential of roofs with 91% accuracy. Further, the tool can be scaled to automatically analyse satellite images of an entire city to identify all building roofs with the most solar potential.

GROUNDBREAKING EXPERIENCE AWAITS NEW SYDNEY THEATRE PATRONS

NEC Australia and Western Sydney's West HQ venue have formed a partnership that will see NEC digital display systems and ICT solutions featured at West HQ, a hub for entertainment, fitness, lifestyle and accommodation.

The partnership centres on the Sydney Coliseum Theatre, a new 2000 seat multimode venue due to open in December 2019. The venue will accommodate theatrical performances, corporate events, conferences and more.

NEC LED display systems for menus, wayfinding and interactive customer promotions powered by Cisco Vision IPTV will feature at the venue. NEC will also develop and deploy solutions for CCTV security systems, network infrastructure and free guest Wi-Fi across the eight-hectare site.

"NEC has been intimately involved with the design and construction of the Sydney Coliseum Theatre at West HQ to ensure the customer experience from arrival to exit is exceptional," said NEC Australia Managing Director Mitsuhiro Murooka. "This really will be a centre of technological excellence; a world-class venue with world-class technology solutions and a one of a kind for Sydney.

"NEC already has a strong relationship with Western Sydney in the health and education sectors, but this is an entirely new frontier for us — the possibilities now and into the future are boundless," he said.

The customer experience will include a digital walkway 'crystal bridge' with glass flooring brought to life by the latest in LED display technology, creating a spectacular, immersive visual experience for patrons before they even enter the Sydney Coliseum Theatre.

"This major partnership with NEC is a step-change in pace, innovation, security and customer experience for West HQ as a destination, and as an industry leader," said West HQ CEO Richard Errington.

"We are incredibly excited about the relationship forged with NEC and are confidently looking to how we will evolve the partnership and do exceptional things for the arts and the community together," Errington said.

Image: An architect's impression of Sydney Coliseum Theatre, West HQ. Image supplied by NEC Australia.

SUCCESSFULLY DEPLOYING PoE AND PoH

A BICSI presentation at the recent Integrate expo and conference in Sydney provided some much-needed guidance on cabling for PoE and PoH applications.

Paul Stathis, Chief Executive Officer

P ower over HDBASE-T (PoH) shares similar characteristics to Power over Ethernet (PoE), so the same cabling principles apply.

Put simply, PoH/PoE delivers up to 100 W of power from a digital power source (eg, Ethernet switch) to a powered device (eg, camera, digital display) over all four pairs of the data cable, simultaneously with data transmission.

Power is applied as 'common-mode' voltage, whereas data is transmitted using 'differential-mode' signalling, so data isn't affected by power and vice versa. A centre tap on the Ethernet pulse transformer extracts the common-mode voltage for power at the receiver.

Done right, PoH/PoE is a brilliant means of using existing cabling to power equipment without needing AC mains cabling.

Issues

PoE/PoH can introduce problems if the cabling can't handle the power. That's because data cabling was originally designed to just carry burst power, not continuous currents and voltages.

Delivering 100 W can mean 0.5 A per conductor at 50 V, and that creates heat. Large cable bundles carrying that much voltage and current yield significant temperature rise and eventually fail to transmit data and/or power. It's like drinking hot coffee through a paper straw — it's not fit for its intended purpose and eventually falls apart.

The same is true of the thin gold-plated contacts in RJ45 connectors — they were never designed to carry high currents, which deteriorate when arcing occurs when disconnected under load.

Solutions for existing cabling

This is perhaps the riskiest deployment of PoH/PoE, because you can't just assume existing cabling will support PoH/PoE. Thankfully, you can quickly get a reasonable idea by inspecting the cabling.

Start by reading what's printed every metre along the cable — conductor diameter (often listed as AWG or American wire gauge) and temperature rating (listed as XX°C).

Conductors of 24 AWG or less have a decent chance of supporting higher currents without generating too much heat. Data cables are commonly 60°C rated. Since temperature is directly related to insertion loss, it's important not to exceed the cable's maximum temperature, so some 60°C-rated cables in high-ambient temperature environments may not support PoH/PoE. In such cases, 75°C-rated cables would be far better.

Resistance unbalance is a major issue for PoH/PoE, so it's recommended to test the cabling for that with a suitable network analyser/cable tester. These devices should have the right metrics in them to immediately determine ability to support PoH/PoE or not.

A quality installation also contributes to supporting PoH/PoE, so inspect the cabling. Look for cable-bundle sizes — the bigger the bundles, the less likelihood to carry PoH/PoE. Heat rise in cable bundles is the biggest concern for PoH/PoE, so bundles should be limited to no more than 24 cables. Also look for adequate spacing for heat dissipation between bundles.

Solutions using new cabling

Installing cabling affords you the opportunity to factor PoH/PoE, and this all involves making informed choices:

- Choose cable expressly designed for PoE/PoH with minimum conductor diameter and higher operating temperature ratings. Most 'PoE-rated' cables are 23 AWG (0.26 mm^2) and 75°C rated.
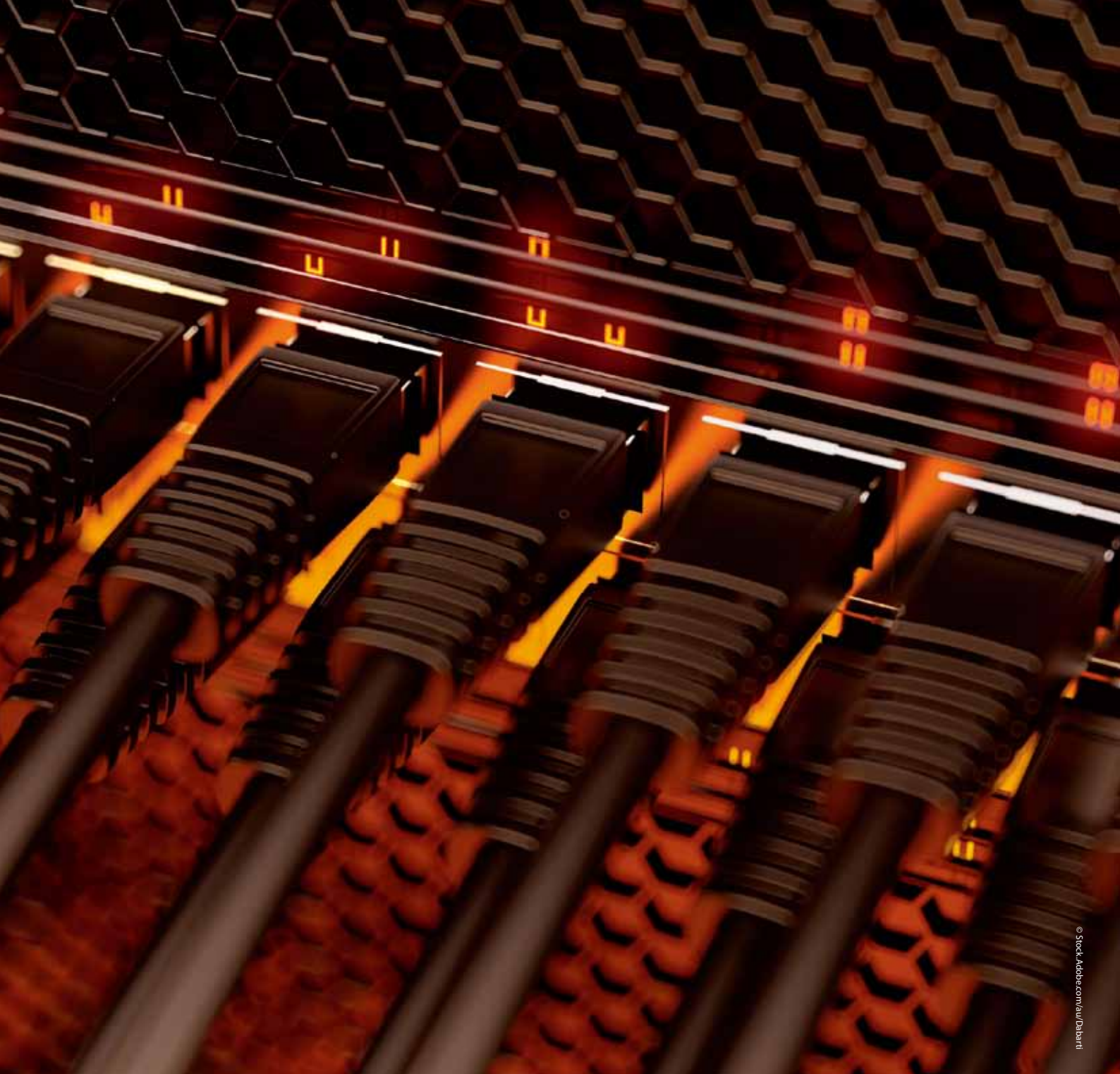
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- Choose connectors expressly designed for PoE/PoH, with pin-contact profiles to minimise arcing on disconnect.
- Choose appropriate cabling support that allows adequate spacing for airflow and heat dissipation. Explore the options afforded by catenaries, mesh trays, open/closed trays, open/closed ducts and sealed/unsealed conduits.
- Limit cable bundles to no more than 24 cables. It may even need to be less, so 'do the math' to work out the maximum number of cables in a bundle to limit heat rise. For large cable runs, it's best to install multiple bundles, reasonably separated to allow airflow and heat dissipation.
- The longer the cable, the greater the potential heat rise. So it may be necessary to reduce long cable lengths to minimise the effect of resistance on heat rise over distance.
- Consider using a higher category cable — eg, Cat 6A instead of Cat 6 — as the conductors are often bigger and the materials are less susceptible to heat and have a larger cable cross-section, all of which provides better heat dissipation.

