

# Fixed Wireless Ethernet

An Overview of the Technology and  
Business Benefits Compared to  
Legacy Terrestrial Networks



## Fixed Wireless Ethernet Contents

Fixed Wireless Ethernet Overview .....	3
Wireless as an Alternative to ADSL.....	3
Wireless Benefits.....	3
Wireless as an Alternative to Optical Fibre.....	4
Consider Contention .....	4
Consider Latency.....	4
Line of Sight and Weather .....	5
Health and Safety .....	5
Channel Communications Carrier Network.....	5
Channel Communications Carrier Owns Its Own Network.....	6
Security.....	6
Fixed Wireless Ethernet Applications.....	6
Channel Communications Carrier - The Company .....	7
Glossary .....	8
Legal Disclaimer.....	9

## Fixed Wireless Ethernet Overview

**Wireless Network** - a Wireless Network refers to any type of Telecommunications Network that makes interconnections between nodes without the use of wires.

**Fixed Wireless Network** - Fixed Wireless Networks are an alternative to 'wired' or 'terrestrial' Networks, which traditionally transport data between sites using copper or Fibre-optic cables in the ground. Fixed Wireless is typically part of a Wireless WAN infrastructure connecting two fixed locations (such as buildings) with a directional radio antenna at each end of the signal. It is designed for various weather conditions, signal distances and bandwidths. Radios and antennas are usually selected to make their transmission beam as narrow as possible and thus focus transmitted energy to their destination. This increases reliability and reduces the chance of eavesdropping and/or data injection. The devices at either end are powered via mains with battery backup. It's a cost-effective and extremely flexible way of enabling data communications between sites and providing access to the internet without the need for leasing and/or installing cables.

## Wireless as an Alternative to DSL Technologies

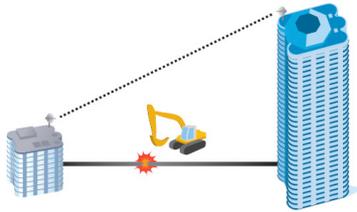
The most popular broadband connection in Australia is DSL. This Network uses traditional copper telephone wires between the subscriber and the telephone exchange to connect to the internet. The speed and stability of DSL at any given time is variable and depends on many circumstances: the length, quality and dimensions of the copper cable, the amount of cross-talk between pairs in the one cable carrying DSL, noise from sources in the business premises (including wiring), noise picked up from the environment such as radio frequency interference, poor cable joints or other faults. DSL is an excellent technology for delivering consumer based internet connections. It often incurs significant opportunity cost however when used in a commercial environment where reliability, security, performance and flexibility are mandatory.

## Wireless Benefits

A Fixed Wireless Ethernet Network allows a company to use extremely fast connectivity without the cost and commitment of leasing a terrestrial cable.

<i>Fixed Wireless Feature</i>	<i>Fixed Wireless Benefits</i>
<b>Connection</b>	through the air is reliable with no cables in the ground that can be disturbed.
<b>Fast installation</b>	in hours or days rather than months.
<b>Flexible</b>	making it ideal for temporary sites and rapid bandwidth upgrade.
<b>High quality and High availability</b>	flexible and high quality connectivity with fibre equivalent performance characteristics including latency, jitter, packet loss and availability.
<b>Symmetrical</b>	(upload speed = download speed) perfect for a wide range of applications including cloudbased applications, web hosting, streaming media, VOIP, and teleconferencing.
<b>Bandwidth options range from 1M-1GB</b>	faster by providing high speed broadband beyond the reach of ADSL, SHDSL, EFM or where Fibre is not available.

## Wireless as an Alternative To Optical Fibre



**Fixed Wireless** is often used to supplement, and even back up an Optical Fibre Network. Although recognised as an excellent high-bandwidth solution, it remains subject to cuts from building and roadworks, fires and floods, earth movement and other disruptions. The main issues associated with Fibre deployment include:

**Upfront Cost** - new Fibre is often prohibitively expensive to deploy as it requires trenching, laying cable, and protecting the strands across large spans of existing infrastructure.

**Installation Lead-time** - Fibre can take anywhere from 6 weeks to 6 months to 'light up' once it has been ordered.

**Significant Commitment** - leasing dedicated Fibre requires extremely

clear vision of the future as businesses are forced to commit to extensive upfront and long-term commitments which are often not substantiated by the business case.

