On-Farm Connectivity Guide

Edition 1 | November 2022

National Farmers Federation

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Sources

This Guide has sourced definitions from a wide range of sources, as noted below. In some circumstances, definitions have been adjusted to convey a clearer meaning and/or provide clearer definition. Sources for definitions have included:

nbn® Glossary of Terms
KPMG Australia
Meat and Livestock Australia
Grains Research and Development Corporation
Australian Farm institute
Queensland Department of Agriculture and Fisheries
Regional Tech Hub
Agriculture Victoria
Society for Precision Agriculture Australia (SPAA)

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Foreword

In an increasingly digitally connected and enabled world, access to telecommunications is no longer a luxury; in agriculture, the increased emergence of cloud-based platforms and mobile applications requires connectivity in-paddock as well as at home.

Connecting Australia's farmers so they can take advantage of a $15.6bn opportunity from internet-enabled digital agriculture is a critical mission for the National Farmers' Federation and **nbn**.

While it remains important to connect our farmhouses and workers' cottages to the outside world, ensuring our farm landscape itself has the connectivity necessary to run a modern farming operation is also critical.

The National Farmers' Federation, together with **nbn**, have been working closely together for many years to help bridge the digital divide between Australia's farmers and their supply chains. In 2021, we released the *Connecting Australian Agriculture* report, detailing the opportunity for Australian agriculture arising from the nation-wide availability of the **nbn®** network.

Now, in 2022, we are continuing our partnership with the release of the *On-farm Connectivity Guide*, Australia's first glossary of key terms used in the emerging on-farm, AgTech and connectivity spaces.

This guide is designed to assist farmers better to understand the key phrases used in the on-farm, AgTech and connectivity sectors as they are relevant to agricultural operations. We want this guide to be a key reference point for industry to use, providing a basis for consistent use of language across the sector to assist farmers, and their technology advisers, to navigate the constantly evolving world of connectivity. Working together, we can help to lift the digital capability of Australia's farmers to ensure that they are adequately supported to adopt digital solutions into their farming business.

This guide has been developed in consultation and with input from a range of industry stakeholders, and we would like to thank them for contributing to this work and sharing their insights for the benefit of Australian farmers.

This is the first, and by no means last, edition of the *On-farm Connectivity Guide*. We look forward to continuing to work with industry to ensure this guide remains fit for purpose now and into the future, ensuring that no paddock is left behind in the journey towards a $100 billion digitally enabled Australian agriculture sector.

