NetCommWireless

Outdoor HSPA+ WiFi Router and Marine WiFi Router
(NTC-30 Series)

6th May 2013

Introduction

1. ABS Internet Activity, Australia, June 2012.
2. Australian Bureau of Statistics (ABS). Year Book Australia, 2012
3. OECD broadband statistics June, 2011.

Australian consumers and businesses have access to a range of Internet access technologies including dial-up, digital subscriber line (DSL), cable, satellite, hybrid fibre coaxial, optical fibre services and fixed and mobile wireless. The availability of these services largely depends upon a user's geographic location. Rural and regional communities, remote commercial sites and metropolitan areas that lack access to fixed line infrastructure rely on wireless networks for broadband access; and at sea, 3G/HSPA, WiFi and satellite services are the only Internet access technologies available.

The growing need for reliable broadband connectivity in areas located beyond the reach of fixed line infrastructure is driving the uptake of mobile and fixed wireless connections which now account for 48.9% of all Australian Internet connections (excluding mobile handsets).[1] Wireless connectivity surpassed digital subscriber line (DSL) connections (which account for 38.4% of all broadband connections) for the first time in June 2011.[2] The global demand for new wireless broadband subscriptions is also experiencing rapid growth, increasing 26% in the first half of 2011.[3]

3G/HSPA+ networks enable cost-effective high-performance connectivity in isolated communities and offshore locations, but issues relating to geographical discrepancies in 3G signal strength remain. This white paper examines the way by which the NetComm Wireless Outdoor HSPA+ WiFi Router with Voice and Marine WiFi Router overcome wireless signal strength challenges to deliver a high-speed 3G/HSPA+, WiFi and phone connection to communities and businesses in remote, offshore and metropolitan black spot areas.

The Need

4. 2011–2012 REGIONAL TELECOMMUNICATIONS REVIEW—SUMMARY

5. GSA. March, 2013.

6. Australian Bureau of Statistics (ABS). Internet Activity, Australia, June 2012

7. Australian Bureau of Statistics (ABS). Internet Activity, Australia, Dec 2011

Delivering competitive telecommunications services to regional and rural areas has long been an issue due to the low investment returns associated with deploying networks to small populations over vast distances. Estimates suggest that Telstra currently has up to 154 million kilometres of copper in the ground, but electrical wires and phone lines lack the extensive coverage needed to connect premises scattered across Australia's vast 7.7 million square kilometre area.

A number fringe districts and outer metropolitan areas only 20km from the CBD are unable to access fixed line services and therefore rely on wireless networks such as the Telstra Next G network which offers coverage to 99 per cent of the Australian population.
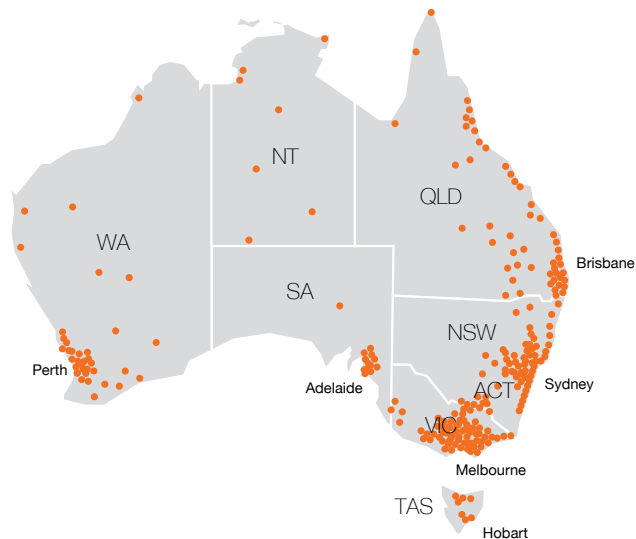
The issue is in the quality of coverage which can vary significantly as a result of variables such as distance from the towers, mountainous terrain, valleys and other non-typical geographies. Wireless inconsistencies have resulted in concerns about the adequacy of mobile and voice broadband services in regional Australia.