We referred several standards to the AV technicians for more guidance on cabling for PoH/PoE, and we recommend them to you too:
- IEEE 802.3bt for PoE;
- IEEE 1911.2 for PoH;
- AS/NZS 11801.1:2019 for cabling design;
- AS/CA S009:2019 for cabling installation (Wiring Rules); and
- AS/NZS 62368.1:2018 for AV/ICT equipment safety requirements.

You may not need to buy and read all standards thoroughly, but at least be familiar with them and learn more about what's said about cabling for PoH/PoE.

The BICSI presentation reinforced the importance of checking and choosing to AV technicians — following that advice will go a long way to helping successfully deploy PoH/PoE and mitigate the associated risks. Anyone wishing to deploy PoH/PoE should follow that same advice.

BICSI South Pacific
www.bicsi.com.au

Wireless canopy makes buildings smart

Image courtesy of Cognian.

A growing number of businesses are turning to retrofit options to improve energy efficiency, reduce costs and, essentially, convert premises into smart buildings. Property owners are often limited by a building's age, rigid structure or potential disruption to tenants, but an innovative technology is allowing any existing building to become a smart building.

Syncromesh from Cognian is a wireless canopy that enables building owners to quickly and simply add a range of building management solutions to lower a building's carbon footprint and reduce energy costs.

"Most smart building solutions are wired, making them inflexible and costly to implement, while traditional wireless networks also suffer black spots and interference issues in-building," said Cognian Technologies CEO and co-founder Mark Blum.

Commercial building 616 Harris Street is located in Sydney's CBD. Converted to commercial premises in 1949, the building's third level contained old fluorescent lights, controlled by one main switch with no dimming or sensor controls. Owner Michael Herrman needed to update the space to make it more attractive to tenants. As part of the upgrade, new LED luminaires could replace the fluorescent lights, but the entire floor was switched as one area, so switching to separately controlled zones would mean costly rewiring.

Herrman contacted Cognian to discuss its Syncromesh wireless solution. Using the existing electrical cables, the old surface-mounted fluorescent light fittings were replaced one for one with dimmable Syncromesh LED luminaires, made in partnership with Australume. Not having to rewire the floor plate meant that Herman saved on costs and installation time. Also, occupancy sensors did not require separate wiring or installation, as the luminaires included sensors.

A new tenant to Level 3, a business education provider, modified the floor design by removing and adding walls to create classrooms. Syncromesh enabled the LEDs to be programmed to suit multiple classrooms, a reception, offices and common areas.

Using the smart canopy, all luminaires in a room can be wirelessly linked together using the Syncromesh BaseBuild App, to act as one zone. A sensor at each light gives a broad sensor coverage across the classrooms.

The lighting in both toilets was also upgraded to non-dimmable LED downlights. Using the BaseBuild App, the common areas were virtually rewired to match the tenant's design. The combined installation took less than one day to install and program.

Where previously all areas were permanently powered during the day each area now has sensor-driven lighting. When a room is vacant, the luminaires automatically turn off or automatically turn on when a person enters the room. The classroom lights dim when a projector is in use.

The sensor lights in the multiple classrooms link together to ensure corridors and common areas stay lit while students occupy the classrooms.

Cognian Technologies
www.cognian.com

Category 8.1
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Next Generation network components
for the most demanding networks

Configurable power supply chassis

The VCCM600 series from Vox Power provides a modular and configurable power supply with fanless architecture. The medical and industrial series delivers a silent 600–750 W of peak power for 5 s in a rugged 4″ x 7″ package.

The product can be configured as a conduction, convection or forced air cooled solution to suit the user's application. This flexibility allows the unit to be integrated across a vast range of applications, making it suitable for standardising the application's power platform. The product's design and heat dissipation techniques allow the unit to be mounted in virtually any orientation, giving system designers more flexibility.

The series is suitable for applications ranging from controlled environments to harsh conditions. Each configured solution can accommodate up to four isolated DC output modules, and each module utilises 100% SMT components.

Digi-Key Electronics
www.digikey.com

Thermal camera for smartphones

The FLIR ONE Pro from FLIR is a thermal imaging camera solution that can be used to identify heat spots, measure temperature, identify water leaks or identify damage.

Suitable for almost all industries and applications, the FLIR ONE Pro converts a user's smartphone into a high-resolution (160 x 120 thermal resolution) thermography sensor, with the ability to measure temperatures up to 400°C while providing measurement and reporting tools.

The FLIR ONE Pro includes a OneFit connector, which allows an Apple or Android mobile phone with protective case to connect to the FLIR ONE pro using the adjustable connector. This allows users to use their mobile phone to test and measure, without compromising damage protection.

VividIR image processing technology allows users to detect problems with precision, while providing customers with documented fixes and solutions.
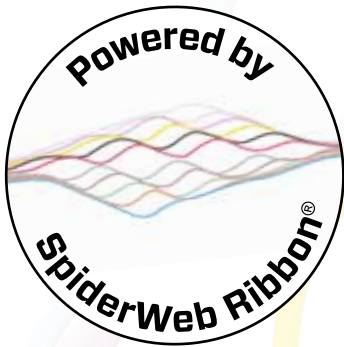
The FLIR ONE app enables users to access more professional problem-solving and advanced functionalities. The app also allows the use of an Apple or Android smart watch to see around corners and awkward spaces. Other app functionality includes multiple real-time spot meters and regions of interest, real-time thermal tips and tricks, and reporting through FLIR Tools.

With a compact pocket design, the FLIR ONE Pro provides a lightweight, portable thermal sensor solution providing quick, reliable diagnosis.

IPD Group Limited
www.ipd.com.au

5G standalone testing

The VIAVI TeraVM 5G testing solution supports standalone (SA) specifications according to the latest 3GPP standards, in addition to non-standalone (NSA) mode. With the capability to emulate 5G RAN and core network elements, it enables end-to-end, wraparound testing of gNodeB base stations (gNBs) and 5G core network functions, accelerating 5G development and deployment.

The test solution enables network equipment manufacturers, node developers and service providers to efficiently test mobile RAN and core elements, validating that the equipment works according to 3GPP standards, interoperates with other 5G elements and performs optimally when fully loaded with complex mobile traffic profiles, even when error situations are injected. As a result, optimised networks and robust 5G services can be delivered to market quickly with minimal risk.

It allows scalable, real-world network emulation in the lab, data centre or the cloud, delivering comprehensive coverage for consistent performance validation. This virtualised testing solution is the first mobile network emulator to support new 5G SA specifications, the company claims, enabling a more agile, 3GPP-compliant network without delay.

VIAVI Solutions Inc
www.viavisolutions.com.au

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AFL's Wrapping Tube Cable (WTC) powered by SpiderWeb Ribbon (SWR®) does more than save space. The unique ribbon bonding pattern allows for quicker installation and splicing, lowering the overall cost of fibre deployment without sacrificing the quality of traditional high fibre density products. WTC with SWR® provides the smallest cable diameter and lowest weight, high-fibre count ribbon cable in the industry.

