Innovative use of 60 GHz for Industrial Solutions

Roy Wittert, Regional Sales Director, ANZ

Agenda

- What is the 60 GHz Frequency Band?
  - Channels
  - Standard
  - Technology
- Propagation Characteristics
- Attenuation Gas + FSPL
- Deployment examples
- Real Case studies
- Practical Considerations

What is the 60 GHz Frequency Band?

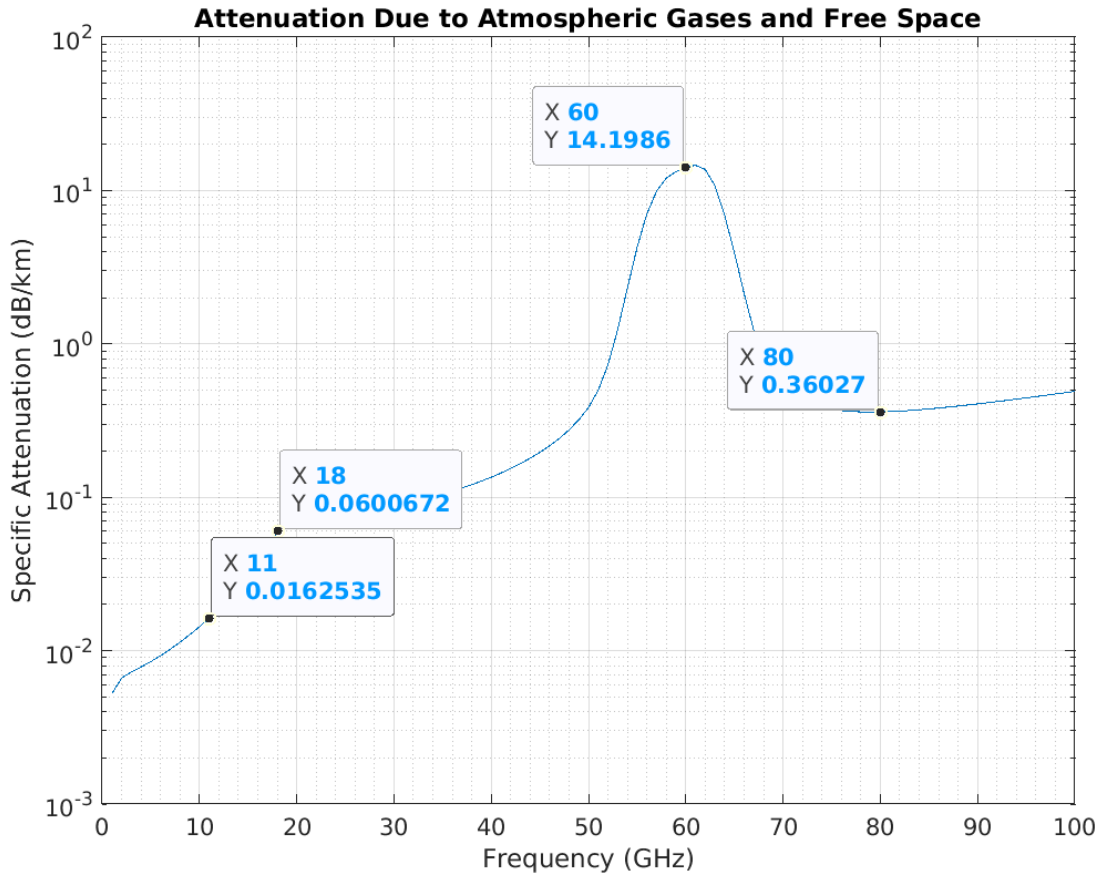
- 12 GHz of spectrum from 57.24 to 70.2 GHz
- Divided into six channels
- Each channel has Bandwidth of 2.16 GHz
- 802.11ay standard
- Terragraph technology

Channel	Center (GHz)	Min. (GHz)	Max. (GHz)
1	58.32	57.24	59.40
2	60.48	59.40	61.56
3	62.64	61.56	63.72
4	64.80	63.72	65.88
5	66.96	65.88	68.04
6	69.12	68.04	70.20

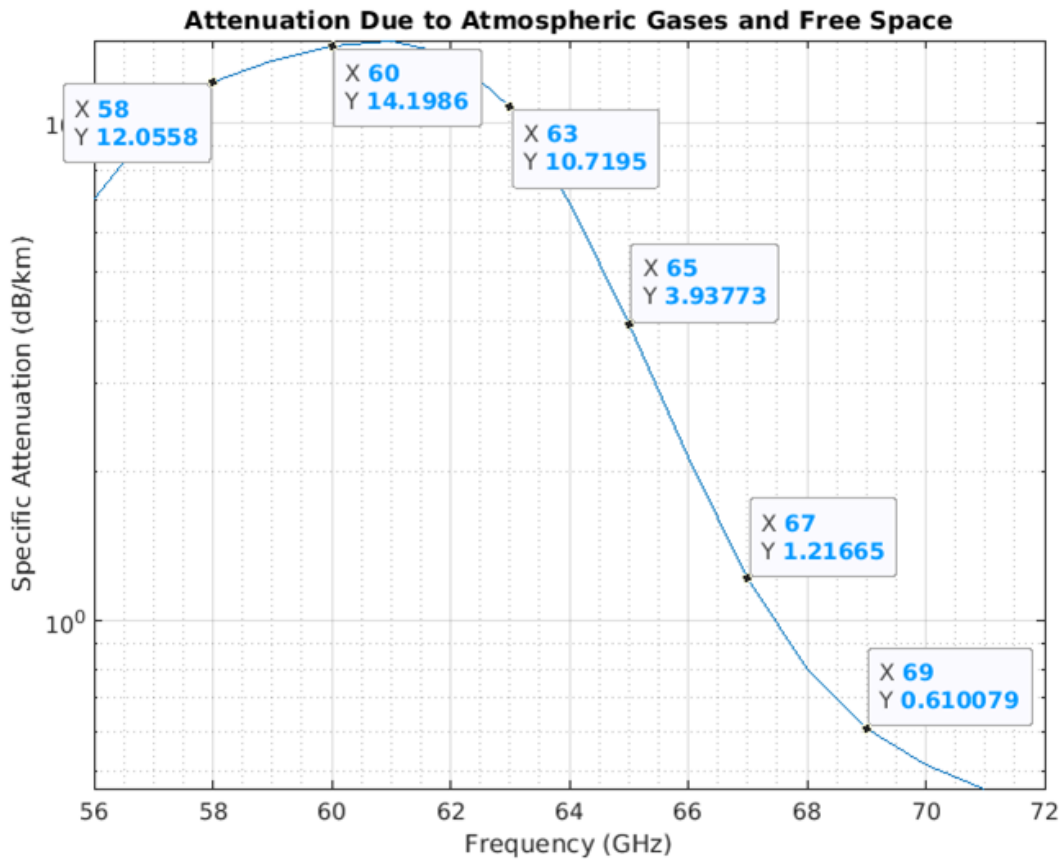
Channel Assignments Vary by Country	
Region	**Frequency channels**
USA	1,2,3,4,5,6
Australia	1,2,3,4,5,6
Papua New Guinea	Under Consultation
Vanuatu	Finalising Consultation
Fiji	1,2,3,4,5,6 TBC
Tonga	1,2,3,4,5,6
Solomon Islands	Finalising Consultation
EU	1,2,3,4,5,6
Canada	1,2,3,4,5,6
Russia	1,2,3,4
China	2,3
Singapore	1,2,3,4
Japan	1,2,3,4
New Zealand	1,2,3,4,5,6
South Korea	1,2,3

Propagation Characteristics Due to Atmos Gases and FSPL

- Key Observations?
  - All frequencies travel!
  - Atmospheric Absorption (oxygen, hydrogen molecules) increases attenuation in addition to Friis' FSPL.



