

Satellite Services Comparison for Australian Businesses

Stephen Myers
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Summary

As Australian businesses and governments of all sizes continue to digitalise their operations, the need for secure, ubiquitous business-grade connectivity to both urban and remote locations is growing. Satellites have become an increasingly important element in the mix of technologies used to meet these connectivity requirements. With digitisation and innovation comes the need for improved connectivity across an entire organisation's field of operation, irrespective of location.

nbn continues to promote choice in the business, enterprise, and government connectivity landscape, with integrated business-grade services extended to all parts of the country via fibre, wireless, or satellite services. The business nbn® Satellite Service complements the availability of its Enterprise Ethernet product, providing secure and reliable connectivity across the country. nbn Business Satellite products, provided in partnership with a range of satellite specialists and integrated service providers, are available to meet broadband connectivity, redundancy (disaster recovery), and IoT platform requirements.

A wave of innovation is transforming the satellite industry, with constellations of small satellites set to be launched into low earth orbit (LEO) and medium earth orbit (MEO). These platforms will leverage reduced launch costs, less expensive satellite designs, and new antenna technology to address the limitations of geostationary satellite systems, namely capacity and latency. Starlink is the most high-profile LEO satellite service, while enterprise-focused platforms O3b mPOWER and OneWeb are still early in their build and launch programs. Starlink offers a business product but has yet to launch sufficient satellites or build enough ground stations in Australia to offer consistent nationwide coverage and business-grade service.

Satellites have long supported the communications needs of the agriculture, mining, oil, gas, transport and logistics, and government sectors. However, this is changing in today's hyperconnected, data-driven world; small and medium-sized businesses (SMBs) now need access to reliable bandwidth, irrespective of their location. Communications needs are growing as universal access to corporate applications becomes essential, integration with cloud services becomes the norm, and staff increasingly expect reliable broadband access. Securely incorporating remote sites into the corporate network is now not only essential; it is also an enabler of innovation and improved efficiency requiring reliable bandwidth to meet the businesses digital tools and goals.

This paper considers the role of satellite services for businesses, enterprises, and the government; outlines alternative satellite platforms, their coverage, and capabilities; and compares the types of products available to customers seeking satellite connectivity in Australia.

The role of satellites in business

Since the first geosynchronous orbit (GEO) commercial communications satellite, Intelsat 1, commenced service in 1965, satellites have played a key role in business communications. Satellites provide a flexible solution for locations where communications infrastructure is limited or costly to deploy. Communications satellites support mobility and efficient content broadcasting and can act as a redundancy for other communications platforms.

Remote connectivity



With short lead times, the key strength of satellites is their ability to connect remote locations where a fixed line or mobile infrastructure is unavailable. Deploying satellite connectivity is often more economical than extending terrestrial networks, particularly if users connectivity needs are limited to a finite timeframe. Satellite ground equipment also offers the opportunity for redeployment when connectivity requirements shift.

Redundancy and security



Satellites are an attractive alternative for backup connectivity if network failures impact terrestrial networks. Satellites can offer a highly diverse path, with minimal sharing of infrastructure used for primary connectivity routes. Differences in technology platforms can also mitigate risk from cyber-attacks targeting key communications infrastructure.

Mobility and IoT solutions



By extending the limits imposed by mobile tower locations, mobile satellite solutions offer nationwide coverage in addition to supporting maritime and aviation connectivity. Connectivity for IoT solutions in the transport, logistics, agriculture, resources, and energy sectors is often best provided via satellite.

Broadcast



Media distribution, electronic news gathering, and outside broadcasting solutions rely on satellites to flexibly and efficiently transmit radio and television signals for broadcast. Media distribution remains the largest source of revenue for the global satellite sector. While not widely used beyond the media sector, multicast services can be used by enterprises to distribute common media to multiple sites without consuming excessive network bandwidth.

Satellites are also commonly used within the telecom sector for backhaul, providing connectivity to remote mobile towers and private networks. Satellites complement fibre and wireless infrastructure to provide robust communication services to business customers.

Satellite platforms

GEO satellites

Most communications satellites operate in a geosynchronous equatorial orbit (GEO), maintaining a stable location in the sky above their footprints. GEO satellites can support coverage to large parts of the world, with a fleet of only three satellites needed for global coverage of populated areas.

The ability to provide an extensive coverage footprint makes GEO satellites ideal for the following:



Connecting geographically distant locations, such as cities in different continents and remote communities



Broadcasting and distributing video content; satellite is a primary platform for distributing pay TV services



Providing uninterrupted connectivity in areas with limited or no terrestrial networks; maritime craft are heavily dependent on satellite communications

With efficient fuel management, GEO satellites are commonly designed for an operating life of 15 years or more. The service footprints of existing GEO satellites were (with limited exceptions) defined at the point of design and reflect the territories in which local regulators have licensed access to radio frequencies.

The economics of satellite operations involves extremely high upfront costs (satellite construction, launch, and launch insurance) with finite capacity available for sale over the satellite's operational life. This model has required operators to secure keystone customers—generally major broadcasting or pay-TV providers—to underwrite the viability of each satellite. With each satellite commonly delivering a capacity of only 1–3Gbps, the cost of broadband capacity for satellites is higher than that of terrestrial networks.