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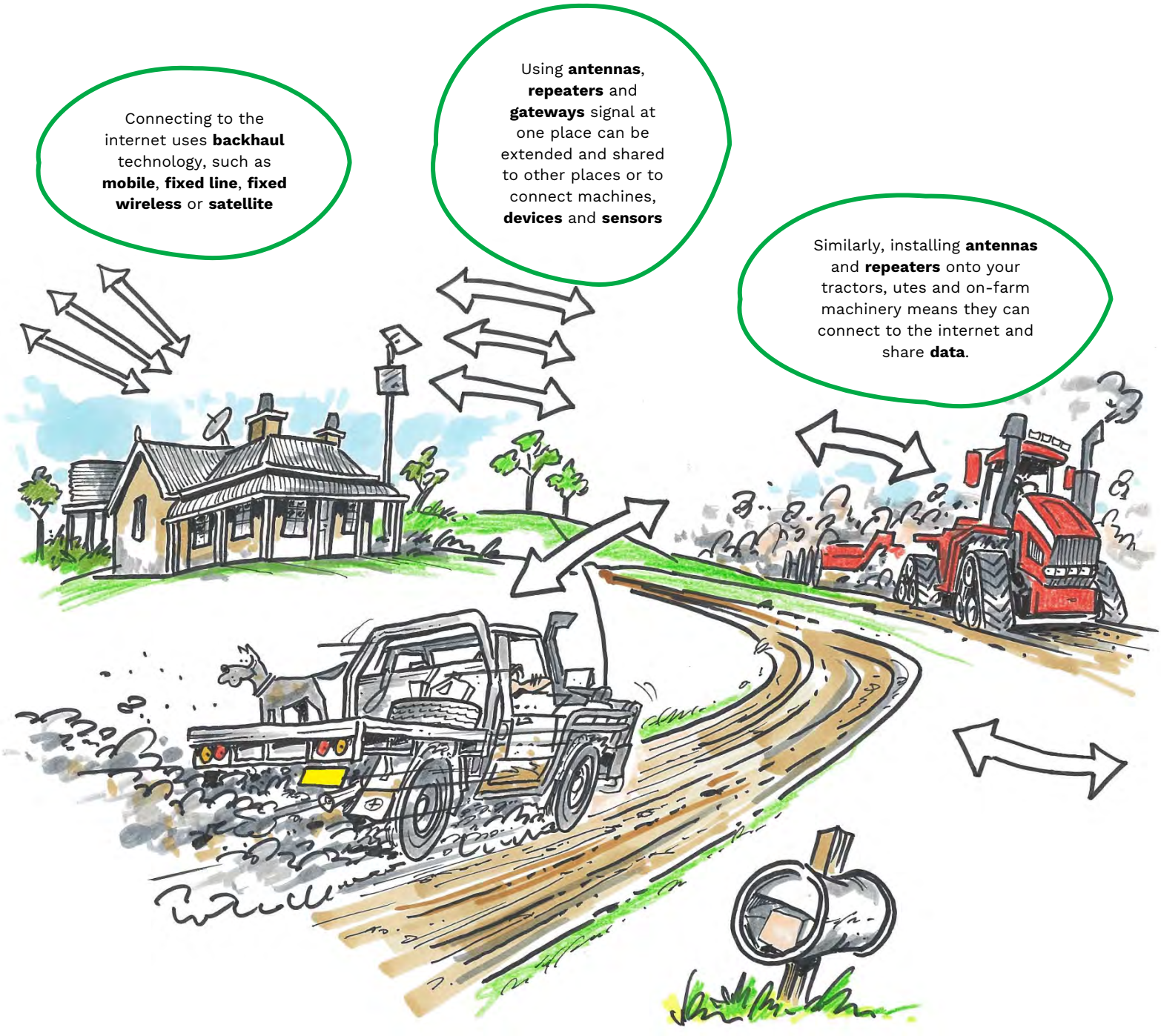
November 2022

Steps to consider in your on-farm connectivity journey

Getting connected, or having connectivity available on-farm, is only one part of the journey. For many farmers, the process of establishing connectivity is the first step in a journey to incorporate digital agricultural practices into their farm business. It can be daunting, however by breaking down the processes and thinking through the various steps in the adoption process you can make informed decisions about the right investments in the right areas.

This Guide is one part of the process in developing on-farm connectivity. Building a farm connectivity plan is a key part of any digital agriculture strategy. A few things to consider as part of the plan include:

