Connectivity 4.0: the new business imperative

Your road map to building tomorrow's networks and connected technologies to support mission-critical infrastructure and services — and enable sustainable growth.

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Foreword

As the world emerges from the COVID-19 pandemic, businesses are doubling down on the new strategies they put in place to ensure they not only survive the disruption but ultimately thrive.

Yet with each year come new challenges. A redistribution of the workforce has challenged employers to maintain service levels amid today's chronic skills shortfalls.

Just as cybercriminals declared cyber war on the world's business community when it was at its most vulnerable, renewed conflict on the battlefields of Ukraine has escalated risk for every business – even in Australia. This is the peril of increased connectivity. Yet even as organisations face these challenges head on, an increasingly challenging economic climate is further distorting the situation.

The end of cheap money is behind us, forcing a complete return to the fundamentals of business. In this environment, you must be brutally clear about where your business makes money, how it makes money, and what kind of people and culture will enable it to succeed.

The sharpening of the macroeconomic climate means that the companies best poised to succeed will be those that not only understand their business and their market, but also appreciate the strategic value of new technologies – and understand that connectivity is the glue that holds it all together.

Far removed from the point-to-point connectivity of yesteryear, today's connected business environments are vast, interconnected webs of data and services. Connections are being created and changing continuously as businesses embrace new technologies for supporting remote teams, integrating closely with partners, servicing customers, extending control to industrial environments and linking new sensors.

These are just some of the many things that keep today's enterprises moving – and they all depend on having fast, pervasive, ultra-resilient, future-proof networks.

At Vocus, we have long been working with many of Australia's most important government and enterprise organisations to tap this promise, and it is only getting more significant as time goes on.

This report explores the challenges of the current era and how next-generation connectivity solutions can resolve them. I trust you will find it illuminating and challenging in equal measures – and I look forward to hearing how you leverage it to build competitive advantage for your business and your customers.

Andrew Wildblood

Chief Executive, Enterprise and Government, Vocus

Executive summary

Emerging from the disruption of the pandemic, businesses and governments have been lashed with a perfect storm of challenges — rising costs, redistribution of workforce, labour shortages, increased cyber risks, global geo-political instability, climate change and increasing customer expectations.

As a result, many organisations have doubled down on the digital transformations they began or accelerated during the pandemic. They are transitioning to new operating models based entirely on digital tools and services.

These operating models are based not on implementing one or two applications, but instead revolve around a complete rebalancing of the business by reviewing existing technology debt and implementing a whole-of-business technology transformation that will take the organisation to the next level.

Back to fundamentals with a renewed approach

It's a complete return to the fundamentals of the business, challenging established connectivity paradigms in the same way that the Industry 4.0 concept has driven manufacturers to reinvent the way they develop and distribute their products.

Applying similar concepts across the business spectrum introduces the need to address a range of issues in three key areas: mission-critical operations, employee experience, and environmental, social and governance (ESG) considerations.

Within these areas are a range of business concerns, from risk management and skills retention, to delivering a desirable employee experience, to ensuring sustainable business growth.

There are also technological issues such as the optimal architecture for hybrid cloud environments; the best ways to securely integrate operational technology (OT), information technology (IT) and Internet of Things (IoT) solutions; and delivering enough of the right quality of bandwidth to support these new and expanding digital ecosystems.

Connectivity reimagined

At the core of this reinvention is Connectivity 4.0, a new era in which network technologies and business needs have evolved and come together to make ubiquitous connectivity a reality.

This paper is about the bold new world of Connectivity 4.0 — what it consists of, how it works, and why you need to embrace its changes to give your digital business staying power in a rapidly changing future.

We explain why runaway digital transformation has created a mandate to review corporate connectivity strategies, what elements it entails, and how it raises considerations such as information security and competition for relevant skills in the era of the Great Resignation.

Indeed, as we look past the Great Resignation, Connectivity 4.0 is a fundamental part of what we might call the Great Reconfiguration — and it's going to affect you, whether you're ready for it or not. Read on to find out how your business can take control of this change and ensure that it stays ahead of the wave of business transformation.

What is Connectivity 4.0?

Just as the transition to Industry 4.0 is revolutionising business by integrating digital services and processes into every aspect of operations, Connectivity 4.0 can revolutionise the way those services connect with each other and the world around them.

Connectivity technologies have evolved through several eras, from the original public switched telephone network to early computer networks, the internet and beyond. And as businesses have become more connected, they have adopted an increasing range of technologies. However, choosing those technologies has traditionally involved balancing performance with flexibility and availability.

Connectivity 4.0 is a new era in which these technologies have evolved to the extent that organisations no longer need to compromise. Together, these technologies can provide ubiquitous connectivity across terrestrial and subsea fibre, regional 4G and 5G mobile services, satellite coverage, and private long-term evolution (LTE) campus networks.

What's more, you can choose a mix of technologies that provides both fibre-like performance and unprecedented resilience, along with the network flexibility and availability your business needs.

Connectivity 4.0 is paving the way towards high-speed, low-latency applications like autonomous vehicles and widespread sensor networks. But it's also driven by the need for ubiquitous connectivity for core business needs right now — including building mission-critical services, enhancing the employee experience, and achieving ESG objectives. It does this by unlocking a new level of pervasive connectivity, enabling organisations to reimagine what's possible like never before.

The transformation imperative

The forces driving digital transformation were in place well before the COVID-19 pandemic redefined the world as we know it. Organisations that were focused on steadily achieving growth and efficiencies have had to accelerate their digitalisation plans, or rapidly change strategies over the past two years.

They have had their resilience tested by pandemic-disrupted supply chains, climate change, natural disasters, the Ukraine conflict and other geopolitical instability. To top it all off, inflation is rising in Australia and abroad, for the first time in decades.

Organisations have had to change their approach to managing talent as workers have reassessed their expectations and considered other opportunities. Amidst a resurgent global economy, staff and skills shortages have affected production, exacerbating the gap between supply and demand more than at any time in recent memory.

Daniel McCormack, Head of Thought Leadership (Research) within Macquarie Asset Management, part of Macquarie Group, has watched the perfect storm of disruptive forces take its toll as businesses scramble to deal with new economic, workforce, cybersecurity, supply-chain and other kinds of risks.

“The world has changed in some very fundamental ways,” he explains. “COVID-19 wasn’t the cause as such, but it accelerated the change.”

Accelerating change and digitalisation

Early in the pandemic, digital transformation was recognised as a critical way of meeting new challenges. One Gartner survey, conducted in mid-2020, found that 69% of boards of directors had accelerated their digital business initiatives as a result of the pandemic’s disruption.

Microsoft CEO Satya Nadella famously noted that the company had seen two years’ worth of digital transformation in just two months. That was an experience shared across the business world as companies sped up years-long transformation plans that suddenly had to be fast-tracked in a matter of weeks.

This increased overall spending on IT solutions and services dramatically. Gartner projected last year that Australian IT spending would

increase from $96.8 billion in 2020 to $109.1 billion in 2022, as businesses invest heavily in new technologies to transform their operations.

Much of this IT spending was needed for pandemic-related purposes — to support remote employees, deliver goods and services to house-bound customers, gain more visibility of supply chains, and take advantage of market opportunities to reduce costs.

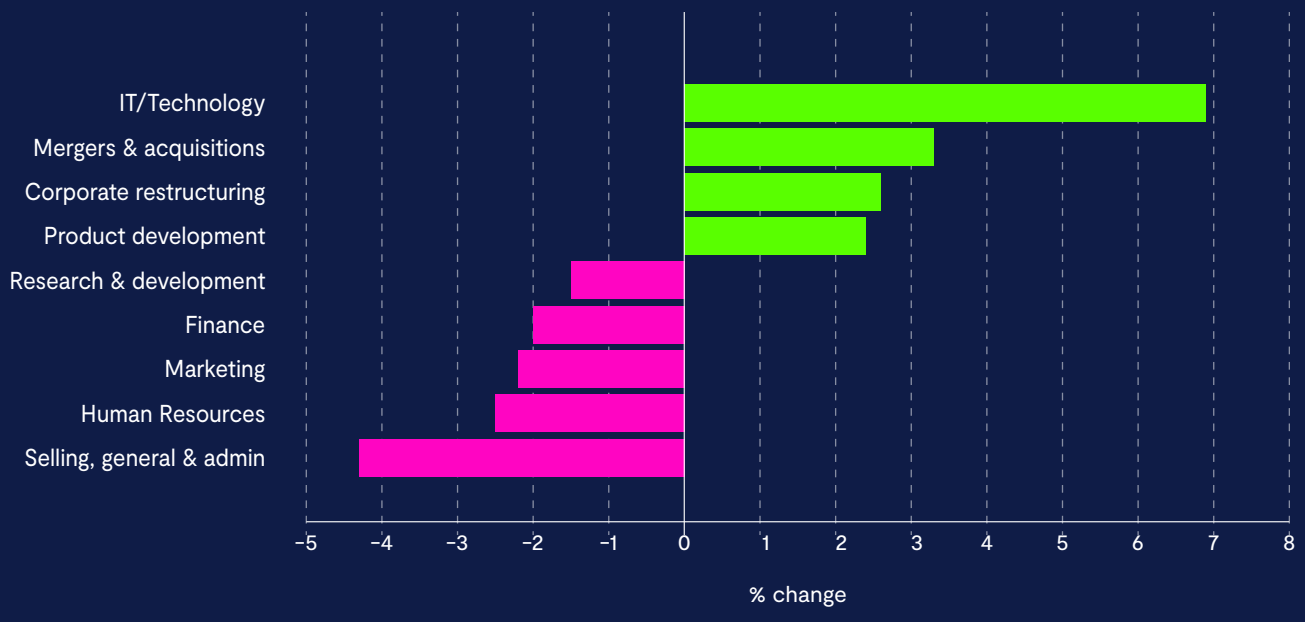
Networking and other connectivity technologies became even more vital as enablers of this change. “There was a general structural demand for connectivity going on already,” McCormack comments.