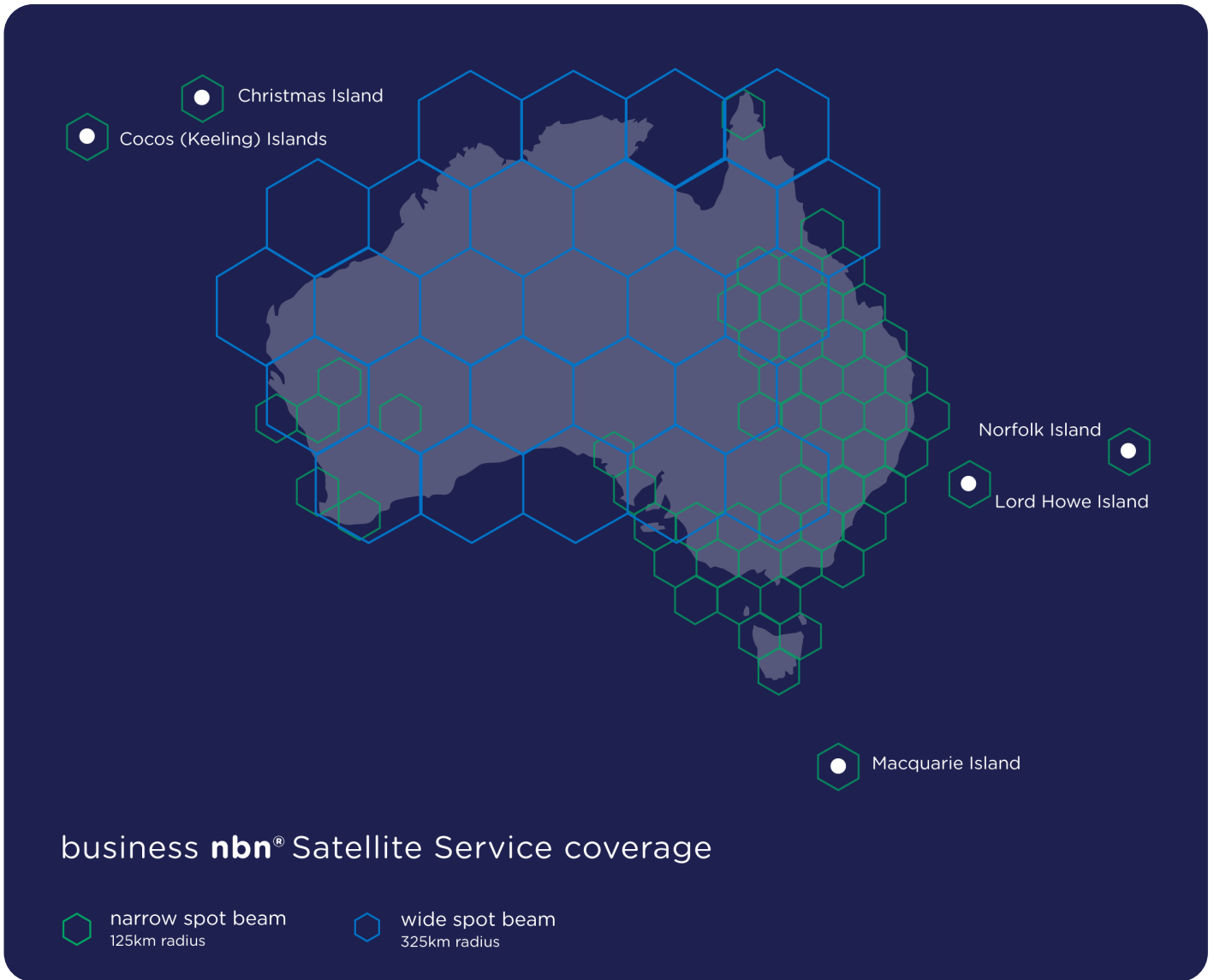
GEO antenna deployed at the customer's site consist of a simple, fixed terminals, a time -tested configuration with proven reliability.

HTS

GEO satellite design has evolved with high throughput satellites (HTS) offering coverage via multiple rather than a single beam, allowing radio frequencies to be reused and multiplying the available capacity. nbn's two Sky Muster satellites were configured with 101 spot beams, delivering a combined capacity of 180Gbps.

Figure 1: nbn's satellite spot beam configuration

NBN Satellite Coverage



Graphical representation not to scale. October 2022

Source: nbn October 2022

Advances in satellite technology enable beam configuration to be managed using software, rather than defined at the point of design. As a result, satellite operators can reconfigure beam designs to reflect changing demands on the ground and respond to special circumstances such as natural disasters.

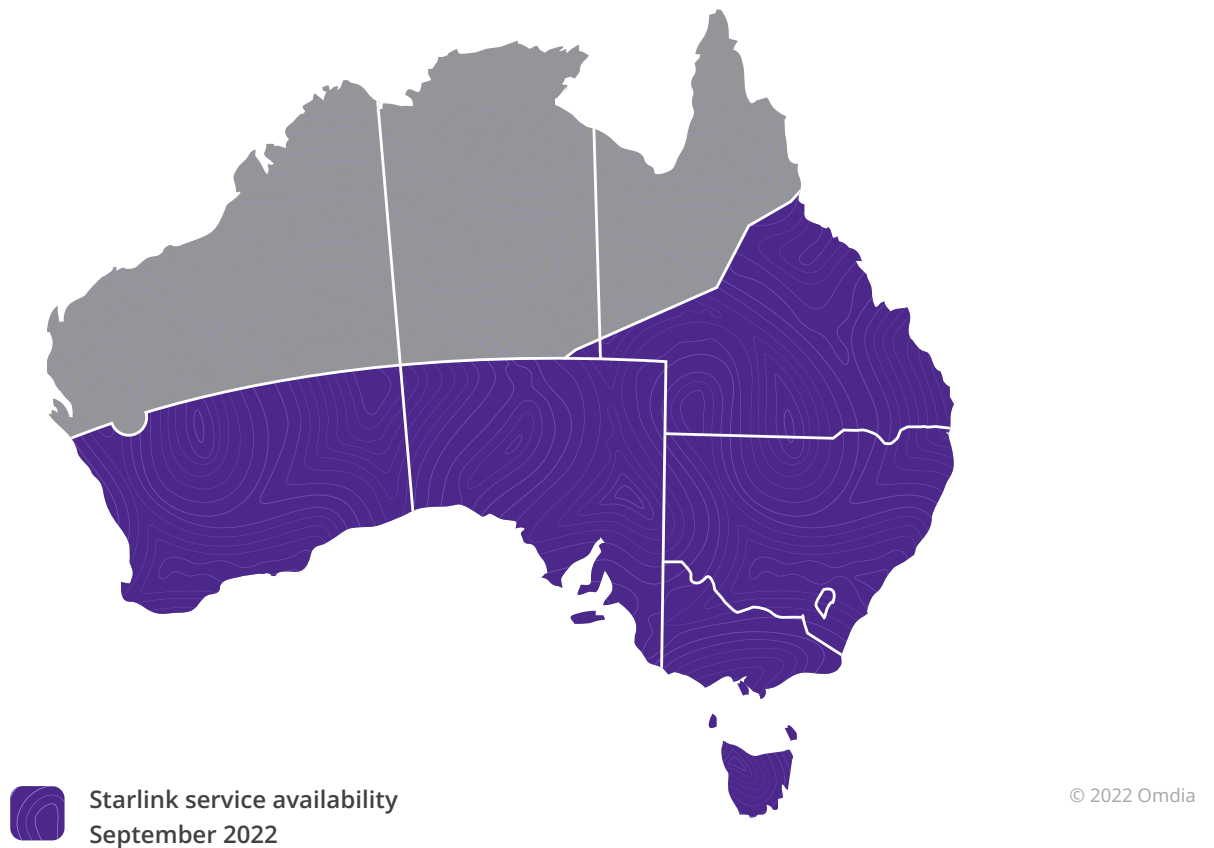
LEO and MEO satellites

The satellite industry is experiencing a wave of innovation, with several LEO and MEO satellite systems under development. The key advantages of these systems are lower latency (due to significantly shorter travel distances for radio signals) and system capacity.

