

Connecting CCTV with Affordable Wireless Broadband Solutions

Introduction

Deploying remote cameras, Wi-Fi access points, IoT/Automation and other network devices in remote locations, around homes, businesses, and in towns is often limited by existing infrastructure. Laying CAT5 cable or Fiber can be expensive. The most economical way is often wireless, but many have had limited success as the characteristics of wireless are not well understood. This material is intended to help users better understand wireless and deploy it with greater success.

Considerations for Wireless

Commercially available wireless systems typically require “Line-of-Sight”. An unobstructed path between ends of the link is needed to make it work. In reality, the wireless can penetrate very light impediments (brush, trees, wooden fences/walls, certain glass), but not mountains, hills, concrete or metal structures. In some cases it is possible to “go-around” a solid structure by reflecting the signal off another solid structure. Any penetration or reflection will result in signal loss, which limits range and reduces throughput. Using a higher gain antenna can help reduce the effect. Devices with higher transmit power and better receive sensitivity will also help. The low cost wireless systems available today operate in shared spectrum (typically 2.4GHz and 5GHz), which can result in unpredictable interference. Some devices have proprietary air interfaces (non-Wi-Fi) that can dramatically reduce instances and severity of interference. Narrow beam antennas are also very helpful.



Wi-Fi vs Proprietary

Proprietary systems were historically expensive and considered impractical for many applications. Today, devices that use Wi-Fi chipsets and proprietary software can offer wireless systems that are competitively priced. Wi-Fi uses a contention-based protocol that requires “listen before talk”. When trying to transmit a continuous data source such as video, this can be a problem. Proprietary systems often use a time slot, deterministic protocol, which offers superior performance in permanent data networks.

Mesh

The advertised advantages of mesh are the “self-healing” nature, ease of deploying ad-hoc networks, and multi-hop ability to go around obstacles when Line-of-Sight is an issue. In reality, mesh systems have data bottle-necks that are difficult to predict and expensive to eliminate. Mesh systems may seem easy to design, but invariably fail to deliver, and require multiple site visits to ascertain and rectify the issue. Mesh systems can also be expensive due to the number of nodes that need to be deployed.

Point-to-Multipoint (PMP)

PMP Systems require some up front design. PMP is typically an economical solution as it uses a shared base station, and can also be efficient in terms of spectrum usage. Some systems also use GPS synchronization that further improves spectral efficiency and overcomes self-interference.

Point-to-Point (PTP)

PTP systems are typically the easiest to deploy. The design and sighting is usually obvious. Narrow beam/high gain antennas avoid interference while allowing some non Line-of-Sight deployment.

| Characteristic | Why it's important | MESH | 802.11n Wi-Fi | 802.11n Proprietary | 802.11ac Wi-Fi | 802.11ac Proprietary |
|-------------------------------------|---|---------------------|--|---|---|--|
| Throughput in 40MHz channel* | Depends on application. HD video cameras typically require 5Mbps. | 5-150Mbps | 10-220Mbps | 10-220Mbps | Wave1: 280Mbps Wave2: 560Mbps | Wave1: 280Mbps Wave2: 560Mbps |
| Throughput consistency | For smooth streaming. | Varies considerably | Varies | Consistent | Varies | Consistent |
| Interference tolerance | With shared spectrum, high, consistent throughput. | poor | poor | best | poor | best |
| Latency | Video and voice, low latency. | Highly variable | Variable | Consistent | Variable | Consistent |
| Summary | Video and voice data is more sensitive to above performance criteria. | Not recommended | Economical, good throughput, but not recommended | Economical and good throughput. Ideal for Voice and Video | Highest throughput, but not recommended | Highest throughput for Voice and Video |

Summary

Wireless networking equipment based on Wi-Fi chipsets, running proprietary software, that offer an ideal combination of low cost and superior performance. These performance advantages allow for successful deployment of wireless networks, especially for applications involving video and voice.

Learn more: <https://www.cambiumnetworks.com/cctv-backhaul/>

* Throughput in 40MHz is dependent on other parameters and is only given as a reference.