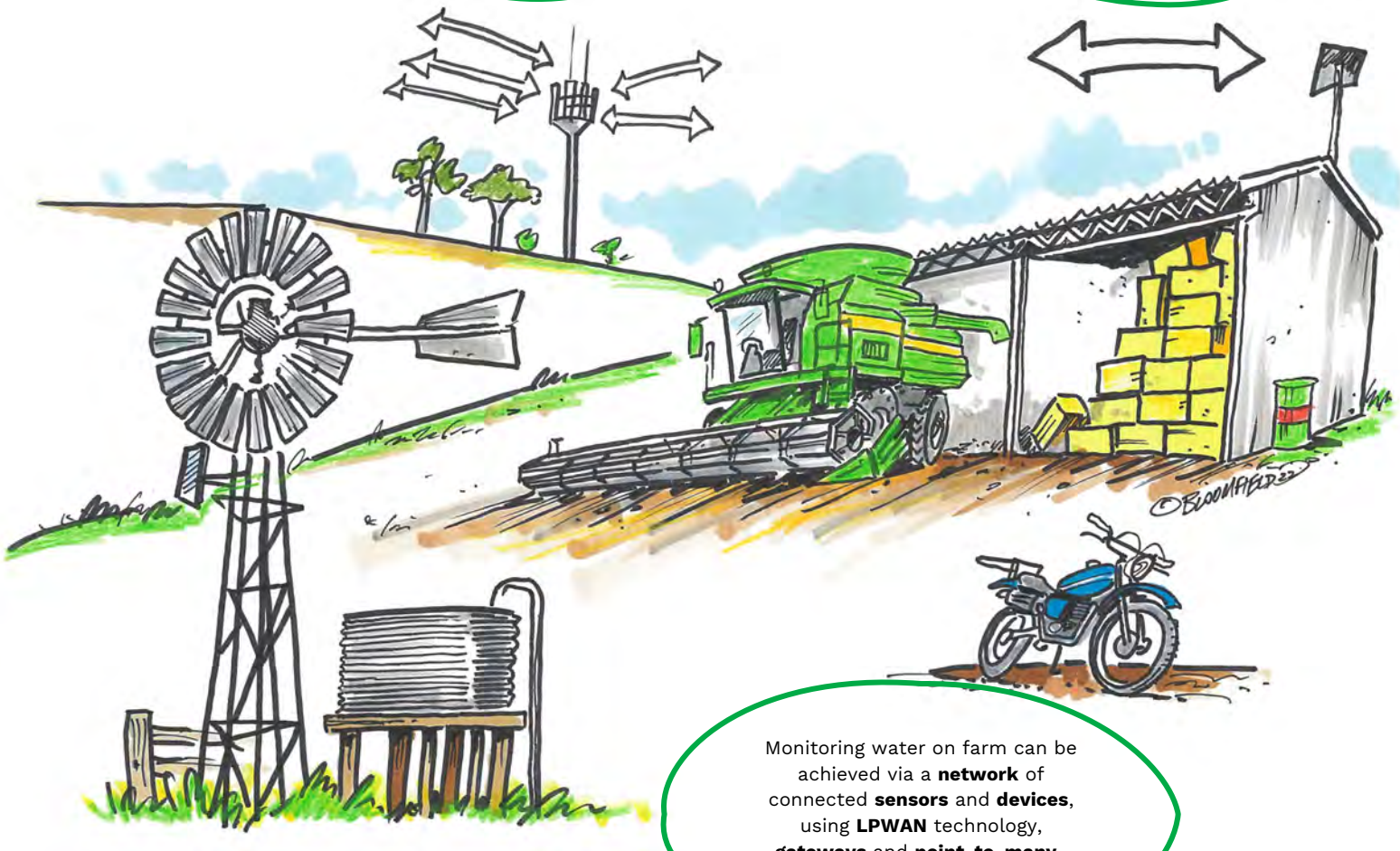
- What network connectivity, such as mobile phone/LPWAN coverage or home-based broadband, is currently available, and where?
- What do you want to connect – buildings, equipment, devices, sensors?



- What power requirements exist for the devices you wish to connect, or the connectivity infrastructure you plan to deploy?
- What do you want to be able to do in these locations – browse the internet, monitor livestock, operate equipment, make calls, gather data points for decision-making?
- What is your landscape – is it flat, undulating, cleared, wooded?
- What are your highest and lowest connectivity priorities – is there a particular project or activity which is more important to connect?
- Who are the providers of services to provide support, guidance, installation, and advice about connectivity on my farm?
- Will you need to arrange a registered cabler/installer to perform the network installation?
- What are you willing to spend? What technologies will lead to positive returns in productivity or payback from implementation?
- What are the potential ongoing costs beyond installation?
- Do you know where to access accurate and independent advice?

Mobile phone and **fixed wireless** towers are other types of **backhaul**, enabling **devices** and machines to connect to the internet.

One way of connecting buildings on-farm is **by point-to-point (P2P)** technology, where an **antenna** or **gateway** enables **wireless** line of sight connection between buildings or locations.



Monitoring water on farm can be achieved via a **network** of connected **sensors** and **devices**, using **LPWAN** technology, **gateways** and **point-to-many-point (P2MP)** systems

The AgTech Connectivity Guide

The AgTech Connectivity Guide provides a definition for key phrases used in AgTech and connectivity. While care has been taken to verify the accuracy of the definition, users are encouraged to speak to their AgTech technology supplier to ensure common understanding of key phrases.