AFL

www.AFLglobal.com
1300 232 476

Wireless client and access point

The revamped Hirschmann BAT-C2 wireless client and access point offers a compact industrial wireless option. Available from Control Logic, the BAT-C2 offers improvements on BAT-C including a new range of software and hardware features, such as 802.11ac support.

Offering both point-to-point and access point modes of operation, the BAT-C2 is suitable in applications where physical cabling is not achievable or where mobile assets are used. It offers a high operating temperature range of -40 to +70°C and the both water- and vibration-proof IP65 housing allows installation in almost any environment.

Control Logic Pty Ltd
www.controllogic.com.au

Copper and fibre optics inspection kit

The Fluke DSX-5000QOi contains the DSX-5000 copper analyser, CertiFiber Pro OLTS quad wavelength, Optifiber Pro OTDR quad wavelength and a USB fibre inspection probe. It is available for rent from TechRentals.

The DSX-5000 copper analyser is designed to enable testing and certification of twisted pair cabling for up to 10 Gigabit Ethernet deployments and will handle any cabling system from Category 3, to 6A and Class C, to FA at Level V accuracy.

CertiFiber Pro Optical Loss Test Set offers efficient fibre optics certification. Featuring a simple user interface, the device helps eliminate errors and speeds troubleshooting. It performs Tier 1 (basic) fibre certification in 3 s and complies with all applicable cabling standards, which call out the Encircled Flux launch condition requirements for optical sources.

The Optifiber Pro OTDR offers SmartLoop technology that tests two fibres in a single test, eliminating the need to travel to the far end of the connection to perform tests. It performs Tier 2 (extended) fibre certification and displays a graphical EventMap to help trace interpretation.

The Fiber Inspection probe enables users to inspect and certify fibre optic connector end-faces in 1 s.

TechRentals
www.techrentals.com.au

Optical demarcation enclosure

The OptiNID (OPN) Duo Optical Demarcation Enclosure from AFL is the latest entry in the OptiNID fibre-optic demarcation family of products. The ultracompact OPN Duo can house up to 4 SC simplex or LC duplex adapters, with the ability to house up to 18 single-fibre or six mass-fusion splices.

The OPN Duo is optimised for the use with AFL's FASTConnect or FUSEConnect field-installable connectors. The base of the enclosure houses an insert that incorporates fibre routing, splice tray, adapter plate and cable retention features. The enclosure also has several optional features such as a clear splice/security cover for protecting provider-side connectors or a grounding plate for grounding armoured or toneable drop cables.

Features include: an integrated splice tray for up to 18 single fusion splices or six mass fusion; optional clear splice/security cover splices, pigtails and provider-side connectors; and snap-lock cover with optional 3/8″ screw for added security. The product is designed and tested to the applicable portions of Telcordia GR-49 and GR-2898.

The OPN Duo is available with two different base cable entry options, either a pair of U-shaped 'drop-in' style grommets or two half-inch ports allowing for a variety of different entry accessories.

AFL Telecommunications Pty Ltd
www.aflglobal.com

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ABB

Integrating humans and automation increases plant productivity

Mitsubishi Electric has increased production efficiency at its Kani manufacturing facility by introducing a human element to previously automated assembly lines. Reintegrating a human element led to an 84% reduction in space, increased productivity and helped the factory react to changes in product demand.

The Kani factory, which is part of the company's Nagoya Works in Japan, produces motor starters and contactors, and has 14,000 variations and possible configurations in its product range. Demand from customers for greater choice had diluted the volumes of each particular product, despite overall product quantities increasing.

Automation is not always the answer

In the past, the Kani factory had totally automated assembly lines which were ideal for mass production with few product variations where high yields could be realised at high speed. However, many individual components were required to be in stock and ready for the manufacturing process, without which the lines would not be able to run for any appreciable length of time.

Many assembly lines had been optimised to produce a limited range of products, and these would stand still when components ran out. It became difficult and uneconomical for the factory to produce small batches.

The company used the e-F@ctory concept and the e-F@ctory Alliance, CLPA and other collaborative engineering groups to address the issue.

After looking at the root cause of inconsistencies by analysing data, Mitsubishi Electric found that natural, normal, organic growth in the production process had inadvertently led to inefficiencies. It re-evaluated the need for 100% automated lines and realised that restoring some human elements could potentially reduce manufacturing anomalies.

Further observations revealed that the automated parts feeding of some larger components not only created a bottleneck, but led to the parts feeders consuming large volumes of space which could, under specific conditions, result in minor damage to the components.

Conversely, the automation of some tasks appeared possible through a combination of technologies. An example was the misalignment of certain screws during the assembly process. The automation system, unaware of the misalignment, would try to insert the screw and cause damage to the entrance of the hole.

Two technologies helped to overcome this problem: the automatic alignment of robots and combining rotational drives for inserting the screws using torque sensors. The hole can now be located easily and aligned correctly, and the torque sensor confirms the absence of misalignment and that the screw is tightened to the correct level. The increased use of vision systems, checking for correct assembly and alignment, has also helped increase the number of right-first-time products.

A further idea was to etch a matrix code on the body of each product and track it through the various stages. As the product arrives at a workstation, its code is read and the appropriate processes and parts applied. At the end of the manufacturing cycle, each product has a traceable manufacturing history, making it possible to track the history of individual issues.

Improving efficiency

By redesigning the process and reintegrating the human element, a single line that occupied 280 m^2 has been reduced to a cell of 44.1 m^2. This 84% reduction in space means that the productivity of each square metre of production hall has been increased through greater utilisation.

Although a single new cell cannot produce the same volume and speed of units as the original fully automated line, it is now possible to deploy up to 6.3 cells in the same space. This means total productivity density is much higher due to three key factors: a wider variety of products can be manufactured in smaller batches, one stoppage does not halt the whole of production and the total number of production lines has increased.

According to the company, the end result is effective optimisation of both machine and human resources, production process and space.

Mitsubishi Electric Australia
www.mitsubishi-electric.com.au

AUGMENTING REALITY
## TO SAVE LIVES IN INDUSTRIAL PLANTS

Boral presented a challenge to students participating in this year's UNSW Sydney's Maker Games: find a solution that will prevent workers from being electrocuted by industrial machinery. Responding to the challenge, Team safAR designed a virtual and augmented reality system that allows workers to safely shut down dangerous machinery in industrial plants.

The Maker Games encourages UNSW Sydney students from multiple faculties to form teams and design prototypes that solve real-world problems set by industry partners. Team safAR's augmented reality software provides workers with step-by-step instructions on how to safely isolate machinery, thus mitigating the chance of workers being accidentally electrocuted after incorrectly isolating or turning off heavy machinery in a manufacturing plant.

The cost of making a mistake while trying to isolate a machine can be fatal. Team safAR revealed that an average of 27 workers die each year from electrocution and more than 530 people are hospitalised with electrical injuries. Until now, workers in industrial plants like Boral have relied on long and complicated manuals to follow correct procedures, with the risk of harm increasing when people specialising in this knowledge are away from the workplace.

How it works

A worker wearing a virtual reality (VR) headset loaded with safAR software looks at a machine to initiate augmented reality video
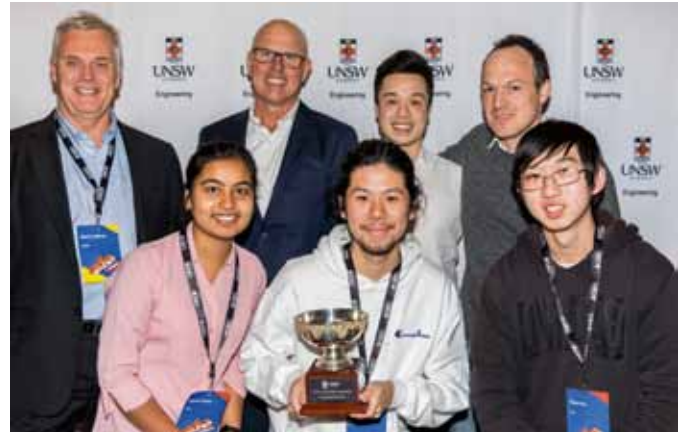
Back row: Professor Mark Hoffman, Wayne Reade, Charles Chan, Dr Edward Obbard.
Front row: Saloni Goda, Derek Sun, Dean Hou. Image credit: Anna Kucera.