Attenuation Due to Atmospheric Gases and Free Space

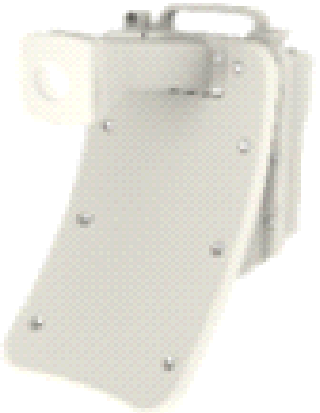


cnWave Building Blocks

Distribution Node

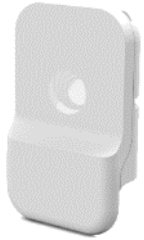
V5000
Dual Sector

Client Nodes (PMP or PTP)



V3000
High Gain
44.5 dBi Dish
40.5 dBi Dish

V2000
Flexible
Mid-Range

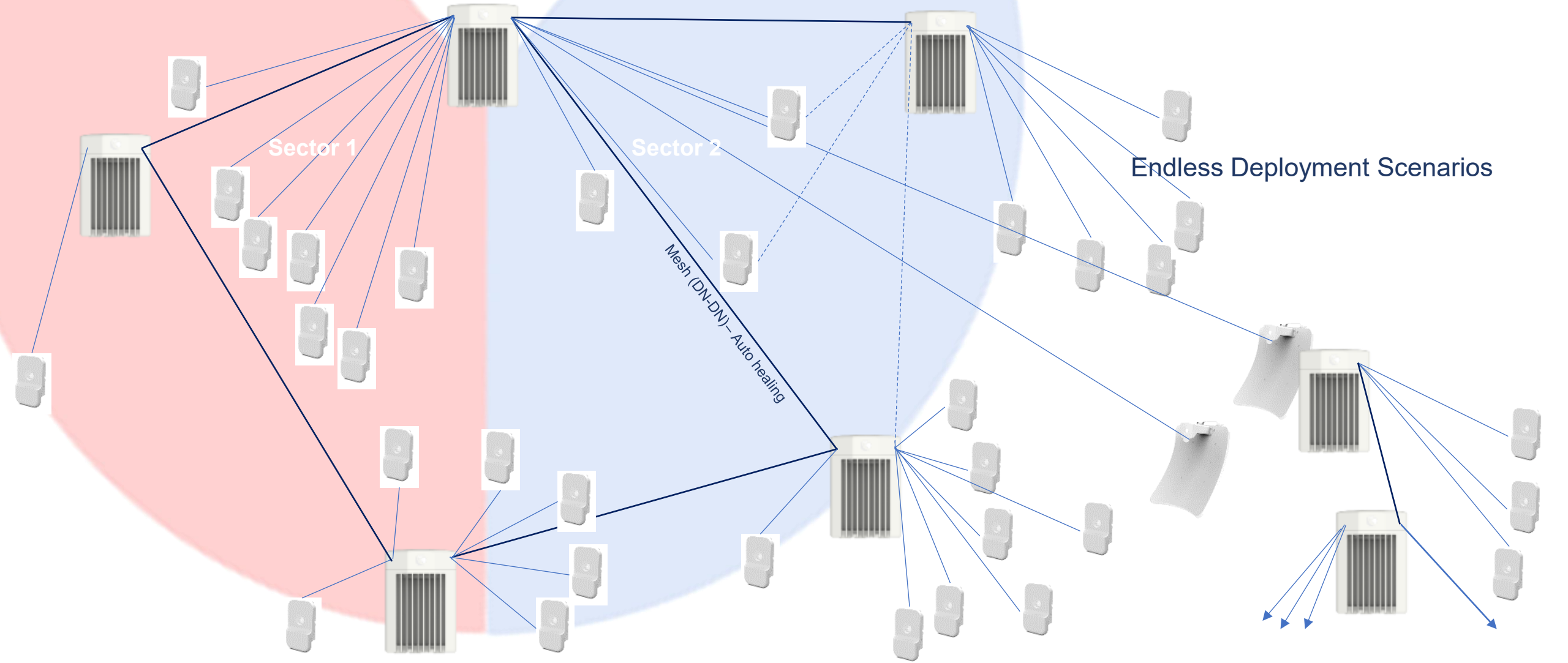


V1000
Small
Form-Factor

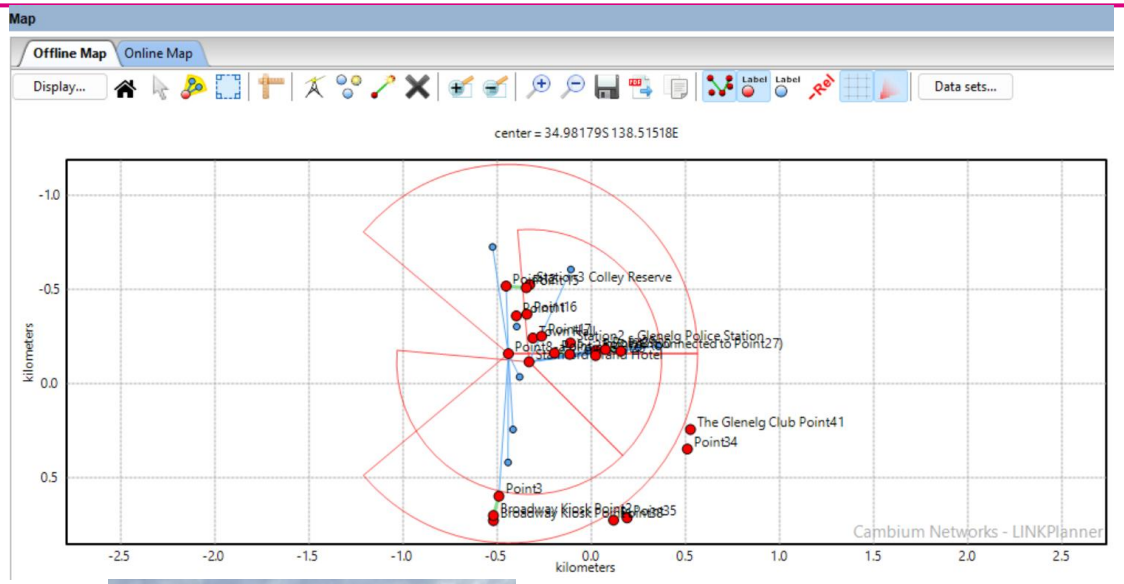
All 60 GHz cnWave products include:

