



Introduction to
nbn™ Internet of Things (IoT) Satellite Services

Wholesale Service Provider of



Lower speed symmetric connectivity managed by nbn

This service is designed for low data rate applications (up to 2 Mbps). Data rates can be as low as 10/10 kbps – ideal for monitoring situations where data volumes are low and information transfer is not overly time-critical. The service operates in a similar way to VISIP, being directly managed by nbn with connectivity to the Internet.

- **Features**

- A symmetrical service offering from 10/10 kbps to 2000/2000 kbps.
- No volume-based data charges.
- There are no monthly data usage caps.
- Supplied as a 'Non-routed' service where the Satellite modem performs a NATing function; the modem has a public IP address however connected devices will be allocated a private IP address by the modem.
- Because it is a virtual service, no physical interface is required between customer network infrastructure and MultiWave Networks; all traffic is passed to the Internet. This makes establishment of the service easy and fast.

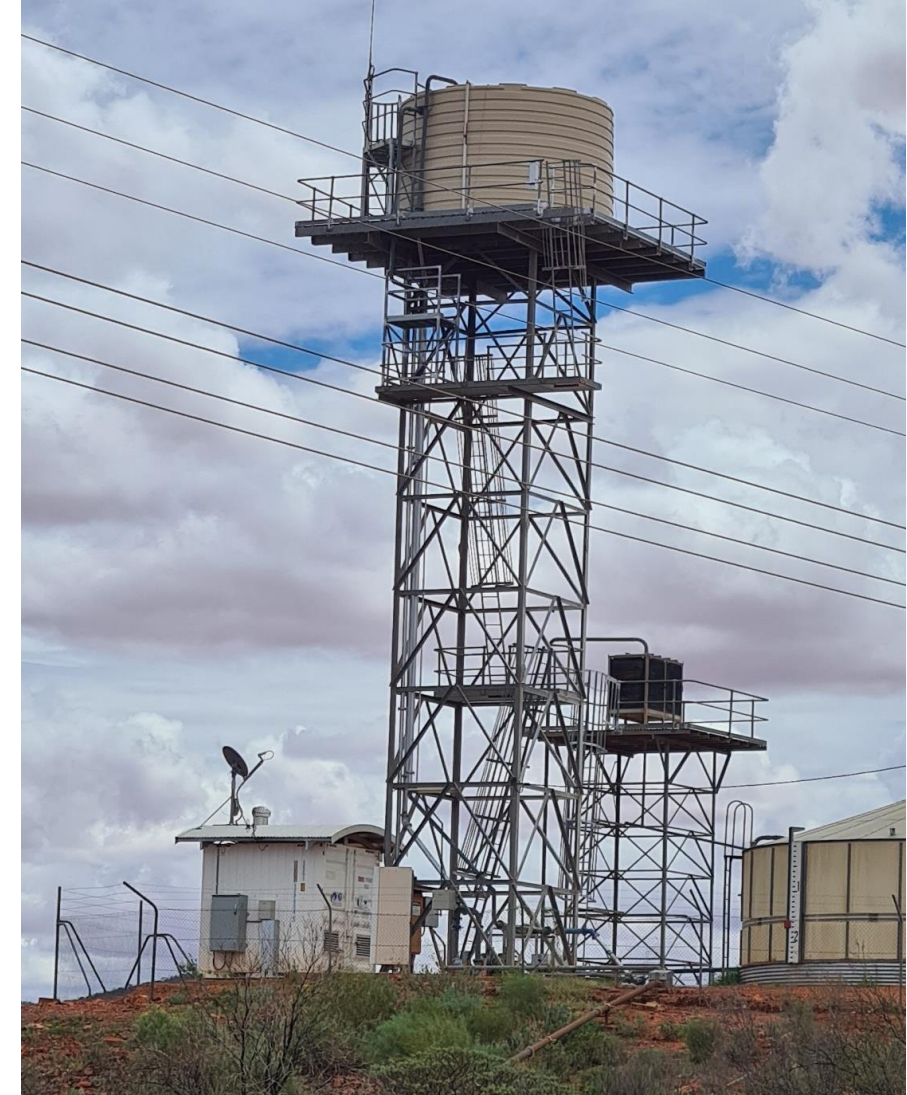
- **Options**

- In addition to the standard products, other combinations can be tailored to your requirements
- Available in multiple bandwidth tiers – please see Price Book for details