> “But COVID-19 exacerbated that — and with a lot more people now working from home, there’s just a much greater need for connectivity.”

For many organisations, this meant embracing cloud-based technologies that deliver the scale and ease of access to support new ways of working and operating. For others, it meant overhauling business processes to take advantage of data analytics and advanced technologies such as artificial intelligence (AI), IoT devices, and process automation.

Faster, richer and more robust connectivity has created new business opportunities, but it has also raised the stakes around data and infrastructure security. That has become more important than ever as increasingly digital businesses find themselves exposed to cyber criminals seeking to disrupt or destroy the business processes that these systems enable.

Average budgetary changes in 2020 as a result of COVID-19 impact



Source: Gartner, September 2020

Entering a challenging new phase

Even as the world opens up again, it's clear that the business operating environment has changed forever. Remote working has evolved into hybrid working, which is now a business imperative in the battle for talent. The digitalised services that were born out of need have become an ever-increasing customer expectation. Meanwhile, economic conditions remain volatile – and are likely to stay that way for some time as the world's business community feels its way back towards normal operations.

> "The global economy bounced back robustly from the pandemic and demand came back because of the aggressive easing of monetary and fiscal policy," McCormack says. "But supply didn't come back, both because of disruptions to supply chains and because the supply of labour just hasn't come back as forcefully as people would have expected."

Exacerbated by the pause in migration, the labour shortage has hit hard as organisations struggle to find and retain the staff they need.

The Australian Bureau of Statistics recorded 480,100 job vacancies in May 2022 — up 13.8% from the previous quarter and 29.7% year on year. One in four businesses reported having at least one vacant position, more than twice the number at the beginning of the pandemic.

After decades of low inflation and interest rates, the explosion in demand, and limited supply of resources and staff, have pushed businesses into a fundamentally different operating environment. It has sent them scrambling to find ways to maintain the continuity of their operations in the face of all this change.

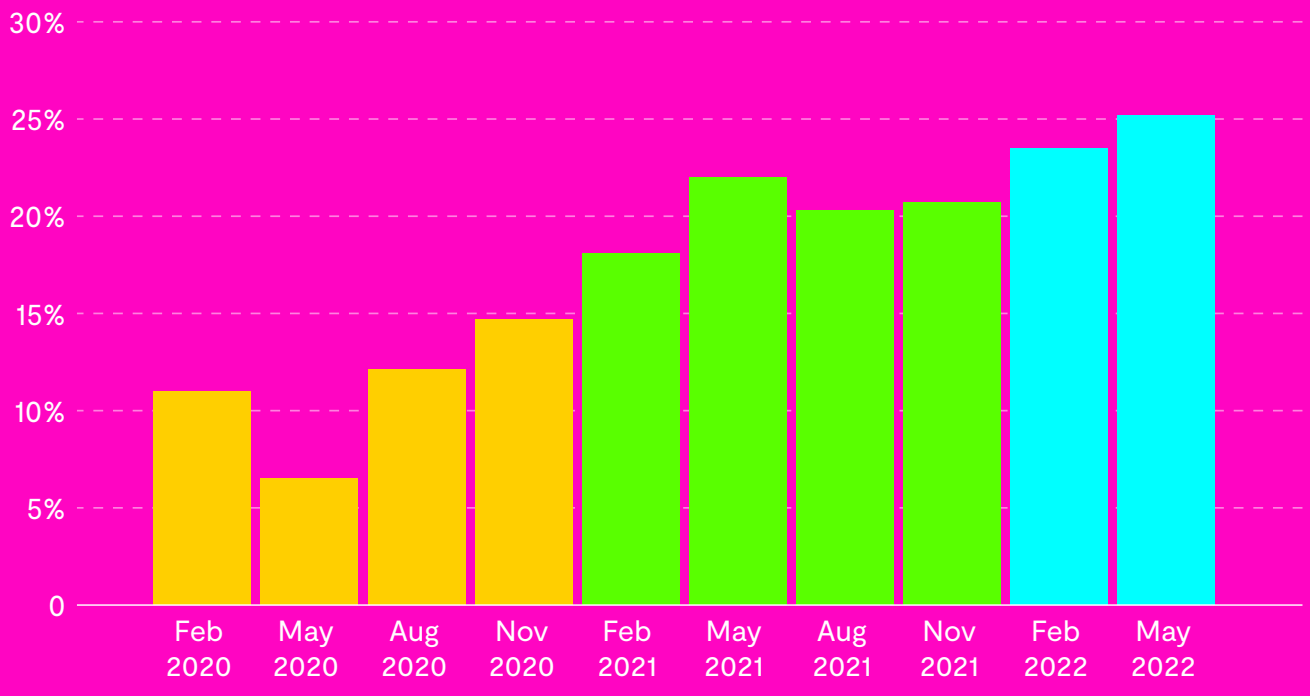
In this environment, digital transformation is more important than ever if organisations are to survive and thrive. It's a new world, full of both challenges and possibilities — and the organisations that most effectively transform to take advantage of those possibilities will be best positioned for future success.

480,100 job vacancies in May 2022

up 13.8% from the previous quarter

Source: Australian Bureau of Statistics

Proportion of businesses reporting vacancies, Australia



Source: ABS Job Vacancies, Australia, 2022

Whole-of-business transformation is the only way forward

The challenging new business environment will put further pressure on productivity, which has been stagnant for the best part of two decades, according to Australia's Productivity Commission.

> "Companies need to invest more in the digital space to boost productivity," McCormack says, "and they'll be incentivised to do that because labour is becoming more expensive — and the economic world is going to be a bit more volatile. Those risks can be managed, but you've got to invest in the resources and know-how in doing so."

McCormack identifies AI and automation as key technologies for improving productivity and freeing up workers to focus on activities that add more value.

By 2025, Gartner has predicted 70% of organisations will have implemented the structured infrastructure automation that will help them to significantly improve their flexibility and efficiency. That's up from just 20% of organisations that were doing so last year — highlighting the game-changing nature of automation technologies.

Similarly, forward-looking organisations are fast-tracking the transition to Industry 4.0.

A conceptual successor to the Third Industrial Age of mass production, Industry 4.0 refers to the wave of transformations in which organisations use connectivity and digital technologies to greatly improve their agility and drive efficiencies through automation.

For example, mining companies have invested heavily in automating vehicles that enable 24x7 mining operations at their remote sites. Government bodies are streamlining citizen services using workflow engines and extensive integration to bring together a range of back-end data sources. And utility companies are using IoT technologies to proactively and efficiently maintain equipment.

However, these and other digital solutions can't be viewed in isolation. They are highly dependent on supporting IT infrastructure and often on each other. Digitalisation initiatives have resulted in enterprises building up huge quantities of data across widely distributed networks of applications and systems, both in the cloud and on-premises.

At the same time, many enterprises have adopted new platforms and modernised their application architecture to become more agile and accelerate their digitalisation initiatives. These apps, systems and platforms need to be connected and their data integrated to unlock the full potential of analytics and AI, delivering the insights and productivity enhancements that organisations need.

Extracting full value from these new IT paradigms, however, requires a top-to-bottom review of technologies and operations as companies work to address core challenges such as building increasingly mission-critical services and enhancing the employee experience to attract the best talent. Businesses are also under pressure to drive sustainable business growth by aligning their efforts with corporate ESG objectives.

Considering these challenges is a crucial part of any comprehensive business strategy, this report will explore each of them to explain how the precepts of Connectivity 4.0 support those goals. Enterprises must look beyond simply becoming 'digital'. They must focus on how they can leverage extensive connectivity to drive whole-of-business technology transformations.

Three core challenges facing today's organisations

1. **Building mission-critical services.** In a world where digital transformation has made cloud-first deployment table stakes, services must be designed with the speed, robustness, and resiliency necessary to support continuous operation.

2. **Enhancing the employee experience.** There's no point digitally transforming businesses if employees don't know how to make the best use of the new environment. A focus on employee experience ensures next-generation business platforms are designed in a way that makes them usable and effective from day one.

3. **Driving sustainable business growth by aligning efforts with corporate ESG objectives.** Success for today's businesses means not only delivering products and services, but also operating in a way that meets the expectations of customers and investors that want to make sure they're buying from and supporting environmentally and socially responsible suppliers. To meet this expectation, businesses must boost transparency by mapping their key initiatives back to ESG goals.

Connectivity is the lifeblood of transformation

Given the increasing importance of data integration and dependency on digital connectivity, robust connectivity infrastructure is vital to the success of whole-of-business technology transformations.

> "There's very strong underlying structural growth in connectivity infrastructure," McCormack says. "It's a game of leapfrog, with strong demand absorbing bandwidth, followed by investment to expand bandwidth, incentivising new use cases, and then demands expand again."

However, just as organisations have radically changed their approaches to IT over the past few years, transformation architects are readjusting their thinking to meet the connectivity challenges of today and tomorrow. They are looking beyond bandwidth to embrace Connectivity 4.0 — a holistic, flexible and scalable approach to reliably connecting the many apps, systems and platforms that organisations depend on in the digital age.