### Advantages of Fixed Wireless Ethernet over Optical Fibre include:

- **reliability:** Fixed Wireless Ethernet connections are rarely blocked. When there are any potential exposures, then a second backup wireless link is simply connected to a different base station. In contrast, the cost to install a second Fibre connection using different street duct access is typically prohibitive and often impossible.
- **non-terrestrial:** in bypassing terrestrial networks, the Fixed Wireless Ethernet Network is completely protected from breaks in fibre-optic and copper networks frequently caused by civil works, rain and other unexpected activities.
- **rapid deployment:** wireless connections can often be installed in days.
- **ease of relocation:** temporary locations, or businesses that relocate frequently, can simply redeploy the equipment with ease and at low cost. In contrast, once Fibre has been laid, it cannot be physically relocated.
- **scalability:** the upgrade cost for wireless services are typically much lower than legacy Networks. Therefore, a business can start with an appropriate capacity and add to it easily as requirements grow. Good business seeks to always maintain a flexible and scalable cost structure. Fixed Wireless Ethernet delivers this business outcome at least in terms of a businesses' connectivity.

## Consider Contention

When a user connects to the internet using wired (ADSL or cable) broadband technology, they are sharing the Network Backhaul with other users. Contention is the ratio used to measure the extent of this sharing. The typical contention ratio for wired services is between 20:1 and 100:1. For example, on a service with a contention of 50:1, up to 50 broadband users may share the equipment and bandwidth in the local telephone exchange. Low priced ADSL is usually delivered with very poor contention ratios to spread the cost over multiple customers. Our Carriers Fixed Wireless Ethernet Network operates with a contention ratio of 1:1.

## Consider Latency

One of the most commonly misunderstood concepts in Networking is speed and capacity. So-called 'speeds' that are quoted for Networks are really just the bandwidth, or capacity of the service - only ever delivered in a perfect world. It's actually the combination of contention, latency and bandwidth that delivers the real 'speed' you will receive. Contention refers to the number of customers using the same service. Bandwidth is the capacity of the connection. Then latency refers to the delay in the Network. It's the amount of time it takes to travel from the source to the destination and back again. Together, contention, bandwidth and latency define the real speed of a Network, and thus the speed at which people can work. Latency is normally expressed in milliseconds. Its measurement is taken by sending a small packet of data, typically 32 bytes, to a host and assessing the RTT (round-trip time) it takes to leave the source host, travel to the destination host, and return back to the source host. The lower the number, the less delay exists within the Network.

**The following are typical latencies:**

**Ethernet .3ms analogue Modem 100-200ms ISDN 15-30ms DSL/Cable 10-20ms Stationary Satellite >500ms, mostly due to High orbital elevation dS1/t1 2-5ms**

**Channel Communications Carrier Fixed Wireless latency is typically 5-15ms for sites within the CBD and 15-30ms for outer-metro areas.**

## Line Of Sight and Weather

**Line of Sight** - the perfect situation for Fixed Wireless Ethernet Networking is when a clear line of sight is provided between the client premises and the base station. This condition ensures guaranteed speeds, latency and availability at all times. However, if direct line of sight isn't possible, we can typically service a customer requirement by using the extensive base station footprint to create any number of repeater sites.

**Weather** - signal attenuation as a result of bad weather is common with many Fixed Wireless Ethernet providers. However, we conduct a link budget analysis (LBA) on every leg of the Network to ensure this so-called "rain fade" does not adversely affect service quality. Even in the worst-case scenario, service can be accurately predicted by factoring in variables such as climate, bandwidth, frequency, power and distance. The resulting LBA is used to design a link that will always perform to the service level commitment. This means that line-of-sight and weather are no longer a definitive factor when comparing our Fixed Wireless Ethernet with terrestrial alternatives, including fibre and copper. Fixed Wireless Ethernet can perform in many indirect situations by taking advantage of local infrastructure.

