White Paper

Key Considerations And Benefits of Unwiring Backhaul

Organizations such as ISPs, carriers, medical facilities, and others that extend across multiple, geographically dispersed locations demand secure, scalable, and cost-effective interconnected networks. A wireless network solution is often the "best-fit "for these applications.

What is Backhauling?

Backhaul or Backhauling, a term derived from the trucking industry, defined as cargo carried on a return journey or shipment sent on a returning vehicle, has several usages in the Telecommunications field.

- In the context of broadcasting, backhaul refers to uncut program content transmitted point-to-point to an individual station, where it is integrated into a completed TV show.
- In satellite technology, it means to transmit data to a point from which it can be distributed over a network or uplinked to a satellite.
- In the networking industry, it simply means to transmit data to the network backbone or, in some instances, to communicate between two devices also referred to as a "point-to-point" connection, commonly referred as P2P or PtP.

Please refer to a couple of typical wireless backhauling deployments on page 3

Why Wireless?

Wireless has many benefits. To list down a few:

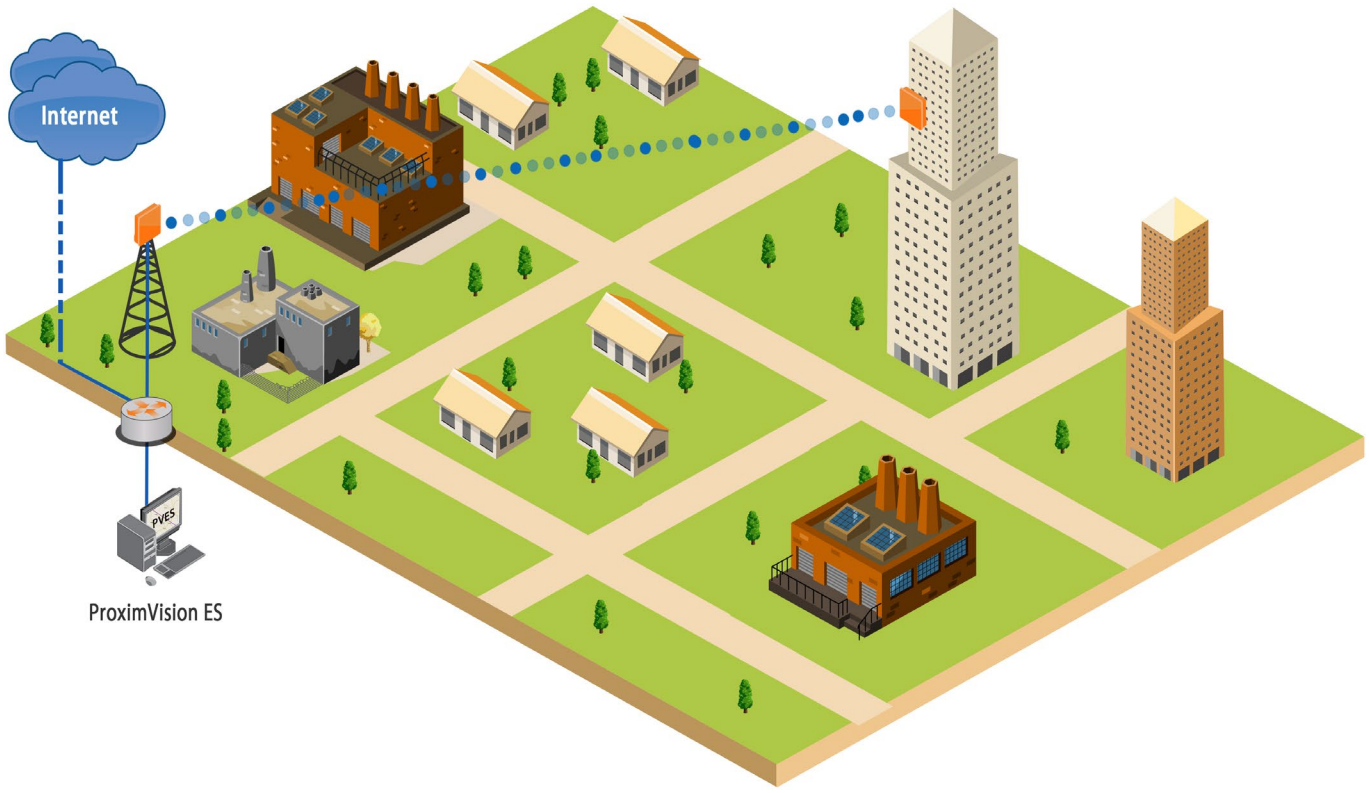
Secure: Contrary to popular belief, today's wireless communications utilize several advanced encryption algorithms that ensure secure information exchange.