Whereas once business systems were built around slow, fixed wide-area network (WAN) connections, contemporary connectivity models abstract communications traffic onto internet protocol (IP) WANs. These networks can run over several technologies, including high-speed fibre-optic cables, point-to-point microwave connections, local wireless and satellite services.

With this speed comes flexibility. Businesses no longer have to schedule backups for off-peak hours, so they don't congest office network connections, for example. New, highly responsive, low-latency network technologies allow organisations to support increasingly decentralised applications that run in the cloud and integrate components from all manner of systems.

These days, there are so many communications options that businesses no longer have to worry that lack of connectivity will prevent them from communicating from one side of their operations to the other.

The technology underpinning Connectivity 4.0

Underpinning Connectivity 4.0 are fast, ultra-resilient, future-proof networks and connected technologies. At its core is fibre, which has the ability to provide extremely high-capacity and low-latency networks for linking offices, networks and hybrid cloud environments.

Fibre services can link major business precincts across a CBD — or across the country — to provide highly reliable connectivity that is also highly scalable. An ever-increasing array of subsea fibre cables is also extending the performance and reliability of fibre to provide global reach for new connectivity paradigms.

Augmenting fibre are wireless technologies such as microwave — a high-speed, point-to-point service for extending fixed connectivity across an area. Satellite was previously constrained by limited bandwidth, but with the launch of high-speed low earth orbit (LEO) services is now capable of delivering fast speeds and much lower latency, anywhere in Australia or around the world.

Another key Connectivity 4.0 technology is private LTE, privately operated mobile networks that are installed in specific locations — such as at a mine, industrial site or factory — to provide continuous connectivity and latency low enough that it can support real-time control of autonomous vehicles or industrial processes.

Communications technologies have progressed enough that they no longer impose the speed or reliability trade-offs of legacy technologies. The availability of LEO satellite services has resolved the coverage dilemma, allowing satellites to work together with the other elements of Connectivity 4.0 to give businesses reliable, resilient and future-proof connectivity no matter where or how they operate.

All these technologies are fast, providing local area network-like speeds for both upload and download streams. They also offer much better latency profiles than in the past. They can ensure that organisations keep digital business processes running as smoothly as possible. Connectivity 4.0 technologies are also highly flexible, since they can be reconfigured and scaled on the fly to match changing business requirements.

In fact, Connectivity 4.0 is enabling businesses to think about the way their people and systems communicate in completely new ways.

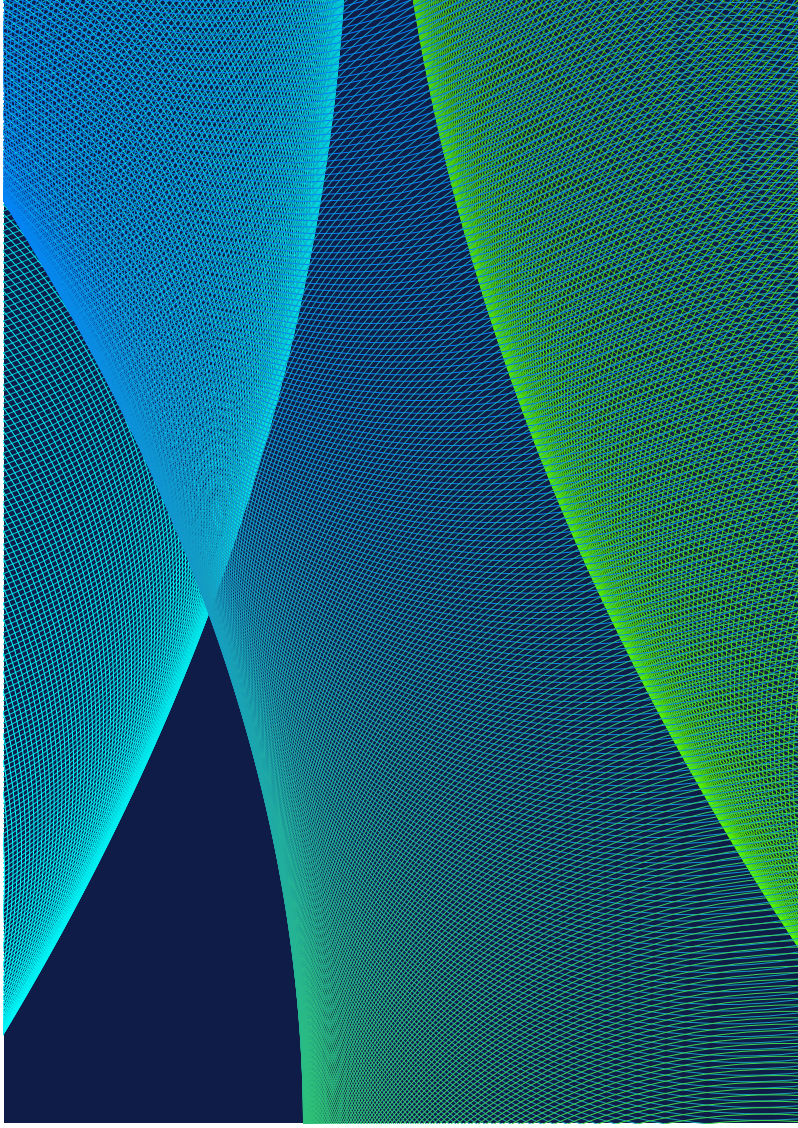
Networks no longer need to be viewed and managed in isolation. By tapping fast, ultra-resilient, future-proof networks, businesses can engage Connectivity 4.0 service providers capable of linking a broad range of networks and devices into a coherent, manageable whole.

In this context, the focus is less on thinking about connectivity as a point-to-point communications service, and more about thinking of it as a way of coordinating the many components involved in keeping digital business solutions operating efficiently.

> "You have to change the people you're talking to," explains Phil Martell, Head of Strategic Network Development with Vocus. "You're not talking to the IT community about delivering X megabits a bit faster anymore. You're talking about an integrated solution to a wider range of problems."

"You have to think about what it is that you're trying to create, work backwards to look at what the infrastructure needs to support, and then come up with a proposal based on a mix of infrastructure and services."

This service-based approach is particularly important in the era of hybrid-cloud infrastructure, which relies on connectivity to coordinate hundreds or thousands of application components and services that may be located anywhere in the world.



The faster those services operate and the lower their latency, the more seamless the digital business services they can deliver — enabling organisations to drive the whole-of-business digital transformation that today's challenging environment requires.

In this context, increasingly connected data centres become key drivers of business change.

The increasing array of connected technologies is steadily reshaping the business infrastructure — and opening up new possibilities for businesses that are truly beginning to benefit from the redesigning of contemporary business processes. In this way, Connectivity 4.0 has emerged as a critical enabler for change — and a core element of the digital businesses of the future.

Why connectivity is the backbone of digital transformation

Digital transformation has been the defining business trend of the past few years, and telecommunications providers are acknowledged as being a core part of this transformation.

Recent Vocus research found that 44% of telecommunications decision makers agreed that their provider plays a major or integral part in the success of their digital strategy.

This suggests that transforming companies are looking to telecommunications providers to support their whole-of-business transformations with technical solutions that are tailored to their needs.

56% **of telco decision makers expect to increase their spend on telecommunications and ICT products and services in the next three years.**

What are the most important traits of your telecommunications provider?

1. Having a strong network that is highly reliable and available
2. Having products and services with customised solutions that can scale with the business
3. Network reach and coverage, particularly to rural and remote areas

What factors are most likely to prevent you from choosing a certain telecommunications provider?

- Lack of coverage in rural/remote areas
- Inability to meet capacity/latency/uptime requirements
- Inability to comply with network security requirements

Source: Vocus research, 2022

Modernising and securing mission-critical services

In a time of rapid operational change, the importance of ensuring the resilience of mission-critical services cannot be overstated. Disruptors might be weather events, cybersecurity attacks or political instability – and today's enterprises must find the right balance of enabling technologies to ensure that they operate continuously and reliably, no matter what external events or forces threaten to compromise them.

That means automating routine processes wherever possible, embracing geographically diverse infrastructure to avoid 'single point of failure' weaknesses, and adopting redundant connectivity to ensure that the connected digital ecosystems of tomorrow can continue functioning.

Increasingly, connectivity solutions are enabling not only IT solutions but also integrating OT, such as supervisory control and data acquisition (SCADA) and other industrial control system (ICS) platforms that manage manufacturing, mining and other industrial processes.

IT networks have typically evolved separately from OT environments, but in today's service-focused environment the two are converging more than ever before. They also typically integrate IoT equipment, such as temperature and water-level sensors, valve controllers, monitoring cameras equipped with AI-based object detection, and more.

Connectivity 4.0 enables this convergence, supporting scalable and resilient converged networks capable of carrying all manner of traffic according to the performance requirements of the application in question.

Delivering Connectivity 4.0 at the bottom of the ocean

The mining and natural resources sector provides myriad opportunities for connectivity innovation, with Vocus helping to develop innovative solutions to ensure connectivity across mission-critical settings such as offshore gas drilling rigs. Here, the forces of nature and physical challenges of industrial environments require innovative connectivity solutions.

For example, how do you extend robust connectivity to a massive, floating platform many kilometres offshore and regularly lashed by violent storms and waves?