This concern was raised in every regional consultation and in around two-thirds of the submissions received by the Regional Telecommunications Review Committee 2011-2012. The committee accepts that there are commercial limits to expanding mobile network coverage, but believe it is equally clear that there is strong unmet demand in regional Australia for an expansion of the wireless coverage footprint.

Wireless communications are expected to play an increasingly important role in enabling participation in the digital economy, both on land and at sea. With many emerging technologies requiring mobile-wireless services to work, access to mobile broadband and voice services is critical in capturing the next generation of productivity improvements, such as water use efficiencies in the agricultural sector.[4]

8.   NBN implementation study, 2010

9.   Australian Financial Review. 'NBN Co set to revise rollout targets', James Hutchinson.

Mission-critical applications used by coastal merchant ships, commercial barges, marinas, offshore rigs and fishing vessels share the same connectivity needs as land based industries in that an optimal 3G Internet and phone connection is needed to maximise productivity, safety and energy efficiency.

The online environment

Wireless broadband is the fastest growing online technology globally.

Globally, 100% of WCDMA operators have launched HSPA; and HSPA+ is mainstream with 254 networks launched in 118 countries. At the start of 2013, 145 LTE networks were commercially launched (97 of these were launched during 2012) and mobile broadband subscriptions worldwide have reached 1.14 billion.[5]
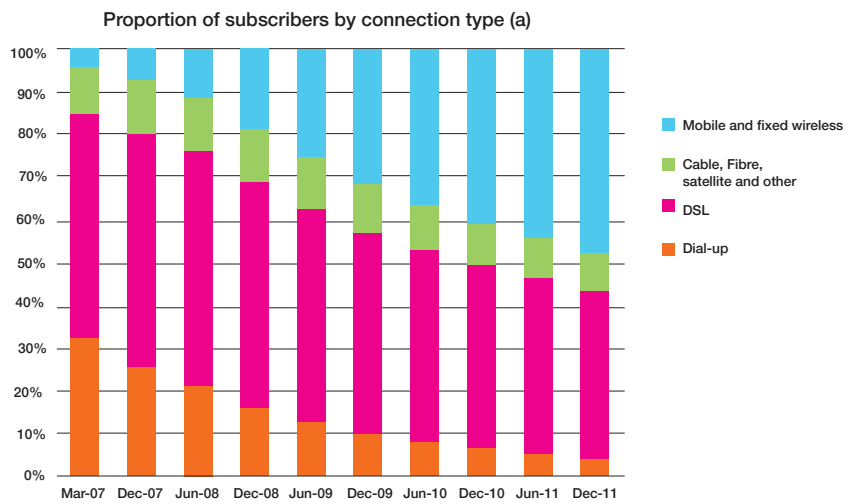
3G Subscriptions growth worldwide
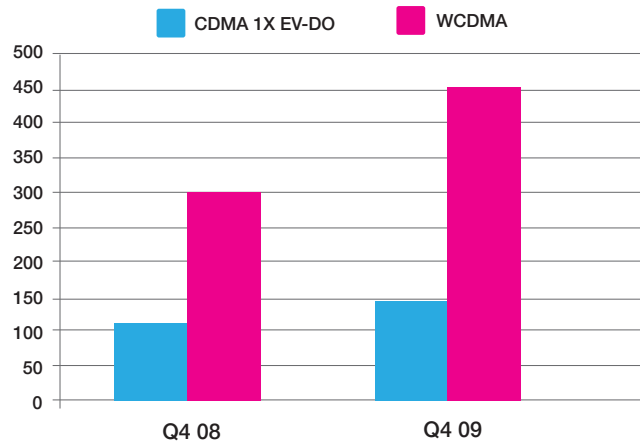
There were 11.6 million Internet subscribers in Australia at the end of December 2011, representing annual growth of 11.0% and an increase of 6.3% since the end of June 2011.

