



# WHITE PAPER

## COMPARISON:

### Multipoint vs PTP in High Frequency Licensed Bands

#### 1. Introduction

Licensed band radio links traditionally have been point-to-point (PTP) links, connecting two sites. In recent years, there have been renewed interests in building multipoint networks in licensed bands, particularly in higher frequency bands like 28, 32, and 38GHz. The big reason is there is large blocks of frequency available (1-2GHz bandwidth) to build high speed networks for today's growing needs for capacity. In addition, licensed band multipoint provides much higher levels of reliability over unlicensed bands with inherent RF interference potentials.

For these reasons, licensed band multipoint networks are being considered as the choice of next-generation technology for edge networks where the bandwidth growth is putting tremendous pressure on the existing network.

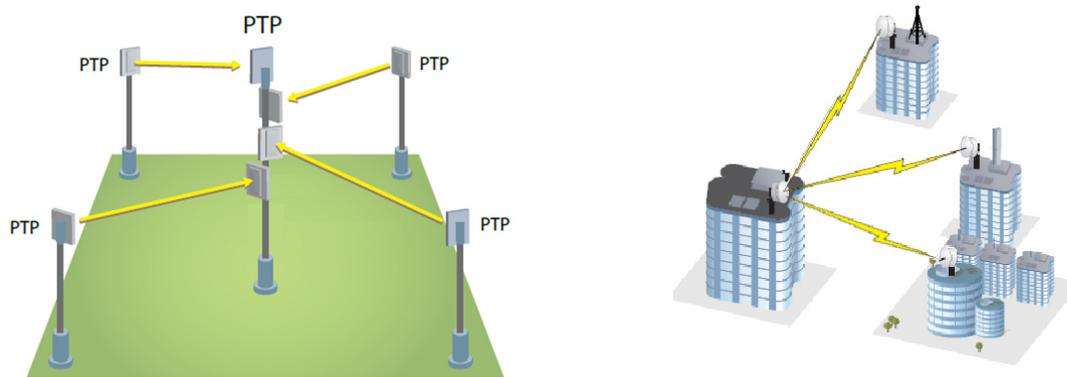
This document is to describe how multipoint deployments are different from traditional PTP links and emphasize the ground-level advantages of deploying multipoint.

## 2. Equipment Cost

Typically, the cost of a multipoint base station (BS) is much higher than that of a PTP radio and the cost of a subscriber station (SS) is about the same as that of a PTP radio. Thus, initial cost of multipoint appears to be higher for connecting a new subscriber.

The situation is much different when you consider that one base station typically can support about 20 subscriber stations. Then, the cost of a BS is amortized over 20 connections. For example, let's assume that a PTP radio or SS is \$100 and the cost of a BS is \$300. Equipment cost for PTP deployment is  $20 \times 2 \times \$100 = \$4,000$ . For multipoint, the cost is  $20 \times \$100 + \$300 = \$2,300$ .

The total network cost is favoring multipoint once you start to add subscribers to the network



*(Left) PTP links require adding antennas at the central tower site. (Right) The base station site needs no additional work as subscribers are added.*

## 3. Tower Space

For network backbone links, PTP makes good sense. There are two radios (antennas) on a tower, so the burden on a tower is not so severe. For an edge network, using PTP topologies quickly becomes unsustainable, as the number of antennas is the same as the number of subscribers.

Multipoint networks are deployed with a number of sectors, typically 3 to 6 so as to increase the total network capacity and increase the link budget by using higher-gain sector antennas.



*(Left) a simple three-sector base station on a mast, (Right) crowded tower site with PTP antennas*

#### **4. Tower Costs**

The tower cost is mostly determined by the number of antennas. Multipoint networks may require typically 4 antennas on a tower. PTP deployments will require an additional antenna installation for each new subscriber. A new antenna means a new tower climb, which adds significant service cost. On the other hand, all multipoint sectors are often deployed upfront and there is no additional need for new tower installation and of course no additional cost at the base station site.

Recurring costs for tower space rental are significant factor and often somewhat overlooked at the outset of the deployment.

#### **5. Tower Loading**

Aside from tower rental costs, tower loading factors must be considered. Some towers with spaces to put additional antennas may not be able to accommodate additional wind loading and weight due to structural issues.

## 6. Spectrum Acquisition Costs

The costs associated with spectrum license depends on the country of deployment and the local regulatory environment. In many countries such as the US, PTP links are licensed for each link. The cost and wait time for approval puts additional burden for rapid deployments of many subscribers. Multipoint network, by definition, must be deployed in a certain area with a block license, which means that once you have the license, you can go ahead and deploy without additional cost or any delay. Thus, for edge networks that are constantly adding subscribers, multipoint block licenses are much more sensible than per link licenses for PTP links.

## 7. Summary

To sum up, here are the quick points for considering PTP and multipoint:

- PTP is good for backbone link with known locations (even at long distances), which do not change much over time.
- Multipoint is good for edge networks with growing subscriber base.
- Multipoint in licensed bands give you better reliability and much larger capacity (larger BW) than its counterpart in unlicensed bands.
- Multipoint may cost more upfront, but quickly become more cost effective as you add subscribers.
- Multipoint is clearly better for tower installation in terms of rental cost, tower loading, tower spaces. In addition, block licenses make better sense for edge networks.