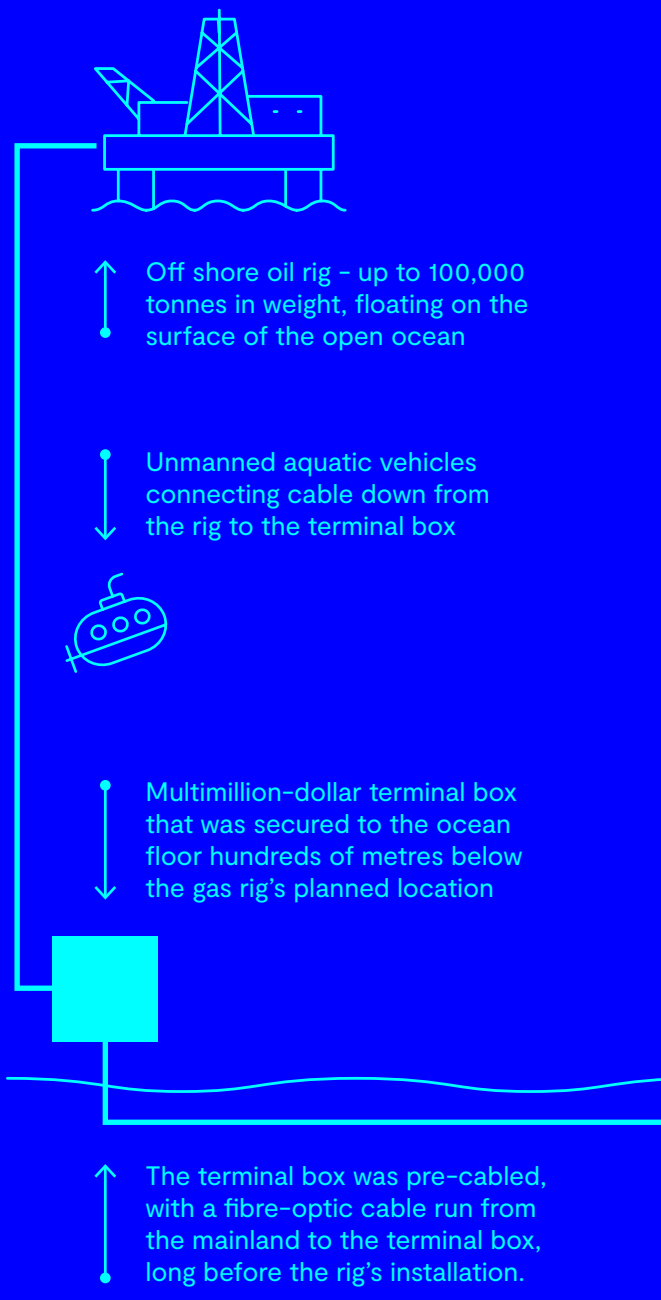
Vocus achieved this by working with a submarine cable specialist to create a multimillion-dollar terminal box that was secured to the ocean floor hundreds of metres below the gas rig's planned location. The connection was pre-cabled, with a fibre-optic cable run from the mainland to the terminal box, long before the rig's installation.

Then, once the massive rig had been moved into place, unmanned aquatic vehicles ran another cable down from the rig to the terminal box. The vehicles plugged in a high-speed, reliable connectivity service that supports the rig's business systems, SCADA and other industrial controls, as well as delivering services to the residential quarters.

Developing such solutions is about much more than simply connecting a fibre service. A rig's massive steel platforms are a challenging environment for deploying conventional wireless connectivity. Extensive site surveys are needed to identify potential coverage blockers.

"We've done a lot of work to create solutions for customers that are using IT-type features of the networks but in fact solve operational problems as well," Martell says. "There's a lot of service and operational thinking required to make that all work — and we have tried to create an infrastructure capability rather than just delivering a single service."

Having that infrastructure capability means the connectivity provider can operate and configure a gas rig's network completely remotely. That includes turning ports on and off as new services are required, monitoring traffic for security anomalies, adjusting bandwidth flow and management, and disabling ports based on access-control restrictions.



LEO satellites and ubiquitous connectivity closes the digital divide

While innovative fibre solutions provide connectivity to remote locations, rapid innovations in wireless technologies, such as satellite, are adding alternatives to increase network reach and resilience.

Although geostationary satellite data services have been available for many years, their utility in mission-critical networks has been limited by their relatively slow speeds, high cost, and the high latency created by their position more than 36,000 kilometres above the Earth.

All of this limited their use to very low-speed applications where performance was not an issue, or to where there was no other way to provide connectivity — such as in remote locations.

> Modern fleets of LEO satellites, however, have changed all that by flying smaller satellites at an altitude of around 500 to 2000 kilometres — close enough to Earth that they can deliver fast, high-powered data communications services with very low latency.

LEO constellations require complex integration of hardware and software systems. Unlike geostationary satellites, which appear stationary when viewed from Earth, LEO satellites must orbit the Earth extremely quickly to maintain their altitude, requiring specialist tracking antennas to maintain connection. Operators like SpaceX, with its Starlink service, are addressing this by building global mesh networks comprised of thousands of satellites, launched dozens at a time by low-cost, reusable SpaceX launch services.

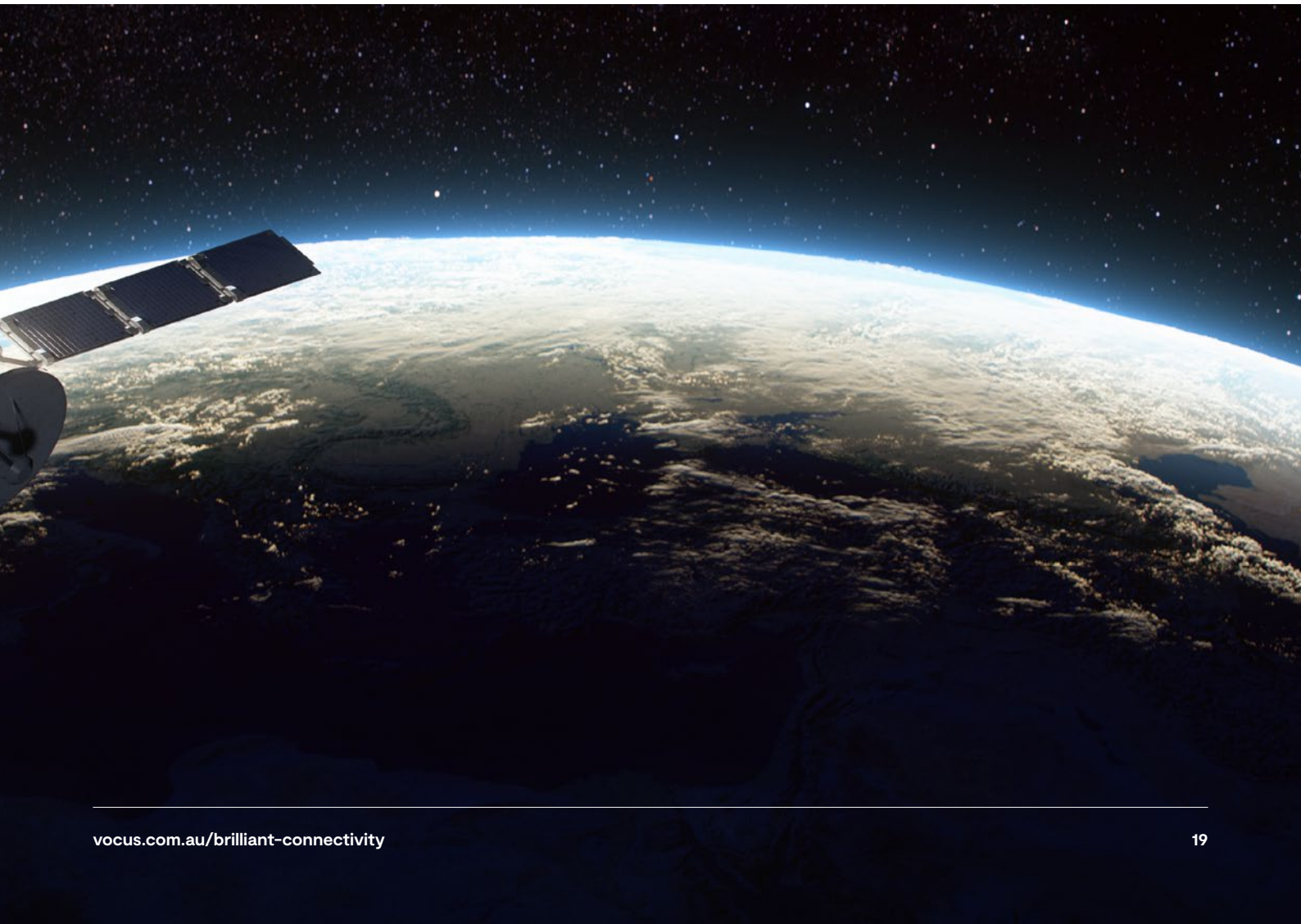
Starlink's performance is advertised as being between 100 and 500 megabits per second, with latency as low as 20 milliseconds when accessed from almost any place on the planet. This enables organisations to build high-speed networks anywhere they might be operating, whether on land or at sea.

"LEO has created something that didn't exist in the satellite industry before, which was low cost services and high performance," says Ashley Neale, Development Manager, Space and Satellite, with Vocus, who works with space and satellite operators to help Connectivity 4.0 solutions tap into the capabilities of their networks.