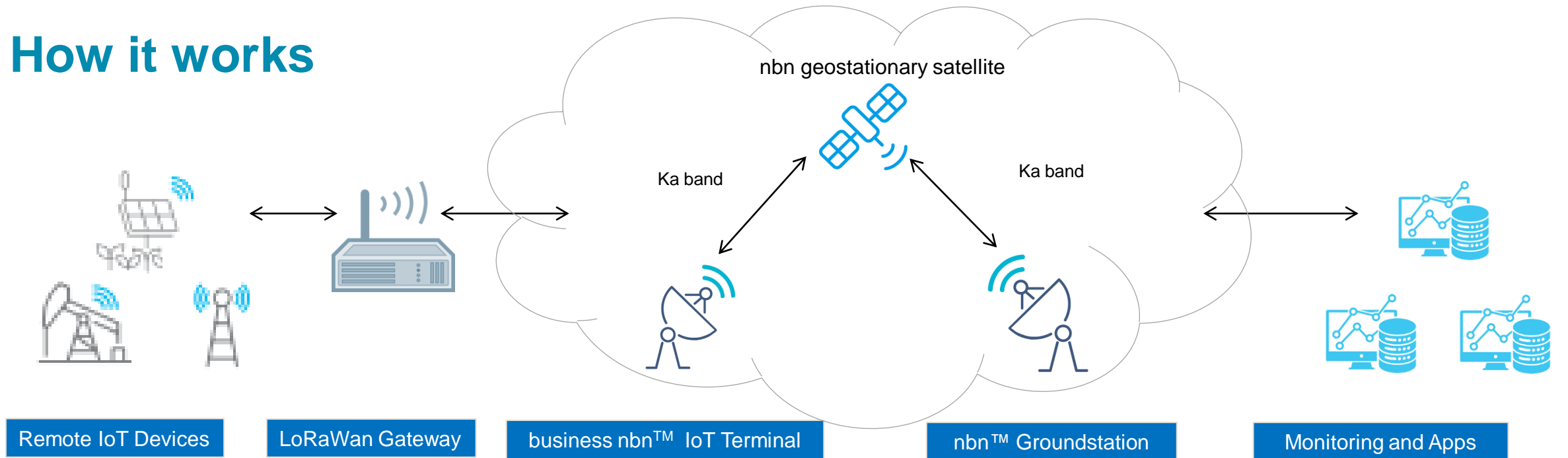
business nbn™ - Internet of Things (IoT) Services

Key Benefits of nbn™ Satellite Backhaul

- Coverage anywhere in Australia and external territories
- VSAT terminal is 'set and forget' – perfect for unmanned locations
- Can provide backhaul for single or multiple local IoT services
- Low ongoing cost with no data caps or excess usage charges
- Provides independent monitoring/control channel – unaffected by the internet demands of other users on other networks (e.g. 4G/SkyMuster)



How it works



Business nbn™ IoT can be used to backhaul single or multiple remote IoT devices

Devices can be directly connected to the business nbn™ IoT Terminal, or connected through a local network, such as LoRaWAN

The nbn™ IoT Terminal communicates directly with one of nbn's geostationary satellites, transmitting data from the devices over the dedicated link with high reliability.

Data is transmitted from the satellite back to one of nbn's 10 groundstations across Australia.

Data from the IoT Devices can then be monitored and analysed in applications and servers interconnected directly to the nbn™ network or connected via the internet.

IoT in Utilities

Smart technologies offer remote control options in utilities management. IoT devices can be used to monitor and manage energy more effectively, reduce energy waste, and, ultimately, improve safety and operational efficiency.

Satellite connectivity is often the only solution for connecting machines at remote locations in the Utilities Industry to transmit the data collected for monitoring, analysis and decision making.