A new perspective

Boral's chief people transformation officer Wayne Reade played mentor to Team safAR and said, in addition to being very proud of his young charges, he was impressed with the fresh approach they brought to solving the problem.

"Having people that weren't fixed, but were very open-minded around how to solve problems really differently... and having them go out to site and listen and engage with people at the front line, and understanding what are their pain points was a really, really important step for Boral," Reade said.

Dean of Engineering Professor Mark Hoffman said the Maker Games was a great opportunity for students to apply their learnings to the real world and a key component of UNSW's strategy to provide 'quality at scale' engineering education.

"One of the reasons the Maker Games is such a wonderful learning experience is it gets the students and industry partners together and we get some really interesting problems solved by people who aren't constrained by pre-existing ideas," he said. "And we have students learning by doing real-world projects, not ones we've created on campus."

As part of their prize, data science student Dean Hou said the team will travel to Shanghai and Beijing to visit their top universities and see how they're innovating.

Team safAR: Saloni Goda, Derek Sun, Dean Hou, Charles Chan and Neel Iyer.

Maker Games finalist projects

Other prototypes presented by Maker Games finalists were:
- An app-controlled system to protect the home against bushfires.
- A mask that protects water utility workers in India from inhaling deadly hydrogen sulfide.
- An app that simulates trading on the stock market as well as real-life events affecting personal finances.
- A virtual reality house inspection app.
- An augmented reality remote inspection tool for fire engineers.
- Drones and robots that can safely navigate wet and dry environments in water vessel tanks.
- A robot that can calibrate and test optimum microphone positioning for audio hardware manufacturers.
- A wearable clipboard/tablet device holder enabling nuclear plant workers to carry out inspections hands-free.

prompts that direct him or her to safely shut the machine down.

"It uses augmented reality, and also machine learning to recognise the machine. And then augmented reality provides a visual reminder or alerts if the machine is on," said team member and computer science student Saloni Goda.

"The software uses AR object recognition and speech recognition," added maths and commerce student Derek Sun. "So it's a really easy-to-use tool; any construction worker can look at the machinery and instantly get feedback on what they should do in the field. It uses some small safety glasses, which are essentially similar to [Microsoft's] HoloLens that give you a VR/AR kind of display so that while you're in the field, you can operate our software hands-free," Sun explained.

"When we went to Boral's Maldon concrete factory, we realised that over the next 10 years, there's going to be a generational shift, especially in the training and how they're going to be doing electrical isolation," team member Charles Chan (civil engineering) said. "So this is the best opportunity to cut in and teach the new people the strict method and giving them step-by-step instructions."

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For more information or to register visit www.melbourne.comms-connect.com.au

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ALL ABOARD FOR THE
5G EXPERIENCE

TE Connectivity (TE) is set to bring 5G next-generation mobile communications technology to the European rail industry and help transform its riders' experience.

Already supplying onboard antennas that are 5G-ready in Europe, the company said the rollout will have massive implications for the quality and speed of data communications.

5G offers data transmission speeds up to 100 times faster than with LTE, peaking at up to 20 Gbps. Its introduction will provide rail operators the opportunity to deliver passengers with high-quality real-time travel information and interruption-free Wi-Fi, including the most demanding of video applications. But operators will have to invest in new onboard communications equipment.

The TE antennas are available for mounting outside on vehicle rooftops and inside on ceilings.

New wideband MiMo rooftop antennas have been designed by TE specifically for use in 5G communications on overground and underground trains, as well as metros, trams and buses. Different versions incorporate one or two antenna elements for MiMo operation, providing a very large frequency response ranging from 698 to 6000 MHz. The antennas are also suitable for legacy communications (2G/3G/4G), Wi-Fi, WiMax and GNSS (including GSMR).

The new antennas meet the EN 45545-2 standard covering fire performance of materials and components for trains, as well as EN 50155, which covers various aspects of electronic equipment used in railway rolling stock. They also conform to IP69 relating to protection against dust and water, which means they even resist high-pressure water jets. DC-grounded antenna elements in the rooftop antennas provide voltage protection in case of catenary line drop up to 40 kA, 100 ms. An internal ground plate allows the antenna to be mounted on non-conductive surfaces.

The ceiling-mountable circular onboard Wi-Fi antenna offers up to 4x4 MiMo Wi-Fi coverage. With a frequency response range from 2.4 to 2.5 GHz and 4.9 to 6 GHz, the antenna is ready for the IEEE 802.11ax standard, which should be fully deployed later this year. It offers data throughput at least four times faster than earlier antennas in congested environments, together with 40% higher peak data rates. This antenna has a low profile (height is just 30 mm). It is supplied with flame-retardant CS23 coax cables (EN45545 compliant) and its white radome is also flame retardant. It, too, can be mounted on a non-conductive surface.

TE Connectivity
www.te.com

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Encompass Blue system contributes to significant energy reduction for The City of Greater Dandenong

41% reduction in energy consumption on 20-year-old HVAC systems; with an additional 12% made by management decisions supported by analytical reporting.

The offices of the City of Greater Dandenong council had a requirement to replace an ageing building management system (BMS) due to difficulty in accessing and making changes to the 20-year-old HVAC system. The existing system had a lack of visibility by maintenance and facilities staff, causing a major delay resolving problems when air conditioning issues were raised by staff. The system's power was not monitored, restricting both trouble shooting and energy efficiency efforts.

Blue IoT was commissioned to provide a world's first IoT Virtual Intelligent smart building management and environmental platform, Encompass Blue (EB), which has resulted in a significant reduction in HVAC energy.

Blue IoT developed an award-winning[1] custom application suite, allowing City of Greater Dandenong staff and mechanical contractors to access the system remotely via a smartphone, tablet, laptop or desktop computer. The suite includes a high-level overview of all systems, calendar settings, energy dashboards and alarms. The systems integrate through visualisation tools and a data analytics platform with logic and rules set within the cloud platforms.

As the platform is 100% cloud operated, Blue IoT uses multiple telcos for backhaul which reduces the risk of downtime. Should a major telco have an outage, the alternative telco will take over automatically, causing minimal disruption to data collection and analytics.

With the lack of power monitoring devices within the building, Blue IoT worked with Socomec to provide a retro-fit power monitoring solution on each of the seven systems the EB smart platform controls. Each system uses three-phase circuits with Socomec Digiware installed on each of the three circuits. These measure all power: voltage, amperage and power factor (energy), to identify any problems within the HVAC system.

Retro-fitting the Socomec Digiware system, Blue IoT and Greater Dandenong staff were able to monitor power usage instantly and identify numerous issues within the HVAC system resulting in the reduction of energy usage.

BlueIoT's Edge Blue platform and the associated suite of Edge Blue devices, LoRaWAN sensors worked in unison with the Socomec Digiware system to uncover reasons for existing issues and identify hidden issues. Upon commissioning it was evident that one particular air handling unit was not providing the expected cooling capacity. Drilling down further it was discovered that the power factor of that unit was sitting at 0.6, which is below normal. A subsequent diagnostic procedure that involved sequentially activating the compressor stages showed that the second compressor was not drawing any active power. Later, physical inspection revealed that the second compressor was faulty and the fan belt was cracked, delivering only 30 percent airflow.