These systems use a constellation of small satellites (generally under 1 tonne) that rapidly orbit the earth. Numerous satellites are required to maintain coverage, with each satellite only able to see (i.e., service) a limited and constantly moving footprint. Systems providing services with an insufficient number of satellites will suffer from periods without coverage. Starlink, backed by SpaceX's capacity to orbit more than 50 Starlink satellites per launch, has launched over 3,000 satellites.

Figure 2: Starlink's constellation service coverage illustrated

Starlink's constellation service coverage



The movement of satellites across the sky introduces additional challenges for LEO and MEO operators. Ground equipment must track each satellite, which for dish-based systems requires constant movement (adding to customer power and maintenance requirements). The alternative is to use phased array antennas (PAAs), hardware that processes signals via many small antennas to electronically direct signals between the satellite and the earth terminal. PAAs are also used where the terminal is in motion (i.e., planes and ships), but the technology is relatively new and remains expensive.

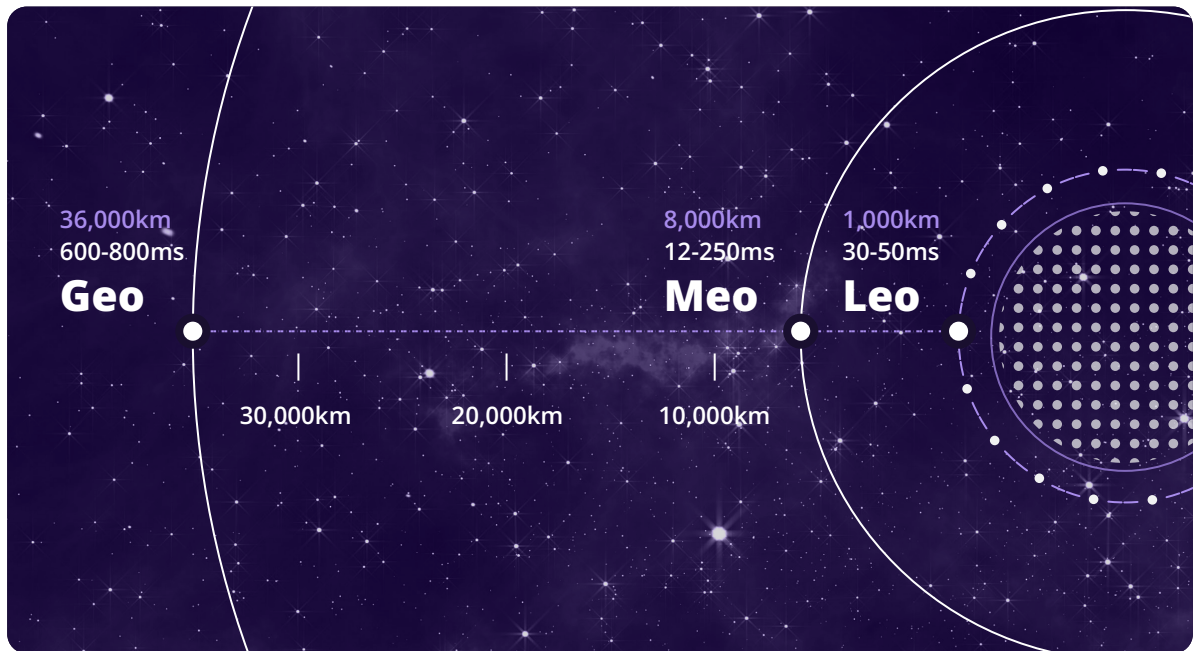
The capacity of an LEO or MEO system is a function of the number of satellites in the system, with each satellite effectively able to support a separate beam or cell. At lower orbits, more satellites are needed to maintain coverage, thereby increasing the system's capacity.



Latency and application performance

The transmission distances involved in satellite communications can affect application performance. Roundtrip latency—the delay in delivery of a data packet due to the transmission of a packet into orbit and back—is a function of orbital altitude. Figure 3 shows transmission latency for the different orbital altitudes.

Figure 3: Impact of orbital location on latency



Source: Omdia

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By comparison, roundtrip latency is around 200ms for a fibre link between Sydney and New York (16,000 km).

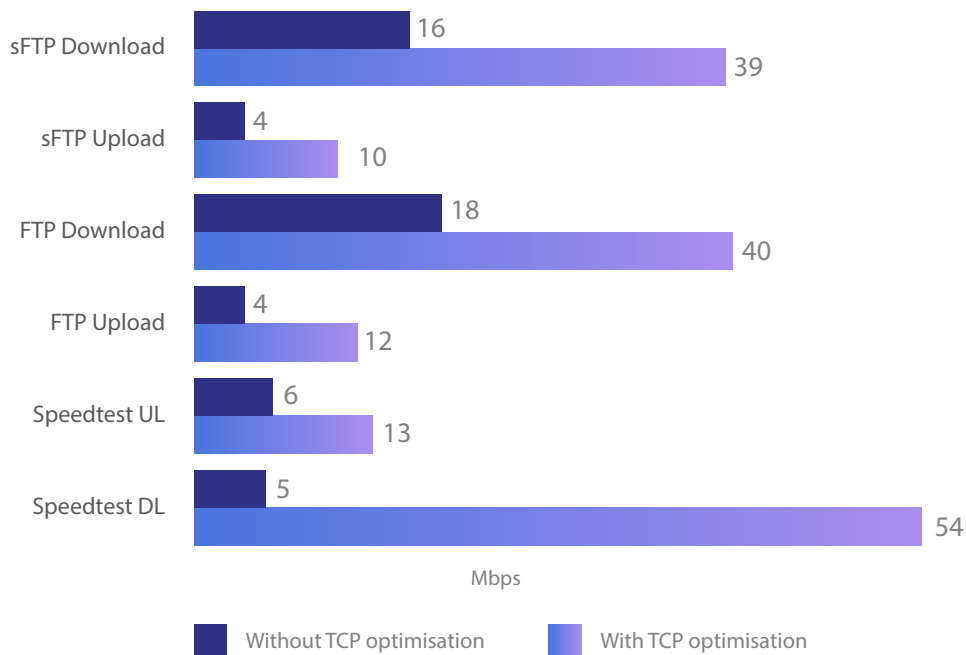
This latency can affect user experiences, particularly for highly interactive, real-time applications, such as high-frequency trading, online gaming, and specialised applications with low time out requirements. Enterprise applications in remote locations facing latency constraints can include remotely operated vehicles and machinery, double satellite voice or video conferencing, and VPNs (which do not support acceleration). Latency starts to be evident to users when it exceeds 100ms.