Asset-intensive enterprises are progressively deploying IoT solutions, using Satellite connectivity solutions to connect and conduct operations more productively and at lower cost. Specifically benefits for the Utilities industry include applications such as:

- Water usage, quality management, measurement and leakage monitoring
- Gas flow measurement & control and valve regulation
- Safety monitoring, control and regulation of electricity flows
- Smart electricity, gas and water management
- Meter reading



IoT in Wind Farms

IoT technology can offer significant advantages to offshore wind power maintenance, with sensor technology able to provide constant data on the functioning of turbines.

The typically remote nature of wind farms means that nbn™ Satellite connectivity is quite often the only feasible backhaul solution for aggregating data collected by the sensors and transmitting it for monitoring and analysis.

Offshore wind farms consist of hundreds of wind turbines, making it a challenge to integrate these turbines to all work together in these hard to reach places.

Wind turbines are expensive and complex with up to 1,000 sensors on each turbine. The turbine can control blade speed and power generation, a sophisticated task which requires intelligent monitoring and optimisation algorithms.

There is a lot that can go wrong if these complex machines are not constantly monitored and adjusted.

nbn™ Satellite connected IoT can collate and communicate data diagnostics from within the head of the turbine, which would otherwise be a time consuming and expensive exercise to manage.



IoT sensors can collate and relay data on all metrics necessary to maintain and optimise wind turbines, including:

- Energy input/output
- Wind speed/direction
- Lubrication pressures
- Stresses
- Temperatures
- Shaft speed and Vibration

IoT in Mining

nbn™ Satellite backhaul is often the only reliable option for a remote mining operation to carry out remote, real-time data monitoring for intelligent, timely decision making. The numerous uses and benefits of IoT in mining can include:

- **Cost Optimisation:** Sensors on mining hardware and systems monitor equipment to find more cost-effective methods of operating, reducing operational downtime and preventing machinery breakage.
- **Asset Tracking, Diagnostics & Predictive Maintenance:** Real-time insights and remote diagnostics are gained from monitoring, gathering, and analysing data from mining equipment. This identifies wear and tear, projects when maintenance is required, facilitates real-time troubleshooting, asset tracking, corrective maintenance and procurement planning, minimising production losses.
- **Increased Remote Management:** Whilst IoT can assist with reducing the cases of downtime, issues will happen; engineers can sign in remotely and help the mine workforce address these issues.
- **Mine Safety Monitoring :** Sensors monitoring seismic activities can be installed on rock bolts to effectively assess their integrity and reduce fatal risk of ground falls.
- **Emission and After-Blast Monitoring:** Gas detectors and particle sensors, can monitor emission levels to sustain a secure working environment. Wireless monitoring of toxic fumes can allow operators to assess when an area is safe enough to resume work after a blast to open up a new site within a mine.
- **Groundwater Monitoring:** Mining operators can keep track of real-time changes in groundwater levels, allowing pumping to avoid contamination and underground flooding.
- **Wearable Event Reporting:** Temperature, humidity, radiation, noise and gas levels can be tracked in real-time, to monitor worker fatigue, exhaustion, and “out-of-tolerance” incidents.
- **Ventilation-on-Demand:** Ventilation can account for 30-40% of energy consumption in underground mines. IoT sensors monitor air quality and flows for remote adjustment of the fan speed, significant energy reducing operational costs and environmental footprint.



IoT in Agriculture

Connectivity has historically posed a significant challenge for those working in the agricultural industry. The remote and disconnected nature of the business has left farmers with few options when it comes to adapting technology to monitor and optimise their efforts.

Satellite connectivity combined with IoT Sensors can now give farmers the ability to transform farms into intelligent systems that can sense and communicate climactic, environmental, machine metrics and other operational practices and risks. Farmers can leverage weather stations, soil sensors and drones to collect information on weather conditions, soil quality, crop's growth progress or cattle's health; getting the right advice to apply the right inputs and make the right decisions at the right time.

- **Crop Monitoring:** Smart agriculture sensors to collect data specific to crop farming, from temperature and rainfall to leaf water potential and overall crop health; amongst other things, monitoring the state of crops allow farmers to define exactly how many pesticides and fertilizers to use.
- **Cattle Management:** As with crop monitoring, IoT sensors can be attached livestock to monitor health and log performance. Livestock tracking and monitoring provides data on stock health, well-being, and physical location, enabling identification of sick animals to avoid heard contamination;
- **Cost Control and Waste Reduction:** With smart sensors, farmers are able to measure and mitigate the risks of losing yield, gain increased control over production, manage staff performance and equipment efficiency. Drones for real-time cattle tracking also helps farmers reduce staffing and operational expenses.
- **Greenhouse Automation:** The use of IoT sensors enables them to get accurate real-time information on greenhouse conditions such as lighting, temperature, soil condition, and humidity and to adjust these conditions remotely.