Mobile wireless Internet connections continue to be the fastest growing and most prevalent Internet technology in Australia. At 30 June 2012, there were 5.9 million mobile wireless broadband connections, an increase of 7% since the end of December 2011. Mobile wireless broadband was again the most prevalent internet technology in Australia, accounting for 49% of all connections. Note these data exclude mobile handsets.[6]

Although Digital Subscriber Line (DSL) connections grew by 1.3% to 4.6 million in the six months ending December 2011, the percentage share of DSL continued to decline, accounting for 39% of connections.

In December 2011, the number of satellite connections decreased by 6% compared to June 2011 to 100,000 subscribers; and while fibre subscriber figures are still relatively low (37,000), the number increased by 18.3% in the same period.[7]

10. Wireless Broadband Technologies for Regional and
    Rural Australia: A Last-Mile Perspectiv

Proportion of subscribers by connection type (a)

Legend:
- Mobile and fixed wireless
- Cable, Fibre, satellite and other
- DSL
- Dial-up

National Broadband Network (NBN) plans to provide high-speed broadband to 100 per cent of Australian premises utilising fibre, fixed wireless and satellite services; but the fibre rollout will not be extended to rural and remote regions because the per-premises cost of the fibre rollout significantly escalates with increasing coverage.[8]

Capital cost per premises activated
$ per premises

Premises covered
Percentiles ranked by cost
per activated premises
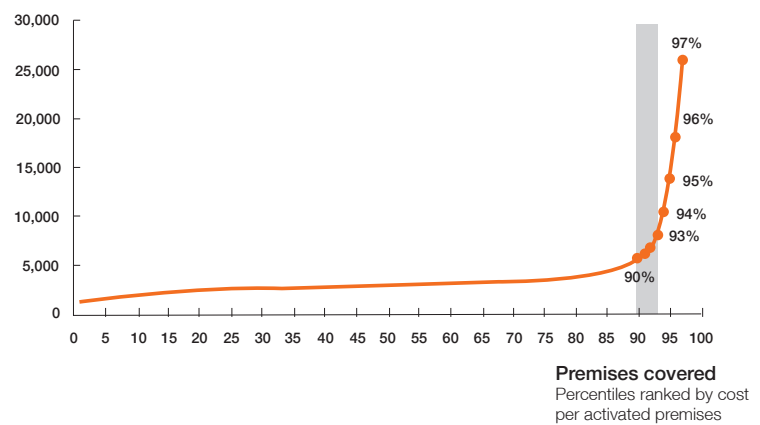
NBN Co is currently reassessing previous estimates that it will pass 286,000 existing homes with fibre and 55,000 newly built homes by the end of the 2012 financial year. Instead passing as few as 140,000 existing homes by that milestone date.[9] Premises earmarked for fibre but currently lacking access to a fixed line connection will therefore continue to rely on 3G/HSPA+ broadband services.

11. Results published in Practical Boat Owner, January 2013

12. National Marine Electronics Association (US based organisation responsible for the NMEA0183) network system based on the CAN-bus (Controller Area Network bus) system.

The offshore online environment

At sea, satellite services, wireless broadband (3G/HSPA+) and WiFi are the only available Internet access technologies.

Satellite services are accessible from most locations globally, but due to the high costs and latency (delay) associated with satellite, these services are best reserved for email and emergency communications. It is advised that satellite be used in conjunction with radio services for emergency messaging, and with 3G/HSPA+ for broadband Internet access as heavy clouds and solar interference can render satellite services temporarily unavailable on a frequent basis. A number of satellite services offer email messaging services, without providing access to the Internet.

VHF and HF radio is essential for safety communications, but as signals can be patchy in areas and unavailable in vast sections of Australian waters, radio communications should be used together with other communication tools such as 3G/HSPA+ within coverage areas. Although satellite provides clearer communications than radio, HF radiotelephone will receive high seas marine weather warnings. Currently, Volunteer Marine Rescue (VMR) offer only VHF coverage which generally use Channel 16, although some states have repeater networks that run on other channels.

