

Reliable Backhaul with TDM Wireless

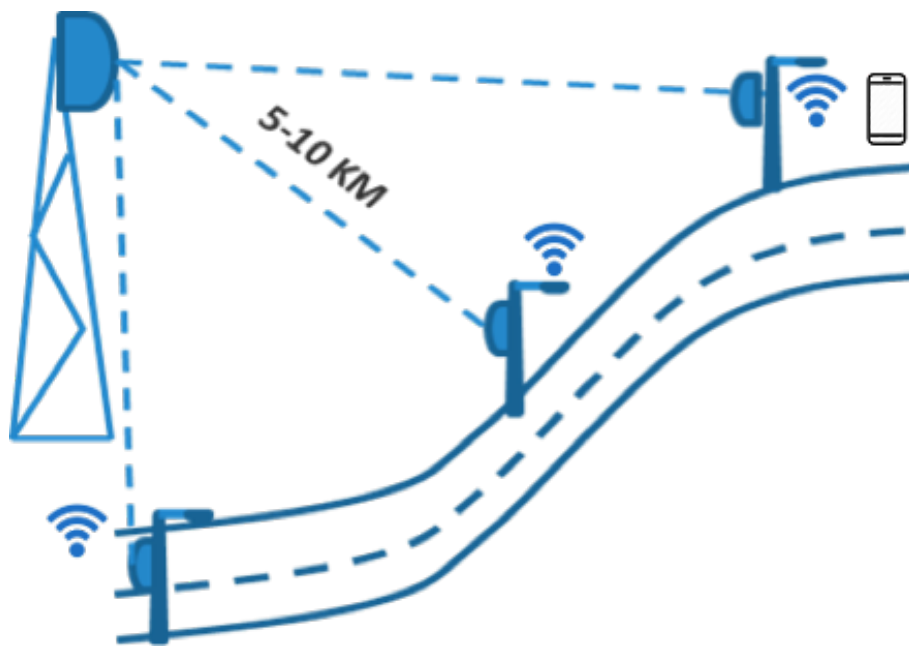
Cambium Networks *cnPilot*™ portfolio offers a cost effective and ubiquitous method to deliver WiFi services. A major challenge to providing such access is the availability of a backhaul connection to deliver Internet access to the WiFi hotspot. Wireless backhaul networks can be quickly deployed at a lower overall cost and are often the preferred way to deliver voice, video and data in outdoor environments as opposed to a wire-line solutions.

A proven and reliable backhaul solution, as any savvy service provider knows, is an essential foundation for trouble free wireless service

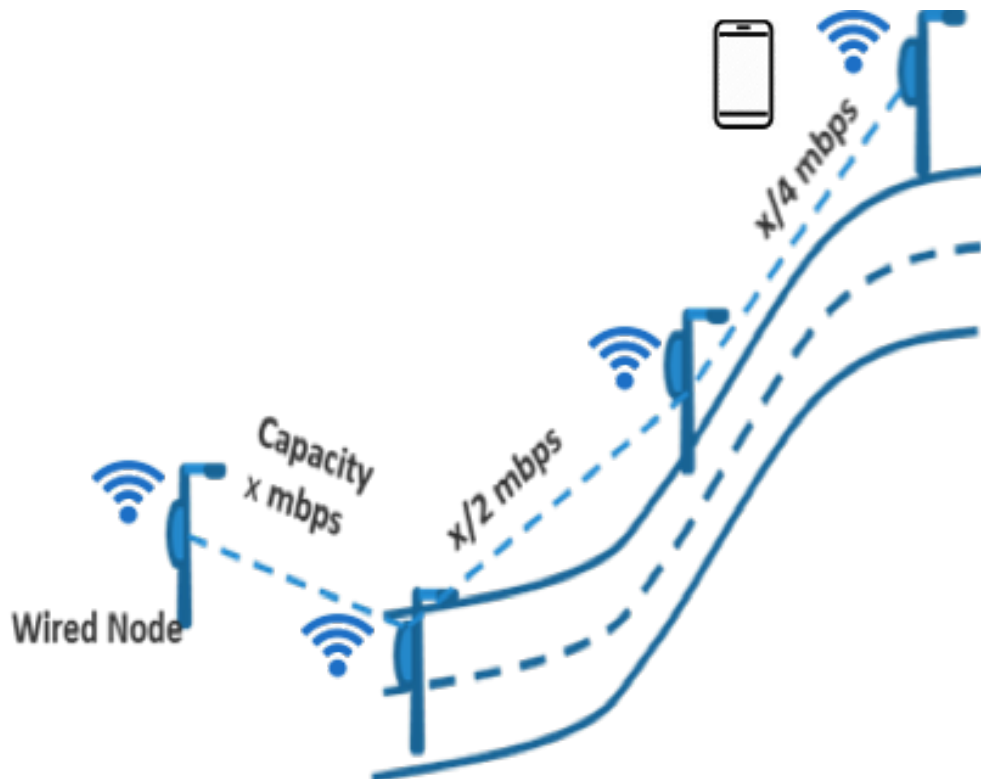
Cambium's Point-to-Point (PTP) and Point-to-Multipoint (PMP) product portfolio provides high-performance synced TDM (Time Division Multiplexed) wireless backhaul. This is a reliable solution to providing backhaul for wireless hotspots in the most demanding conditions. Mesh backhaul is sometimes considered as an alternative. This white paper evaluates the Mesh alternative when compared with synced TDM wireless networks.