It was also discovered that two air handling units were consuming energy during after hours when the unit is expected to be off resulting in a 1.4kW draw 24 hours a day, seven days a week. Physical inspection revealed that the fans were not switching off when the unit was commanded to turn off due to a wiring issue in a previous maintenance effort. In both cases the remote operational capability of Encompass Blue synergised with the high accuracy and reliability of the Socomec Digiware system which expedited troubleshooting and mobilised
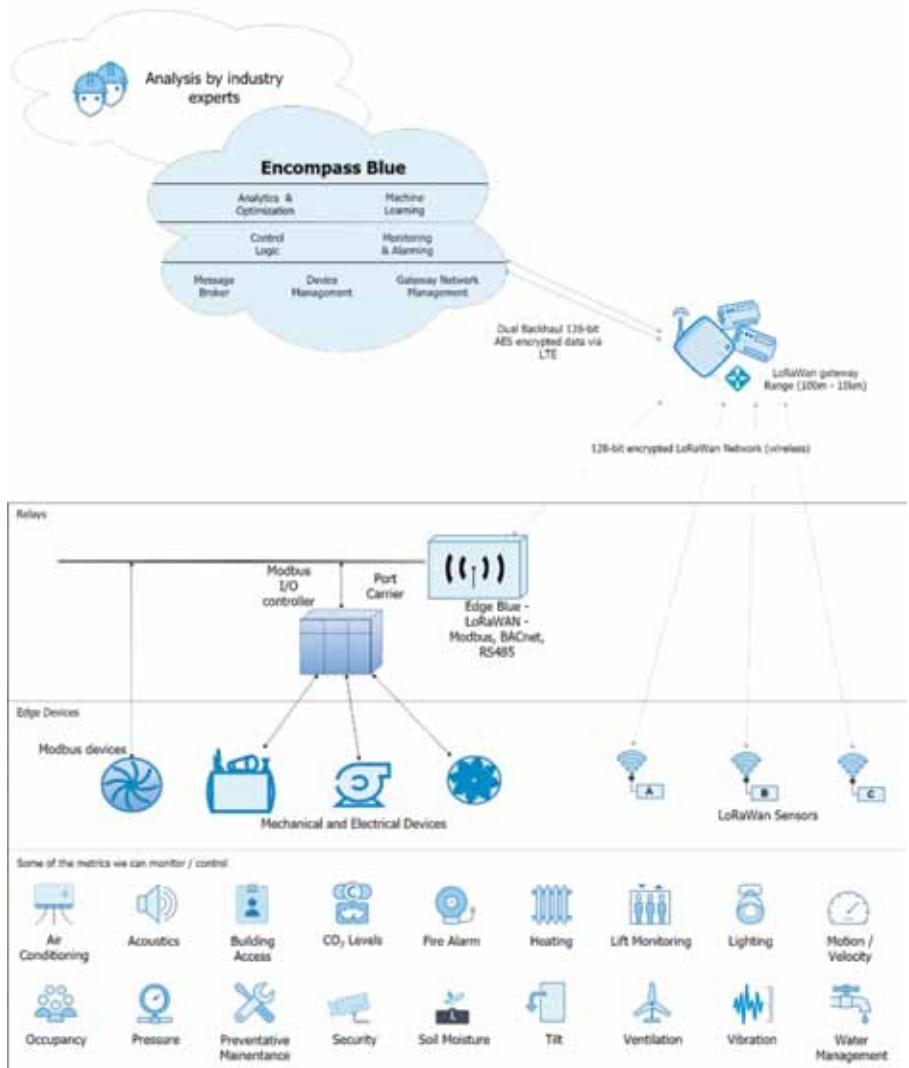
contractors on the ground only when the issue is identified, saving time, money and energy.

Bob Sharon, founder and chief innovation officer, Blue IoT said, "Integrating Socomec Digiware with our world's first virtual smart building and environmental platform (EB) was the right choice for this purpose. We needed a product that integrated with ease, provided a high level of accuracy and is manufactured to a high standard. Socomec has all this, along with an outstanding reputation. It met all the requirements to ensure the EB platform captured accurate data for the client.

"The level of service provided by IPD and Socomec meant we were able to deliver a seamless installation for the client and provide instant feedback on current faults within the HVAC system, allowing the client to rectify these quickly and efficiently. Our existing relationships with the IPD team, meant the entire process of specifying, designing and installing the Digiware system was effortless and we knew we were able to deliver the correct solution for the client."

The Blue IoT virtual smart building and environmental management platform, 'Encompass

Blue' is Australian developed and owned. The data is transported via Asia Pacific's first LoRaWAN Class C full duplex encrypted IoT network, developed by Blue IoT, and resides in Australia's first uptime tier IV data centre.

Bob added, "The last major rectification works to the HVAC systems, which Blue IoT identified as necessary, were completed during February 2019. This meant March 2019 was the first full month of savings.

"Compared with the same energy bill period in 2018 for March to June, the overall savings for four months post rectification work was 21% of kWhs of the total electric bill and 47% of HVAC kWhs."

IPD Group Limited
www.ipd.com.au

Current sensors

Socomec iTR split-core current sensors accurately measure electrical current across data centres, infrastructure and industry applications. The iTR sensors integrate with Socomec's DIRIS Digiware, DIRIS A-40 or DIRIS B power-monitoring devices to measure currents between 25 and 600 A.

An extended operational range allows users to monitor currents across large areas. Status monitoring of upstream circuit breakers can be done without connecting directly to the breaker itself, reducing installation and maintenance downtime.

The sensors provide automatic detection of current rating and secure disconnection under load. The RJ12 connection and cable colour coding provide quick and easy-to-navigate connections, while the integrated smart intelligence corrects any installation errors.

The iTR sensors include technologies such as VirtualMonitor status monitoring and AutoCorrect automatic configuration. VirtualMonitor technology is designed to be an effortless and cost-effective solution for monitoring the status of protective devices. The technology allows users to monitor the status of protection devices throughout an entire installation without extensive wiring to auxiliaries. Users can also access device status remotely and in real time.

The iTR sensors also provide access to AutoCorrect automatic configuration. AutoCorrect technology eliminates wiring errors and ensures correct readings at all times, preventing time-consuming on-site adjustments.

Socomec's iTR sensors guarantee precision across the entire measuring chain in accordance with the IEC 61557-12 standard: class 0.5 for active energy, allowing accurate measurements over a wide range of currents. A current sensor is accurate from 2% of its lowest rating to 120% of its highest rating.

IPD Group Limited
www.ipd.com.au

3-channel wireless sensor

The SG-Link-200 is a 3-channel wireless sensor with a rugged, weatherproof enclosure. It includes onboard PGA, filtering and a high-resolution ADC for precise measurement of a large range of sensor types, including strain gauges, load cells, pressure transducers and accelerometers.

The product has three differential input channels, adjustable gain (1 to 128), adjustable filtering, high-resolution 24-bit data and noise as low as 1 μV p-p.

Compatible with 120, 350 and 1 kΩ Wheatstone bridge sensing circuits, the sensor includes a temperature sensor and either a 1.5 or 2.5 V sensor power output. It also features remote strain calibration using an onboard shunt resistor, as well as available factory bridge completion (¼, ½ or full-bridge).

The battery-powered wireless sensor has continuous, periodic or event-triggered operation; a continuous sampling rate of up to 1 kHz; wireless range of up to 1 km; and data logging for up to 8 million data points.

The LXRS protocol allows lossless data collection, scalable network size, node synchronisation of ±50 μs, and output waveform data and/or derived parameters (mean, RMS, peak-peak). The duty-cycle sensor excitation for low-power operation is well suited to battery-powered applications.

The SG-LINK-200 package includes: weatherproof IP68; mount with 2 x M8 screws or 3M VHB 4941; stainless steel compression limiters; and an operating temperature range of -40 to +85°C. It is powered with a D-cell battery or input 4–36 VDC.

Metromatics Pty Ltd
www.metromatics.com.au

Fibre-optic cable

Flex-Span ADSS fibre-optic cable expands on AFL's single-jacket ADSS portfolio. Flex-Span designs are optimised for a broader combination of fibre counts and span lengths, providing ADSS system designers more flexibility in their product selection.

Flex-Span's core configuration contains five buffer tubes with 24 fibres each, for a total of 120 fibres. This allows higher fibre counts in a small diameter (<0.475″) while still maintaining the span length capability. A smaller diameter can lead to less loading on the poles while also providing the same hardware size.

Flex-Span ADSS requires no support or messenger wire so installation is achieved in a single pass. The cable is suitable for use on distribution lines and necessitates using formed wire dead ends. Flex-Span utilises dry core technology and, as a result, messy flooding compounds are not used.

Fibre counts for Flex-Span ADSS are 12 up to 144 with any type or combination of singlemode or multimode fibres within the cable. Operating temperature spans from 40 to +70°C. Pole-to-pole span lengths range from 15 m to over 305 m.

AFL Telecommunications Pty Ltd
www.aflglobal.com

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FUTURE OF DATA CENTRES
IN AN 'ALWAYS ONLINE' WORLD

Dave Sterlace*

Whether privately run or shared by the public, data centres will become vital for hosting mission-critical applications and streamlining information in the Internet of Things world.

