



INTERFERENCE IN BROADBAND WIRELESS BACKHAUL SYSTEMS

Innovative Interference Mitigation Solution

Abstract

Network carriers such as AT&T, Verizon, and Sprint are rapidly deploying new networks to meet the needs for wireless data with the exponential growth in demand for wirelessly transmitted data; however, interference is still a challenge in many of the networks. We explain some of the challenges and presents a solution based on Bascom Hunter's technologies.

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Understanding Backhaul Networks

Backhaul systems are the interconnection between the core network and the user access network at the “edge.” The rapid growth in mobile user devices leads to exponential increase in demand for high-bandwidth and data-intensive communication links for backhaul systems.

In the past, backhaul networks have been mainly implemented using Ethernet cables, fibers, or copper wires. However, such infrastructures don’t have the flexibility to meet the present service and geographic diversity demand. In addition, the high capital and operating expense of hard wired networks prohibit fast deployment. Increasingly, the carriers and service providers are looking to wireless alternatives.

According to research published by ABI Research, “Small Cell Backhaul Equipment Market Reaches \$5B in 2018”, the current market for wireless backhaul equipment is \$700M and, by conservative estimates, the market will grow to \$2B by 2018. The newest interest in 5 GHz wireless backhaul, the unlicensed national information infrastructure bands (U-NII), is currently \$35M by itself, and is expected to grow to \$350M by 2018, and is the fastest growing sector among all systems in the wireless backhaul market.

In wireless backhaul networks, to address the network capacity demand, the natural approach is to put more equipment in closer proximity to wireless devices. This means that the number of cell sites is growing rapidly, and inevitably leading to more interference in communication channel.

Simultaneously, to drive down the cost, there is a push for equipment to processing wider RF bandwidths to provide more data. The approach using passive filters for as interference mitigation (IM) measure does not scale well to wideband and multi-band RF signal processing, which leads to degradation in the quality of services.

Challenges with Interference in 5GHz Backhaul

One of the most attractive options to expand the network in for wireless backhaul is in the unlicensed national information infrastructure bands (U-NII), specifically in 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.725-5.825 GHz radio bands. The networks avoid the congested licensed spectrum, however they are also open to unpredictable interference sources. On top of this, non-line-of-sight configurations where inadequately compensated multipath effects can severely degrade link performance.

In some cases, interference simply distorts data packets and degrades the signal to noise ratio, but more detrimentally, interference leads to packets drop or completely blocks the communications link. The primary concern of many newly deployed and future planned wireless backhaul is to address of interference in order to provide the same or higher quality of services as wired networks.

There are a few measures to mitigate and counter the interference problem. For one, proper installation with frequency and path analysis of the sites can help to make sure that the system parameters with filtering are properly set. In addition, components such as directional/dual polarized antenna, and multiple input multiple output (MIMO) antennas can be added to the system to provide higher separation of the desired signal from the interferer. Finally, to

counter interference in real time, advanced signal processing and monitoring capabilities with intelligent dynamic frequency selection can also be added to the radio system.

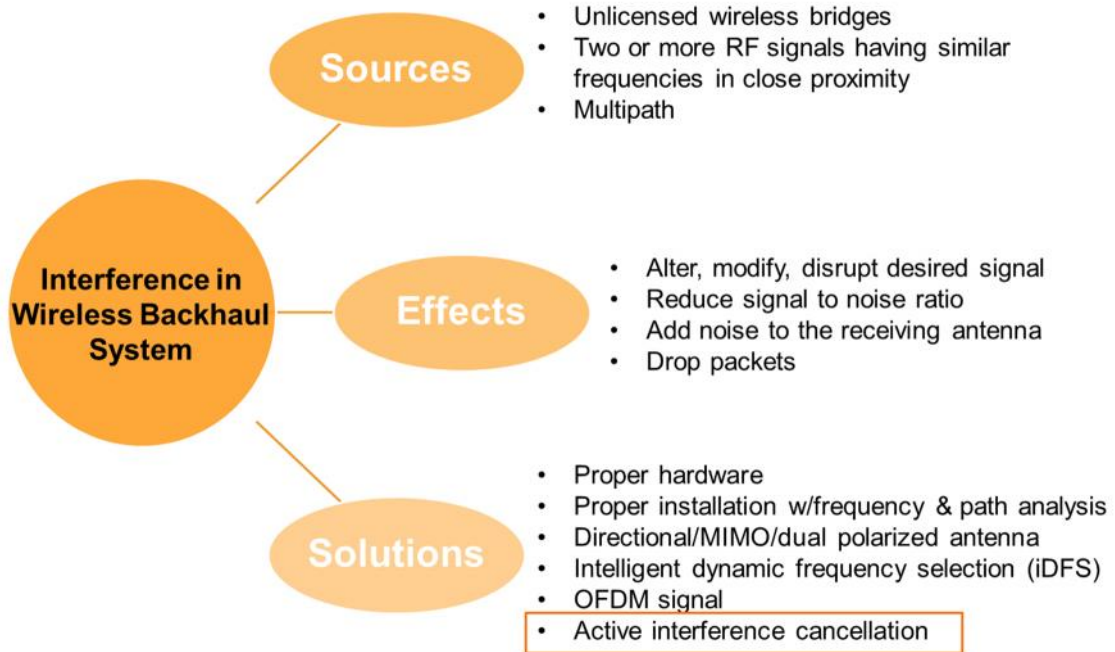


Figure 1: Interference problem in wireless backhaul networks and potential solutions.

Active Interference Mitigation

Bascom Hunter’s approach to interference mitigation is based on a photonic-based high-resolution wideband interference cancellation system. It is adaptive, compact, and capable of removing high-power interference in band or in close proximity to the signal of interest. The technology has been tested and validated with results showing over two orders of magnitude greater performance than existing products. Bascom Hunter’s technology offers several key advantages over current technology including: greater levels of interference removal, low distortion of signal of interest, high dynamic range, insensitive to IEM, and operation over wide bandwidth. The innovative solution can improve the network reliability and reduce costs.

About Bascom Hunter

Over the last five years, the amount of data sent wirelessly has increased tenfold. The result is a dramatic increase in demand for wireless bandwidth—exponential growth with no foreseeable slowdown. The finite resource of available radio frequency spectrum, however, is plagued by unreliable coverage and signal interference. Today’s solutions simply will not meet tomorrow’s demand. Bascom Hunter’s mission is to enable customers to get the most out of the RF technology revolution. We provide the leading solutions in wireless communication and security at competitive prices. Contact us today to learn how our products can help you to address coverage problems and take full advantage of wireless technologies.

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