As enterprises move workloads to the cloud, latency can affect application performance and productivity, especially if the applications are not designed with environments with latency tolerance in mind. The emergence of edge computing reflects a desire among enterprises to not only enable new processes, but also improve application performance by removing latency from these processes.

Satellite operators, including nbn, offer solutions that mitigate the impact of latency. HTTP and TCP accelerators improve website loading times by prompting data transmission without waiting for the user's device to acknowledge receipt of the previous packet. Figure 4 highlights the improvements throughput that can be achieved with Transmission Control Protocol (TCP) acceleration.

Figure 4 – Benefits of TCP optimisation

Benefits of TCP optimisation



Source: nbn

© 2022 Omdia



Acceleration solutions can include TCP fast start (a solution that skips the bandwidth discovery process at the beginning of a transmission session), webpage optimisation (prefetching and caching pages in anticipation of usage), and the use of multiple TCP sessions. Application streamlining, which involves changes to application communication protocols, can also help optimise performance.

Australian service availability

VSAT services are available nationwide from GEO satellite operators with Australian coverage, including Optus and Intelsat. Inmarsat offers satellite-based mobility products targeting the transport sector.

The business nbn® Satellite Service is currently offered via 16 service providers, which are a mix of specialist satellite brands and major integrated service providers. Customers can select a service provider based on their specialised product needs or as part of a broader connectivity portfolio that may include other nbn services; several providers also retail nbn’s Enterprise Ethernet product providing customers a nationally integrated fixed line, fixed wireless and satellite communications network solution. Business Satellite Services are available nationwide (unlike the consumer-focused Sky Muster services), including on remote islands such as Norfolk Island, Christmas Island, Lord Howe Island, and the Cocos (Keeling) Islands.

Figure 5: nbn Business Satellite retail service providers – updated RSP list



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Most retail service providers (RSPs) offering the nbn business nbn® Satellite Service are Australian-owned or Australian-listed. For customers sensitive to foreign ownership, several options combine the entirely Australian-owned and operated infrastructure of the nbn with an Australian service provider. Use of local suppliers ensures Australian privacy and security requirements are met, and customers benefit from nbn’s cybersecurity capabilities.

Product comparison

The following product comparison assesses the relative performance of available satellite platforms without focusing on specific products. The assessment positions each platform relative to its peers across six criteria central to an enterprise procurement decision. In each radar chart, a scale of “5” indicates a favourable assessment, while “1” indicates a less favourable comparison. A service is considered “Enterprise ready” if it is specifically designed for enterprise rather than consumer use. Further considerations may include service level agreements (SLAs), security and privacy policies and capabilities, sovereignty, and opportunities for integration with existing network infrastructure and contracts.



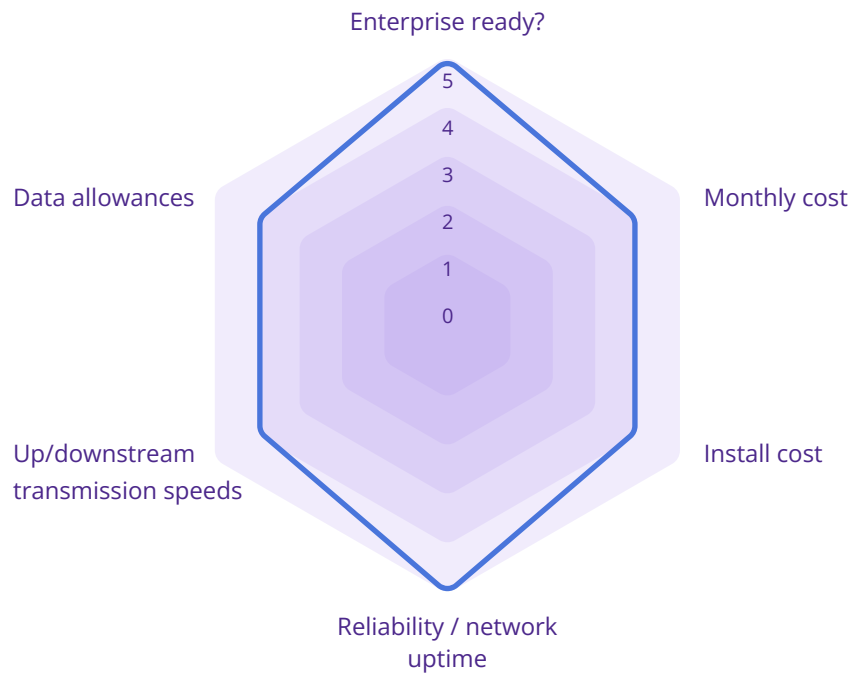
business nbn® Satellite Service

nbn's wholesale business-grade satellite services are designed to enable RSPs to offer committed capacity (wholesale speeds of up to 50Mbps downstream and 13Mbps upstream) to government and business customers. Services can also be configured to support additional speed bursts of up to 50Mbps (contended). Depending on the underlying service, plans offer unlimited data or quotas in 100GB increments. nbn and its RSP customers published that the target network availability is 99.7%.

The service offers VoIP traffic prioritisation, standby mode plans to support disaster recovery requirements, and three service levels. The nbn satellite services are wholly owned and operated in Australia and protected by nbn's network security operations.