> “When you’ve got a truly ubiquitous, low cost and high-performance network, you can connect proper metro-grade broadband anywhere in the world,” he says, noting that the ability to bridge the longstanding digital divide is allowing businesses to extend connectivity anywhere in Australia or around the world, without rethinking their network architecture.

LEO services also provide new options for improving the resilience of Connectivity 4.0 services, safe from unpredictable weather and other continuity threats.

On a gas rig, for example, the LEO data service could be used as a backup to undersea fibre cabling. This maintains critical connectivity even in the event the fibre is accidentally broken by wave action, physical wear and tear, or an explosion or other accident.



Private LTE brings Connectivity 4.0 where you need it

Another transformative wireless technology is private LTE, which is conceptually a successor to Wi-Fi networks but uses longer range mobile communications protocols to deliver high-speed coverage to specific areas — for example, at a mine, solar farm, or large industrial complex.

Private LTE networks are built using similar components to commercial mobile networks, with base stations mounted on towers scattered across the coverage area. Two large base stations can provide blanket coverage across a 12 kilometre radius, with smaller mini base stations added in areas of high usage, such as where there are a lot of workers or an array of connected equipment.

“Private LTE gives you the ability to take standard telco infrastructure and customise it to make those solutions work in the most remote areas,” says Martell, who notes the ability of such networks to connect operational technology in ways that has never been possible before.

Private LTE is transformative for businesses that have previously been forced to rely on whatever commercial 4G or 5G mobile signals manage to reach their site location. With the right site survey and engineering work, it’s possible to build private LTE networks that provide high-speed connectivity to every part of a commercial environment or industrial operation — even deep underground.

The implications of this degree of connectivity are significant, with the potential to link every piece of equipment within the coverage area, including workers’ smartphones.

Rockingham Lake regional park. Scientific environmental conservationist working with the aid of technology to collect data. The Australian Bush has been damaged by fire.

In addition, the technology’s extremely low latency offers new capabilities to connect devices such as autonomous vehicles, which must be able to react instantly to commands or changes in their environment.

Containerised private LTE networks are also being used to rapidly provide connectivity in areas that suffer interruptions to normal coverage — for example, when bushfires destroy commercial mobile base station towers, or floods inundate a region.

The potential to rapidly restore communications in such areas makes private LTE as important to emergency services operators as it is to businesses seeking to extend connectivity to industrial sites.

In such industrial environments, private LTE has already filled another crucial part of the Connectivity 4.0 platform — providing flexible, robust terrestrial communications backed by service characteristics and control that legacy wireless infrastructure cannot supply.

By connecting a private LTE network to LEO satellite backhaul, it's possible to combine the respective and complementary strengths of both technologies to build robust connected campuses anywhere on Earth.

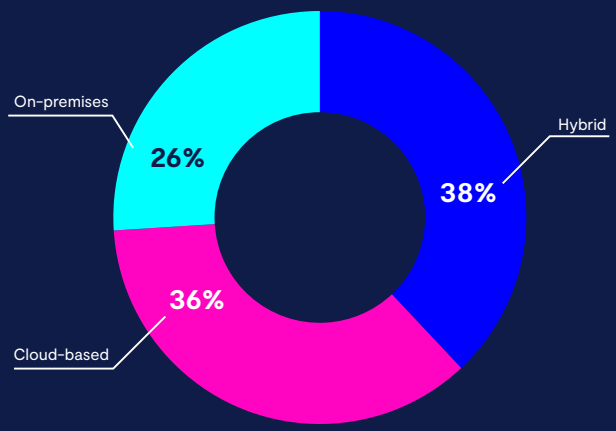
> "We think private LTE will be really critical in terms of the way companies manage their infrastructure assets and operational requirements in order to deliver productivity dividends," says Simon Parker, Head of Strategic Projects with Vocus.

"The technology suits any organisation that has a range of requirements around workplace activities like autonomous vehicles and active predictive maintenance. It creates opportunities for precision monitoring and control, even at facilities that don't have people in them but are operated remotely."

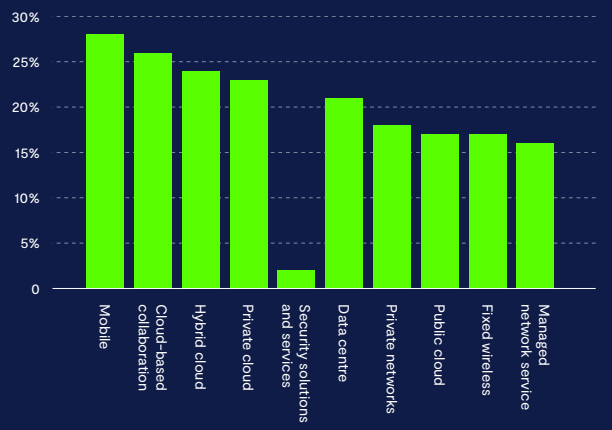
Mission-critical services rely on robust, ubiquitous connectivity

Cloud architectures have long been fundamental to whole-of-business transformations, with Vocus research finding that three in four companies are using strictly cloud architectures or hybrid cloud environments.

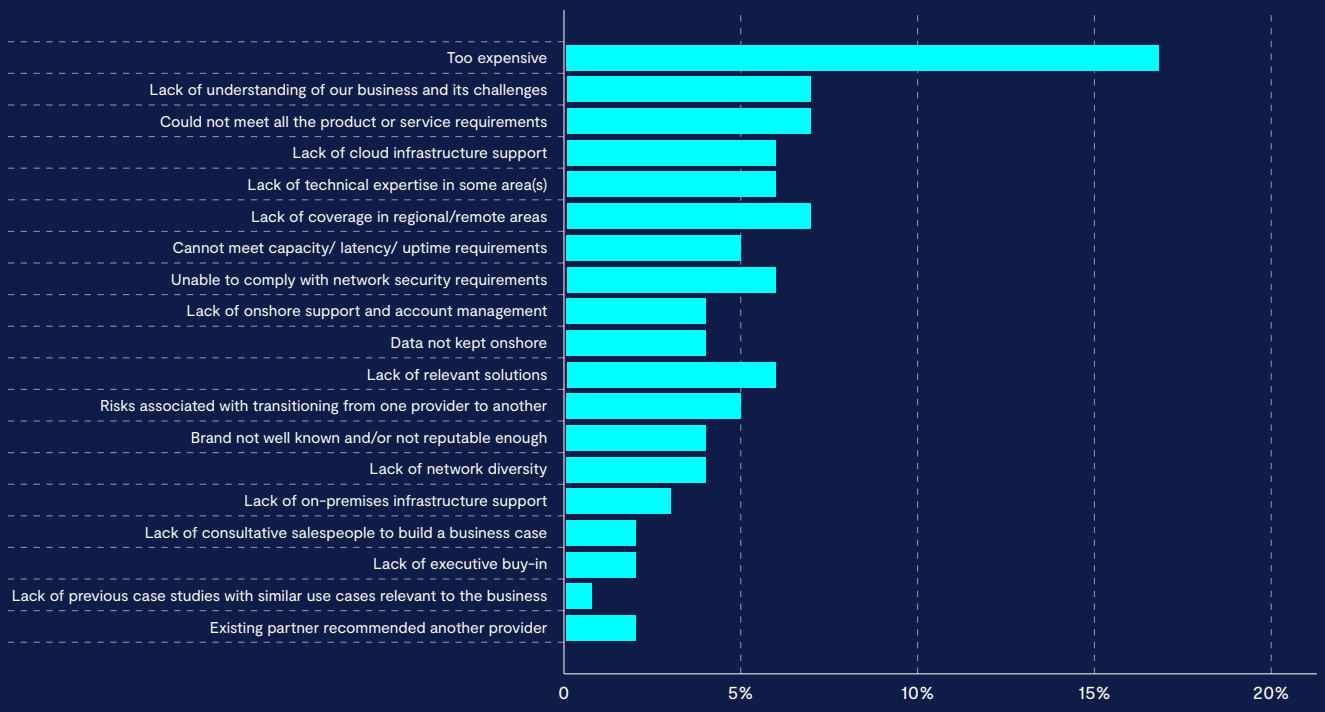
Infrastructure for mission-critical operations



What solutions will organisations invest in?



Top considerations when selecting telcos



Source: Vocus research, 2022

Meeting the critical infrastructure risk

With Connectivity 4.0's flexibility and ability to integrate new technologies to meet operational business requirements, it's going to be increasingly important in helping businesses adapt to the infrastructure, security and other risks created by ever-changing global circumstances.

It will also play an increasing role in helping organisations address the Australian Government's growing expectations of them to protect the integrity of critical infrastructure. This has been the subject of extensive consultation and reform in recent years as new threats accumulate.

A raft of recent amendments by the Australian Government to the Security of Critical Infrastructure Act 2018 (SOCI) have imposed significant obligations on operators of critical infrastructure. These include new requirements around ensuring the security and resilience of the systems they administer.

To meet their security obligations under SOCI, operators must undertake a range of improvements to security risk management — including more quickly responding to and reporting cybersecurity incidents.

They must also participate in a central Register of Critical Infrastructure Assets managed by the Cyber and Infrastructure Security Centre.

The changing definition of critical infrastructure

The pandemic, natural disasters, and other recent disruptions have shown just how dependent we are on a broad range of goods and services, effectively redefining what critical infrastructure means today.

Recent amendments to SOCI reflect that change, including new additions to the longstanding definition of 'critical infrastructure', which was traditionally focused on conventional infrastructure like electricity, water and gas.

