



The Synergy of SD-WAN and LEO Satellites

Providing Essential Services Everywhere

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Introduction



Ecosystem research shows that technology-led transformation is now the most important business priority for 42% of organisations in Australia.

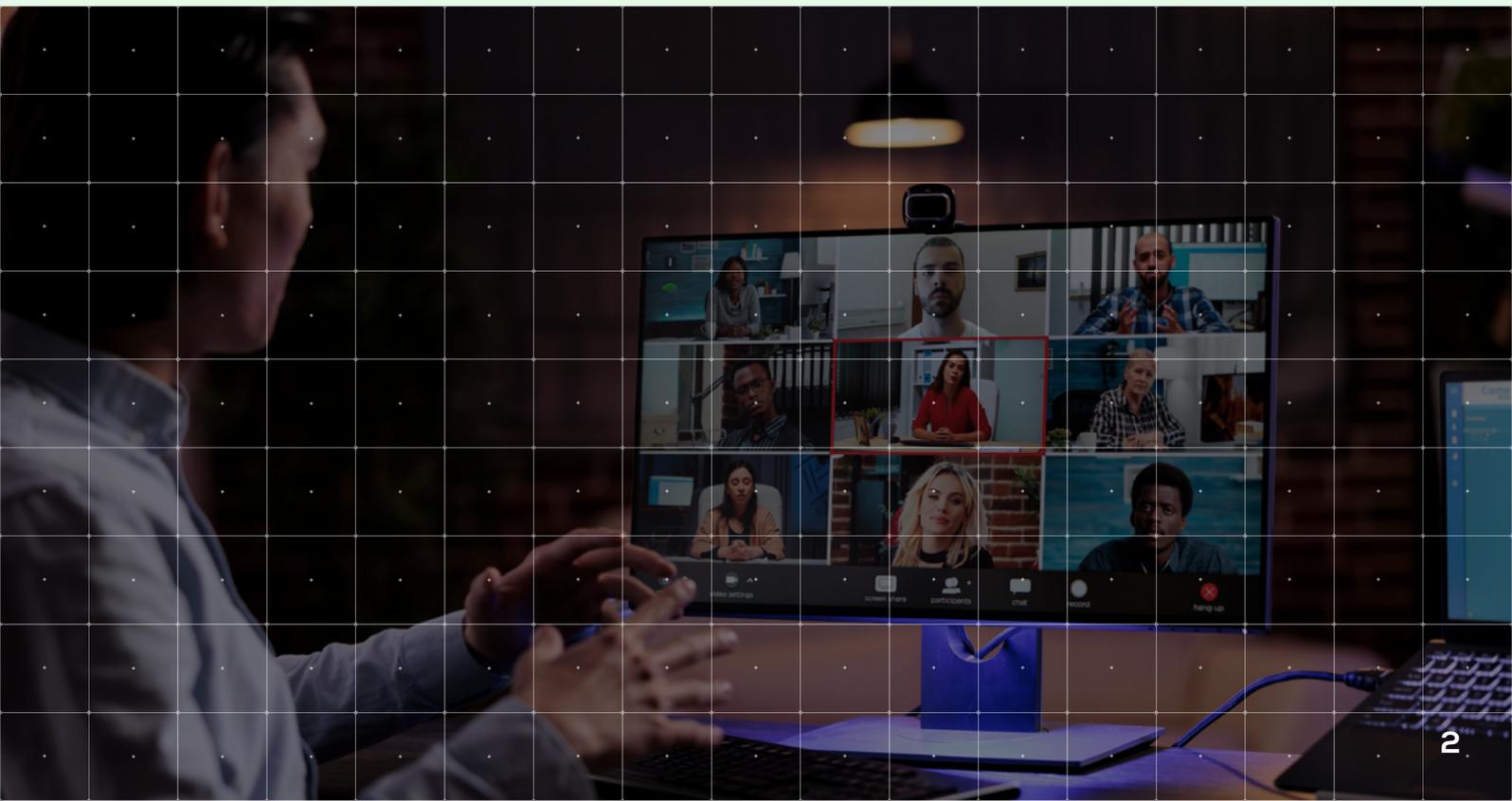
Organisations are progressively integrating digital technologies and cloud services into both their operational processes and customer-oriented solutions. However, organisations with remote production facilities and branch locations have faced challenges in fully harnessing technology due to a lack of reliable connectivity – and this has been particularly pronounced in Australia.