Scalable: Modern, sophisticated wireless devices are designed to quickly and easily expand to new locations.

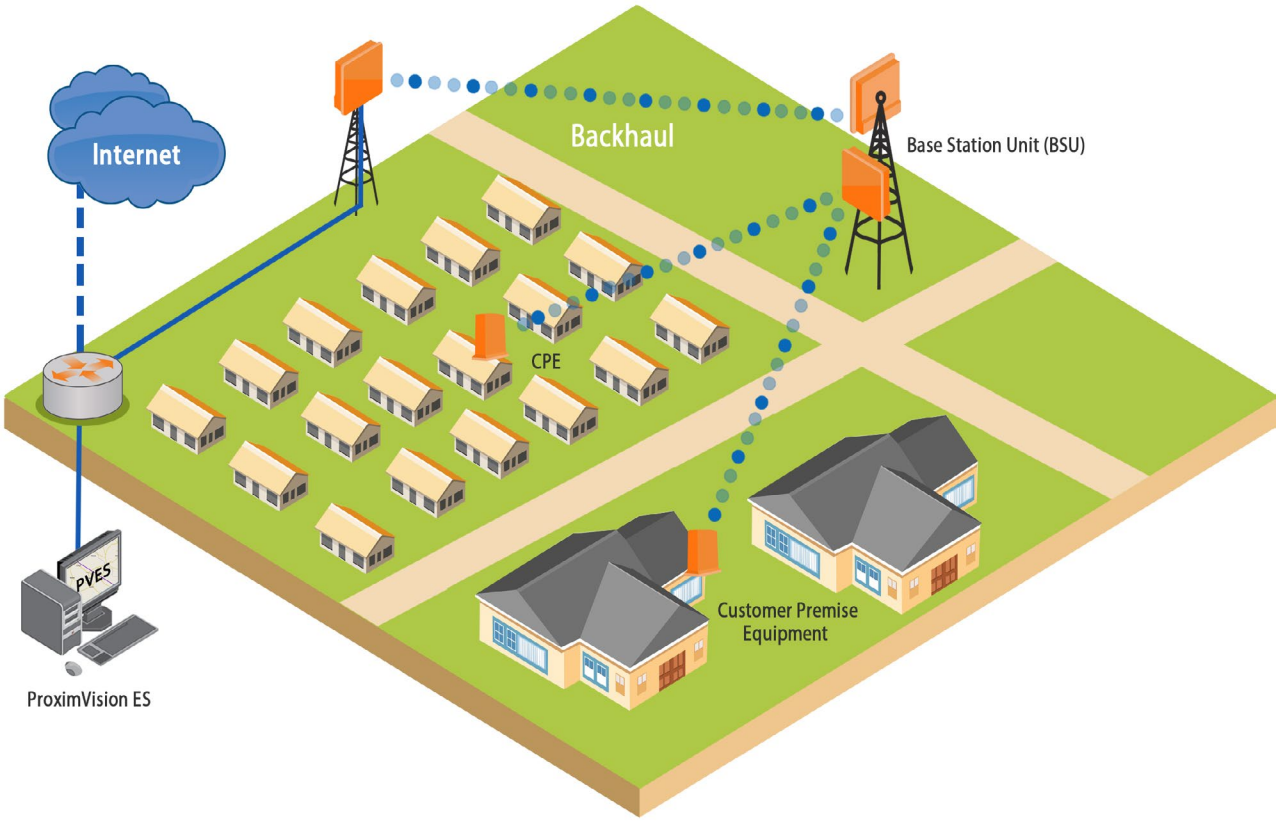
Cost-efficient: By avoiding the capital expense of laying fiber and the operational expense of maintaining it, wireless communications proves to be far more cost-effective.