Term	Definition
Access plan	An (internet) access plan is an agreement between a customer and a retail (RSP) or internet service provider (ISP) for access to the internet. It typically involves a customer purchasing an allowance of data which allows them to access the internet, with the data allowance to be consumed within or over a period of time. The allowance will usually specify a timeframe over which it can be used (ie per month) and, once used, may result in the user being 'shaped' or having no access at all. An access plan is usually sold in terms of gigabytes which can be downloaded; in some instances, users can purchase unlimited data allowances. Plans often have a choice of speed tiers, where a consumer can pay more for a higher speed plan.
Access point	An access point (or Wi-Fi Access Point (WAP)) is a networking hardware device that allows other Wi-Fi devices to connect to a wired network.
AgTech	AgTech is any innovation used across the value chain to improve efficiency, productivity, profitability and/or sustainability. It includes hardware and software, business models, new technologies and new applications. The new frontiers of AgTech are in the digital space, using data, tools and decision-support to assist agribusinesses to meet emerging consumer demands or enter new markets.
Backhaul	Backhaul refers to the side of the network that communicates with the global internet, and generally references which type of network or technology (mobile, fixed line, satellite etc) is being used to underpin individual internet access. In an agricultural setting, backhaul may refer to the type of on-farm connectivity network deployed to support devices operating on-farm.

Term	Definition
Bandwidth	Bandwidth refers to the throughput (uploads and downloads from a device) of the internet service. Speed of the connection. the number of users on the same connection, location and the type of devices are factors in relation to bandwidth. Bandwidth is usually measured in kilobits, megabits or gigabits per second.
Base station	A base station is a wireless communications station installed at a fixed location and used to communicate as part of a telecommunication provider's network. In an agricultural setting, a base station can also refer to a stationary GPS/GNSS receiver for precision agricultural practices.
Bit	An abbreviated term for binary digit, the smallest unit of computer data. A bit is a basic unit of information in computing, essentially a '1' or '0'.
Bits per second (bps)	Bits per second (bps) is a common measure for data transmission speed. The speed in bps is equal to the number of bits transmitted or received each second.
Broadband	Broadband is a term used to refer to 'always on' high speed Internet.
business nbn® Satellite Service (BSS)	business **nbn** Satellite Service (often referred to as BSS) is an enterprise-grade wholesale broadband satellite service provided by **nbn**. With business **nbn** Satellite Service connections an end user can choose the type of speed tier that suits their need through their RSP.
Byte (B)	A unit of storage measurement - a byte is made up of 8 bits. All information is stored or transmitted as bits and bytes, which determine the size of the document, picture, video clip etc that you may wish to download or send via email.
Cat M1	Category M1 (Cat M1) is a low-power wide area (LPWAN) cellular technology that is built specifically for IoT projects. Like most LPWAN networks, Cat M1 functions at its best when transferring low to medium amounts of data at a long range. It transmits small packages of data from the field sensor noted to the server and requires a small amount of power which can be supplied by battery or solar.

Term	Definition
Cel-Fi	A Cel-Fi device repeats an available mobile signal over a larger area. These devices are regulated by the Australian Media and Communications Authority (ACMA)
Citizens Band (CB) Radio	Citizens Band Radio (CB Radio) is a radio communications protocol using frequencies around 27MHz to enable one to many communications.
Cloud	Cloud refers to remotely-hosted managed services (of which storage may be one of these services) that are accessed over the Internet. By using cloud computing, users and companies don't have to manage physical servers themselves or run software applications on their own machines. The cloud enables users to access the same files and applications from almost any device, because the computing and storage takes place on servers in a data centre, instead of locally on the user device.
Data	In computing, data is described as information that has been translated into a form that is efficient for movement or processing by electronic means.
Data interoperability	Interoperability is a characteristic of a product or system to work with other products or systems and share data without interference or confusion.
Data plan	See 'Access Plan'.
Device	A gadget that collects and transmits data e.g., soil moisture probes, water level sensors, electric fence sensor, weather stations. Each device will have a technology embedded, such as a microchip and radio transmitter, allowing it to sense and communicate data via a network to a central server.
Exchange	An aggregation point for wired telecommunications services. Exchanges are also utilised for providing backhaul transport for mobile and fixed communications.
Frequency	These are the radio bands over which wireless signals broadcast.