For more than a decade, Internet providers have developed novel technologies to connect these underserved regions where wired networks were unfeasible. Despite their impressive advancements, solar-powered drones, intercontinental balloons, and geostationary satellites fell short of their lofty goals. A giant technological leap in space engineering has enabled the launch of satellite constellations into low-Earth orbit (LEO), extending Internet accessibility to even the most remote areas of Australia.

At the same time, advances in network management allow remote organisations to harness this connectivity that is newly available to them. SD-WAN provides an overlay across any transport type, including LEO satellite, to enhance its responsiveness. This control layer improves application performance, bandwidth management, transparency, security, and cost. The provision of low latency, high-speed connectivity in remote areas will undoubtedly trigger innovation to help bridge the digital divide.



Already, 53% of Australian organisations have implemented an SD-WAN to take advantage of these benefits, according to Ecosystem data.



Linking Remote Australia: The Significance of Connectivity

Until now, many organisations across rural Australia have been forced to contend with the high-latency connectivity provided by the Sky Muster satellites included in the National Broadband Network (NBN). The government's [Better Connectivity Plan](#) has seen an allocation of AUD 1.1B in telecommunications funding for rural and regional communities.

The network is the backbone of digital transformation - IoT sensors, intelligent machines, remote operations centres (ROCs), and clouds need to be interconnected to facilitate the flow of data across the organisation. Organisations with presence across the country also aspire to offer the same services available in metropolitan areas to customers in remote areas. Industries in rural Australia often face unique operational challenges with lack of fixed-line infrastructure being paramount. Better connectivity can increase productivity, enhance decision-making, and improve links with global markets.

Improved connectivity will also see organisations across the country leverage IoT for better operational efficiency and employee experience.



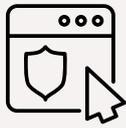
The Australian Digital Inclusion Index estimates that **almost 1 in 4 Australians is digitally excluded** and the gap is most pronounced in regional and remote locations.

Figure 1: What Organisations in Australia Want to Achieve Through IoT Deployments



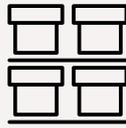
71%

Employee Safety



67%

Smart Security & Surveillance



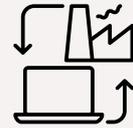
59%

Remote Inventory Management



38%

Energy Efficiency



36%

Remote Asset Tracking

Australia N=139

Source: Ecosystem Global IoT Study, 2023

The arrival of LEO satellite Internet services presents organisations with even greater opportunities to infuse their operations with data and connect to the world. It is a breakthrough for organisations in remote areas, providing a platform for them to digitise their operations. High-speed, low-latency Internet means organisations can integrate their own machine-generated data with real-time intelligence from external sources.

Introducing LEO Satellite Connectivity

The miniaturisation of satellites and [the lower price of heavy launches to low-Earth orbit](#) (LEO) has enabled the launch of satellite constellations in LEO – only hundreds of kilometres from the ground – which can provide higher bandwidth and lower latency than those at a geostationary orbital altitude of 35,786 km.

Figure 2: Low Earth Orbit (LEO) vs Geostationary Earth Orbit (GEO) Latency (ms)



With LEO satellite Internet services maturing, their capacity continues to increase. As constellations progressively grow, service providers can now sustain redundancy even in the event of malfunction or malicious attack. New beam hopping technology allows satellites to concentrate on congested locations, dynamically increasing throughput to adjust for changes in demand. [Northern Sky Research predicts worldwide satellite capacity will hit 172 Tbps in 2030](#), four times higher than what it is today. In the short span of their existence, satellite operators have generated a new, reliable, and high-performance Internet service available across the globe.

The Power of LEO Satellite Connectivity and SD-WAN

Access to the Internet anywhere is only the first step. As remote organisations propel their digital transformation journeys, they will need solutions to efficiently manage and optimise their networks. Adopting a software-defined approach empowers network and IT managers with those tools.

The advent of LEO satellite-based Internet services links industries in remote locations to the world. Integrating low latency, high bandwidth connectivity with an SD-WAN means organisations can supercharge their networks with greater performance, scalability, resiliency, and manageability. Ecosystem estimates that organisations can expect an ROI of more than 4x over five years with an SD-WAN. Breakeven can often be measured in months rather than in years.