WiFi on vessels is used in three key ways: Long Range WiFi to connect to the Internet, WiFi networking on the boat and a wireless NMEA data connection. Long Range WiFi provides a low cost point-to-point connection option, but is limited by transmission power, the type of antenna, the environment and location. Long Range WiFi coverage offshore is generally limited to areas around large marinas and harbours. The process involves using the WiFi device's wireless connection manager, or a dedicated web page created by the long range WiFi adaptor, to select a wireless hotspot and connect to it. The problem is that whilst in transit, users are frequently required to connect to new WiFi access points.

3G/HSPA+ wireless broadband services offer a cost-effective alternative to satellite with less delays (lower latency); whilst also providing superior coverage when compared to Long Range WiFi. Where coverage is available, 3G/HSPA+ is the most effective Internet access technology for commercial and leisure craft utilising online communications for entertainment, communicating with the office, ports and marinas, transmitting reports or accessing weather and oceanographic data. Extra large vessels, such as cruise ships, often have a mobile cellular tower on board; but most vessels require a powerful router to connect to an onshore 3G network.

The challenge

Both in Australia and globally, the poor economies of scale associated with extending broadband services to low population density areas presents significant difficulties for rural communities and vertical sectors such as farming, agriculture, mining and meteorology.[10]

While lower capital and operational costs make wireless technology the most effective means of connecting remote and offshore areas, reliable access to wireless networks remains a challenge due to the poor data speeds and coverage experienced in many rural and urban fringe areas. To effectively participate in the digital economy, rural communities require a fast and powerful wireless connection.

On the open ocean, commercial and leisure vessels face a different set of challenges in that they are mobile, often having to shift between access technologies depending on location and connectivity requirements. In the home or office, a broadband Internet connection is most often shared between multiple users or devices via a wireless router. The challenge has been to achieve the same multi-device networking capabilities onboard.

Offshore users utilising a USB (dongle) to connect a laptop or other USB device to 3G are unable to share the connection with tablet computers, smart phones and other wireless-enabled devices which are not equipped with a USB port. A USB also lacks the capacity to network marine navigation devices such as GPS systems and speed, depth, wind and log instruments. While these devices have made navigating a journey at sea simpler and safer, a shared network it essential in creating integrated instrument networks that share high-speed data.

In a recent test conducted by David Pugh and Ben Meakins[11], eleven marine device models from five different brands were tested for their ability to communicate with each other. They found that 'while units with displays dedicated to speed, depth and basic navigation are still available, most can now be configured to show a range of data from a network. The other development is the way these instruments, and their information sources such as transducers, communicate with one another.' Having recognised the benefits of networking, manufacturers have developed their own networking systems, but at the expense of locking customers into a single brand. The results found that most major manufacturers have developed NMEA 2000[12] compatible instruments, but the standard requires that each item have its own dropper cable to the backbone.

The offshore challenge, then, is to establish a powerful wireless network with the capacity to connect marine instruments as well as wireless-enabled devices such as laptops, tablet computers and smart phones using a single device.

The Solution

NetComm Wireless' NTC-30 Series routers, which include the Outdoor HSPA+ WiFi Router with Voice and Marine WiFi Router, extend and amplify a 3G signal and share it between multiple devices via WiFi, providing high-speed broadband connectivity to remote locations, boats and marinas.

Prior to the introduction of the Outdoor HSPA+ WiFi Router with Voice, businesses based in fragile wireless coverage areas relied on the installation of high gain directional antennas, such as Yagi antennas, to improve signal strength. This option involves using a cable to connect the antenna to an adapter which is then connected via cable to the modem. At sea, a combination of cellular amplifiers, wireless signal repeaters and high gain directional antennas were needed to enhance the signal to the modem.