## Health and Safety

All wireless devices, such as mobile phones, Wi-Fi computers and cordless phones emit Electromagnetic Radiation (EMR). Our wireless units typically transmit less EMR than a mobile phone, and whereas mobile phones are generally used very close to a person, our equipment is mounted outside the building, usually at least tens of metres away from anyone. Furthermore, EMR decreases with the square of the distance. So being just 10 metres away from Channel Communications Carrier transmitter reduces EMR exposure by 99% - to virtually nothing. Finally, although the wireless equipment does use microwaves, it should not be confused with microwaves used for cooking. Microwave ovens typically use more than 1,000 times the power of wireless data equipment.

## Channel Communications Carrier Network

Our Channel Communications Carrier Fixed Wireless Ethernet Network should not be confused with Wi-Fi. Wi-Fi is a WLAN (Wireless Local Area Network) protocol designed for short range, in-building portability. Wi-Fi uses a contention based MAC (Media Access Control) which means every client has to "fight" for its bandwidth and share of the spectrum. Channel Communications Carrier Fixed Wireless Ethernet is a WMAN (Wireless Metropolitan Area Network) with strict controls on the contention and serves much greater distances. It is delivered with a standard Ethernet socket that can be connected directly to any computer, firewall, router or other Ethernet device. Customers simply plug the blue cable into the Ethernet socket that we install at their premises. This is equivalent to plugging the cable into a modem. No other special configuration of the customers' equipment is required. When we provide private Networking within a corporation, a similar Ethernet socket is provided at each location and we then connect them together without wires. Channel Communications Carrier uses a variety of proprietary wireless data radios selected from the leading carrier-grade equipment vendors. The most effective and reliable solution is selected for each application.

**'Channel Communications Carrier Uses Licenced Spectrum'** - all radio spectrum is licensed and regulated by the ACMA (Australian Communications Media Authority). Despite claims to the contrary, there is no such thing as Unlicensed Spectrum. We make use of both "Class Licence" and "Apparatus Licence" spectrum. Class Licence Spectrum is designed for the co-existence of multiple users, so the maximum transmit power levels are restricted. Wireless Carriers like Channel Communications Carrier have designed the Network for these power conditions. Apparatus Licences apply to equipment operating in specific locations and the spectrum is closely regulated to minimise interference. Higher power levels are allowed under Apparatus Licences, which result in longer range and faster speeds. The amount of spectrum available for Channel Communications Carrier use is roughly 30-50 times that provided by mobile carriers. This enables us to offer far higher data-rates than mobile phone networks.

## Channel Communications Carrier Owns its Network

Channel Communications Carrier owns and operates its own Network. Unlike most other Carriers in Australia, the Channel Communications Carrier Network bypasses all telephone exchanges and the legacy PSTN (copper) Network. Each base station (transmission tower) is typically on a tall or medium height building with an excellent line of sight over a region. Each base station comprises:

- redundant backup power systems.
- networking equipment.
- point-to-point (PTP) backhaul radios “feeding” the base station with internet connectivity.
- point-to-multipoint (PTMP) radios (sector radios) that distribute the service to customers. Typically, a sector radio will service 60-80 degrees using directional antennas. Every client site contains a subscriber radio with a built-in antenna. This unit establishes the Wireless connection with the respective sector radio on a nearby base station. A sector radio can be thought of as the master. Every master can talk to many clients at the same time without reducing service quality in any way.

## Security

Sending signals over airwaves can create the opportunity for a security risk in the form of data interception. To counter this, the following techniques have been deployed to provide protection at the physical, network and application layers of the Network. The result is a highly secure and robust system without Wireless eavesdropping or malicious user attacks:

**Proprietary Wireless and Data Formats** - Channel Communications Carrier uses proprietary communications signalling and data-link protocols that make it almost impossible to intercept or spoof the wireless data streams.

**Transmission Encryption** - encryption is employed on every wireless link.

**MAC Address Authentication** - the Channel Communications Carrier Base Stations maintain a user-configurable, password-controlled table of authorised Subscriber Unit MAC Addresses. Subscriber units cannot talk to the Network unless the Channel Communications Carrier Base Station Unit authenticates its MAC Address and adds it to the Network.

**MAC Address Filtering** - the Channel Communications Carrier Subscriber Units are configured to filter the downlink traffic stream to prevent a Subscriber Unit from outputting traffic that is destined elsewhere. The filtering restrictions can be based upon Ethernet Addresses, VLAN Addresses, or IP Addresses. Only the Channel Communications Carrier Network Operations Centre (NOC) can configure the filtering controls.