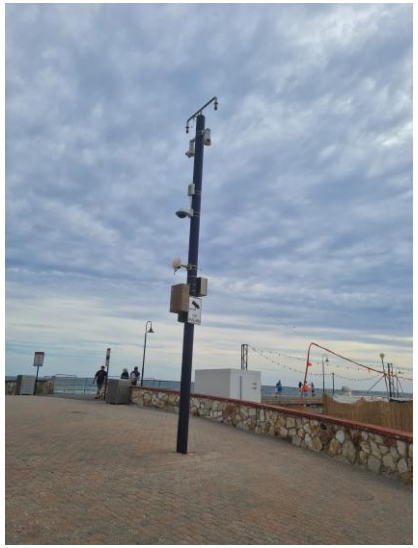
- Cloud or on-premises network management with cnMaestro™
- Optional advanced management features with cnMaestro X
- Network planning capabilities with cnHeat, LINKPlanner, and ANP
- On-board or Remote e2e Controller Software
- Layer 2 or layer 3 network connectivity
- IPv4 or IPv6 networking protocols
- Security with HTTPS interfaces and 128-bit AES encryption
- 3-year warranty
- Options for extended warranty, Cambium Care Pro, and advanced replacement

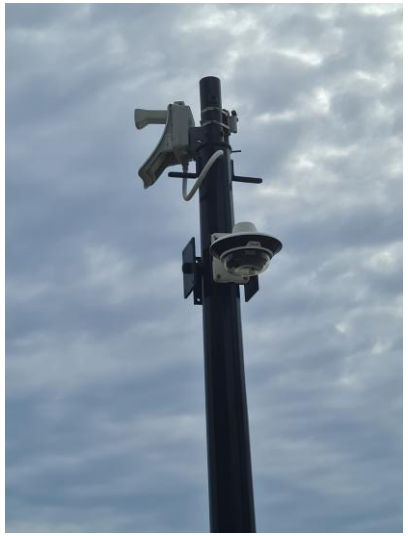
Deployment Example – Building a mesh network