Using the example of an online business which suffered a degraded signal and slow wireless speeds due to its distance from the nearest 3G tower, an external antenna was connected to a 3G router which was attached to a switch to create a wired network for desktop PCs; and a separate WiFi router was then used to create a WiFi hotspot within the premises. The use of multiple separate components increased the frequency of mechanism failure.

The Outdoor HSPA+ WiFi Router with Voice presents a new alternative, combining a powerful antenna system, 3G/HSPA+ modem, Wireless LAN access point and telephone adapter for analogue phone connectivity in a single device.

The Marine WiFi Router establishes a 3G connection up to 60km offshore and can be configured to connect onboard GPS chart plotters, speed, log, depth and wind instruments to a shared network within a radius of up to 100 meters. Designed for 35 to 70 foot vessels, the router connects multiple wireless and wired devices using a single broadband account and allows phone calls to be made using a standard analogue phone.

The Marine Outdoor Router combines a 3G/HSPA+ modem, high-performance OMNI external antenna system, Wireless LAN access point, Ethernet ports and telephone adapter in a single weatherproof device to ensure a seaworthy network for multiple Internet-enabled devices.

The waterproof and rust resistant Marine Outdoor Router connects directly to the vessel's 12V AC/DC power supply using a 10 meter power cable; and is IP67 rated, having undergone extensive testing (Salt Spray Test. IEC 60068-2-11 Test: Ka.; ASTM D610-01 rust grade 4) to ensure maximum durability in harsh open ocean conditions. The device also features corrosion proof mounting options and stainless steel connectors and screws.

Commercial M2M applications

The widespread availability of wireless networks is transforming the way that Machine-to-Machine (M2M) communications are utilised to remotely control, measure, monitor and transfer data from sites often dispersed over a wide area, or based in difficult to access locations.

The Outdoor HSPA+ WiFi Router with Voice and Marine WiFi Router enable reliable real time communications between onboard devices and a central system for remote management. Featuring TR-069, problems can be diagnosed and resolved without sending a technician to remote sites, or needing an onboard technician, to upgrade firmware or to check the network connection status, WiFi and device settings.

The Outdoor Routers support applications such as telemetry and remote SCADA, real time security / CCTV monitoring, remote employee / crew training and support, updates to GPS systems and access to a corporate VPN. Significant cost savings can be achieved by using a single 3G data plan for multiple applications.

Application examples

Disaster management / emergency communications
The reliability of communications during emergency situations is a serious concern for regional communities. Natural disasters such as the Victorian bushfires and the Queensland floods have highlighted the importance of reliable communications. According to the 2011-2012 Regional Telecommunications Review Committee, there is a concern that many of the communications deficiencies which became clear in the aftermath of these disasters remain unresolved. The Outdoor HSPA+ WiFi Router with Voice offers an effective disaster management solution, supporting all wireless voice and data communications needs in affected communities and in areas prone to extreme environmental conditions.

National parks
The NSW Office of Environment and Heritage (OEH) works to protect and conserve the NSW environment, servicing NSW national parks and reserves where ADSL infrastructure does not exist. After trialling the Outdoor HSPA+ WiFi Router with Voice as an alternative to their current setup, which pairs 3G gateways with multiple external antennas, the OEH found that a powerful broadband connection could be achieved using a single unit without the need for cabling between various components.

Energy sector
Regional site offices running high-latency applications (SAP) depend on reliable 3G connectivity to avoid costly systems failure. The Outdoor HSPA+ WiFi Router with Voice provides a stable, high throughput service in areas that experience inconsistent wireless signal strength.

The Technology

The NetComm Wireless Outdoor HSPA+ M2M WiFi Router and Marine WiFi Router combine a powerful antenna system, cellular modem, Wireless LAN access point and telephone adapter in a single unit. The embedded cellular modem delivers data downloads of up to 21Mbps (HSPA+), which can be shared via a WiFi and Ethernet network. With an integrated Wireless LAN access point and MIMO antenna technology to transmit a strong signal (up to 100 metres) for convenient indoor and outdoor Internet access, and wired connectivity powered via Ethernet to support video and other high-bandwidth activities without disruption.

