ITRAINONLINE MMTK

Wireless Troubleshooting: Interference Countermeasures

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Interference and noise

One challenge that we will eventually face when operating WiFi outdoor infrastructure is minimizing the throughput-reducing effects of interference and noise.

A strong signal is not enough for a broadband wireless receiver to work reliably. The level of received signal must be consistently higher than the received noise. The signal to noise ratio (SNR) must be as high as possible. To have a high SNR, there are two simultaneous conditions to be met, i.e.

- The receiver must receive a signal that is above its sensitivity.
- The noise level at the receiver input must be lower than the desired incoming signal. Noise is defined as “everything other than the desired signal”.

Failure to meet these two conditions will result in a low SNR.

Maximizing the received signal level

We have direct control over maximizing the received signal. Some of the standard procedures are

- Link budget – enough transmission power, receiver sensitivity, fade margin and antenna gain to overcome free-space loss and the coax loss.
- Line-of-sight (LOS) – LOS path with an unobstructed view from end to end.
- Fresnel zone – enough clearance above and between path obstacles.
- Installation – make sure the antenna is mounted securely, aligned properly, the connectors are waterproofed, use good connectors (don’t use a cheap connector or coax).

Minimizing interference and noise levels

We normally don’t have that much control over noise and interference sources. Some of the noise sources are,

- Natural noise – atmospheric and galactic noise.
- Man-made noise - RF signals pick up by our antenna. This includes microwave oven, cordless telephone and indoor wireless LAN.
- Receiver noise – noise generated inside the receiver circuitry.
- Interference from other networks – interference caused by nearby wireless networks on the same band.
- Interference from our own network – this occurs when we use the same frequency more than once, using channels that do not have enough space between them, or selecting incorrect frequency-hopping sequences.

- Interference from out-of-band signals – this is caused by strong nearby signals outside of the frequency band that we are using, such as AM, FM and TV transmitters, pagers and two-way radios.

Interference countermeasure strategies

Some of the typical interference countermeasure strategies are as follows

1. Use of sectoral or narrow beam antennas, usually high gain antennas. This is the easiest and most effective way to reduce interference, especially in spectrum crowded areas.
2. Short paths.
3. Selection of frequencies which not many stations are using.
4. Changing the antenna polarization.
5. Adjusting the antenna azimuth.
6. Equipment/antenna location.