Term	Definition
Gateways	Access points, which can include antennas, that send and receive signal between devices and networks. Gateways usually connect two networks together, enabling one to connect to the internet. One gateway can connect many networks to a single connection to the internet, such as a LPWAN to a higher bandwidth broadband network. In a mesh network, a gateway often refers to the main/central point of connection to the modem.
Geostationary (GEO) satellite	Geostationary (GEO) satellites are located more than 35,000km from earth and enable communication between a fixed range of latitude and the satellite. One consequence of GEO satellites is the higher latency experienced, given their distance from the earth.
Gigabyte (GB)	One billion bytes, or 1,024MB. It is usually used to refer to data volume.
Gigabit(s) per second (Gbps)	Gigabit(s) per second, or Gbps, is one billion bits per second. It is usually used to refer to data speed.
Internet of Things (IoT)	The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data. In agriculture the term is often used to describe sensors/stations in the field or in machines. Devices can be remotely monitored and controlled (including some in real time), and can include anything from pumps, sheds and tractors to weather stations and computers.
IoT communications network	A network designed specifically to connect IoT-capable devices and sensors to a backhaul communications network.
IoT device	A device, such as a soil moisture probe, often with minimal power requirements, capable of recording, collecting and sending data via wired or wireless communication.
Internet Service Provider (ISP)	An organisation that offers access to the Internet to its customers. *See also: Retail Service Provider (RSP)*

Term	Definition
Kilobit(s) per second (Kbps)	Kilobit(s) per second, or Kbps, is one thousand bits per second. It is usually used to refer to data speed.
Kilobyte (KB)	One thousand bytes, or 1,024B. It is usually used to refer to data volume.
Land connected	A landline telephone connected via wires to an exchange which can be used to make voice calls.
Latency	Latency is the term used to indicate any kind of delay that happens in data communication over a network. Latency is often more noticeable with satellite connections and is attributable to the time it takes data to travel from earth to a satellite and back to the network's base (receiving) station.
Local Area Network (LAN)	A network of devices connected together in a single location.
LoRaWAN®	The LoRaWAN® specification (Long Range Wireless Access Network) is a LPWAN protocol designed to wirelessly connect battery operated 'things' to the internet in regional, national or global networks, and targets key Internet of Things (IoT) requirements such as bi-directional communication, end-to-end security, mobility and location services. It uses lower radio frequencies with longer range between gateway and devices to cover large areas. LoRaWAN® frequencies are determined by national / regional regulators – in Australia, the allocated frequency is 915-928MHz. Care should be taken to ensure that any imported devices can operate within this frequency. Other common spectrum frequencies used by LoRaWAN® around the world include: • US 902-928 MHz, • EU 863-870 MHz • China 470-510 MHz and 779-787 MHz
Low Earth Orbit (LEO) satellite	Low Earth Orbit (LEO) satellites, or constellation satellites, are an interconnected network of satellites operating between 250km and 2,000km above the earth. LEO satellites used for communications purposes typically have lower latency than geostationary (GEO) satellites, however because of the speed that a LEO satellite orbits the earth, many satellites are required in order to supply a constant connection.