Figure 6: Product assessment – business nbn® Satellite Service

Business nbn® Satellite Service



Source: Omdia

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nbn has reduced the total cost of operations for satellite services, waiving equipment and installation charges (up to \$9,000), when a contract for at least one year is signed. Advertised retail plans start from \$429 per month for a service offering transmission speeds of 30Mbps downstream and 1Mbps upstream and a 100GB data allowance per month.

business nbn® Satellite Service offerings also include products designed to support IoT devices (with bandwidths as low as 10kbps).

nbn Sky Muster and Sky Muster Plus

The Sky Muster product is an entry-level, consumer-focused service outside the coverage footprint of nbn’s fixed-line and fixed-wireless networks. The wholesale service supports either of the following speeds:

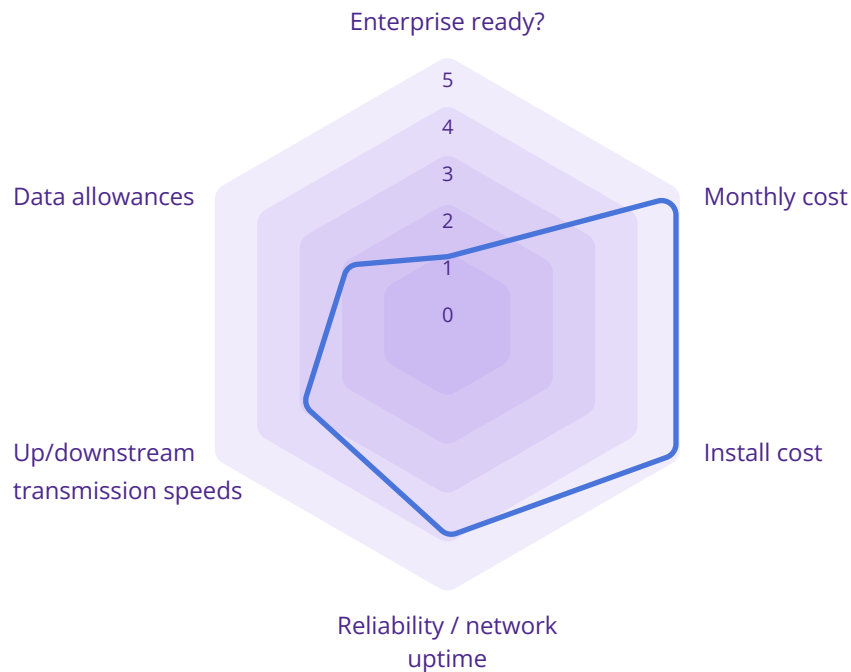
↓ Up to 12Mbps downstream ↑ 1Mbps upstream

↓ Up to 25Mbps downstream ↑ 5Mbps upstream

The Sky Muster Plus plans can burst above 25Mbps downstream and feature unmetered data with the exception of video streaming and VPN traffic, to which a data allowances of between 25GB and 150GB per month for traffic between 4pm and midnight is applied. Video streaming and VPN traffic is shaped to 128kbps if the monthly data allowance is exceeded.

Figure 7: Product assessment – nbn Sky Muster Plus

nbn Sky Muster Plus



Source: Omdia

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The service may be sufficient for small businesses, but as a consumer-grade service it does not have the additional features that are expected from corporate and government customers, such as higher service levels and flexible plan and bandwidth options, and may at times be subject to traffic congestion. Sky Muster Plus plans cost significantly less than market alternatives, with plans advertised for as little as \$50 per month.

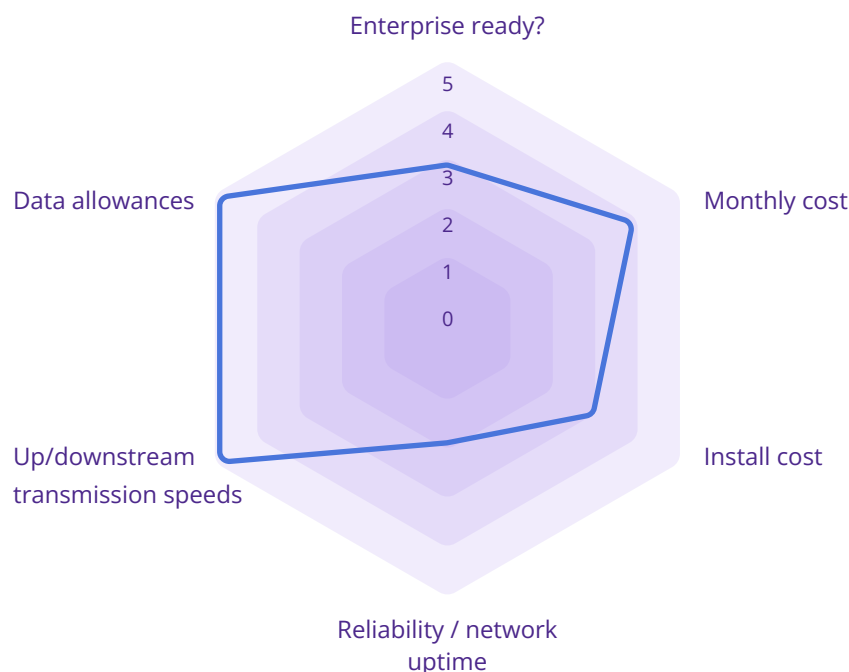
Starlink Business

Starlink Business was launched in February 2022, offering faster speeds than Starlink’s standard service. Initially branded as a premium service, its expected download speeds range from 100–350Mbps (square hardware) or 100–300Mbps (circular hardware), while expected upload speeds of 20–40Mbps or 15–40Mbps are advertised. Starlinks’ advertised expected download speeds have been lowered since the launch of the business service, as customer numbers have grown. The provider has yet to achieve nationwide coverage, with much of northern Australia on a waitlist.

Starlink advertises network reliability exceeding 99%; however, this figure may be unacceptable for many businesses because it suggests the service may be unavailable for up to 15 minutes per day (on average). No service level or performance guarantees are offered. As Starlink increases its number of operational satellites in orbit (currently around 2,500, with plans to go up to 12,000), the frequency at which an end user has no line of sight to a satellite will decline.

Figure 8: Product assessment – Starlink Business

Starlink Business



Source: Omdia

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While data use is uncapped, business customers do not have access to committed capacity and service performance may be affected by the activities of other users in their region. This may be unacceptable for users requiring connectivity for business-critical applications.