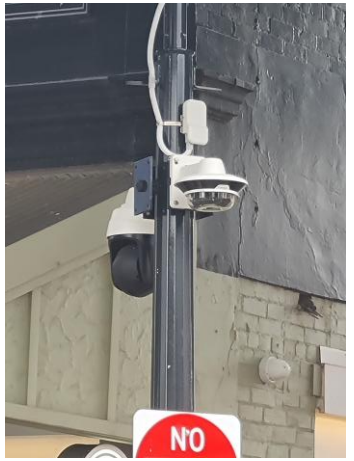


City of Holdfast Bay – Glenelg CCTV Upgrade



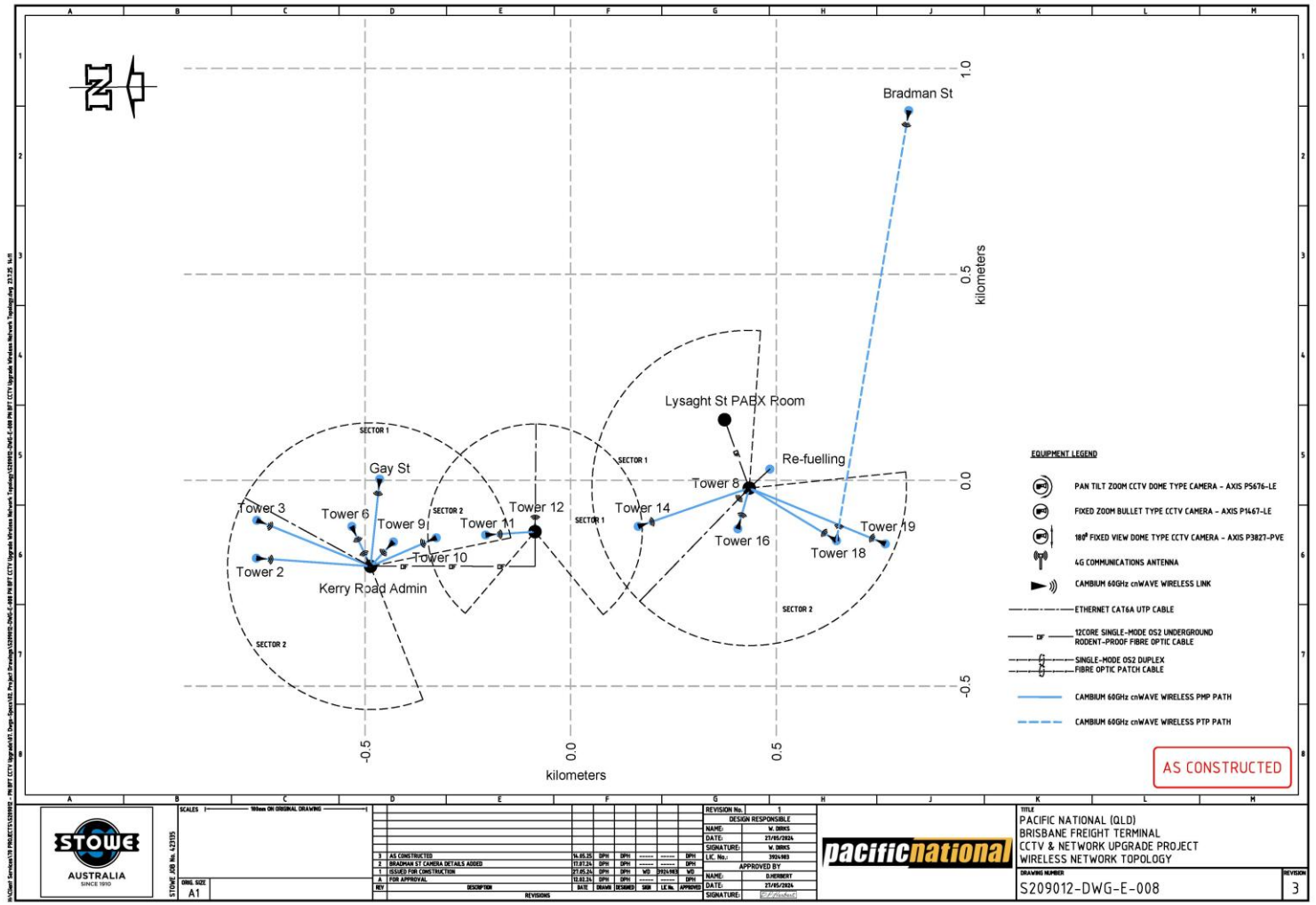




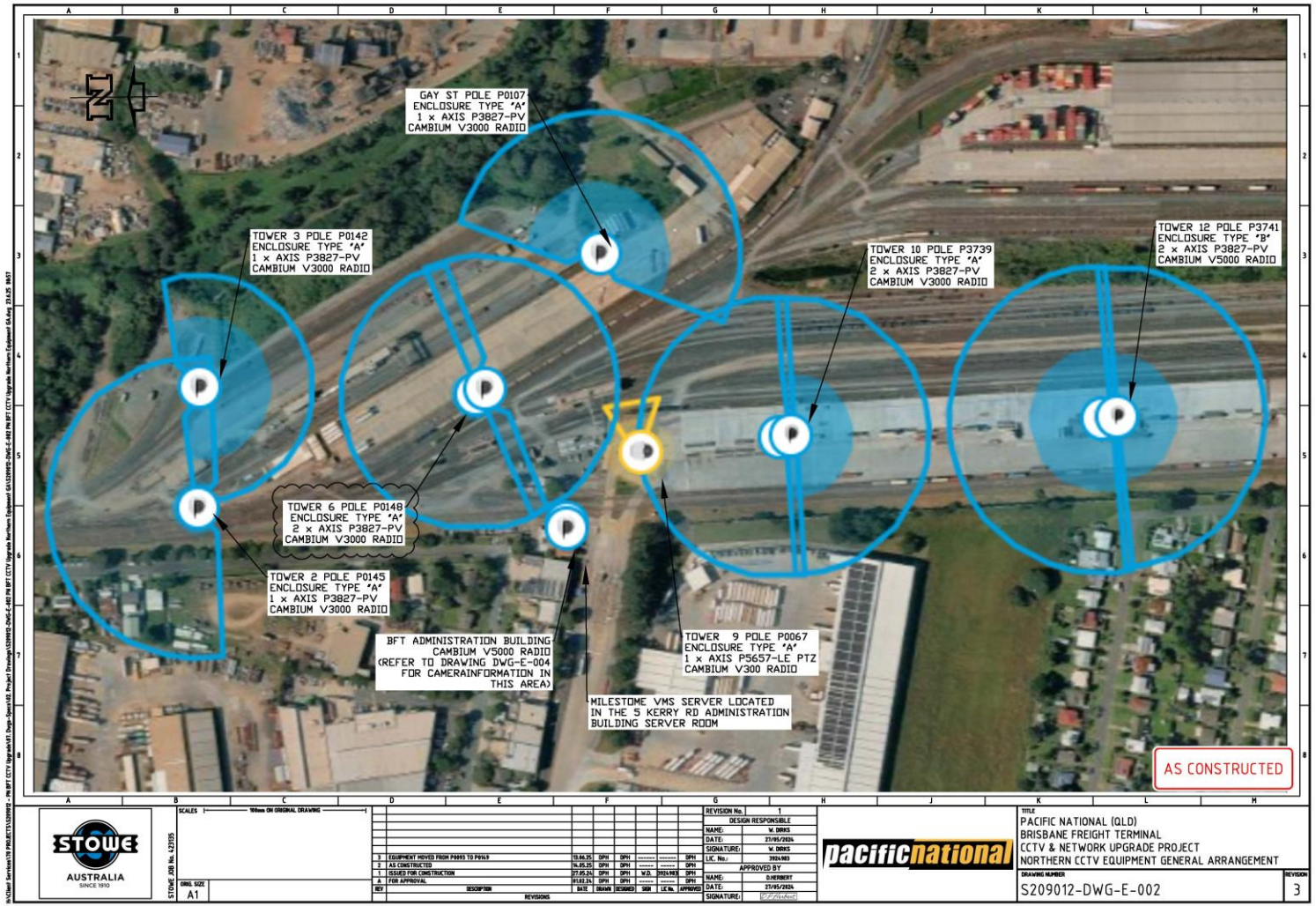


Stowe Australia - QLD