Term	Definition
Low Power Wide Area Network (LPWAN)	Low Power Wide Area Network (LPWAN) describes a variety of low power, low cost and long-range technologies used to connect IoT devices to a network. LPWAN encompasses a range of approaches including LoRaWAN, Sigfox, Cat M1, NB-IoT and others.
Long Term Evolution (LTE)	Long Term Evolution (LTE) is the name given to 4G networks used in mobile telephony.
Machine to Machine (M2M)	Machine to Machine (M2M), refers to objects that can communicate to each other, for example two or more autonomous tractors may communicate their location to each other.
Megabit(s) per second (Mbps)	Megabit(s) per second, or Mbps, is one million bits per second. It is usually used to refer to data speed.
Megabyte (MB)	One million bytes, or 1,024KB. It is usually used to refer to data volume.
Mesh	A mesh network (or mesh Wi-Fi) is a network system that transmits (or repeats) Wi-Fi evenly over an area through a network of remotely located devices. Instead of functioning like a Wi-Fi repeater, mesh Wi-Fi spreads Wi-Fi signals out evenly. In most systems, a central wireless router connects to multiple nodes or gateways that take the connection signal and repeat it. Mesh networks operate well in large homes, or in homes with thick walls, where signal repeaters can provide a consistent signal strength throughout the building. In an agricultural setting, a mesh network might be used in a large shed or structure to spread coverage evenly. Most mesh networks will require a power source to operate each repeater node.
Metered data/content	Metered data or content refers to the way data transmitted by browsing the internet is counted. An access plan may specify the maximum amount of data which can be consumed by an individual customer over a specified period. Once the data limit is reached, the customer may be ‘shaped’.
Microwave	A transmission type that transfers information by electromagnetic waves across both short and long distances. Microwave signals are normally limited to the line of sight; longer distance transmission may require a signal repeater.

Term	Definition
Mobile	A network with a series of mobile base stations that relay a wireless signal, that allows devices to connect and transmit and receive data e.g., mobile phone networks. See also Long Term Evolution (LTE).
Mobile broadband	Mobile, or wireless, broadband refers to internet access supplied via the LTE or mobile phone backhaul network. While the specific technology used to provide mobile broadband services varies, each service provider uses radio frequencies to transmit and receive data between their customers and a local transmission point. Normally, this requires a number of base stations, similar to mobile phone towers, which transmit to customers who have a small transmitter/receiver located at the premise requiring connection.
Modem	A device which connects a home network to the internet. In some situations, the network termination device is also the modem. *See also: Router, **nbn** Connection Box, Network Termination Device (NTD)*
Managed Service Provider (MSP)	A managed service provider is a provider that services and maintains the operation and delivery of devices, internal network and connectivity past the point of the network termination device.
Narrowband	Refers to an 'always on' network used to connect IoT devices.
Narrowband IoT (NB-IoT)	Narrowband IoT (NB-IoT) is a Low Power Wide Area Network (LPWAN) radio technology standard to enable a wide range of cellular devices and services.
nbn Connection Box	Also known as an NTD or Network Termination Device. This is the box that is installed in your home where you connect a router to enable access to the internet. *See also: Network Termination Device.*

Term	Definition
nbn® Fibre to the Node (FTTN)	An **nbn** Fibre to the node (FTTN) connection is utilised in circumstances where the existing copper network will be used to make the final part of the **nbn** network connection, from a nearby FTTN cabinet or micro-node to your premises. The fibre node usually takes the form of a street cabinet. Each street cabinet will allow the **nbn** network signal to travel over optic fibre from the exchange to the cabinet and connect with the existing copper network to reach the premises.
nbn® Fibre to the Premise (FTTP)	An **nbn** Fibre to the Premises connection (FTTP) is used in circumstances where an optic fibre line will be run from the nearest available fibre node, to your premises. FTTP also requires an **nbn** network device to be installed inside the connected premise. This device requires power to operate.
nbn® fixed line	**nbn** fixed line refers to a residential- or enterprise-grade wholesale broadband service operating to a premise and supplied by a copper wire, coaxial or fibre optic cable. Fixed line connections are usually found in built-up areas of Australia; as of November 2022, 79% of regional Australians connected to the internet with the **nbn** network are connected via **nbn** fixed line technology. These are often referred to as FTTP, FTTC, FTTB, FTTN or HFC
nbn® Fixed Wireless	**nbn** Fixed Wireless is a residential-grade wholesale broadband service operating predominantly in semi-rural, regional and remote Australia. Fixed Wireless connections are supplied from 2,200 base stations which transmit a signal over a distance (presently up to 14km, increasing to up to 29km by 2025) and are received by an antenna connected to the property.
nbn® Sky Muster®	**nbn** Sky Muster® is a residential-grade wholesale broadband satellite service provided by **nbn** and available in places where fixed line or **nbn** Fixed Wireless services are not available. **nbn** Sky Muster plans are data-capped and operate with speed limitations.