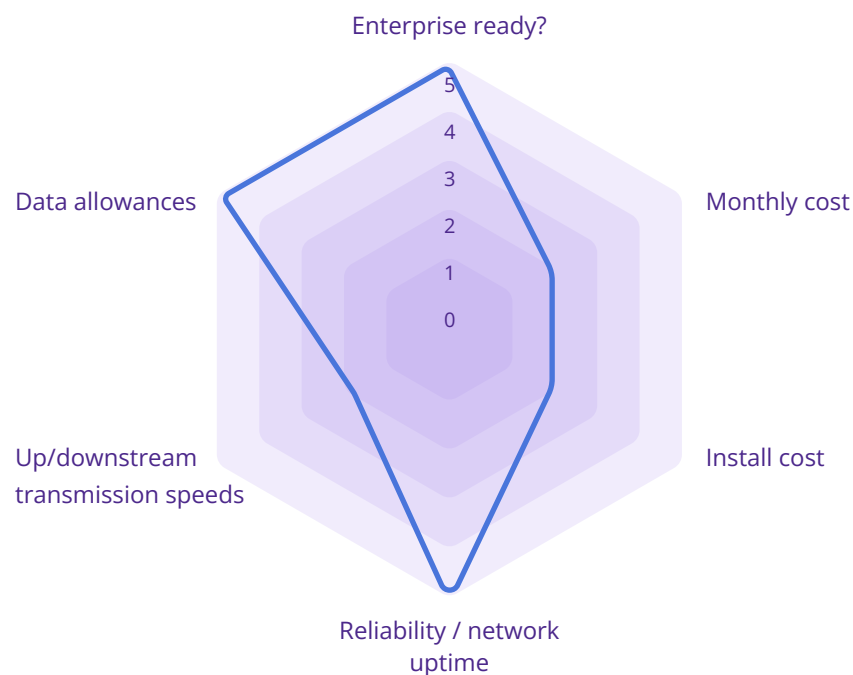
US owned and operated, Starlink Business costs \$750 per month on top of an initial \$3,740 hardware fee, and is sold directly to the end user. Support is mostly provided online via Starlink's global customer operations based in Washington and California. As a standalone service, the Starlink service cannot be purchased as part of a local RSP's network service, with customers forgoing the benefits from the local support and integration opportunities this affords.

Traditional GEO satellite services

Several GEO satellite operators offer VSAT connectivity for the Australian business market. bandwidth is generally low, and committed information rates are available for a premium. Subscribers must sign long-term contracts (e.g. two years) and incur both monthly and equipment (dish purchase and installation) costs, resulting in high ownership costs. Services are well established and offer good reliability (99.85% or less than three minutes of downtime per day).

Figure 9: Product assessment – Traditional GEO satellite services

Traditional GEO satellite services



Source: Omdia

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With six operational satellites, Optus is the largest Australian-focused GEO satellite provider, offering satellite connectivity alongside a range of other connectivity and business applications to enterprise customers. Large international satellite providers can offer regional or global connectivity options, facilitating connectivity between sites in multiple jurisdictions for multinationals and supporting transport solutions (shipping and aircraft).

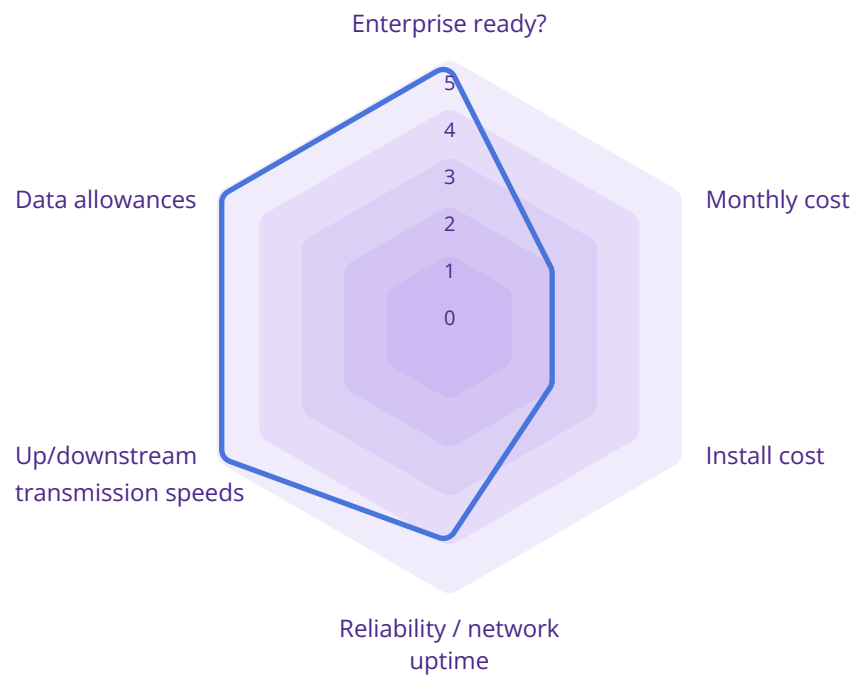
The GEO category also includes services from regional HTS operators. Satellites such as Intelsat Horizons-3e provide coverage across the Asia & Oceania region, with a proportion of beams directed to cover Australia. Horizons-3e features 41 Ku-band transponders, with four spot beams focused on Australia. Telstra Agile Satellite uses the Horizons-3e platform.

O3b MEO

O3b is an MEO satellite platform operated by SES that started offering services in 2014. The platform draws on a fleet of 20 satellites orbiting at an 8,000km altitude, and each satellite has a capacity of 16Gbps, split between upstream and downstream connectivity. The MEO orbit delivers data services with a latency of around 140ms.

Figure 10: Product assessment - O3b

O3b



Source: Omdia

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O3b has a global focus on providing connectivity to remote areas, with several regions in the Pacific using the platform as their primary means of internet connectivity. For SES Networks, the operating unit of the O3b platform, a third of its revenue is from government customers (including defence), and the rest is from high-value enterprise customers.

Future satellite platforms and capabilities

The satellite sector is undergoing a wave of innovation. Small satellites, improved launch economics, and advances in in-space communications and data processing are all changing the scope of services available. New entrants are launching satellite constellations, and established players are building high-capacity platforms. LEO platforms are attracting the greatest investments, with OneWeb and O3b mPOWER services set to launch over the next two years. Launch plans are also underway for Amazon's Kuiper Systems and Telesat.

Upcoming launches will see new capabilities introduced to the market while expanded service offerings are made available to business customers.

OneWeb

OneWeb is launching a fleet of 648 LEO satellites, with around 428 currently in orbit. Full global coverage is not expected for a further 18 months. In Australia, OneWeb has distribution agreements with Field Solutions Group (FSG) and Vocus, while Telstra announced an MOU to provide ground stations and service distribution.

O3b mPOWER

With the launch of 11 satellites planned between 3Q22 and 2024, mPOWER will extend SES' MEO satellite offering. Rather than 10's of Mbps, terminals will be able to support 10's of Gbps, with latency under 150ms. Customers can also select their gateway of choice, allowing traffic routing to be optimized. mPOWER targets an uptime of 99.5% and will be marketed as providing fibre-like connectivity to cloud services.