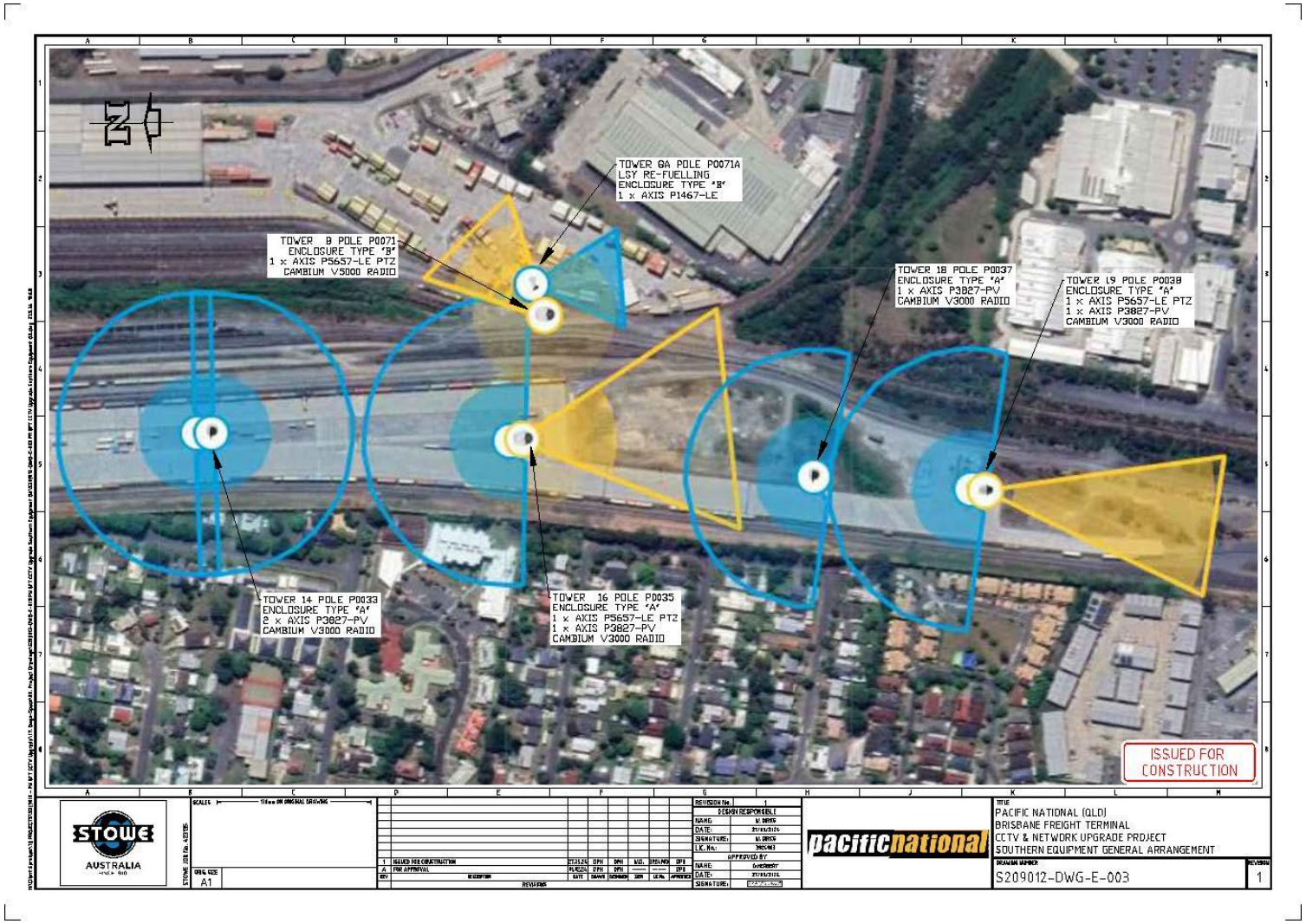
- Dave Cormack
  - SENIOR NETWORK ENGINEER, Stowe Australia
- Darren Herbert
  - Account Manager
- Case Study
  - Pacific National – Acacia Ridge Freight Terminal
  - Application - CCTV backhaul