Term	Definition
nbn® Sky Muster® Plus	**nbn** Sky Muster Plus is a residential-grade wholesale broadband satellite service provided by **nbn** and available in places where fixed line or **nbn** Fixed Wireless services are not available. Since 1 July 2022, the only internet activity that counts towards the monthly data allowance on **nbn** Sky Muster Plus plans is video streaming services and VPN use between 4:00pm to 12am midnight daily. All other internet activity continues not to count towards the monthly data allowance for the remaining 16 hours of the day (12am midnight – 4pm). n**bn** Sky Muster Plus plans have the ability to burst above speeds of 25/5Mbps where network conditions allow.
Network	The infrastructure that enables two or more physically or wireless-connected components to exchange data.
Network Service Provider	A provider who specialises in supplying and managing networking services on a commercial basis.
Network Termination Device (NTD)	The point of interconnection in a premise where a modem is connected to the backhaul provider's network. *See also **nbn** Connection Box.*
Node	A network communicating device that connects several devices or sensors to a gateway.
Open source	Open Source refers to the full programming code which has been made freely available for modification, editing, and transfer for community benefit.
Platform	A platform refers to the means by which information collected by a device and shared across the network is presented to the user in a meaningful format. This includes visualising sensor data via a dashboard interface. A platform is often connected to the internet via an interface (where cloud storage may be used), or may be proprietary (requiring connection to the data source). Some common types of platforms include Facebook, Twitter, YouTube and Spotify

Term	Definition
Point to Point (P2P)	Point-to-Point (P2P) wireless connections are used to connect two locations together using directional antennas with line of sight. They use a combination of small, powerful, highly-directional aerials, routers, and cables to set up the connection. The connection can be used to receive and rebroadcast any computer network from one location to another – including an internet connection – for up to 50km from the original point. The connection can also be called a Wi-Fi bridge, or wireless bridge.
Point to Multi Point (P2MP)	Point to Multi Point (P2MP) wireless connections are used to connect two or more locations together from a central point which has line of sight.
Protocols	A communications or network protocol is the specification of a set of rules for a particular type of communication. Protocols are standards that dictate how electronic systems "talk" to each other. Wireless communications have their own protocols, all starting with the numbers "802".
Range	The distance that a signal can travel to connect to and service an end device.
Repeaters	A device that receives a signal and amplifies or re-transmits it. It is used to extend the range of base station signals and to expand coverage and will sometimes require power to operate.
Retail Service Provider (RSP)	A retail service provider (RSP) is the interface between the wholesale service provider and the customer/end user. A customer will purchase access to the internet from an RSP through an access plan which specifies the terms and conditions of access.
Router	A router receives your internet connection, distributes it to your computers and devices and is capable of distributing it to multiple devices simultaneous. A router's internal computer can manage the connection in a variety of ways and allows computers and devices to communicate with each other. The connection can be routed via cables or wirelessly (Wi-Fi).

Term	Definition
Satellite	A communications vehicle orbiting the Earth. Satellites typically provide a variety of information from weather data to television programming. Satellites send time-stamped signals to GPS receivers to determine the position on the Earth. *See also: Geostationary satellite, Low Earth Orbit (LEO) satellite,* ***nbn***® *Sky Muster*®*,* ***nbn***® *Sky Muster*® *Plus.*
Secured	Has security measures in place, such as a password, to protect the device from a malicious attack.
Shaped data	Shaped data, or shaping, refers to the experience of a customer who has used all the data allocated in their access plan, and usually results in the connection speed experienced by the customer slowing down. Shaping will usually end once the next period (as specified by the access plan) begins.
SigFox	An inexpensive, reliable LPWAN solution used to connect sensors and devices. *See also: Low Power Wide Area Network (LPWAN)*
SIM	A subscriber identity module, or SIM, card is used in devices connected to an LTE network and provides the device with a unique international identification feature enabling two-way communication.
Spectrum	The radio frequency bandwidth on which a gateway and device communicate.
Terabyte (TB)	One trillion bytes, or 1,024Gb. It is usually used to refer to data volume.
Terabit(s) per second (Tbps)	Terabit(s) per second, or Tbps, is one trillion bits per second. It is usually used to refer to data speed.
Ultra-High Frequency (UHF)	Ultra-High Frequency (UHF) is a radio communications protocol using frequencies between 300MHz and 1GHz to enable communication.
Ultra-High Frequency Citizens Band (UHF CB)	Ultra-High Frequency Citizens' Band (UHF-CB) is a licensed spectrum allowing two-way communication between licenced parties on the 477MHz band.