Optus 11

Set to be launched in 2H23, Optus 11 will be the first software-configurable satellite providing coverage to the Australian and New Zealand markets. The satellite will be able to adjust its coverage, capacity, and frequencies through onboard processing and active antennas with beam-forming capability. Consequently, Optus will be able to actively reconfigure the capacity available for broadband connectivity to meet changing demand patterns.

The capacity of the Very high throughput satellite (VHTS) is expected to range from 500Mbps to 1Tbps, but some of this capacity will be allocated to supporting broadcasting services. Optus will continue its history of providing services to the broadcast sector, with Sky New Zealand signed as a cornerstone customer. Optus will also use its satellite to provide backhaul capacity to its mobile network and the Australian government's Mobile Black Spot Program.



Viasat-3

ViaSat-3 is a fleet of three GEO satellites that will provide global non-polar coverage. The satellite to service Asia is third in line for launch and is scheduled to operate in early 2023. Each VHTS satellite is expected to deliver throughput of around 1Tbps, distributed over Asia & Oceania.

Because of its broad coverage, ViaSat-3 is well-positioned to support transport solutions; with satellite provider Viasat looking to strengthen its position in the in-flight connectivity market. Viasat expects to be able to support speeds of up to 1Gbps to maritime, enterprise, and government customers, as well as broadband solutions for unconnected populations.

In Australia, Telstra has entered an agreement with Viasat to collocate satellite access nodes (ground stations) at hundreds of sites across Asia & Oceania, all connected by fibre. Telstra will likely add ViaSat-3 capacity to its satellite solutions portfolio offered to Australian and multinational enterprises.

Other capability developments

Notable technology developments with potential to enhance satellite capabilities include the following:

Inter-satellite communications: Operators of constellations are looking to support direct communications between satellites. This capability results in the following:



Extending LEO satellite services in areas where no ground stations are in view



Allowing the formation of private networks connecting distant countries with no links that transit other states



Complicating the management of data sovereignty and privacy risks as data travels through different jurisdictions

Direct-cloud links



The integration of ground stations in data centres improves the availability of cloud services via satellite connections. SES is an early mover in this space, offering connectivity solutions to AWS and Azure data centres. With hyperscale operators keen to expand their involvement in the satellite sector, Omdia expects other providers, including nbn, to offer similar capabilities in the near-term.

In-orbit data processing and storage



The inclusion of small-scale data centre capabilities in orbit brings processing power closer to the satellite-connected end user.

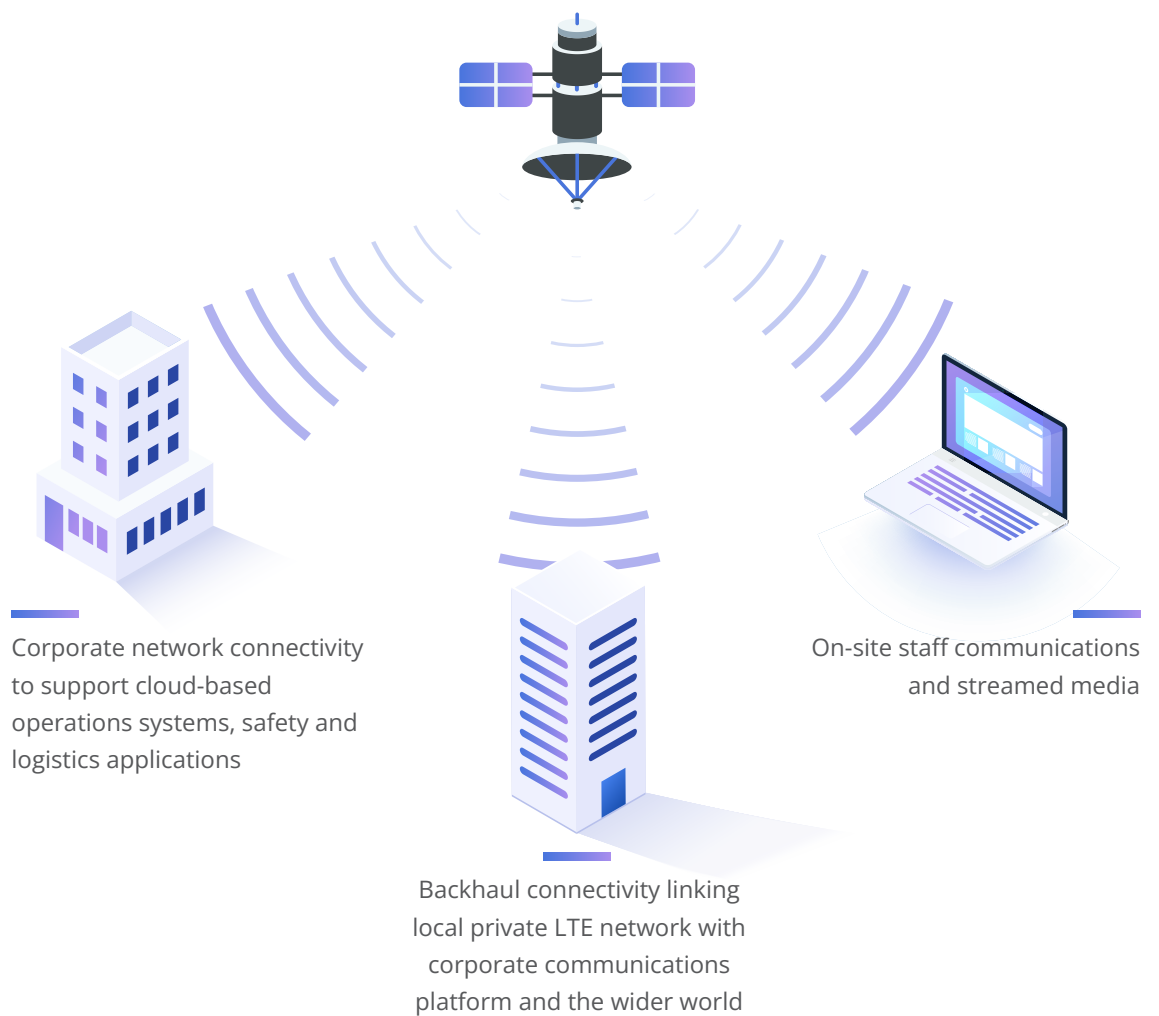
Deployment scenarios

Figures 11 and 12 depict two satellite connectivity deployment scenarios.

