InfiNet InfiMAN 2x2 vs. Cambium Networks PMP 450

A Competitive Analysis for Choosing the Most Valuable Wireless Solution Vendor

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SUMMARY:

- ITEM 1: Carrier grade competitor

- ITEM 2: Side-by-side comparison

- ITEM 3: Economic value

About Cambium Networks

General overview

- Privately Held since 2011 when the private-equity firm Vector Capital purchased the wireless broadband networks businesses from Motorola Solutions

- Produces sub-6 GHz wireless broadband point-to-point (PTP) and point-to-multipoint (PMP) platforms (radios)

- Operates from U.S. with R&D centers in the U.S. (outside Chicago), U.K. (Ashburton) and India (Bangalore)

- Sells through a range of global distributors

Vertical Markets & Solutions

- *Wireless Service Providers (WISPs)*: rural, municipal, remote office & primary or redundant connectivity

- *Government Public Safety Sector*: data and video surveillance, disaster recovery, data network for public works

- *Enterprises*: video surveillance backhaul, device/site monitoring, LAN extension, leased line replacement

How they look like

InfiMAN 2x2

PMP 450 & PMP 450i

InfiMAN 2x2 vs. PMP 450 & PMP 450i

	InfiMAN 2x2	PMP 450 & PMP 450i	✅ InfiMAN 2x2 *wins with*
Supported frequencies	• 3.1-3.4 GHz • 3.4-3.7 GHz • 3.7-3.9 GHz • 3.9-4.0 GHz • 4.9-6.0 GHz • 6.0-6.4 GHz	• 900 MHz • 2.4-2.48 GHz • 3.3-3.6 GHz • 3.55-3.8 GHz • 4.9-5.9 GHz	• Wider range of frequencies • Flexibility: frequency range can be changed by license software upgrade; not necessary to replace hardware
Integrated antenna options/ RF connectors type for external antennas	*BS:* • 14 dBi, 90° (3 GHz) • 16 dBi, 90° (5 GHz) • 21-23 dBi, 90° for Qmxb • 2 N-type connectors *CPE:* • 19/22 dBi integrated flat (3 GHz) • 19/23/26/28 dBi integrated flat (5 GHz) • 19/24/27 dBi integrated flat (6 GHz) • 2 N-type connectors	*AP:* • 17 dBi, 90° (5 GHz) for PMP 450i only • 2 N-type connectors *SM:* • 8 dBi integrated patch (2.4 GHz & 3 GHz) • 9 dBi integrated patch (5.4-5.8 GHz) • 19 dBi integrated flat (3 GHz) • 23 dBi integrated flat (5 GHz) • 25 dBi integrated dish (5.4-5.8 GHz) • 2 N-type connectors	• Wider range of integrated antennas to ease the installation & to perfectly fit to any distance; at Cambium, PMP450 AP model features connectorized option only and for SMs, external modules (reflector and CLIP) are needed for additional gain

InfiMAN 2x2 vs. PMP 450 & PMP 450i

	InfiMAN 2x2	PMP 450 & PMP 450i	✅ InfiMAN 2x2 *wins with*
Throughput	*BS (in 40 MHz):* • Up to 250 Mbps per sector *CPE (in 40 MHz):* • Up to 180 Mbps	*AP (in 30 MHz):* • Up to 190+ Mbps per sector for PMP 450 • Up to 200+ Mbps per sector for PMP 450i *SM (in 30 MHz):* • Up to 100 Mbps for PMP 450 • Up to 200+ Mbps for PMP 450i	• Higher capacity for each CPE in the sector (in real field deployments) thanks to the BS beamforming technology and to a higher processing power (of up to 200k packets per second)
Output power	*BS:* • Up to 23 dBm (3 & 6 GHz) • Up to 27 dBm (5 GHz) • Up to 25 dBm for Qmxb *CPE:* • Up to 23 dBm (3 & 6 GHz) • Up to 25 dBm (5 GHz)	*AP:* • Up to 22 dBm (3 GHz) • Up to 24 dBm (5 GHz) for PMP 450i only *SM:* • Up to 22 dBm (3 GHz) • Up to 19 dBm (5 GHz) • Up to 24 dBm (5 GHz) for PMP 450i only	• Higher **average per-chain** output power (even on higher modulations) which provides highest capacity operation and longer distances

InfiMAN 2x2 vs. PMP 450 & PMP 450i

	InfiMAN 2x2	PMP 450 & PMP 450i	✅ InfiMAN 2x2 wins with
Ethernet interface	_BS:_ • 1 x Gigabit Eth _CPE:_ • 2 x Fast Eth, 2nd PoE out port	_AP:_ • 2 x Gigabit Eth _SM:_ • 1 x Fast Eth for PMP 450 • 2 x Gigabit Eth for PMP 450i, 2nd PoE out port	• 2nd PoE-enabled port for the entire suite of CPEs (except the Smnc 19 dBi model) which can be used to ease the CCTV setup or to power up another InfiNet unit
Modulation levels	• QAM64 5/6 • QAM64 3/4 • QAM64 2/3 • QAM16 3/4 • QAM16 1/2 • QPSK 3/4 • QPSK 1/2 • BPSK ½	• 256QAM • 64QAM • 16QAM • QPSK	• Higher bit rate for the same SNR: e.g. PMP 450 requires between 17 and 24 dB SNR for 16QAM, while InfiMAN 2x2 works at 16QAM½ or 16QAM¾, approximately for the same range of SNR • Higher granularity of modulation levels (Mod + FEC)
Power consumption	• Up to 12 Watt for BS except Qmxb which reaches up to 40 Watt • Up to 7 Watt for CPE	• Up to 55 Watt for PMP 450i (AP & SM) • Up to 15 Watt for PMP 450 (AP & SM)	• Lower power consumption of the units in a sector which has a direct impact in TCO