Term	Definition
Unmetered/uncapped data	Unmetered/uncapped data refers to data transmitted over the internet that does not count towards the data allowance purchased in your access plan.
Unsecured	Has no security measures to protect devices from a malicious attack.
Uninterrupted power supply (UPS)	A battery system which ensures continuity of power supply in the event of a power outage. A UPS may be necessary to ensure continuity of connectivity where powered repeater systems are installed. Solar panels connected to a battery system are an example of a UPS.
Very High Frequency (VHF)	Very High Frequency (VHF) is a radio communications protocol using frequencies between 30MHz and 300MHz to enable communication.
Virtual Private Network (VPN)	A Virtual Private Network (VPN) sets up a secure “encrypted” connection for an entire internet connection. Regardless of what you’re connecting to, people can’t see (and therefore steal) your data. **More information: View nbn’s VPN Fact Sheet.**
Voice	Voice is often referred to a type of telecommunication technology. *See also: Voice over IP (VoIP), Land Connected and Mobile.*
Voice over IP (VOIP)	Voice over IP (VoIP) is a service that uses the internet to make voice calls to any other phone number in the world, rather than using a traditional LTE connection. Data used in VOIP calls may be metered and count towards data allocations specified in your access plan. *See also: Wi-Fi calling*
Wide Area Network (WAN)	A network that allows computers and devices to communicate with each other across large geographic areas.
Wholesale service provider	A wholesale service provider is typically a backhaul network provider responsible for delivering a telecommunications network, or public utilities. **nbn** is an example of a wholesale service provider.

Term	Definition
Wi-Fi	A facility allowing wireless network enabled technology to connect and communicate with an attached network, such as local, business or internet networks.
Wi-Fi calling	Wi-Fi calling uses your compatible mobile telephone to make calls and send and receive SMS and MMS using the internet rather than your mobile service. *See also: Voice over IP (VOIP).*
Wireless	A system using radio signals rather than wires to connect computers, sensors, mobile phones, etc. to each other. *See also: Wi-Fi.*
Wireless broadband	See mobile broadband or **nbn**® Fixed Wireless.
Wireless access point	See Gateway or Access Point
Yagi	A type of directional antenna comprised of 2 or more parallel antenna elements, commonly used to connect legal mobile-repeaters or cellular-based modems. Yagi antennas typically have medium to high gain, which makes them suitable for increasing signal type in rural and remote areas.

Did you know?

The Regional Tech Hub offers independent advice and support and helps regional Australians negotiate often confusing phone and internet options and technical issues. If you're unsure about how you can connect, or you feel like you're getting the run-around from providers, you can contact the free services of the Regional Tech Hub.

www.regionaltechhub.org.au
helpdesk@regionaltechhub.org.au
1300 081 029

Connecting Regional Australia

Now more than ever, we're focused on lifting the digital capability of Australians in regional and remote areas.

Improving technology

We are continuing to evolve the **nbn**® network for you, with record investment to extend its reach and capability, and help bring competition and improved service deeper into rural and regional Australia.

Understanding local needs

Our dedicated **nbn**® Local team works with your community, helping to provide localised solutions for a network better suited to your region.

Supporting digital innovation

We're working with industry groups to enhance what's possible in the fields of business, health, education, agriculture and more.

We're committed to delivering a better nbn® network for regional Australia.

nbn® Local

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