## Fixed Wireless Ethernet Applications

The Channel Communications Carrier Fixed Wireless Network has been designed to support the type of applications business needs today including High-speed Internet Access, while boasting a flexible design to support applications of the future. Applications include:



**Access the Cloud** - cloud computing describes a new delivery model for its services and applications based on the internet. It typically involves provision of dynamically scalable and often virtualized resources over the internet. This frequently takes the form of web-based tools or applications that users can access and use through a web browser as if it was a program installed locally on their own computer. Naturally, this type of internet traffic is an overhead on your Ethernet Network across the organisation. Fixed Wireless Ethernet is perfect for providing the speed, security and almost-instant set-up that new business, offices, or more temporary workplaces require.

**Backup to Fibre and Copper Networks** - the Channel Communications Carrier Fixed Wireless Ethernet Network offers a solution designed to enable continuity in the event of an unforeseen Network interruption, which traditional terrestrial outlets are not able to provide. We enable businesses to avoid losing real-time access to their data centre by providing a redundant link that will ensure continuity of data transfer to remote sites.

**Temporary Service** - Channel Communications Carrier Fixed Wireless Ethernet is the ideal solution when internet or corporate Network connection is required at a temporary site, whether for a day, or for a year. Our Fixed Wireless Ethernet can even be cost-effectively deployed for single-day events, providing sufficient bandwidth for hundreds of internet users. High capacity internet connectivity has been routinely provided by Channel Communications Carrier for numerous high profile events. Alternatives such as ADSL would not provide the required performance, while Optical Fibre would not be available on short notice, if at all. Fixed Wireless is also the perfect solution for reliable, high speed internet connectivity for building site offices which are not only temporary, but prone to relocation around a construction site.

**Virtual Private Network** - seamlessly extend your Local Area Network (LAN) across multiple sites to support voice or video communications, data mirroring for business continuity, disaster recovery and more. VPN allows geographically dispersed offices and individuals to access the company's Network from almost anywhere. In this environment it's important for data to be encrypted and roaming users to be able to connect to their corporate Network at any time.

**Voice Or Video Communications** – Channel Communications Carrier Fixed Wireless Ethernet is ideal for voice and video communications.

**Voice over Internet Protocol (VoIP)** provides free voice calls within a corporation, and very low cost calls to the world-wide telephone network. VoIP offers a host of other benefits, such as sophisticated conferencing and diversion features. Using VoIP is as simple as using a traditional handset to place a call. The Channel Communications Carrier Network is far superior to ADSL broadband for VOIP and video thanks to:

- **QoS (Quality of Service)** control, which gives time-critical data such as voice or video priority over data which can wait a few milliseconds, such as email.
- **Symmetrical transfers** (same speed in both directions).
- **Low latency and jitter** (no delays or dropouts) the guaranteed high speeds of our Fixed Wireless Ethernet Network enables video conferencing without freezing or pixilation, and its symmetrical high speed makes it perfect for 'telepresence' – a recent extension of video conferencing that offers the experience of 'being there' without the costs and inconvenience of long-distance travel.

## Channel Communications Carrier – The Company

Fixed Wireless Ethernet offers a real alternative to traditional landline based Networks for enterprise applications. Channel Communications Carrier is not a reseller of other Carriers -- it has built its own state-of-the-art network using advanced wireless technologies and IP networking equipment for total control over features and delivery of service. Channel Communications Carrier Network sends data at high speed through the air using radio waves instead of copper wires or optical fibres. The network is particularly suited to internet, VoIP, video-conferencing, backup to terrestrial networks, virtual private networks and temporary services. The Channel Communications Carrier Network is available to businesses within Sydney, Melbourne, Brisbane, Gold Coast, Perth, Newcastle and Adelaide.



### **Products Available Include:**

**Private Data Links** - seamlessly extend your Local Area Network across multiple sites across Australia for multi-site businesses, voice or video communications, data mirroring for business continuity, disaster recovery and more.