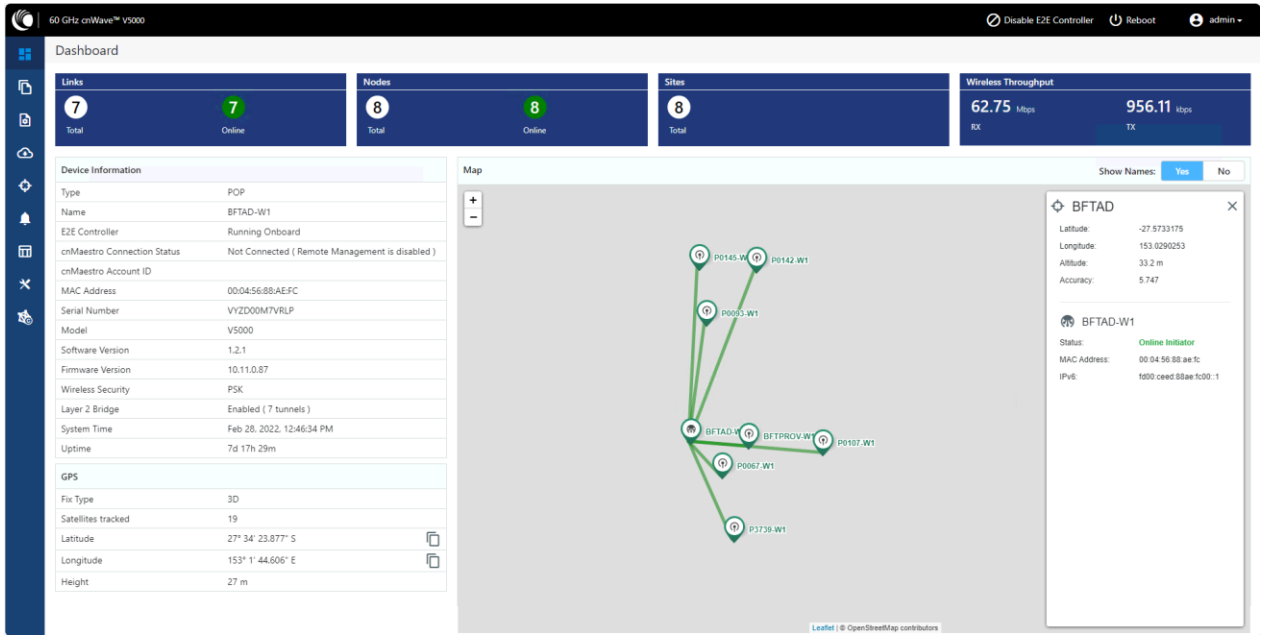
Stowe Australia – Upgrade Northern

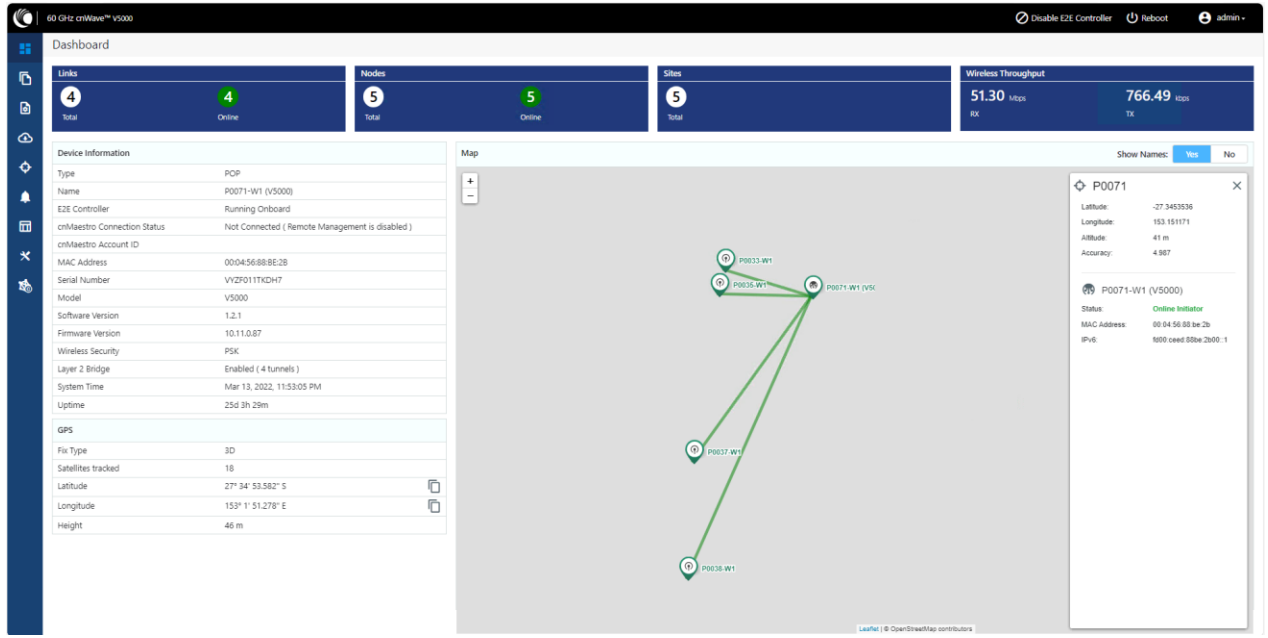


Stowe Australia – Upgrade Southern



Acacia Ridge Freight Terminal – NMS View



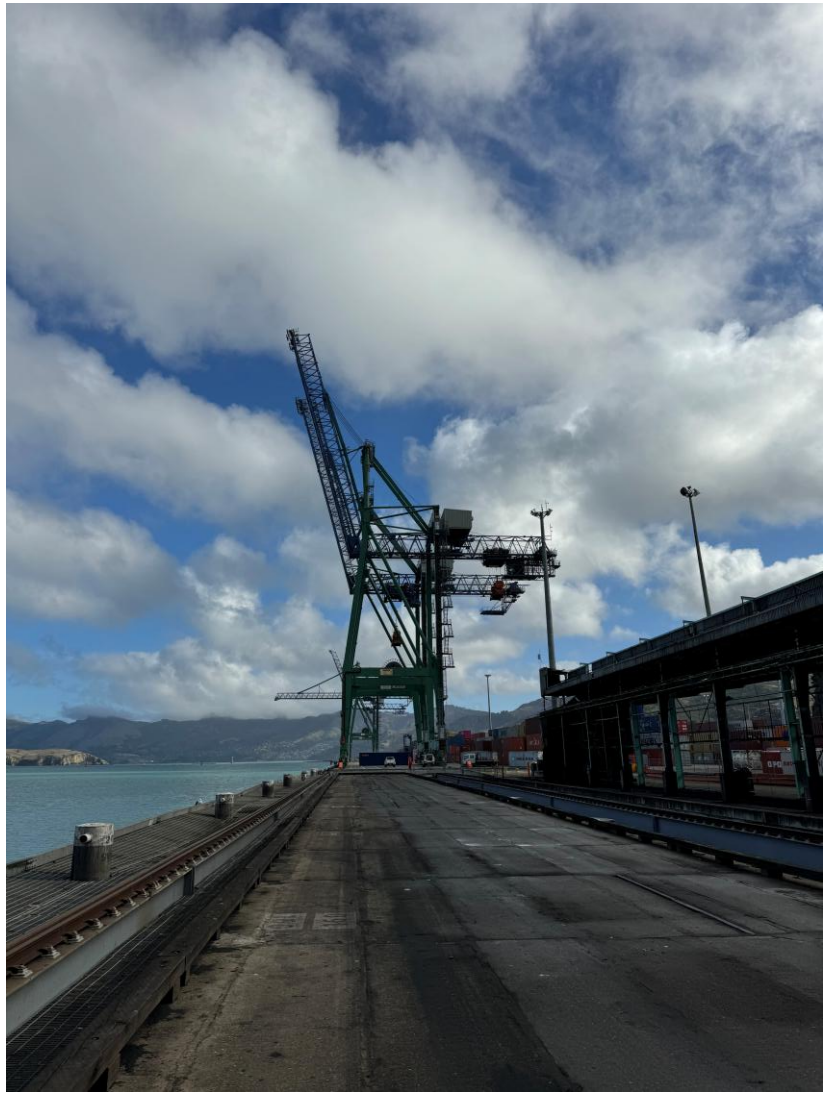


Outback Communications - NZ

- Corey Weir
  - LEAD ENGINEER
- Case Studies
  - Container Crane CCTV
  - LPC Coal Ship Loading
  - Future project in planning

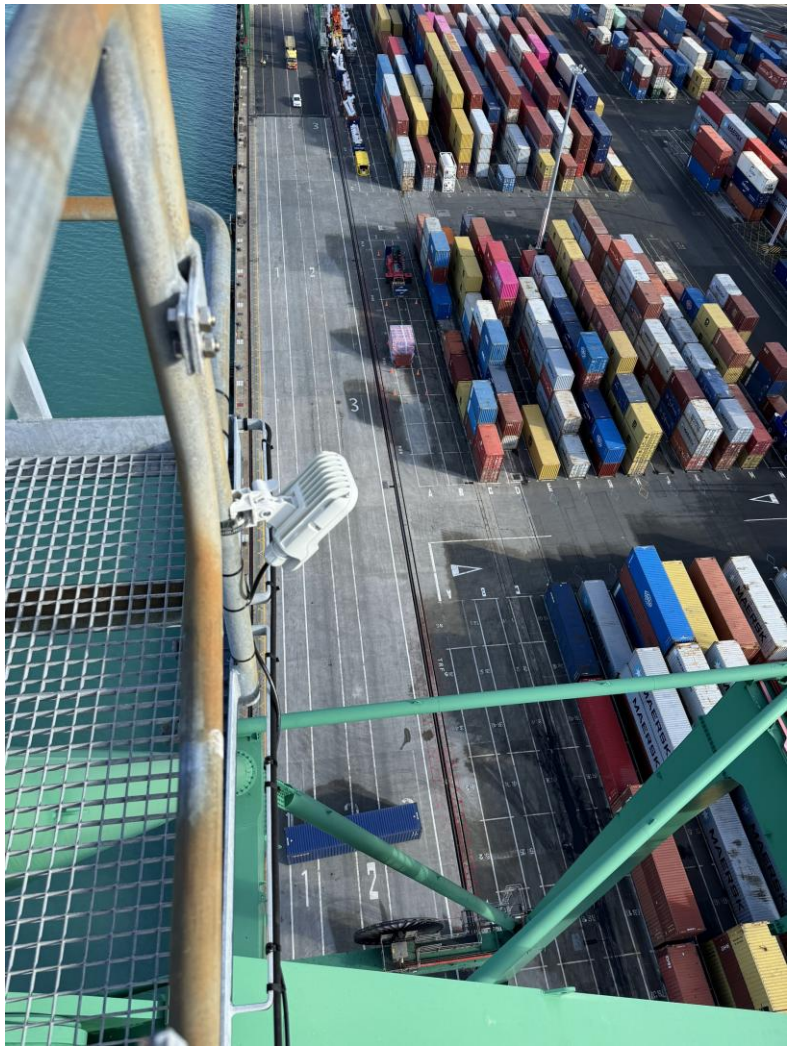
Case Study – Container Crane CCTV

- Application
  - Requirement for higher capacity CCTV system for existing container crane where the cabin moves in and out with the container
- Challenges
  - Originally provisioned using a coaxial Analog camera system
  - Difficult to service and support with limited capacity – no provision for ethernet in the umbilical cord system.
  - Replacement of this cord system beyond economic sense – Expensive!
- Solution
  - Nomadic solution using 60 GHz PTP solution
- Results
  - Interference free
  - Up to 1 Gbps bandwidth with sub-ms latency