Technology Overview

Synced PMP/PTP networks use PMP devices as to connect the end user or Subscriber Module (SM) to the distribution network and uses PTP as backhaul connection to relay end user traffic to internet or organization VPNs. Due to the long range offered by PTP relays a single hop is usually sufficient. However, additional hops can be used without substantial performance impact. Depending on the network configuration, a synced PMP/PTP network can support up to 100 users per cell with expected performance and fixed latency. The cell size can be adjusted as required to trade off end-user bandwidth versus cost of deployment. Redundant cell coverage and backhaul can be built into the network in order to support failure scenarios.



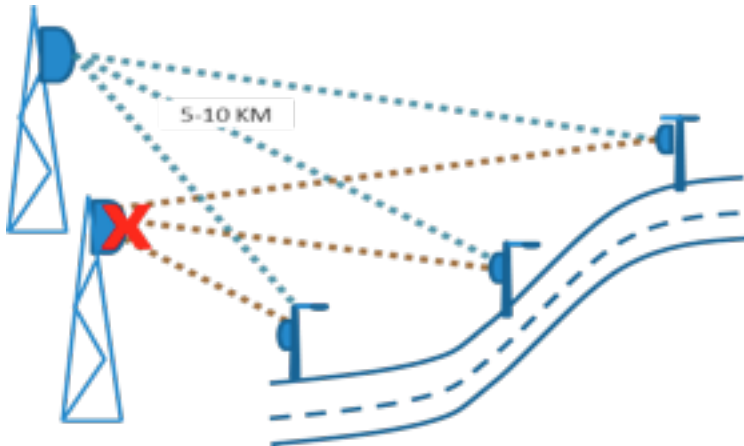
Wireless mesh networks are usually based on 802.11 with some proprietary extensions for routing. 802.11 is a protocol based on competing access to a shared wireless channel with no overall access coordination. Each wireless backhaul device is a wireless router that interacts with other routers to create a radio network. One or more routers perform the role of a wireless gateway that connects to the wired network. Redundancy is offered by providing alternative wireless mesh paths. Two nodes that need to communicate with each other must devote a radio to a common channel. Traffic may traverse multiple hops before reaching the core network. This can greatly reduce network capacity as bandwidth decreases by 50% over each hop



Potential advantages of Mesh network

Self-healing and build-in redundancy

A properly designed mesh networking protocol can have automatic traffic rerouting in case of failure of one node when enough nodes are included into the mesh networks. Note that TDM PTP/PMP can use planned redundant links to achieve the same functionalities as shown in the below figure.

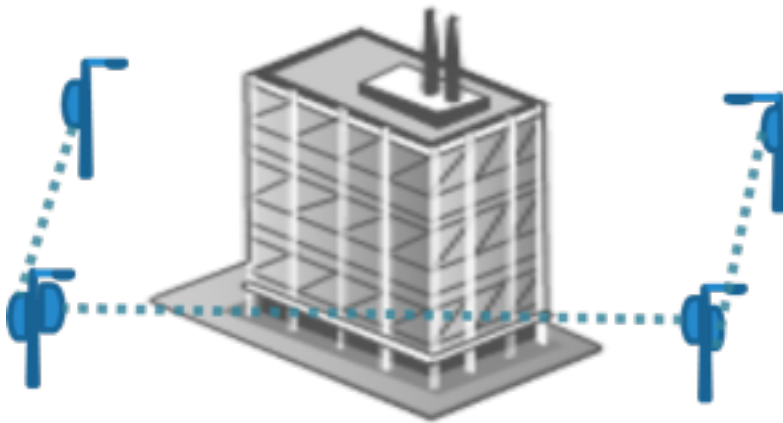


Single device to provide hotspot and backhaul

The same radio can be used to provide wireless mesh backhaul as well as wireless access for small networks where throughput is not important. This configuration will have performance and bandwidth limit due to single radio used. Ill-behaved wireless clients can severely degrade the performance of the backhaul.

NLoS coverage

Mesh networks can be used for Non-Line-of-Sight (NLoS) network configurations where wireless signals are blocked by buildings. The network hops can be configured to provide a path around obstacles. TDM PMP/PTP synced system can be planned to accommodate this problem as shown in the following figure.



Benefits of Synced PMP/PTP Networks

Better overall performance

When wireless spectrum is scarce, efficient channel reuse is important. GPS synced networks can reduce self interfaces, reuse frequencies and can utilize RF spectrum more effectively. This results in more spectrum efficiency and better overall throughput and performance.

Lower total cost

Synced TDM networks can support a larger cell size supporting with many more users with consistent throughput. The path to the backhaul has a known, low latency over a single hop from the subscriber unit to the PMP Access Point (AP) as well as at each PTP hop.

Dedicated backhaul with no degradation

PMP/PTP uses direct backhaul connection to the gateway node as compared to mesh network backhaul where performance degrades as the number of hops increases.

Deterministic traffic behavior

Data routing, performance and latency are more consistent with synced PMP/PTP network. This will make system planning, configuration and debugging more efficient. Operators can confidently provide an SLA to demanding customers.

Summary

While mesh networks may be suitable for some small deployments, there are major issues when implementing mesh networks in a large scaled environment. By employing a planned PMP for hot spot users and synced PTP as backhaul, Cambium Networks' PMP/PTP solution avoids network degradation due to traffic collisions, reduced interference, and improve performance. Utilizing two or more PMP APs for coverage and multiple PTP backhaul devices, PMP/PTP networks can achieve the same or greater redundancies as those of mesh networks relying on repeater nodes, while realizing more predictable performance and lower total costs.