IoT in Wineries

In addition to the general agricultural uses, nbn™ Satellite connectivity for IoT is helping vineyards to improve efficiency and produce higher quality wines through real-time data analytics and precision recommendations.

- Sensors can communicate climactic, environmental and other operational practices and risks, this data, combined with information from other sources, such as historical data on vineyard characteristics and previous vintage results, to underpin informed predictions.
- IoT is increasingly valuable in monitoring and predicting the risk of grape crop diseases so that precise, just-in-time treatment can be administered. Sensors monitor key parameters, including ambient temperature, wind speed, relative humidity, leaf wetness, soil moisture and rainfall, to communicate disease risk on an hourly basis
- Understanding and monitoring environmental factors, including air and soil temperature, pH, rainfall and exposure to UV, can directly improve production practices, including where to plant for the best results.
- IoT can identify and monitor areas with distinct climactic conditions in order to produce a unique wine.
- Predicting the optimum time for harvesting grapes is also essential to avoid changes to taste and to maintain quality.
- Beyond the vineyard, IoT in wine cellars monitor the ageing of the wine – including light and humidity, highlighting when tiny fluctuations occur and correct them before any damage is done.



IoT in Construction

IoT offers a construction site where equipment, materials, and workers are synchronised to a central server that governs and monitors their activities in real-time, assuring adherence to current policies and ensuring their safety.

Remote construction sites can benefit from the use of IoT connected over nbn™ Satellite to transmit real-time data for monitoring, analytics and smart decision-making. Remote devices can be helpful when construction takes place in locations inaccessible to humans, polluted, or unsafe to be in. After post-machine analysis, the work environment can be made human-safe.

- **Monitor and manage safety:** IoT Sensors, including noise, vibration, motion, humidity, temperature, and pressure can inform management of potential harm that requires immediate care. Managers can foresee and reduce damage caused by accidents or disasters, and respond quickly with real-time instructions to workers.
- **Real-time site map:** create a real-time map of the construction site, in the case of a crisis situation, danger zones can be marked on the map, and workers can be prevented from entering.
- **Expense tracking:** IoT can increase the precision of estimates, it can also keep track of fresh and imminent construction-related expenses on and off the job site. IoT can assist business owners in real-time budget tracking, timely delivery of new equipment and resources and tracking available resources to minimise waste.
- **Address skills and labour shortage:** IoT-based automation is a means of a range of addressing short-term labour shortages and delays in labour hire.



A KPMG survey found 95% of construction organisations believe emerging technology like IoT will fundamentally impact their industry, with 72% saying technology adoption, e.g. IoT deployment, is part of their strategy.

PwC found that 98% of industrial organisations expect digital solutions, like IoT-enabled predictive maintenance, to boost efficiency by up to 12%.



IoT in Remote Telehealth

IoT-enabled devices make remote healthcare monitoring possible, keeping patients safe and healthy, and empowering physicians to deliver care remotely. IoT connected via nbn™ Satellite gives patients and health professionals the assurance of the transmission reliability which is necessary for critical health data to be monitored.

- **IoT for Patients:** blood pressure and heart rate monitors, glucometers can change people's lives, giving patients access to constant tracking of health conditions and personalised care
- **IoT for Physicians:** specialists track adherence to treatment plans, connect with patients proactively and collect data to identify the best treatment process
- **IoT for Hospitals:** devices help in hygiene control, preventing infections; pharmacy inventory control and environmental monitoring; real-time tracking of medical equipment or staff at different locations



- **Cost Reduction:** real time patient monitoring significantly cuts down unnecessary visits to doctors, hospital stays and re-admissions
- **Improved Treatment:** physicians can make timely, evidence-based informed decisions
- **Faster Disease Diagnosis:** patient monitoring and real time data helps in diagnosing diseases at an early stage or even before the disease symptoms develop
- **Proactive Treatment:** continuous health monitoring opens the doors for providing proactive medical treatment
- **Drugs and Equipment Management:** through connected devices, these can managed efficiently with reduced costs and losses
- **Error Reduction:** IoT devices not only help in effective decision making but also ensure smooth healthcare operations with reduced errors, waste and system costs



MultiWave Networks

For all your nbn™ Satellite Services

Why MultiWave Networks for nbn Satellite?