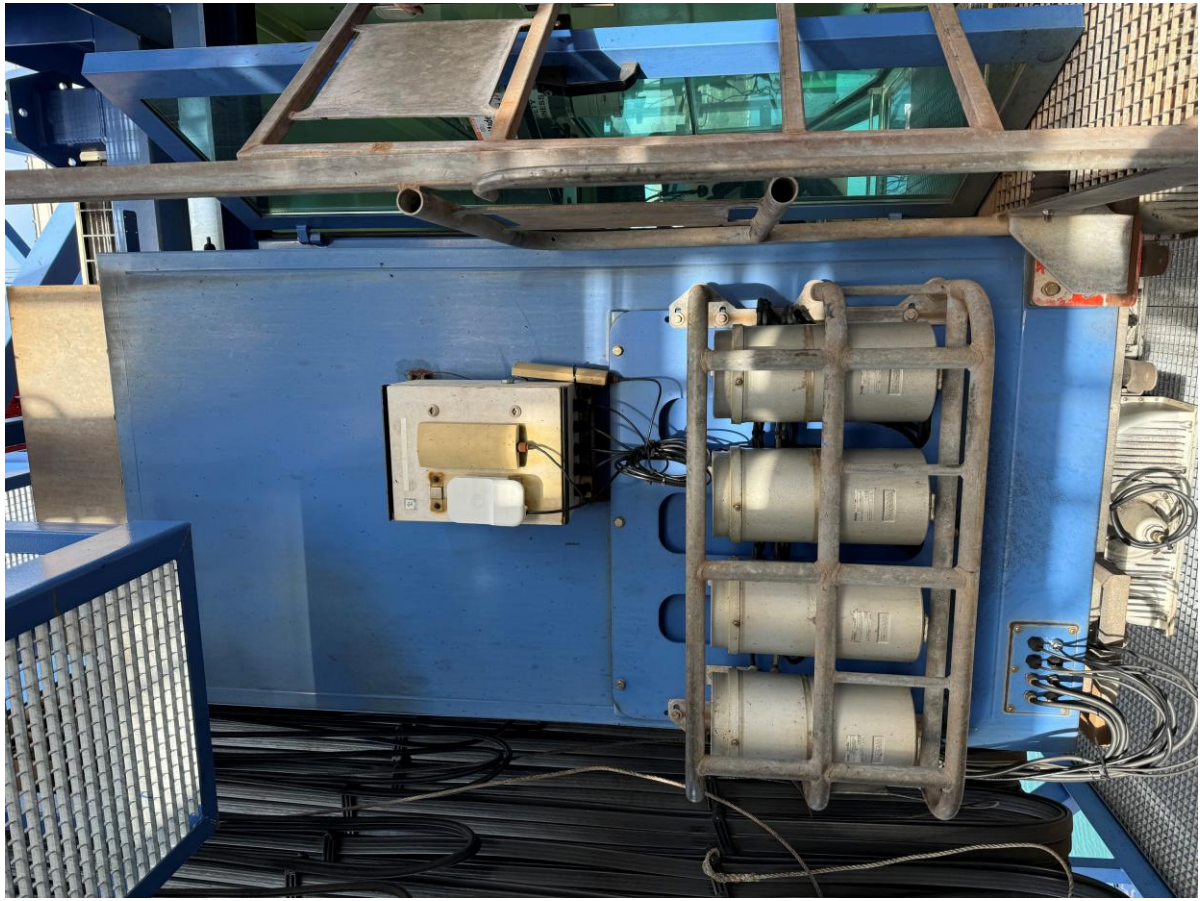


Container Crane Photos

Container Crane Photos



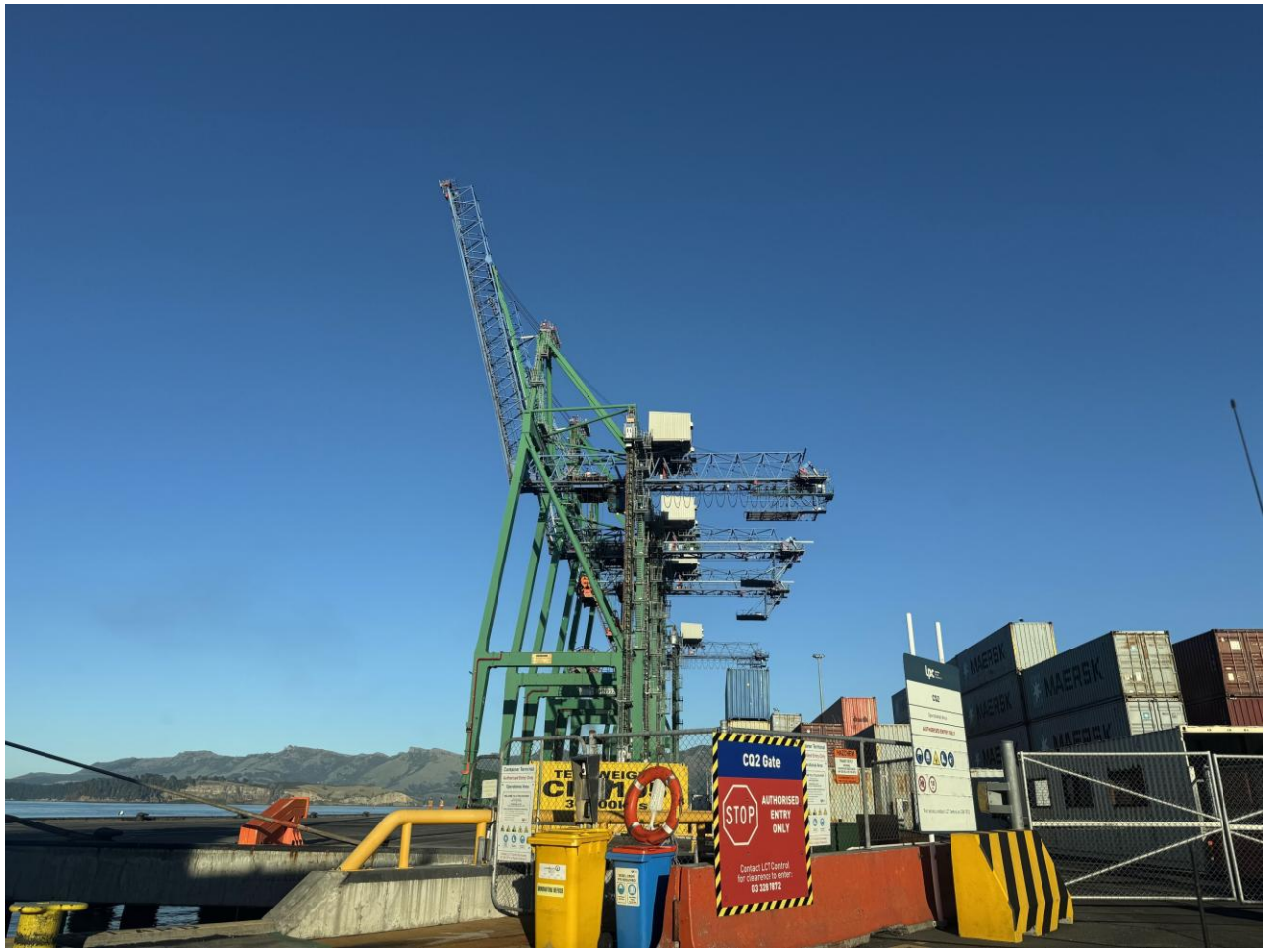
Container Crane Photos



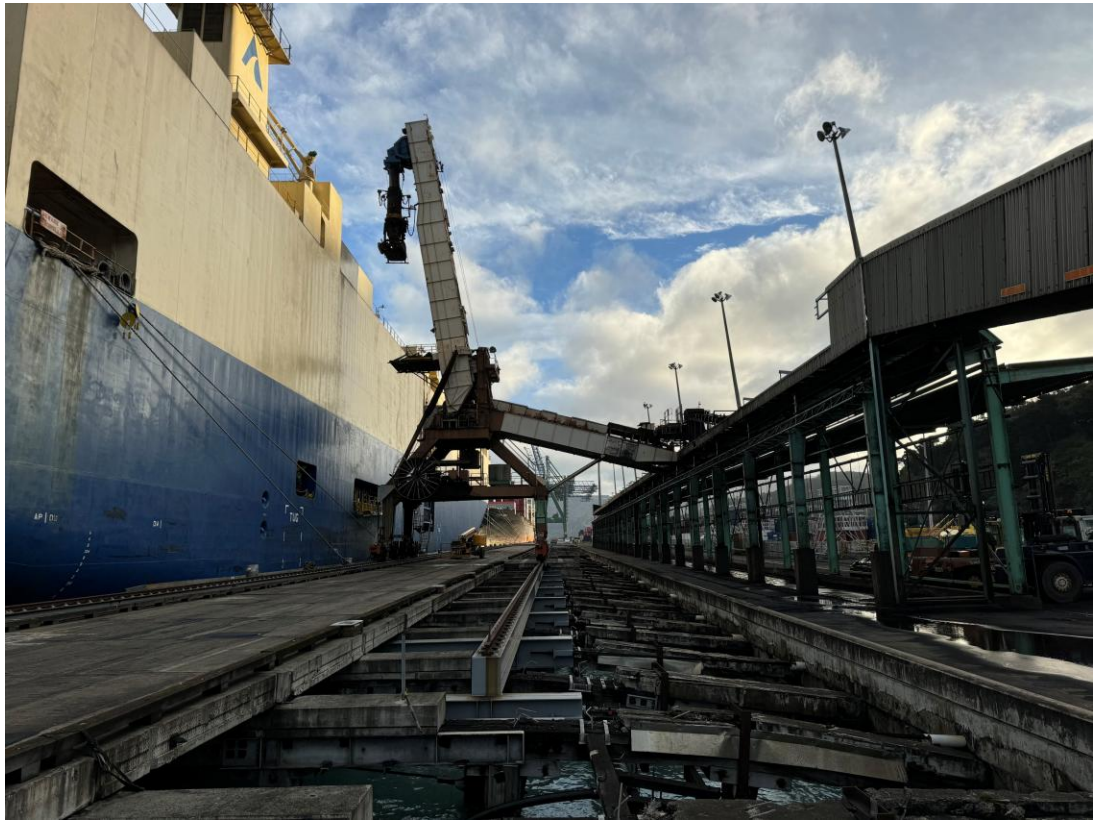
Container Crane Photos

Case Study – Lyttelton Port Company, Coal Ship Loader Stacker Reclaimer

- Loading export ships with coal
- SCADA Control and Monitoring as well as ESTOP signalling
- The existing and unlicensed 5 GHz radio subject to increasing interference and this was contributing to bit errors and high latency issues.
  - When latency increased to > 30 ms, ESTOP would trip.
  - This would disrupt the loading of the coal ship – the whole conveyor system would stop.
  - This ripple effect engages the protection and emergency system - the entire operation to stop.
- 60 GHz radios would need to be on moving stacker/reclaimer system and must be able to tolerate changes in propagation delay – movement of up to 1.5 m/sec
- 60 GHz radio system was selected.
  - This enabled rock solid uninterrupted performance since installation
  - < 1ms latency meant that coal loading operations would continue uninterrupted
  - Up to 2 Gbps each way capacity allowed for scalable capacity for increased services such as CCTV
  - No drop-outs or outages since installation
  - No interference meant improved performance and reliability
  - High confidence in operations



Lyttelton Port Company Photos



LPC coal reclaimer and stacking conveyor

- Coal yard cameras - V5000 DN and V2K CN for high capacity PMP CCTV application
- LINKPlanner used for planning, reporting and BOM generation.
- V2000s all installed and commissioned on the coal reclaimer and stacking conveyor.
- -60 dBm maintained at furthest end.
- Fade margin of greater than 25 dB

Lyttelton Port Company – Reclaimer - Stacker Solution

Preparing for future projects – CCTV in Yard

cnWave 60 GHz Deployment: Environmental & Physical Considerations

- Line of Sight (LoS): 60 GHz requires clear LoS; obstructions like buildings, cranes, or vegetation can disrupt links.
- Range and Propagation: Short-distance links (20m–1.2 km); oxygen absorption reduces interference but limits coverage.
  - Oxygen absorption peaks at this frequency band (about 15 dB/km)
- Rain and Weather Impact: Significant attenuation during rain events; add fade margin in link budget for high availability.
  - Rain fade is significant at 60 GHz, especially during high rainfall. Design links with link margin to accommodate this.
- Mounting and Alignment: Use stable mounting structures to minimize misalignment risk; precision alignment is critical.