Ecosystem research finds that **42% of Australian organisations intend to increase investments in SD-WAN over the next year.**

Reliability and scalability: enhancing organisations with SD-WAN and LEO satellite internet

A defining attribute of SD-WAN is that it reduces latency by allowing organisations to access cloud services directly without first routing through the corporate data centre. Avoiding backhauling is particularly important for remote sites that are already distant from headquarters and cloud data centres. Other key features include:

- 1 Application Aware Routing**
Deep packet inspection allows the identification of thousands of applications to enforce steering policies. High-priority traffic can be routed via satellite, broadband, or both depending on the network performance at the time.
- 2 Compression and Deduplication**
WAN optimisation tools, like data deduplication to eliminate redundant packets and dynamic compression help to reduce the volume of data transmitted. Preserving bandwidth is especially beneficial for remote sites without access to fibre circuits.
- 3 Forward Error Correction (FEC)**
This technique avoids packet loss by transmitting additional parity bits, which can be used to recover lost packets. For remote sites with high variability in network performance, packet ratios can be dynamically scaled up during periods of degradation.

Resiliency

A traditional WAN architecture that relies on a solitary transport type is vulnerable to outages due to the single path between the site, data centre, and cloud. This is particularly concerning for remote locations that may only have access to an inconsistent quality fixed-line circuit. An SD-WAN, however, can incorporate multiple transport types to build diversity. By performing bandwidth aggregation, traffic can be steered from a single application across a LEO satellite link and a fixed-line connection to avoid congestion during peak periods. Additional resiliency is added by SD-WANs with cloud gateways able to seamlessly redirect traffic to an alternative region during a nearby cloud outage.



Ecosystem finds that 64% of organisations in Australia will invest more on improving resiliency over the next year.

Scalability and Agility

Organisations that are undergoing geographic expansion demand networks that can be rapidly provisioned to promote scalability. The two main LEO satellite Internet providers, OneWeb and Starlink, can now deliver low latency, high bandwidth services across all of Australia. Requiring only a power source, user terminals come in a variety of form factors that can be self-installed. New branches can be added quickly in areas with limited connectivity options or where building new fixed-line circuits would cause delays and add costs. Remote sites can be onboarded to the SD-WAN by utilising automatically discoverable, plug-and-play appliances that can be deployed by non-IT personnel.

Manageability, Visibility, and Control

As WAN increases in size, it becomes increasingly complex, with the need to integrate a variety of applications, transports, and cloud services across an ever-growing number of sites. Not only does this create additional workload for network administrators, but it also has the potential to introduce new vulnerabilities.

A key benefit of SD-WAN is the ability to improve observability of the network and gain control. Centralised monitoring includes granular dashboards revealing metrics, such as latency, jitter, and packet loss across last and middle mile (in case of cloud gateways) paths for each application. This reporting not only accelerates troubleshooting and optimisation, but also lets network managers build in automation through insights into performance under various conditions.

Once zero-touch appliances are deployed, branches can be configured according to a template, which allows the orchestrator to enforce policies without requiring manual processes. Changes to policies can be made to multiple branches with a few clicks rather than updating them one at a time or sending technicians out to physically manage the device. Other valuable reporting features include network provider SLA policing, shadow IT discovery, and compliance audit logging.