In 2018, computers accounted for 41% of total internet traffic. With the advent of 5G, smartphones will account for 44% of this traffic by 2022, with at least one-third of all data passing through the cloud by 2020. The distinctive technological demands of mobile applications are driving data centre facilities to become bigger than ever. By the end of 2018 there were over 400 such 'hyperscale' facilities around the world.[1]

There are nearly 8000 data centres around the world, and more than 2500 are concentrated in just 20 metropolitan hubs. Australia is one of the most mature data centre markets in the Asia–Pacific. Despite increasing competition from countries in the region, like Singapore and Japan, the Australian data centre industry continues to expand. Currently, Sydney is the primary location of data centres in Australia, with coastal cities like Melbourne and Brisbane fast emerging as key hubs. Hyperscale cloud vendors are likely to spur demand for high-density power racks, with each one of them drawing over 30 kW of electricity in the next three to five years.[2]

To keep electricity bills from mounting, innovative management tools are essential. Operations at a modern-day data centre are best served by visibility into the interconnected systems, allowing aspects like power management and HVAC (heating, ventilation and air conditioning) to run in tandem. Latest digital switchgear and data centre automation solutions make this possible.

As digital solutions are developed, we can learn from the values of process industries such as semiconductor fab, oil and gas, and pharmaceuticals, all of which have similar needs as data centres. For instance, all require continuous operations, reliability, ease of maintenance, safety for operators, grid interaction and efficiency.

It is an exciting time, where gains of other industrial-scale operations can be applied to data centres. The sheer scope of some operations make data centres an important user on the grid. Energy costs account for more than 40% of the operating cost of a data centre, with such facilities set to consume one-fifth of the world's energy by 2025.

The future holds promise on this front. Data centre operators will not be limited to being consumers, but will become interactive contributors to smart grids, with the implementation of micro- and nano-grid techniques, as well as alternate green and renewable energy systems. Nearly 8% of all new data centres will be powered by clean energy by 2020. The industry is now better integrated with the power grid, and hyperscaling is driving up efficiency.[3]

ABB's industrial automation portfolio provides a shortcut to digitalisation by futureproofing existing infrastructure without having to 'rip and replace', thereby boosting efficiency and saving costs. A smart circuit breaker, like the Emax 2, can be coupled to power measurement and monitoring systems at facilities. One such solution, ABB Ability Electrical Distribution Control System, with its roots in power management for commercial buildings, can save up to 30% on operational costs.[4]

The upcoming Data Center Dynamics event at the Sydney International Convention Centre on 15 August is an ideal platform for ABB to share its insights and technology highlights for the data centre industry. Visit ABB in the Power Up Lounge to learn how digitalisation can help operators gain real-time access to performance metrics and help increase safety, reliability and efficiency through predictive maintenance and better monitoring.[5]

[1] https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-741490.pdf
[2] https://cloudscene.com/market/data-centers-in-australia/all
[3] https://www.ciena.com/insights/articles/Twelve-Mind-blowing-Data-Center-Facts-You-Need-to-Know.html
[4] https://new.abb.com/low-voltage/launches/abb-ability-edcs
[5] https://www.datacenterdynamics.com/conferences/sydney/2019/

*Dave Sterlace, ABB's Global Head of Technology for Data Center Industry Sector. Dave Sterlace is the Global Head of Technology for the Data Center Industry Sector at ABB, bringing more than 25 years of experience in critical power. He is Chairman of the Marketing Committee for The Green Grid, an industry organisation whose mission is to drive accountable, effective, resource-efficient, end-to-end ICT ecosystems.

ABB Australia Pty Ltd
www.abbaustralia.com.au

Cybersecurity and data protection solution

Acronis True Image 2020, from Acronis, combines traditional data protection and cybersecurity, addressing the company's Five Vectors of Cyber Protection: safety, accessibility, privacy, authenticity and security of data (SAPAS).

The product allows users to automatically replicate local backups in the cloud, automating the 3-2-1 backup rule recommended by data protection experts.
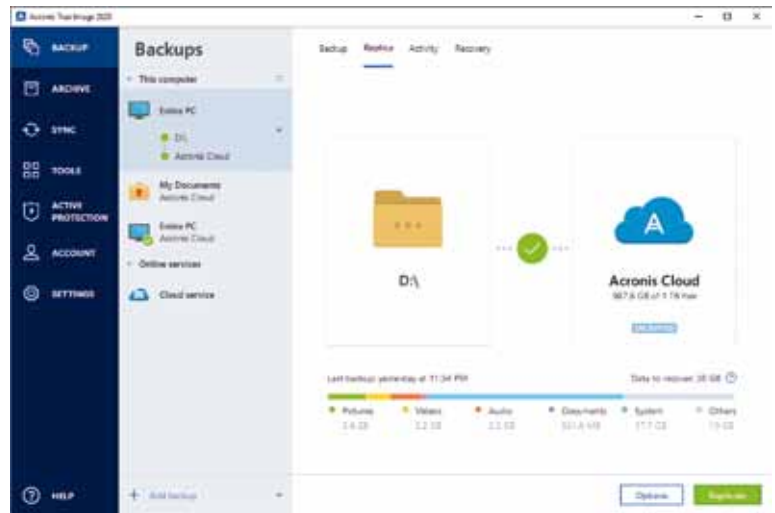
An integrated anti-malware defense — Acronis Active Protection — powered by artificial intelligence is included, as well as blockchain-based data authenticity certification and verification. The technology stops ransomware and cryptojacking attacks in real time, automatically restoring any affected files.

The Tray Notifications Center provides users with backup status updates. Users also have the ability to select which Wi-Fi networks can run backups, avoiding metered connections and unsecure public networks that can put data at risk.

Three versions of Acronis True Image are available: standard, advanced and premium. All versions include Acronis Active Protection and cover an unlimited number of mobile devices.

Acronis
www.acronis.com.au

In-vehicle computer

The Nuvo-5100VTC from Neousys Technology is a rugged embedded system meeting EN 50155 certification, designed for railway and in-vehicle applications.

The product features an Intel 6th Generation Core processor for emerging high-end requirements and the fanless design maintains EN50155 TX class temperature range from -40°C to 70°C.

Aiming particularly at railway and vehicle usage, the product offers Gigabit PoE+ ports with M12, x-coded connectors to provide best signal integrity and rugged Ethernet connectivity. It also integrates CANbus 2.0 and isolated DIO to interact with in-vehicle devices. Additionally, four mini-PCIe slots are available to supply a versatile means of wireless communication by installing 3G, 4G, Wi-Fi and GPS modules.

The product is shipped with Neousys' patented damping bracket to protect hard drives against shock and vibration in the vehicle.

The device features intelligent ignition control, M12 PoE+ ports and CANbus and has undergone severe tests, including EMI/EMS, rolling vibration/shock, cooling and dry heat, to ensure good performance in railway applications.

Features include: support for Intel 6th-Gen Core i7/i5/i3 LGA1151 CPU; 4x 802.3at Gigabit PoE+ ports via M12 connectors; onboard CANbus for in-vehicle communication; 4-CH isolated DI and 4-CH isolated DO; 2x SATA ports for two 2.5″ SATA HDD/SSD, with one hot-swappable HDD tray, supporting RAID 0/1; 4x full-size mini-PCIe sockets with SIM support; and a 8–35 V wide-range DC input with built-in ignition control.

Backplane Systems Technology Pty Ltd
www.backplane.com.au

Energy storage solution

The REACT 2 energy storage solution from ABB includes a high-voltage Li-ion battery with a long life and a storage capacity of up to 12 kWh. The modular solution can grow with the needs of any household from 4 to 12 kWh and reduce electricity charges thanks to an achievable energy self-reliance of up to 90%, according to the company.

The line, available in power ratings of 3.6 and 5.0 kW, is claimed to have one of the industry's highest energy efficiency rates, providing up to 10% more energy than lower voltage battery systems.

Thanks to the possibility of both AC and DC side connection, REACT 2 is a solution for new systems or the retrofitting of existing ones, allowing home owners to improve their energy self-consumption and save on their energy bills.