The integrated telephone adapter connects standard analogue phone handsets to the device, allowing phone calls to be made over the 3G UMTS network for a full landline experience.

The IP67 rated housing and stainless steel connectors and screws allow the router to operate in extreme conditions in marine applications without suffering from rust and other physical defects.

Key features:
- Industrial-grade fixed wireless data gateway designed for deployments on boats and in marine applications
- Ideal for providing wireless connectivity over 3G UMTS networks
- Embedded high-performance 3G cellular modem supporting HSPA+/ EDGE/GPRS
- IP67 and environmentally rated chassis to withstand extreme weather conditions
- Stainless steel metal connectors and screws to ensure the device remains free from rust
- Extended temperature tolerance in operation
- 2.4 GHz band wireless LAN access point with 2x2 MIMO antenna technology
- IEEE 802.11n standard for WiFi data speeds up to 300Mbps
- Ethernet 10/100 connectivity with Power over Ethernet Injector
- Analogue telephone connectivity (CS Voice) for complete landline replacement (optional configuration)
- Alternative DC power input available as an optional extra to suit diverse installation environments
- Built-in VPN clients for a secure connection over a public cellular network

High-speed broadband
Provides access to 3G/HSPA+ networks, delivering broadband speeds reaching 21Mbps downlink to remote and low signal areas.

Multiple device connectivity
The device delivers Power over Ethernet and wireless options to support the simultaneous connection of multiple Internet-enabled consumer and commercial devices including PCs, laptops, smart phones, gaming consoles and M2M enabled equipment.

Indoor and outdoor WiFi
Featuring an integrated Wireless LAN access point and MIMO antenna technology, a reliable 802.11n WiFi signal reaching wireless N speeds of up to 300Mbps is transmitted inside and outside the premises.

IP67 rating

The sturdy and weather and dust resistant device is proven to withstand severe environmental conditions, extreme temperatures and water immersion to ensure durability in harsh climates.

TR-069 client for remote management

Using TR-069, problems can be diagnosed and resolved quickly and easily without having to send a technician out to upgrade firmware or to check the network connection status, WiFi and device settings. Businesses using M2M to connect equipment such as utility meters, medical devices and climate control systems will also benefit from avoiding costly technician site visits.

Weather and rust proof Marine WiFi Router

The waterproof and rust resistant Marine Outdoor Router is IP67 rated and has undergone extensive testing (Salt Spray Test. IEC 60068-2-11 Test: Ka.; ASTM D610-01 rust grade 4) to ensure maximum durability in harsh open ocean conditions, and features corrosion proof mounting options and stainless steel connectors and screws.

Technical Specifications

MCU
- Atmel AT91SAM9G45 Microcontroller, ARM9-based 400MHz Processor

MEMORY
- 128MB DDR SDRAM
- 256MB NAND Flash

OPERATING SYSTEM
- Embedded Linux 2.6

PEAK DATA SPEED
- Downlink: 21Mbps (HSDPA Cat. 14)
- Uplink: 5.76Mbps (HSUPA Cat. 6)
- EDGE MS Class 12: 247Kbps

CELLULAR BANDS
- UMTS/HSDPA/HSUPA: 850/900/2100/1900 MHz
- GSM/GPRS/EDGE: 850/900/1800/1900 MHz

WIRELESS LAN
- IEEE 802.11b/g/n 2T2R
- Frequency: 2.4 ~ 2.438 GHz
- Ralink RT3072 Chipset
- Peak Data Rate: Max 300 Mbps (MIMO, WPA2)

WIRELESS SECURITY
- WEP 64-bit, WEP 128-bit, WPA, WPA2, WPA-PSK, WPA2-PSK, TKIP, AES, Multiple SSIDs