**High Speed Internet** - business-grade, high availability, high speed internet access with symmetrical upload and download speeds

## Glossary

**ADSL / ADSL2+ (Asymmetric DSL)** DSL where uploads and downloads are not the same speed. **ADSL1** allows a maximum 1.5Mbps download and 256kbps upload speed. The newer 2+ variant is rated at 24Mbps download and 1Mbps upload. However that speed can only be achieved within a few hundred metres of the exchange and a more realistic speed for the majority of the population should average at 10Mbps download and 600kbps upload.

**Bandwidth** in computer networks, the maximum speed at which data can be transferred, usually measured in megabits per second (millions of bits per second).

**Contention Ratio** the ratio between actual bandwidth available and the theoretical bandwidth required to provide all users sharing the service the promised bandwidth. On ADSL, for example, a contention ratio of 20:1 is typically used, so the actual bandwidth is only 1/20 of what would be required to supply the full bandwidth to all users.

**DSL (Digital Subscriber Line)** a technology that allows digital signals to be transferred over standard telephone lines. There are different types of DSL, with the newer being faster.

**Encryption** a system of securing data, making it intelligible only to the authorised party which is in possession of the 'key', a secret number almost impossible to guess.

**Ethernet** a technology for interconnecting computing devices in a Local Area Network (LAN) or Wide Area Network (WAN).

**Internet** the global network which connects hundreds of thousands of networks together using standardised protocols such as TCP/IP.

**Jitter** a measure of the variability of latency in the network. The standards-based term for jitter is packet delay variation (PDV). PDV is an important quality of service factor in assessment of Network performance.

**Latency** the time it takes data to get from a source point in the network to its destination. Sometimes the return trip is also included in latency. Latency will be greater than the raw transmission time allowed by the bandwidth, because there are usually delays at various points in the network.

**MAC Address (Media Access Control Address)** a unique number assigned to a network interface device at the time of manufacture. One use of MAC Addresses is MAC Address filtering, which can enhance security. That is, a network can be configured to allow only devices with specified MAC Addresses to connect.

**Packet Loss** packet loss occurs when one or more packets of data travelling across a computer network fail to reach their destination. The rate of packet loss is measured as a percentage. Some protocols are designed to resend lost packets, data integrity is ensured even if there is a high loss rate, however packet loss becomes problematic with applications involving voice or video streaming.

**QoS (Quality of Service)** ability to provide different priority to different types of data flows, or to guarantee a certain level of performance to a data flow. An important application of QoS is to ensure that video or audio data has priority through a network, since small delays in other data (such as websites or email) are not noticeable.

**SHDSL (Symmetric High Bit-Rate DSL)** this variant of DSL offers symmetric upload speed and download speed. Circuits may be bonded to create a 4Mbps link. However, to achieve 2Mbps the distance of the circuit must be no greater than 3km. Once the circuit exceeds this distance, the circuit will run at slower speeds. Maximum distance from exchange is 6km where the speed will fall down to 192kbps.

**TCP/IP (Transmission Control Protocol and Internet Protocol)** communications protocols used for the internet and other similar networks. TCP/IP comprises a set of layers, each solving a set of problems involving the transmission of data.

**Telepresence** an enhanced form of video conferencing which uses high quality audio and video to give the participants the impression of being in the same room.

**Video Conferencing** communicating with one or more people at a different location using both sound and image. Traditionally, teleconferencing has provided only small, jumpy images of the other party, mainly due to limited bandwidth. See also Telepresence (above).

**vDSL / vDSL2 - Very High Bit-Rate DSL** a high speed, short distance DSL technology which allows speed of up to 18Mbps download and 16Mbps upload within the high rise building. The second variants of vDSL will allow speeds of 50Mbps to 100Mbps within the same building. This technology is very popular in countries like Korea, where the internet is used for mass distribution of video and TV.

**VOIP Voice over Internet Protocol** system for allowing voice communications over computer networks, including the internet. From the user's point of view, VoIP can be identical to making traditional phone calls. If the computer network does not perform adequately, call quality can suffer, however a properly designed VoIP system can offer better performance and features than regular telephony, and at much lower call cost.

**VPN Virtual Private Network** a system to allow businesses to access their internal networks and computers over the internet or other public network. Encryption and other techniques are used to ensure that data cannot be accessed without authorisation. VPNs are primarily used to connect branch offices and allow mobile staff to access the company's network.

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