Focus: Founded in 2016, MultiWave Networks Pty Limited is a privately owned and funded company established to provide wholesale and B2B nbn™ satellite services to the Australian market. As a B2B provider, we deliver to our downstream Partners a white label service, tailored to their needs.

Service Options: MultiWave Networks offers the **full suite** of wholesale nbn satellite options:

- business nbn™ satellite
- Standard Sky Muster™ and Sky Muster Plus™
- Future satellite Comms on the Pause and Comms on the Move products

Flexibility: Our Partners may use our services directly, or on-sell them to third parties using their own brand. Also, Partners can interface directly to our network, or have MultiWave manage all the traffic carriage aspects.

System Capabilities:

- Ordering and service management portal
- Branded end user usage notifications
- For Sky Muster™, systems to manage contention levels and maintain compliance with nbn mandated fair use policy rules
- Wholesale billing

Industry knowledge and relationships: There remain unique challenges in serving regional and remote Australia, particularly in respect of the low population density and achieving cost effective marketing and distribution. Our operational experience enables us to be more than a pure wholesaler, offering the benefit of our industry relationships to assist with the challenges in serving this market.

About nbn™ Satellite

nbn™ Satellites

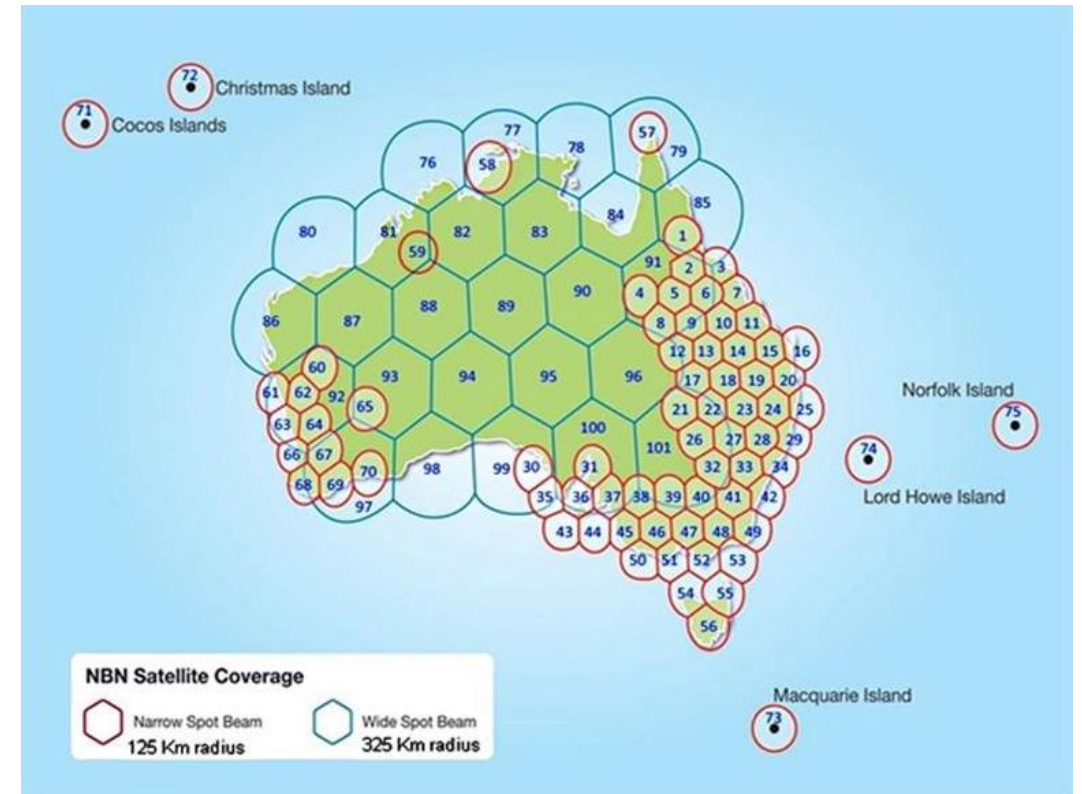
- 2 satellites launched in 2015 and 2016
- Owned and operated by NBN Co for Australian use only