- Power and Backhaul: Ensure sufficient PoE power availability and confirm fibre or microwave backhaul at distribution nodes.

cnWave 60 GHz Deployment: Planning & Management Essentials

- Mesh Design and Redundancy: Utilize Terragraph-based mesh for fault tolerance and automated rerouting.
- Planning Tools: Use LINKPlanner for link design and cnHeat for signal modeling and placement optimization.
- Remote Monitoring via cnMaestro: Manage firmware, performance, and diagnostics centrally with single-pane-of-glass view.
- Interference vs Penetration: Low interference due to spectrum absorption; cannot penetrate walls or dense foliage.
- Site Survey and Regulatory Check: Confirm LoS in field, validate structure readiness, and comply with local 60 GHz regulations.

60 GHz cnWave Selection Guide

	V1000	V2000	V3000 – Small Dish	V3000 – Large Dish
Capacity (each direction)	Up to 1Gbps ✓	Up to 1.8 Gbps ✓✓✓	Up to 1.8 Gbps ✓✓✓	Up to 1.8 Gbps ✓✓✓
PTP – Range*	Up to 150 m ✓	Up to 1.0 km ✓✓	Up to 1.5 km ✓✓	Up to 2.3 km ✓✓✓
PMP – Range*	Up to 150 m ✓	Up to 470 m ✓✓	Up to 670 m ✓✓	Up to 720 m ✓✓✓
Form Factor	Small ✓✓✓	Integrated Radome ✓✓	Dish ✓	Dish ✓
Ease of PTP Alignment	Simple ✓✓✓	Simple ✓✓✓	Use the alignment tube ✓	Use the alignment tube ✓
Built-in I/O	Single 1000BaseT ✓	2.5 GbE PoE Out 2.5 GbE PoE In ✓✓✓	1000BaseT PoE In 1000BaseT PoE Out SFP+ ✓✓✓	1000BaseT PoE In 1000BaseT PoE Out SFP+ ✓✓✓
List Price	✓✓✓	✓✓	✓	✓

* Recommended ranges are rules of thumb. (MCS9 99.9% at 32 mm/hour rain) LINKPlanner should be used to determine range, capacity and fade margin for your specific geographic location and connectivity requirements

cnWave 60GHz V5000i and V2000i

- Gbps PTP/PMP/Distributed Meshing for Industrial Applications
- Hazardous Environments
  - ATEX 'Intrinsic Safety' in EN/IEC 60079-11:2012
  - HAZLOC: Class 1 Div 2 (C1D2)
- Applications
  - **Oil/Gas Upstream** (wellpads, drilling rigs, tank farms)
  - **Oil/Gas Midstream** (pipelines)
  - **Oil and LNG Downstream** (refinery turn-arounds, temp worker trailers, hazardous zone video surveillance)
  - **Railyards and Ports** (fueling and fuel storage areas, LNG terminals, chemical transfer zones, hazmat depots)
  - **Utilities and Power** (biogas waste-to-energy plants; gas-fired power plants)
  - **Chemistry Plants** (paint, plastics, resin manufacturing, outdoor plants)
  - **Waste treatment** (landfill gas monitoring)
  - **Battery storage facilities**
- **DN publication: July**
- **First Shipments: 4Q**

C600500C120A	**60GHz cnWave V2000i Client Node Radio Only**
C600500A104A	**60GHz cnWave V5000i Distribution Node Radio Only**

Thank you

Q&A

- Roy Wittert
- Regional Sale Director
- roy.wittert@cambiumnetworks.com
- 0429583560