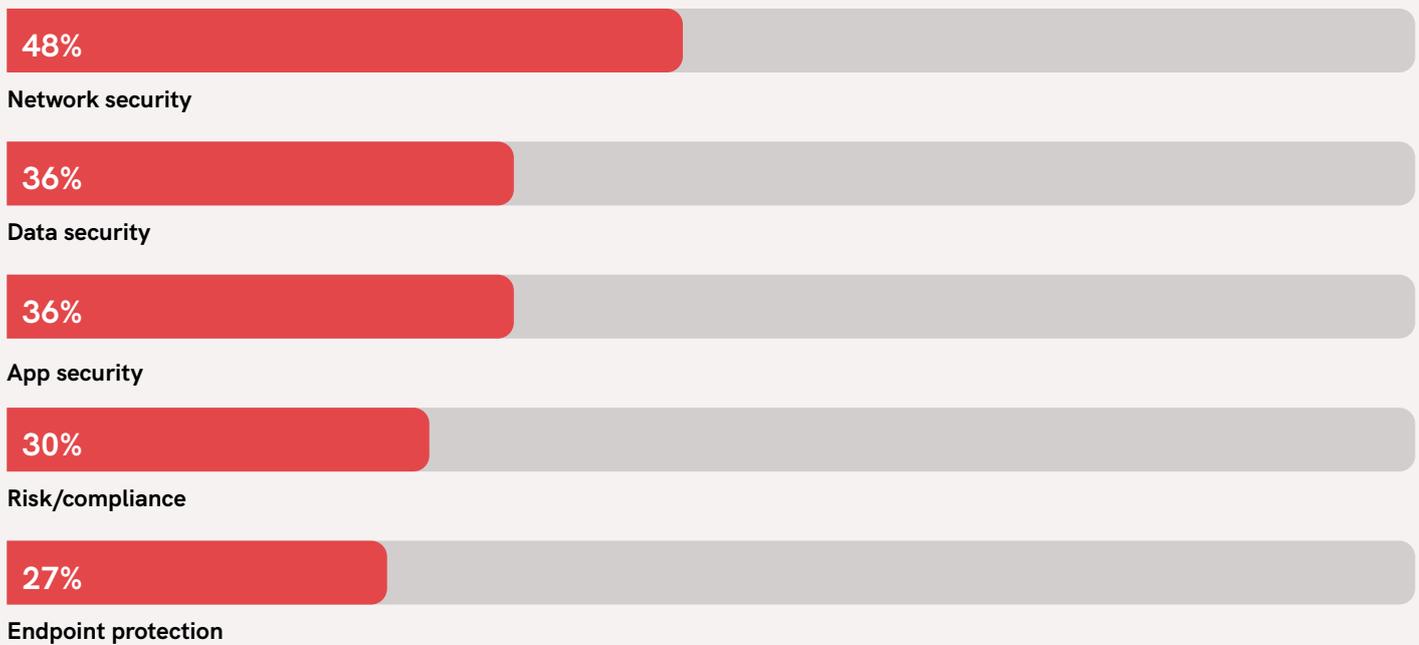
Security



Ecosystem research finds that **58%** of technology leaders in Australian organisations believe a data breach is inevitable. This not only emphasises the need for prevention but also the ability to limit the impact of any breach.

Network and security convergence is occurring at pace as organisations shift more critical workload and data to the cloud. One of the key features of SD-WAN is that it comes integrated with the necessary slice of the security stack at the branch rather than routing all traffic through a centralised data centre. Moreover, SD-WAN service providers allow traffic to traverse their own private backbone connecting directly to the major clouds, reducing reliance on the public Internet. An additional benefit of LEO satellite Internet coupled with SD-WAN is that inherent low latency supports secure, efficient communication despite encryption overhead.

Figure 3: Organisations in Australia Prioritise Network Security



Australia N=61

Source: Ecosystem Digital Enterprise Study

Industry Transformation: Unlocking Opportunities with SD-WAN and LEO Satellite Connectivity

For many organisations beyond the reach of urban infrastructure, digital transformation is difficult to even imagine. The emergence of LEO satellite Internet with the enhancements that an SD-WAN overlay can provide will create a foundation for remote industries to digitise their operations.

Agriculture

The dramatic rise in input costs and the need to increase sustainability are making digitisation more urgent in the industry. [The Australian Farm Institute estimates that the digitisation of Agriculture could add over AUD 20B in value to the industry.](#) Sensors deployed around crops, on drones, or in satellites are generating data to help farmers optimise their decision-making. More efficient fertilisation and irrigation, optimal planting and harvest times, and faster damage identification are all possible on data-driven farms. Automated ploughing, seeding, weeding, and harvesting are also helping to improve efficiency. For farmers to react at the optimal moment to changing conditions, the continuous movement of data, and reliable connectivity are now essential.

Transportation

The time-sensitive nature of transportation makes continuous connectivity vital to the industry's digitisation. [The Centre for International Economics estimates that connected and automated vehicles will provide AUD 299B in net benefits in regional Australia over the next 50 years.](#) Vehicles generate and consume increasing volumes of data, to enable asset tracking, predictive maintenance, autonomy and safety systems, emissions visibility, and route optimisation. Passenger services, including live timetable updates, instant ticketing, and onboard Wi-Fi also require robust Internet. Freight and passenger vehicles move between urban areas blanketed in signals and remote locations lacking terrestrial networks, necessitating an intelligent management tool like SD-WAN. This allows seamless switching between satellite and 5G over the journey and prioritisation of critical systems over bandwidth-hungry services like passenger entertainment.

Emergency Response

[To improve the resiliency of communications infrastructure during disasters, the Australian government has established a AUD 20 M innovation fund for technologies, like LEO satellite Internet.](#) Reliable connectivity plays a fundamental role in emergency response when communications can be the difference between life and death. During natural disasters, terrestrial networks can be damaged, making satellite connectivity a resilient solution. With mobile terminals that can be rapidly deployed, responders can establish command posts even in remote locations. This approach allows emergency teams to gather real-time data, coordinate efforts, and keep the public informed. Emergency responders are taking advantage of digital technologies, such as drone-based monitoring, space-based Earth observation, and AI to prioritise their action.