Geostationary

- Customer terminals are set and forget – no complex satellite tracking is required
- Satellites orbit the earth at 36,000km resulting in latency of approx. 600ms

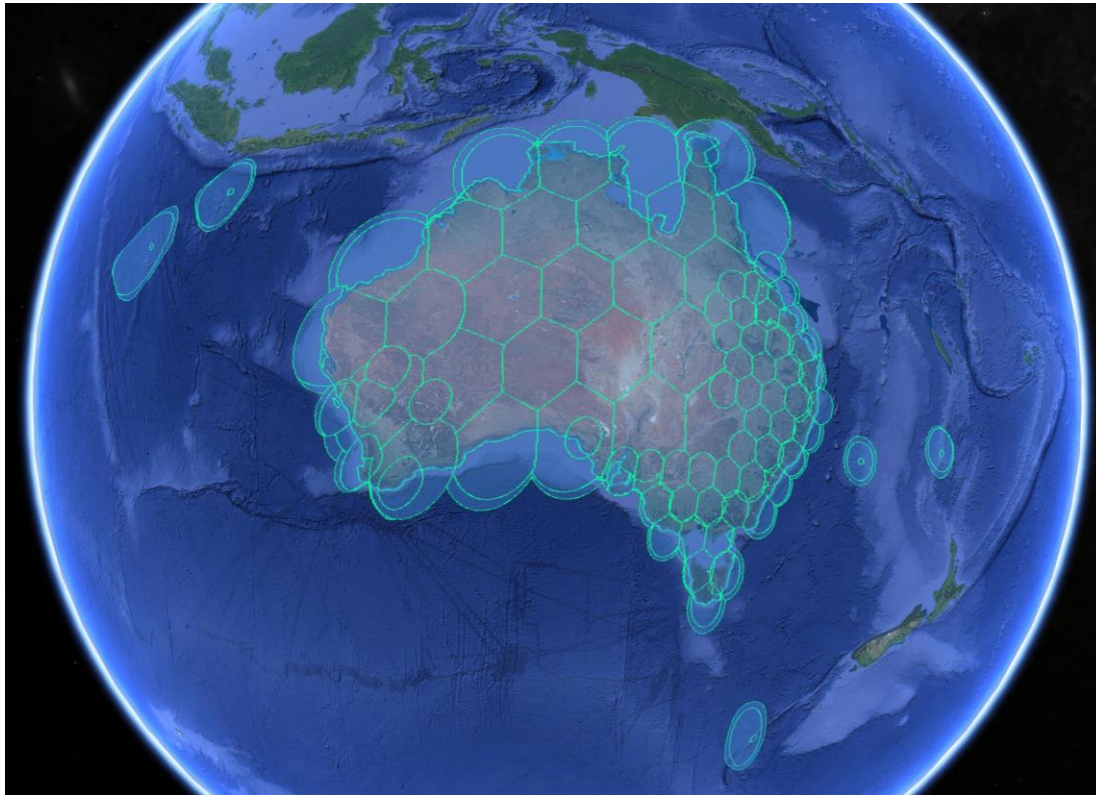
Ka band with spot beam architecture

- 101 spot beams covering all of Australia and the External Territories
- High frequency (Ka band) allocation allows for high bandwidth channels that can transmit more data with minimal terrestrial interference when compared to lower frequency satellites
- Can utilise smaller terminals – less than 80cm diameter
- Use of high frequency (Ka band) can mean services are susceptible to rain fade causing some degradation of the signal during heavy rain



Coverage: business nbn™

100% coverage of Australia and its key territories



VSAT Terminal kits vary in size and power according to the grade of service required – a service qualification process identifies the correct kit for a particular location