The term now includes 11 core sectors, including:

- financial services and markets;
- communications;
- data storage and processing;
- defence;
- food and groceries;
- higher education and research;
- healthcare and medical;
- transport;
- energy;
- space technology;
- and water and sewerage.

From a business perspective, this shift in the government's and society's attitudes has effectively raised customer expectations to unprecedented levels, bringing new meaning to 'mission-critical services' for many organisations.

Increased reliance on connected and online systems really makes businesses more vulnerable to attack," says Anita Sheridan-Roddick, APAC Group Sales Manager with managed security service provider Seccom Global. She notes that "companies have had to be more strategic, diligent and vigilant when it comes to maintaining security".

Ever more resourceful cyber criminals have taken advantage of the disruption of the past few years, escalating attacks such as ransomware and distributed denial of service (DDoS) to become major threats to business continuity and real-world tests of corporate resilience.

Reports of ransomware attacks alone increased by 15% during the 2020–21 financial year, the Australian Cyber Security Centre (ACSC) observed in its latest Cyber Threat Report. The report also warned about increasing risks from targeting of supply chains, rapid exploitation of security vulnerabilities, exploitation of the pandemic environment, and business email compromise attacks, which cost businesses over $50,600 per incident, on average.

Recognising the intensifying attack climate during the pandemic and as a result of growing geopolitical uncertainty in Ukraine, Taiwan and elsewhere, the ACSC has joined similar organisations around the world in entreating businesses to improve their security practices.

A sound connectivity strategy is an important element of these efforts, Sheridan-Roddick says. These include infrastructure-level innovations such as SD-WAN services, network segmentation to create private data networks, secure access service edge (SASE) architectures to protect edge-computing devices, zero-trust authentication services, and automated detection and incident response to strengthen organisations' resistance to security attacks.

> "We're having a lot of conversations with customers around asset and vulnerability management," she says. "And while the risks are the same as before, they're just amplified.

There is no doubt that the risk of state-based attacks has increased, but also the risks from your general, run-of-the-mill cyber criminals."

"They are running companies now," she continues. "Rather than being just one person sitting in the dark launching attacks. It's organised crime — and the risks to our national security and national infrastructure are very real."

The ACSC recommends that organisations adopt an "enhanced cyber security posture" that includes at least five key elements. These include:

- Patching applications and devices
- Implementing mitigations against phishing and spear-phishing attacks
- Ensuring staff report all suspicious emails received, links clicked and documents opened
- Ensuring that logging and detection systems are fully updated and functioning
- Reviewing incident response and business continuity plans, including clear and well- understood response plans for ransomware attacks.

With around one in four of the cyber incidents reported to the ACSC now related to critical infrastructure or essential services, businesses operating in many of these sectors are on notice about the risks posed in the new environment.

Because many rely on extensive OT environments as well as conventional IT, they will need to invest heavily in supporting infrastructure capable of extending SOCI-compliant controls from one side of their business to the other — and even out to close supply-chain partners.

“We’re going to have more volatility in terms of GDP and asset prices,” says Macquarie’s McCormack, “and at the same time, cyber and disruption risks continue to increase.

“For businesses, being flexible is absolutely key. You need to be able to respond to those pressures and opportunities very quickly — and Connectivity 4.0 embodies that flexibility to support businesses going forward.”

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per incident, on average

Source: ACSC, Cyber Threat Report 2021

Next steps for building mission critical services

1

Build for redundancy

Ensure you have the right combination of terrestrial and satellite options to ensure continuous connectivity to all of your sites, then look for opportunities to support new, low-latency applications by adding local wireless and private LTE services.

2

Design to manage risk

In today’s volatile geopolitical and economic climate, business success requires careful attention to cyber security, operational continuity, supply chain, and other kinds of risk — so make sure you have considered how your partners can work together to use Connectivity 4.0 to minimise this exposure.

3

Reimagine your future

Embracing Connectivity 4.0 will open up new opportunities to tap the benefits of automation, AI and other technologies. Keep your mind on the future and never stop thinking about how new capabilities will enhance your business for the future.

Transforming the employee experience

Although a significant part of Connectivity 4.0 relates to the technologies that comprise it — including fibre, private LTE, satellite, mobile and point-to-point microwave — the transformation it enables is not just about connecting things.

Indeed, one of the most significant benefits of the Connectivity 4.0 mindset is its ability to solve the challenges around remote workforces that were thrown up by the pandemic's massive disruption.

Gartner has predicted that around 47% of Australian knowledge workers will be working from home at least one day per week by 2025 — with 19% saying they would like work from home full time. The implications of this fundamental disruption to the workplace are still being evaluated by employers, who had to 'wing it' during the pandemic as employees were sent home en masse.

Large-scale remote working was a learning experience for employers and employees alike. Both groups had to navigate the challenges of transferring their job responsibilities online while dealing with reduced physical contact with co-workers and their familiar office environment.

> "For people to have a productive work environment, or to work effectively and efficiently in any sort of work environment, the technology needs to be reliable, simple for everyone to use, and problem-free," says Amber Kristof, Chief People Officer with Vocus.

Vocus was able to transition 90% of its more than 1,300 Australian employees to remote work by leaning on online collaboration tools.

The company shifted meetings online and organised social catchups and wellness initiatives to ensure that the technology-enabled work didn't become too isolating for staff.

The company's human resources team reached out regularly to support employee wellbeing, using surveys and check-ins to see how people were handling the new work arrangements. A cross-functional management group supported input from every part of the business, ensuring that diverse voices had the chance to be heard as the working culture remained in a state of flux for the better part of two years.

For many team members, the shift to remote work was illuminating because remote collaboration software proved to be a great leveller. "With a greater emphasis on setting aside time to build connections, many team members connected more often than pre-COVID, and in fact, had never done that much team connectivity with interstate colleagues before," Kristof explains.

"They were building relationships with people they had never sat on a team call with — and they felt more connected, just because we had simple-to-use technology that meant they got to know people personally. They now have very different relationships than they did before."

In this sense, connectivity was as much about people reaching out to each other as it was about the core business of moving data. And despite the assumption of many managers that employees needed to return to the office full time to regain past productivity, survey after survey shows that the demonstrated benefits of increased connectivity mean employees can now expect flexible, remote work to be a permanent part of their working lives.

As well as enabling collaboration between workmates, enhanced connectivity is also proving to be a critical way of supporting employee well-being and retention. Just as it supports connectivity across industrial environments, better connectivity is also fundamental to supporting human-centric outcomes such as occupational health and safety, mental health support, and general well-being by providing connectivity to family and friends.

Keeping employees engaged

Over time, broad adoption of Connectivity 4.0 will normalise this level of seamless collaboration – allowing employees to build everyday communities across home and business spheres without having to think about the technology underlying it.

Whether in the office or in the field, businesses will be able to design next-generation employee experiences around the ubiquitous, reliable connectivity that makes collaboration possible.

That ensures videoconferencing calls are simple and reliable, and online collaboration is seamless and quick. But Connectivity 4.0 is also likely to increase the use of automation to assist employees in performing many of their most routine tasks.

Yet the benefits of improved connectivity extend much further than simply making workers happier or more efficient. Surveys suggest that the Great Resignation's aftershocks will continue to shape hiring policies for some time. One recent Robert Half survey found that 44% of employees are planning to look for a new job in the second half of 2022 alone.

Although 48% said they are leaving for salary reasons, others cited lack of career progression opportunities (37%), unhappiness with the content of their job (30%), lack of flexibility (25%), and a high workload (23%).

Similarly, the main reasons people stay in their current jobs are flexibility (53%), their relationship with managers and co-workers (42%), the content of their job (35%), and company culture (35%).

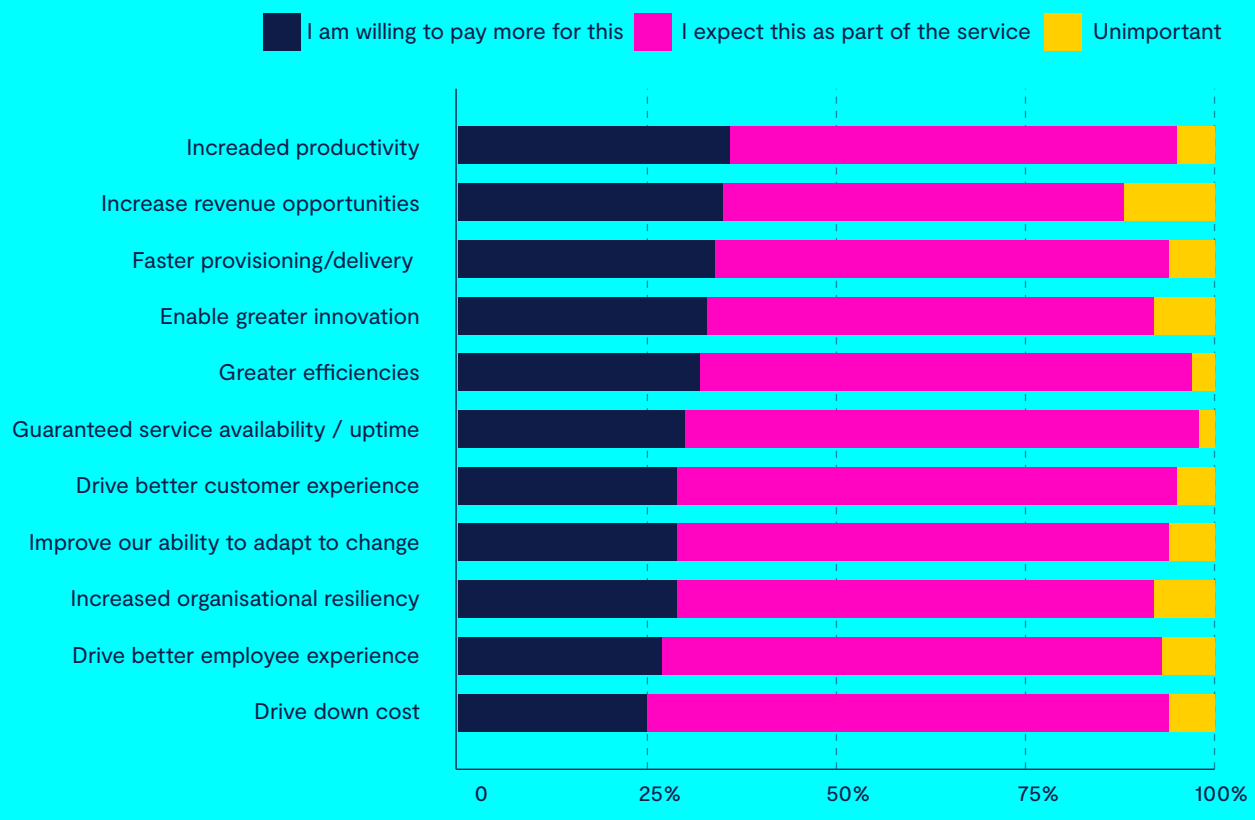
Only around one in three employees is staying for the salary – an instructive point for employers seeking to reconstitute their workforces in an era of distributed and remote work, enabled by enhanced connectivity.