Mining

Employee safety, commodity price volatility, and environmental sustainability can all be addressed through digital transformation; however, connectivity remains a challenge. [Australia's Mining industry is a global leader in digitisation, accounting for 60% of the world's autonomous mining trucks.](#) Machine-generated data, captured by wearables, drones, cameras, and autonomous trucks can be turned into insights when they can flow across the mine. Employee safety can be improved through location-based hazard avoidance, AI-enhanced safety compliance and response, and autonomous vehicles. Mining productivity can gain a boost through remote exploration, predictive maintenance, and directing many tasks from ROCs. Using real-time data from sensors and weather forecasts, mines can reduce environmental impact by reacting quickly to adverse groundwater readings or rescheduling blasting during windy periods. Digital mines require edge computing with low latency connectivity to the cloud and ROCs to make certain data can be acted on quickly.

Developing a Roadmap with a Trusted Partner

For most organisations looking to extend their WAN edge to remote sites with LEO satellite connectivity, it will be a new experience with many unknowns. Simultaneously adding an SD-WAN overlay can be a difficult task without the help of an experienced advisor. Working with a managed services partner (MSP) that can integrate LEO satellite connectivity with the SD-WAN layer can remove much of the complexity that comes from managing multiple providers. This results in transparent, consolidated billing, unified SLAs, and ensures clients have a single point of contact and accountability in the event of network performance issues. The managed services model also facilitates the shift from CapEx to OpEx and allows an organisation to scale up its WAN as the business expands.

Organisations should work with a trusted partner to build a roadmap that starts with a strategic vision for business transformation. A services partner with deep expertise can identify digital solutions that align to this future state. It is important to select a partner that helps to assess and mitigate risk, while understanding the potential opportunity that connectivity can support in remote organisations.

Factors to Consider when Selecting a LEO Satellite Internet Service

The options for space-based Internet services are set to expand with new entrants preparing to deploy additional LEO constellations, while more traditional GEO satellite providers endeavour to modernise their own offerings. Below are some current and upcoming features that help to differentiate between consumer and enterprise-grade solutions.

SLAs and CIRs. SLAs and Committed Information Rate (CIRs) are available from business-grade ISPs to assure uptime and bandwidth. These assurances can be provided by limiting users in selected zones and using beam steering to prioritise clients with higher service requirements.

User Terminal Variety. Enterprise users require a broad range of equipment including robust, dual-parabolic terminals, ruggedised, vehicle-mounted terminals, and compact, flat-panel terminals.

Services and Support Ecosystem. Business-grade ISPs have built ecosystems to deliver tailored solutions. Additionally, managed support services ensure equipment reliability.

Portability and Mobility. While most user terminals are geo-locked to avoid congestion, ISPs are increasingly permitting portability. Handover technology that maintains a connection during motion is on the horizon.

Sustainable Space. Responsible ISPs are developing strategies to reduce their footprint in space by designing tools to avoid collisions and deorbit satellites sustainably at the end of their life.

Multi-Orbit Capability. This emergent technology allows user terminals to automatically switch between LEO, MEO, and/or GEO satellites to maintain redundancy.

Ecosystem Opinion



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Any organisation looking to digitise operations or extend digital platforms to remote sites should consider how low-latency, fast Internet can help to unlock new opportunities.

Not only do they require a high-quality connection, but also a unified management layer to infuse intelligence into the ever-widening network edge. LEO satellite Internet services integrated with SD-WAN can provide that solution for organisations in remote regions across Australia. SD-WAN delivers high-performance, scalable, and resilient networks with increased visibility and control. All of this is done in an automated way to reduce the burden on network and IT managers.

About the Author

Darian helps businesses navigate the path towards digital transformation, providing insight into cloud, automation, data management, and telecommunications. He has spent two decades advising business leaders on using technology to enter new markets, improve client experience, and enhance service delivery. Previously, Darian spent ten years at IBM, where he was a principal advisor for infrastructure services and hybrid cloud in Europe, with a focus on the telco and energy industries. Prior to this, he was a research manager at IDC, gaining emerging markets experience in Asia Pacific, Central Eastern Europe, Middle East, and Africa. In his final position, Darian headed up IDC's ANZ offshore research team based in Kuala Lumpur.

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