The units have a flexible and modular design, with plug-and-play connection and system monitoring through a dedicated mobile app. REACT 2 is Modbus TCP/RTU Sunspec compliant and compatible with ABB free@home for a full ABB smart home experience.

ABB Australia Pty Ltd
www.abbaustralia.com.au

Enterprise performance management software

Honeywell Forge is a software solution that converts data from equipment, processes and people into intuitive, actionable insights that enable monitoring of enterprise operations from a single screen. This helps users optimise the efficiency, effectiveness and safety of their business.

It is designed to be quick to implement, with a hardware- and software-agnostic approach that allows for use of existing systems. The software leverages predictive analytics to help identify maintenance issues before they happen, enable workers to be more productive and safe, and reduce costs.

It will be offered across a range of sectors, including Honeywell Forge for Industrial, Honeywell Forge for Airlines, Honeywell Forge for Inspection Rounds and Honeywell Forge Cybersecurity.

Honeywell Building Solutions
www.honeywell.com

Ion LED lighting range

Energetic Lighting Australia presents a range of energy-efficient products using ion LED technology.

The range includes the Tempest Nova weather-proof batten, the Stellar standard and wide-body battens and the UFO high-output highbays, each able to provide multiple power selection, ease of installation, dimming, sensor options and a high lumen output for minimal wattage consumption.

The design parameters for these products include multiple colour temperature availability, performance in adverse conditions and time-saving wiring advantages, while maintaining an overall focus on energy efficiency.

In addition to these products, Energetic Lighting Australia offers a complete range of highly competitive LED lamps and tubes, plus innovative high-quality fittings including downlights, oysters, panels, floodlights, lowbays and much more, all designed with energy efficiency and cost-competitiveness in mind.

Energetic Lighting Australia Pty Ltd
www.energeticlighting.com.au

Long-range surveillance camera

The SX800 long-range surveillance camera from FUJIFILM is equipped with a built-in FUJINON lens capable of 40x optical zoom to cover focal lengths of 20–800 mm. It also features digital zoom capability of up to 1.25x to enable long-range surveillance equivalent to 1000 mm in focal length.

The camera features an image stabilisation mechanism for accurate compensation of camera shake without time lag, allowing installation at high positions susceptible to gusty winds or places that suffer large vibrations such as highways and airports.

The SX800 uses the Rear Focus AF mechanism, which achieves autofocusing as fast as 0.3 s. The mechanism is capable of continuous AF, maintaining focus on a subject in real time, automatically switching to the optimum AF system according to the shooting site's conditions.

The image processing engine handles computation at high speed to detect and correct heat haze and fog accurately in real time, producing clear images.

FUJIFILM Australia Pty Ltd
www.fujifilm.com.au

Electromagnetic radiation monitor

Narda Safety Test Solutions has developed the RadMan 2 for complex monitoring of current and future 5G and millimetre-wave technologies.

The small device is worn on the body to provide an instantaneous indication of the impermissibly high levels of exposure to electromagnetic radiation.

Narda Safety Test Solutions GmbH
www.narda-sts.de
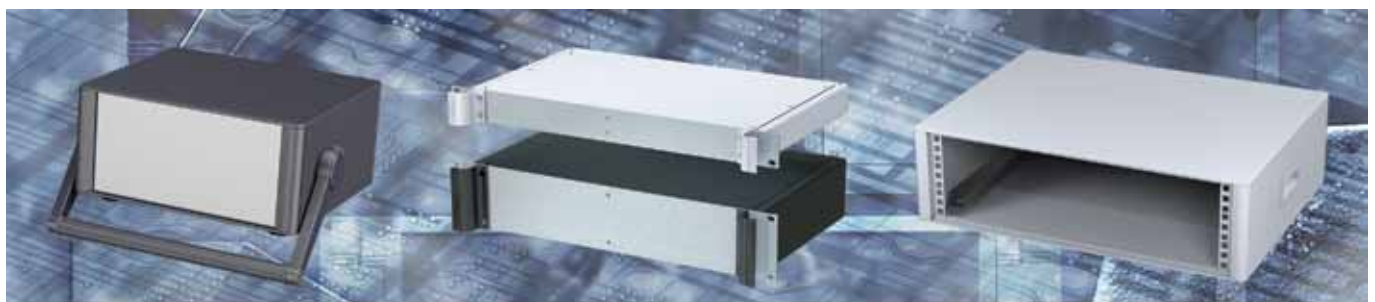
Network security appliance

The FWA8600 1U rackmount network security appliance, from iBASE, is based on the Intel Xeon Processor D-2100 Series and features up to 29x GbE ports. This highly scalable system is designed for managing data-driven workloads and enabling robust levels of performance in enterprise network security, unified threat management and WAN optimisation applications.

This sleek network appliance supports up to 128 GB RDIMM, with 4x DDR4-2666 DIMM sockets and an Intel I210-AT Ethernet controller. It comes with network interface card (NIC) slots to accommodate up to three IBN cards with 8x GbE ports each and one IBN-P401Q card for a maximum of 29x GbE ports. It offers flexible I/O connectivity and expansion features with a PCIe x8 slot, an M.2 expansion slot to interface with SATA 3.0 & PCIe x4 bus for high data throughput, as well as 2x USB 3.0, and an RJ45 serial console with LCM display for easy operation. LAN bypass is also available in certain configurations.

The FWA8600 features Intelligent Platform Management Interface (IPMI) 2.0 with the iBASE IDN100 module, allowing users to remotely manage and monitor systems even without an operating system. A suitable platform for cloud computing and data centres, it also supports Trusted Platform Module (TPM 2.0) to provide hardware-based security, easily encrypting data and protecting authentication credentials from hackers.

Backplane Systems Technology Pty Ltd
www.backplane.com.au

Lighting solutions design tool

The Pierlite Composer from Pierlite (a GLG company) is an online design tool, purpose built to create customised lighting solutions for clients, with a rapid lead time.

Pierlite Composer allows for the delivery of custom products in weeks as opposed to months. The digital configurator enables 'Design-on-Demand' with technical documentation, compliance and 3D models. Pricing estimates and codes are also available within moments of submitting product requirements. The designed products are manufactured on demand at GLG's in-house manufacturing facility.

Features include the ability to visualise a complete product prior to order via a virtual 3D model of the configured solution. This enables clients to preview the completed product prior to it being delivered, allowing for amendments to be made prior to production.

Pierlite Australia Pty Ltd
www.pierlite.com.au

Low-profile 4GX modem

Control Logic has announced availability of the Teleorigin RBMTX-LITE low-profile 4GX modem. The router is dedicated for users looking for easy and robust mobile internet access, without the need for installing software or drivers for the device. With the impending shutdown of 3G networks, it is suitable for those with an existing 3G device.

The RBMTX-LITE features an easy-to-configure web interface, with rugged housing, a built-in serial port and low power consumption. In addition, the device supports OpenVPN, including optional Wi-Fi and Digital I/O. It can be paired with Control Logic's SmartVPN service to provide a suitable connectivity solution.
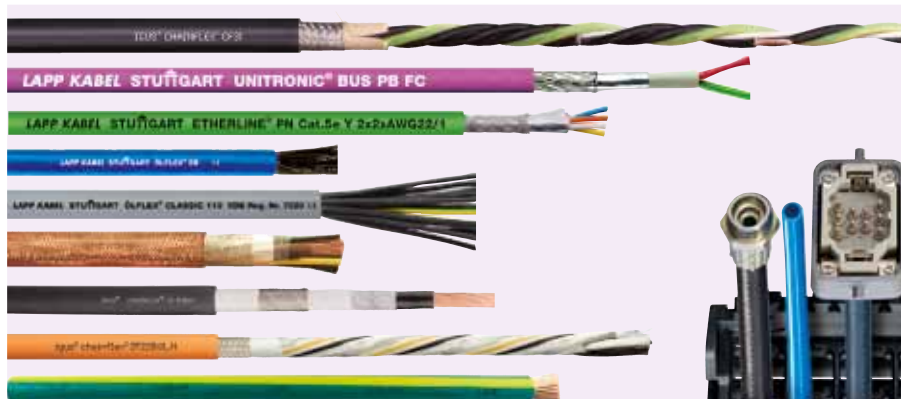
The RBMTX-LITE is appropriate for many applications including metering, traffic systems, transportation and logistics, security, vending machines and facility management.