There is much more to employee retention than just higher salaries, it seems. Employees want to be engaged in new challenges. Employers can support this with investment in modern, scalable connectivity technologies that make their workplaces more attractive to potential recruits — and give them the skills they will need to function in the digitally transformed future.

Better connectivity enables better employee experiences

The disruption of the COVID-19 pandemic not only permanently changed the way businesses operate, but also reset employee expectations about the way they want to work. Supporting these new paradigms requires fast, reliable and scalable connectivity to deliver a better employee experience. Indeed, recent Vocus research found that respondents would be willing to pay their telecommunications providers more if it would help them.

"They were building relationships with people they had never sat on a team call with — and they felt more connected, just because we had simple-to-use technology that meant they got to know people personally. They now have very different relationships than they did before."



Source: Vocus research. 2022

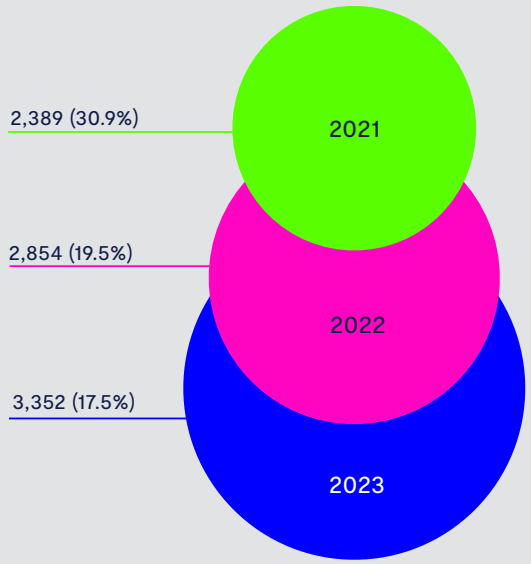
Enabling the present to automate the future

Automation has come a long way in recent years, aided by increasingly intelligent technology and service-based cloud infrastructure. For example, the latter generally provides developers with application programming interface (API) hooks that let their applications communicate with core systems without human intervention.

This ease of access is driving a surge in robotic process automation (RPA), which to date has been mostly installed within specific business workflows for repetitive tasks, such as document handling and processing.

Business spending on RPA tools will increase by 19.5% this year, Gartner predicts, as organisations increasingly dive into the technology and push towards a broader idea of 'hyper-automation'.

Worldwide RPA software end-user spending forecast



Source: Gartner (August 2022)

This involves combining application environments with RPA capabilities to produce more sophisticated and capable automation platforms.

AI capabilities will underpin many process-agnostic software capabilities such as process mining, task mining, decision modelling, integration platforms as a service (iPaaS) and computer vision to extend the reach of automation platforms.

This means businesses can build automation processes that take in data from all manner of sources, and interact with the world around them in completely new ways.

Integrating AI-driven computer vision into a manufacturing facility will, for example, allow the rapid evaluation of manufactured products or packaging for defects.

Integration with the OT systems on that line will enable those systems to work in step with the automation platform — for example, by slowing down a conveyor belt to provide enough time for a robotic arm to remove a defective item.

The potential applications are endless – and they are fundamentally enabled by the ubiquitous integration that Connectivity 4.0 brings.

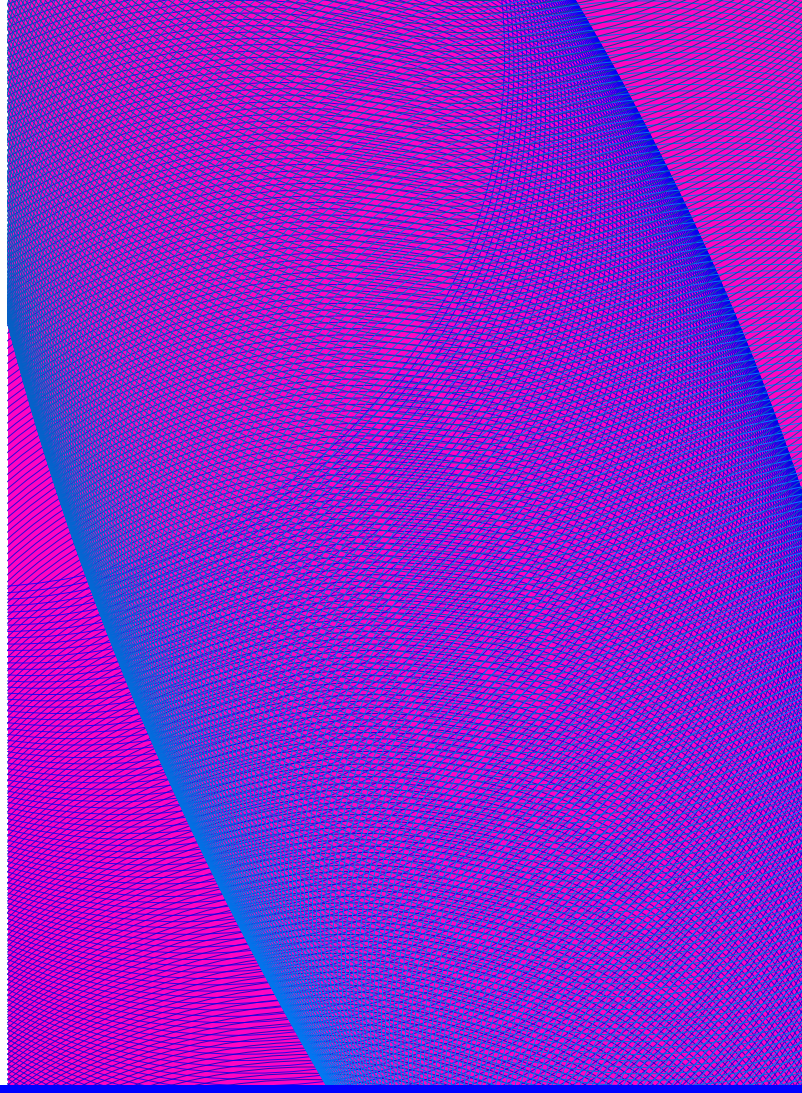
By delivering a consistent operating platform that is available to employees and business processes anywhere a company needs them to be, the new paradigm enhances employee experience. It opens the door to a world where technology not only brings people together but also enables intelligent processes that save workers time they used to spend doing repetitive tasks.

In the long term, Kristof says, using automation to support employees will be crucial for employers to maintain employee satisfaction and keep valuable workers from walking out the door.

This is particularly important when staff shortages are commonplace and those at work feel increasing pressure to compensate.

“Doing gap analysis work to identify technical and leadership development needs and desires will help us make sure we’ve got the people in our teams today who can be here for those future roles,” she explains.

> “By using our new technology to help our people to be future-ready, we can encourage them to stay because they know we’re going to invest in them being ready for the future.”



Next steps for transforming the employee experience

1

Support a flexible future

Years of labour market disruption have changed the dynamic between employer and employee. Embracing Connectivity 4.0 will support your employees’ desire for more flexible working arrangements by enabling them to work in whatever way makes the most sense for them.

2

Help your employees stay connected

New hybrid cloud architectures allow services, devices and people to be connected in completely new ways. Explore this new paradigm to not only improve your existing business, but also to find new ways that it can improve the employee experience overall.

3

Use automation to support your workers

Better connectivity makes automation more viable than ever — so use it not to replace your employees, but to offload routine work and free them to add value in new ways.

Achieving sustainable growth

Supporting employees may be a crucial part of the digital reinvention of businesses, but it's only one part of a larger realignment of corporate philosophy. That realignment includes recognising rising employee and customer expectations for embracing environmental, social, and governance (ESG) goals at a systemic level.

Reflecting a more fundamental change than earlier models of corporate social responsibility, ESG paradigms have become intrinsic to the way companies position themselves as socially and economically responsible entities.

In the United States, McKinsey & Co has noted, more than 90% of S&P 500 companies now publish ESG reports.