Mining site

Operations at mining sites are increasingly connected to corporate networks to enable remote operations (including remote-controlled machinery), logistics planning, and reporting. Wi-Fi and mobile connectivity improve communications within the site and with the rest of the world. Worker lifestyle is improved with access to streamed media, communications, and online services such as telehealth.

Figure 11: Mining site deployment scenario



Source: Omdia

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Wind farm operator

Renewable energy generation sites are often located away from populated areas and thus lack communications infrastructure. Satellites can help operators in several ways: Head office sites can be given a backup link that is not reliant on terrestrial networks, ensuring uninterrupted connectivity with unattended generation sites. Remote sites can be supported with consistent connectivity for real-time operational control, fault alerts, and performance data collection. Site security can also be maintained with CCTV feed streamed to the central office.

Figure 12: Wind farm operator deployment scenario



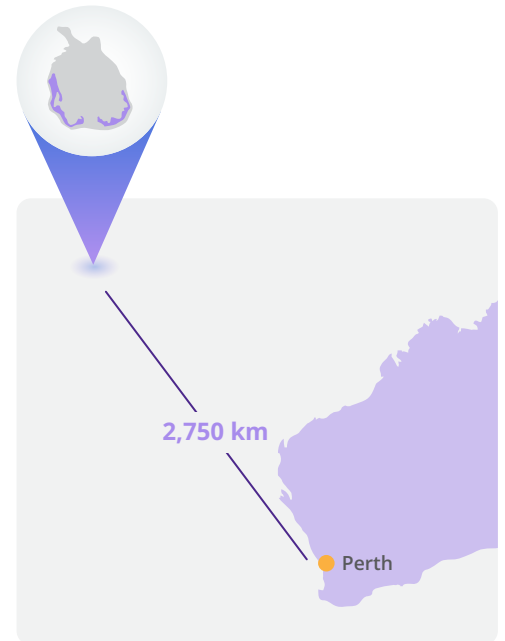
Source: Omdia

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Case study

Cocos (Keeling) Islands

Indian Ocean Territories Telecom (IOTT) is the local internet service provider on the Cocos (Keeling) Islands, an Australian external territory located in the Indian Ocean, 2,750 km from Perth. IOTT provides the local population, businesses, and government organisations with 4G mobile services and internet connectivity, relying on satellite as the mainstay of communications services. Previously a user of C-band and Sky Muster capacity, IOTT has seen recent demand for business nbn® Satellite Service.



Brad Waugh, director of IOTT, speaking of his use of the Business Satellite service as the backhaul platform for the island’s 4G network



“I couldn’t really get the quota and quality of service that I needed to run it, but with the business service I can now get an unlimited service plan and run the network well off that.”

The platform is meeting business needs, with VPN and secure platforms going **“from an unusable system to being able to be logged on 24/7,”** said Waugh.

The Business Satellite service is used by critical community services, including the Australian Federal Police (AFP) and airport, as well as the local school and freight handling co-op. It will soon support operations for the local power and water company. The Business Satellite services have proven an attractive solution, addressing:



Data allowances

Sky Muster’s home broadband data allowances had proven insufficient for the needs of the island’s school, regularly running out by mid-month.



Signal reliability

Tropical rainfall can cause rain fade, but the larger dish with a higher-power transceiver used for the Business Satellite service alleviates this issue.



Cost

The Business Satellite service has replaced C-band capacity at a substantially lower price. C-band, costing around \$2,000 per Mbps, was retained only to support a few niche low-bandwidth applications and as a redundancy.

IOTT works with several wholesale suppliers but highlighted the responsiveness and efficiency of MultiWave Networks when dealing with support requests.



“The service has been really good”

Brad Waugh, director of IOTT

MultiWave Networks, founded in 2016, is a privately owned and funded company established to provide wholesale nbn satellite services to the Australian market. As a B2B provider, MultiWave delivers to its downstream partners white label services tailored to their needs. The company is associated with Pivotel, a specialist provider of secure satellite and cellular communication solutions to Australian individuals, businesses, communities, and government institutions.

Case study

Vocus

Vocus supports many customers in the resources and government sectors, market segments that often need connectivity in remote locations. The business nbn® Satellite Service become central to meeting these needs, used in Vocus’ wide area networking products and supporting high levels of service assurance.



“It’s a great product; technically it is the best geo-satellite offering in the region”

Ashley Neale (Vocus Development Manager – Space and Satellite, Special Projects), commenting on Vocus’ adoption of the business nbn® Satellite Service



While continuing to offer customers other satellite services, the nbn BSS has become core to Vocus' remote connectivity proposition. Vocus identifies several factors for this:



Fully feature product

the business nbn[®] Satellite Service meet the requirements of Australian business with bandwidth and SLA options that align with business KPIs.



"It's the best geo-satellite service in the region, built on business-grade SLAs."



Integration

the business nbn[®] Satellite Service product design aligns with industry standards facilitating integration with other services. This standardisation allows Vocus to provide customers a spectrum of services, using a range of technology platforms, and deliver the same experience.



"nbn has made it easy for us to deliver that great experience for our customers."



Local support

Vocus takes confidence that should customers come to them for support, nbn has the local resources to promptly respond to service requests. Local workforce and 24/7 support from nbn allows Vocus, to maintain high levels of customer satisfaction.



"There is no other satellite operator that has such a big team in Australia, whose sole mission it is support their RSP ... and support us with our customers."

The ability to rapidly deploy a remote service is also highly valued by Vocus. During the COVID-19 outbreak in Wilcannia the government came to Vocus to source the communications needed to support the police and army deployment. Working with nbn, connectivity was able to be establish within days – ***"and you just can't do that on anything else."***

In late 2021 Vocus was awarded the Australian Space Industry Award at 2021 ACOMM Awards in recognition of its commercialisation of the BSS product.

The author wishes to thank the following for their assistance in developing the above case studies

Brad Waugh of IOTT

MultiWave Networks

Ashley Neale and Steve McGrory of Vocus

Appendix

Methodology

This report is based on Omdia's primary research, discussions with industry participants and research resources. Product assessments were undertaken between May and August 2022 and reflect publicly available information of the services considered.

Author

Stephen Myers

Principal Analyst, Service Provider –
Strategy and Regulation, Omdia

stephen.myers@omdia.com



Get in touch

www.ondia.com

askananalyst@ondia.com

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