InfiMAN 2x2 vs. PMP 450 & PMP 450i

	InfiMAN 2x2	*PMP 450 & PMP 450i*	✅ *InfiMAN 2x2 wins with*
Operating temperature	• -40°C to +60°C (by default) • -55°C to +60°C (extended)	• -40°C to +60°C	• Units available for extended temperatures, for the harvest conditions deployments
Channel bandwidth	• 3.5/5/7/10/14/15/20/28/30/40 MHz	• 5/7/10/15/20/30 MHz	• Ability to address any customer requirement regarding the channel width • PMP 450 is limited to maximum channel BW of 30 MHz
IP rating	• IP66, IP67	• IP67, IP66 for PMP 450 AP, PMP 450i SM and 3 GHz PMP 450 high gain integrated SM • IP 55 for PMP 450 SM and PMP 450d (integrated dish SM)	• Highest protection against dust and powerful water jetting for all models within InfiMAN 2x2 platform, including CPEs, which is not the case for all SMs within Cambium PMP 450 platform

Air protocol

- InfiNet Wireless proprietary air protocol, more suitable for multiservice IP networks
- Adaptive Marker Access (minimized latency for priority traffic, less sensitive to interference, license exempt and licensed bands)
- Native TDMA support (reduced overall jitter, licensed bands, use of GPS synchronization)
- Beamforming smart antenna: operates with adaptive beam which is electronically steered towards the CPE under operation
- 2x2 MIMO, OFDM, dynamic TDD, auto-bitrate, ATPC, DFS and Instant DFS

- Cambium Networks proprietary air protocol
- 2x2 MIMO, OFDM
- Scheduled TDD - deterministic and scalable regardless of load
- Dynamic Interference Filtering to provide industry leading noise isolation for improved performance (for PMP 450i)

Scalability

- Unlimited number of CPEs connected to BS (in PtMP)

- All InfiNet units can be used as CPE or as BS - only license software upgrade is required
- Any InfiLINK unit (LITE and PRO) can be used as CPE

- Up to 238 subscriber modules per sector

- AP cannot be converted to SM
- Different hardware models for AP and SM

Multiple Base Station synchronization for the licensed bands

- TDMA-based wireless architecture, together with the TDD synchronization hub is a complete solution which provides TDD synchronization to InfiMAN 2x2 systems, both legacy and newly deployed
- TDD synchronization eliminates self-interference between multiple co-located units and enables frequency re-use within the same site (the timing reference is GNSS-based)

- GPS Synchronization via Autosync (CMM3, CMM4, uGPS, iGPS)

Main networking features set

- Multicast friendly (IGMP snooping, multicast server)
- Diagnostic tools (enhanced tools to diagnose almost all levels of functionality from network side to radio)
- ARP protocol support
- Traffic filtering up to Layer 4
- RIPv2/OSPFv2/static routing
- Tunneling (Ethernet-over-IP, IP-over-IP)
- L2/L3 Firewall, NAT(multipool, H.323-aware)
- DHCP client/server/relay
- Web GUI, CLI, SNMPv1/SNMPv3, configurable SNMP Traps

- Data layer functionalities are limited for a simple wireless bridge:
  - Protocols used: IPv4, UDP, TCP, IP, ICMP, Telnet, SNMP, HTTP, FTP
  - Network Management: HTTP, HTTPS, Telnet, FTP, SNMP v3
  - VLAN: 802.1ad (DVLAN Q-inQ), 802.1Q with 802.1p priority, dynamic port VID

QoS, security & enhanced radio tools

- 17 priority levels
- IEEE 802.1p, IP TOS/DiffServ support
- Full voice support
- Traffic limiting (absolute, relative, mixed)
- Traffic redirection

- Storm/flood protection
- 128 bit advanced over-the-air encryption

- Automatic over-the-air firmware upgrade
- Spectrum Analyzer mode
- Channel testing tools
- Radio link test and radio link statistics tools

- Diffserv QoS

- 56-bit DES, FIPS-197, 128-bit AES

- Spectrum band scan (across channel sizes and frequencies)
- Radio link test and radio link statistics tools

Choosing InfiNet Wireless gears

- Sell more services to individual customer **(lower OPEX, higher ARPU & faster ROI)** by:

  - Using the most appropriate equipment and technology for each requirement: beamforming with TDMA GPS sync and dynamic TDD, or polling marker access, low/medium/high gain integrated antennas for CPEs according with their location in the sector, or high Tx power for CPEs for higher link availability, IP66/IP67 protection for CPEs etc. unlike Cambium PMP 450 platform which lacks in terms of flexibility which is critical for a wireless BWA network

  - Differentiating networking features (rich networking feature set - L2 and L3 switching, routing, traffic shaping, advanced QoS mechanism, etc.)

- *Lower dollar/bps ratio for InfiMAN 2x2 gears which generate higher economic value compared to Cambium Networks PMP 450 gears*

Choosing InfiNet Wireless gears

- ***Guarantees lower TCO*** by:

  - Units stock keeping/rotation ("any unit – any topology" concept)

  - "Pay as you grow" remote capacity upgrade

  - Common firmware platform for all units/ topologies/ frequency bands, extensive feature set available across all models

  - All InfiNet units can be used as CPE or as BS - only license software upgrade is required

  - Same units for multiple applications – only different configurations

  - Unlimited number of CPEs connected to BS (in PtMP)

THANK YOU!

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