True ESG, McKinsey concludes, "is consistent with a company's well-considered strategy and advances its business model ... to ensure that their business endures, with societal support, in a sustainable, environmentally viable way".

Australian companies are leading the world when it comes to acknowledging climate change as a financial business risk. One recent KPMG analysis noted that 78% of Australian companies now acknowledge climate change as a financial business risk – well above the 56% average across the global 250 largest companies.

The principal driver behind the shift in how climate change is viewed was the global investment community – which has long recognised the value at risk from by the changing climate and the decarbonisation of economies. Indeed, in 2015 the Financial Stability Board established the Taskforce on Climate-related Financial Disclosures (TCFD), which in 2017 designed recommendations to "help companies provide better information to support informed capital allocation".

And while in 2018 just 16% of Australian companies were following TCFD guidelines, that proportion has increased to more than 60% in intervening years.

TCFD "really is raising the bar on the response of business to climate change, by enabling very consistent disclosure against key themes of interest to investors including governance, strategy, risk management, metrics and targets," notes Andrew Tipping, General Manager – Clients and Business Development with climate risk and energy transition consultancy Energetics.

A typical business climate change strategy has four 'pillars', Tipping says, including:

- purchasing (and investing) in clean energy
- pursuing net-zero emissions reduction targets
- investing in data analytics to support decision making disclosures
- building resilience as the climate destabilises.

Together, these pillars bolster a significant program of change that will lean heavily on ubiquitous, robust connectivity to build the new energy-efficient, clean energy-powered, highly resilient operational architectures enabling Connectivity 4.0.

> "Climate change is with us and we need to prepare for a changed environment with a different risk profile," Tipping says. "Accordingly, the pace of the business and governmental response is accelerating, in terms of mitigation and adaptation measures."

The speed of decarbonisation is seeing renewable-energy mandates increasingly built into commercial contracts, as corporate customers lean on their suppliers to help them meet their own ESG mandates — and core suppliers look up and down the value chain to manage their carbon footprints.

"Some sectors of the economy have very limited emissions reduction options available to them, because the renewable and low-emissions technologies aren't there yet," says Tipping.

"But the telecommunications space is a relatively easy sector to decarbonise because it's emissions profile is dominated by electricity use — and you can decarbonise this dramatically by using or buying renewable energy. With the extraordinary wind and solar resources across Australia, you are supporting a nation-building opportunity."

Putting ESG at the heart of business

Having evolved from conventional notions around community engagement and charitable giving, ESG initiatives are continuing to mature as they integrate parallel concerns around climate change, sustainable development and operations, net-zero emissions, socially responsible growth, employee wellbeing, and diversity and inclusion (D&I).

Amidst a global readjustment of the workforce as the Great Resignation and subsequent labour-market trends continue to wreak havoc, corporate commitment to objectives such as D&I and employee engagement and wellbeing are fundamental to reducing attrition and ensuring that businesses can retain the skills they need to progress their transformations.

As the myriad threads of ESG are factored into the new business environment, companies will benefit from ESG frameworks that recognise not only the importance of employees but also the importance of providing and advocating for a workplace that helps them achieve their individual best — whatever that involves.

“To serve our customers best, our people need to be at the centre of every decision we make,” explains Louisa Harris-Baxter, Head of ESG with Vocus.

“ESG has gone from being a nice-to-have to being a must-have, very quickly, and the employee value proposition is is an important reason why. They are the conduits to our customers and the people working with them day in and day out.”

Under Harris-Baxter’s lead, Vocus has been expanding an ESG framework that includes the company’s approach to topics like D&I, modern slavery, climate change and community investment.

In a power-intensive industry like telecommunications, net-zero emissions has become a particular focus, and a guiding force for strategic investment. It is also a subtext to everyday work with customers, who are increasingly looking to the expertise of companies like Vocus to help consolidate their infrastructure as a way of achieving their own net-zero targets.

As this change continues to reshape the way telecommunications and data infrastructure operates, connectivity will become more important than ever. Power generation and consumption will be intrinsically linked to self-monitoring, self-managing networks of IoT smart sensors that tap AI capabilities to monitor usage and manage increasingly automated assets.

“As we move from a highly centralised, energy generation and distribution system to a decentralised system with millions of connected devices, it’s a data-rich environment,” Tipping says.

> “There’s a lot of opportunity to create value from collecting and analysing the data and information that’s available and using the insights to build resilience — we’re going to see a huge transformation in that space.”

“Already a hot, dry continent prone to extremes of weather, Australia faces both known challenges and, as the climate destabilises, uncertainty. We need to adapt and build resilience across communities and all parts of the economy. At the heart of this response is communications infrastructure that enables everything from

disaster and emergency services, resilient transport, water and energy systems, as well as a plethora of industrial scale data processes."

In a digitally transformed world where investments in hybrid cloud computing are allowing businesses to shift their energy efficiency obligations to cloud service providers, the surge in net-zero activity is proof positive that Connectivity 4.0 will be fundamentally transformative for the modern workplace.

By leaning heavily on hybrid cloud platforms, this transformation will support the shift to a cleaner and more energy-efficient operating mode than ever before.

In this vein, Vocus has been working since 2019 to improve the energy efficiency of its data centres, and is committing to a business-wide net-zero target that will drive its environmental investments in coming years.

> "We are setting our ESG ambitions, particularly in relation to net-zero, with a very clear mind to the part we can play in helping our customers to meet their ESG objectives," Harris-Baxter explains, noting that Vocus has worked closely with major suppliers and customers to ensure that its targets are aligned with customer expectations.

"We are all working towards a common goal with respect to climate change," she says, "and there's a lot we can learn from each other to help us get there."

Next steps for achieving sustainable growth

1

Better connectivity means lower consumption

As you look for ways to improve your sustainability credentials, better connectivity will enable you to collect and aggregate real-time performance data from across the business — enabling you to run smarter and consume less.

2

Address diversity

Better connectivity helps turn business ESG goals into achievable change, so work to tap new data sources to improve your organisational diversity and inclusion — and your workers will be happier, more efficient and more likely to stay.

3

Track progress against objectives

Make sure that your transition to Connectivity 4.0 includes appropriate methods to measure and track your progress. In today's market, such information is useful not only for operating your business, but also in strengthening its brand and reputation.

Transform your connectivity for the future

Change is an ever-present part of business, but in recent years the amount of change that organisation and workers need to deal with — human, technological, industrial, political and more — has been truly transformative.

Remote work has fundamentally rewritten the employee experience. The shift to online interactions has escalated the importance of customer engagement, driving businesses and governments to expedite their digital transformations. Natural disasters and interrupted supply chains have forced companies to be more agile and more resilient than ever. And staff shortages have pushed companies to deepen their commitment to hyper-automation as they look for new ways to do more with less.

Underlying all these changes is a need for ubiquitous, fast, resilient connectivity that not only provides and links the technologies involved but also enables the process change that businesses need to remain relevant.

By transitioning to Connectivity 4.0, you can help elevate your organisation so that it can focus on addressing business challenges rather than technological issues. Here's how Connectivity 4.0 can help address four of those challenges.

More business is mission-critical

Today's enterprises have often grown organically over many years, and their infrastructure has too — often creating challenges in sustaining mission-critical business requirements. Much more than simply replacing old technology with new technology, Connectivity 4.0 fixes this by providing the opportunity to re-architect the business in a hybrid-cloud world — where ubiquitous access to high-speed, low-latency and highly reliable connectivity lets you reimagine the business not in terms of what it used to be, but in terms of what it can be.

Achieving sustainable growth

ESG initiatives that focus on one or two business silos are destined to fail. Success requires engaging every part of the business — not just the executive team or an isolated sustainability team — to drive the employee experience and cultural change that transformation requires. “Companies that have a mature ESG practice often find that it helps to drive innovation and strengthen governance across the board,” says Vocus’ Harris-Baxter, “but it’s not possible to achieve true sustainability integration unless everybody feels like it’s their job to drive the agenda forward.”

Find a way to measure your change and its outcomes

It’s not enough anymore for applications and systems to just work. To optimise your business and employee experience, clarify your key performance indicators and develop monitoring tools that allow you to meaningfully track the progress of your reinvention. This includes partnering with infrastructure providers capable of providing clear, real-time visibility into operations and automation to help ensure mission-critical services are never running at less than their optimal performance.

Enable your people to be their best

Buffeted by the winds of the pandemic and trends like the Great Resignation, the workplace is unlikely to ever be the same as it was in the past. Employees are demanding greater engagement, involvement with more meaningful transformation projects, and support for whatever work–life balance suits them. Failing to meet those objectives could see invaluable skills walk out the door, so make sure your infrastructure has the flexibility to accommodate their expectations.

> No matter where your organisation is on its digital journey, Connectivity 4.0 will unlock a new level of pervasive connectivity, enabling you to reimagine what’s possible like never before, and help better prepare your organisation for the future.

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About Vocus:

Vocus, Australia's specialist fibre and network solutions provider, owns and operates 25,000kms of secure, high-capacity fibre connecting all Australian mainland capitals with Asia and USA. Vocus' network includes the 4,600km Australia Singapore Cable (ASC) from Perth to Singapore via Indonesia and the 2,100km North-West Cable System (NWCS) from Port Hedland to Darwin connecting offshore oil and gas facilities. Vocus owns a portfolio of well-recognised brands catering to enterprise, government, wholesale, small business and residential customers across Australia.

vocus.com.au/brilliant-connectivity

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