CONNECTIVITY

- 1x (RJ-45) Ethernet 10/100Base-TX Port with Auto MDIX
- 1x Mini USB 2.0 Console Port
- 1x DC-in Port

ANTENNA INTERFACES
- 2x N-Type Cellular (MIMO)
- 2x N-Type WLAN (MIMO)

SIM CARD READER
- Lockable Tray Reader
- Push-Button-to-Release
- Mini USIM/SIM Format

LED INDICATORS
- Power, Network Service Type, Tx/Rx Data Traffic, Data Carrier Connection, Signal Strength

ADMINISTRATION & CONFIGURATION
- Web-based User Interface (HTTP)
- Dual System Management
- SMS Client (Send/Receive)
- Advanced SMS Diagnostics and Command Execution
- Firmware Upgrade via LAN or Over-The-Air (FOTA)
- System Monitoring
- Diagnostic Log Viewer
- System Status and Security Logs
- NTP Server Support
- SNMP v1/v2
- MIB
- 1x Reset Button

REMOTE MANAGEMENT
- Web-based User Interface (HTTP)
- Telnet, SNMP v1/v2
- TR-069 Client

LAN
- DHCP Server/Client/Relay
- Static Route
- UPnP

WAN
- WWAN (Cellular)
- PPPoE
- PPP (PAP/CHAP)

ROUTING & POSITIONING

- Static
- RIP (v1/v2)
- VRRP
- Dynamic DNS
- NAT
- DMZ
- MS A-GPS (for Location Based Services)

FIREWALL & SECURITY
- SPI Firewall
- Anti-DoS

VPN
- PPTP
- GRE
- OpenVPN

ENVIRONMENT
- Normal Operating Temperature: -20°C ~ +65°C
- Extended Operating Temperature: -25°C ~ +75°C (with Performance Deviations)
- Environmental Rating: IP-67 (sealed against water and dust)

POWER SUPPLY
- Power over Ethernet: 48 V DC
- DC In Port: 8 ~ 28 V optional with supply of external power supply

STANDBY INPUT CURRENT
- 110 mA @ 12V DC

3G ACTIVE INPUT CURRENT
- 300 mA @ 12V DC

MAXIMUM INPUT CURRENT
- 560 mA @ 12V DC

DIMENSIONS & WEIGHT
- 255mm (L) x 240mm (W) x 80mm (D) 2345g (including mounting and antennas)
- REGULATORY COMPLIANCY
- A-Tick (Australia), CE (Europe), FCC (USA), RoHS

MOUNTING KITS
- 1x Wall/Pole Mount
- Optional 1x adjustable Pole Mount

Conclusion

Degraded wireless signals negatively impact both consumers and businesses by limiting effective participation in the digital economy. Remote asset management and mission-critical applications in areas which lack access to fixed line infrastructure depend on reliable access to wireless networks, but the low investment returns associated with deploying tower infrastructure in low population density areas limit the expansion of wireless coverage. The industrial strength Outdoor HSPA+ WiFi Router with Voice and Marine WiFi Router offer a cost-effective solution by extending and strengthening connections to global 3G networks, creating a powerful WiFi network for multiple commercial and leisure applications in weak coverage areas.

About NetComm Wireless Limited

NetComm Wireless Limited (ASX:NTC) is a leading developer of innovative broadband products for telecommunications carriers and ISPs worldwide. Specialising in fixed and mobile broadband technologies, NetComm customises products to successfully deliver the performance capabilities of world-leading carrier networks to home, business and industrial applications. Customer premises Equipment (CPE) and Edge technologies are specifically designed to extend a reliable connection to fringe service areas globally. For 29 years NetComm Wireless has engineered a solid portfolio of world-first data communication products and is today a world renowned developer of HSPA+, LTE, machine-to-machine (M2M) and fibre access devices. Headquartered in Sydney, Australia, NetComm Wireless has offices in New Zealand, Canada, Middle East and Europe. For more information about NetComm Wireless visit:

www.netcommwireless.com.au.