Control Logic Pty Ltd
www.controllogic.com.au

ENSURING NETWORK UPTIME

WHY NETWORK REDUNDANCY IS ESSENTIAL FOR THE DELIVERY OF CRITICAL COMMUNICATIONS SERVICES

Trevor Manning, Director of Operations

For telecommunications networks, achieving a high-availability end-to-end service requires reliable building blocks, as well as a set of alternatives that do not share any common failure points.

For life- and mission-critical networks, such as hospitals and utilities, or for business-critical networks where ICT is a strategic enabler, ultra-high network uptime is essential. It's well accepted that network redundancy is a crucial element in ensuring network uptime.

There are four key elements to consider in the network architecture: customer applications, the core network, access networks and interconnect networks.

Customer applications can be impacted by the local area network (LAN), on-premise infrastructure or the carrier's network terminating unit (NTU). The core network is expected to provide 99.999% uptime, which equates to less than five minutes of downtime per year.

Access networks are less highly available but fully duplicated hardware can be used to protect against hardware failure. And, all carriers end up meeting in ultrahigh-availability data centres where switching between networks and applications takes place.

In reality, especially in regional and remote areas, carriers may share some parts of their backhaul with other carriers. This can mean that true redundancy doesn't exist, potentially compromising the real availability of the network.

If physical infrastructure is shared, then any diversity will be rendered useless. For example, if dual fibres run through the same pit and that pit gets flooded, or the bundled cable is physically cut, then both services will experience an outage at the same time. Even if a dual-carrier strategy is deployed without media diversity, a joint outage may occur.

Realising close to 100% uptime is only achievable by using multiple carriers and multiple media solutions to eliminate any common failure points.

Organisations relying on critical networks should ask themselves five key questions:

1. Are there any common points of failure in the network?
2. Do redundancy paths share any common physical locations?
3. Are redundancy paths, even with multiple carriers, completely uncorrelated with the failure of the media being used?
4. Do protected services terminate in the same physical location?
5. Do protected services share a power supply?

Answering yes to any of these questions could pose a problem for uptime. Providing a life- or business-critical service requires careful consideration in terms of how true redundancy can be achieved. Protected services are only as good as the weakest element of the carrier's network.

Even with all the electronics, paths and technologies duplicated, soft issues related to people and systems can bring the network down.

Carrier duplication with media diversity is the best form of network service diversity. If carefully constructed, true network and media redundancy can be achieved resulting in an ultrahigh-availability service for critical applications.

There are four key levels at which redundancy should be considered:

1. Hardware. At the hardware level, all electronic equipment should be fully protected with automatic service restoration.
2. Path. In microwave networks, at the path level, shallow ducting can cause multipath outages, so it's important to choose a provider that uses techniques to guarantee protection against multipath outages. Heavy rain can also affect bands above 10 GHz, so links should be individually designed according to the rain conditions of that area.
3. Network. At the network level, a ring or mesh topology should be used for the core.
4. Service. At the service level, it's important to diversify both carrier and media to avoid failure.

By ensuring redundancy at these levels, uptime can be improved and mission- and life-critical services can operate with more certainty. However, economic considerations can limit the amount of physical redundancy a business can afford.

A cost-effective risk mitigation is to use software-defined wide area networking (SD-WAN) to prioritise critical traffic over multiple physical paths. This can help overcome issues around redundancy by choosing the clearest path to ensure traffic can always find a way through.

Legacy WAN networks don't include this functionality but businesses don't need to replace existing systems to gain the benefits of SD-WAN. Instead, they can overlay SD-WAN onto existing networks to achieve the required redundancy and reliability without incurring excessive costs or disruption.

VERTEL
www.vertel.com.au

Light speed

USB access key
Image credit: signify

Volkspark stadium in Germany is home to Hamburg football club HSV Fußball AG. Thanks to Signify, it's also the site of an innovative new means of wireless communication.

Journalists in the stadium's press centre are the first to file their stories via the Trulifi Li-Fi system — a highly reliable, secure and fast internet connection through the centre's ceiling lights. The company said that HSV is the world's first football club to install the groundbreaking technology, which utilises light waves rather than radio waves to provide an internet connection.

Opened in 2000, Volkspark stadium has a capacity of 57,000 and is one of 10 stadiums that will host the European football tournament in Germany in 2024. It is also certified to host other top international tournament matches.

Like many stadiums, the wireless signal in its busy press centre was prone to overload due to journalists accessing the network and interference from mobile devices of fans, staff and officials, all pinging the wireless router.

The club now offers a stable, secure and fast internet connection — a must for the journalists required to write, edit and file their stories under time pressure. Along with high-quality, energy-efficient LED lighting that helps lower the club's carbon footprint, the innovative internet facility makes the stadium an even more attractive venue for high-profile matches.

Signify installed 84 Philips PowerBalance gen2 LED recessed luminaires in the stadium's press centre. Eight of the luminaires have an integrated Trulifi 6002 transceiver, which modulates infrared light waves to provide an internet connection of up to 150 megabits per second (Mbps).

Journalists using the system receive a USB access key, which plugs into their laptop. This picks up the Li-Fi signal and transmits data back to the luminaire. The Li-Fi system is free from interference

Image credit: signify

and encrypted. An extra layer of security is built in as light waves cannot pass through walls.

"We opted for Li-Fi given the increasing demand for bandwidth from journalists using our press centre. For them, a reliable wireless connection is everything. Now they have good quality light to write their stories along with a reliable, fast and highly secure wireless connection," said Daniel Nolte, Segment Leader Area Organization & Infrastructure at HSV.

The Trulifi system range can satisfy different market segments and also includes Trulifi 6013, which uses coloured light to create a robust, secure fixed point-to-point connection with a speed up to 250 Mbps.

The system showcases Signify's ability in leveraging lighting infrastructure to unlock the potential of light in new high-growth segments with LED technology that's not only innovative but also energy efficient.

Signify
www.signify.com

THE RISK OF ARC FLASH

Another arc flash injury has prompted the Electrical Safety Office (ESO) to issue an urgent callout to electrical workers: reset your safety focus and test before you touch. The arc flash burns were caused after an electrical worker failed to test a circuit before working on a switchboard.

The ESO is investigating three other serious incidents where electrical workers received significant arc flash burns working on or near energised equipment in a switchboard. The workers were performing electrical testing, working near energised parts or had failed to correctly isolate the circuit before commencing work. Working in switchboards carries a greater risk of injury due to fault currents and work often being carried out within a confined space.

ESO recommendations

The ESO urges workers to turn off power to the entire switchboard, if possible, even if this means rescheduling work. If live work is required, a risk assessment must be conducted. The ESO also stressed that the risks associated with performing work near exposed live parts can be equivalent to those associated with live work. For the risk of arc flash, the risk assessment must consider the level of possible fault current present at the board. The following should be taken into account:

- The physical size of the switchboard.
- The size of the incoming consumer mains.
- High fault current ratings of circuit protection devices.
- The presence of fault current limiters on the switchboard.
- Transformers located near the switchboard.

The ESO advises working through the hierarchy of controls to choose the control that most effectively eliminates or minimises the risk of working near energised electrical parts. This may involve a single control measure or a combination of two or more different controls. Under the hierarchy of controls, substitution, isolation and engineering controls are ranked at the same level of protection, ahead of administrative controls and then personal protective equipment.

A safe system for managing the risk of arc flash should include:

- electrically isolating nearby electrical equipment or installation before starting work and ensuring it can't be reconnected while the work is being carried out;
- using insulated or non-conductive physical barriers to prevent inadvertent contact with energised parts;
- ensuring workers have appropriate knowledge and skills to perform the work safely;
- testing procedures to prove parts are de-energised before work commences;
- ensuring non-workers are excluded from the area by use of screens, barriers and signage;
- ensuring workers have suitable tools, test equipment and PPE.

Additional consideration should be given to using a safety observer and any legislative breaches may be referred to the Electrical Licensing Committee for disciplinary action.

For more information on working on or near exposed energised parts, refer to:

- The Electrical Safety Code of Practice 2013 — Managing electrical risks in the workplace.
- AS/NZS 4836:2011 Safe working on or near low-voltage electrical installations and equipment.

www.electricalsafety.qld.gov.au

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www.VOLTEX.com

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