Reliable: The latest wireless solutions are extremely reliable and provide uptime / availability of 99.99% and more.

High Performance: With the advent of latest technologies, wireless solutions can provide throughput in excess of 4G speeds.



Point-to-Point Communication

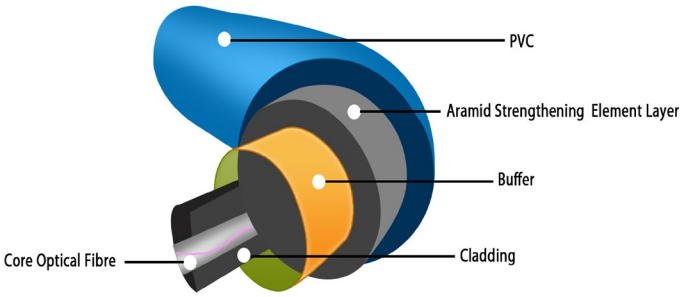


Network Backhauling

Communication Mediums of Backhauling

Fiber optic

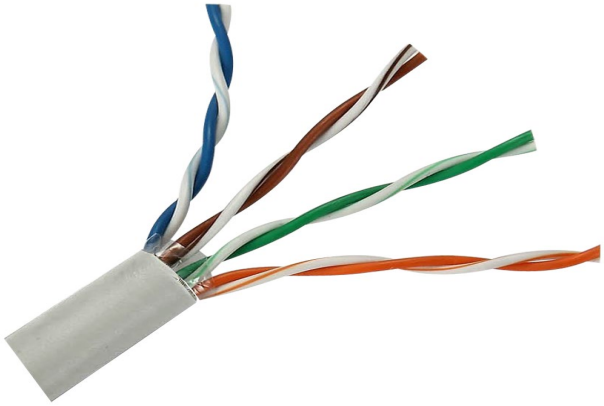
Technology that makes use of light to transmit data. The optical fiber consists of a core, which carries the light. This core is clad to prevent leakage. There are further layers, such as a resin layer and a plastic jacket that add strength to the cable. Fiber for backhaul or Point-to-Point applications are expensive due to trenching and installation costs.



Optical Fiber

Ethernet Cables

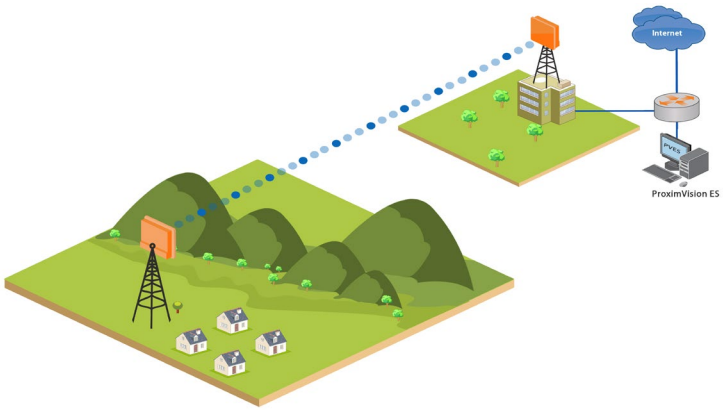
The Ethernet (CAT 5) cable, capable of transmitting up to 1000 Mbps, consists of four pairs of wires. Each pair has a common color of twisted copper wires. Ethernet cable as a PtP solution is seldom used due to high attenuation, susceptibility to interference and high costs .



Ethernet Cable

Wireless

The medium used to communicate wirelessly between devices is radio frequency (RF). An RF signal begins as an electrical alternating current (AC) signal generated by a transmitter. This AC signal is sent through a cable and radiated out of an antenna in the form of an electromagnetic wireless signal. Changes in electron flow in an antenna, otherwise known as current, produce changes in the electromagnetic fields around the antenna. At the other end, another antenna receives the signals. Once received by the antenna, it is passed to the receiver in the form of electrical signals.



Wireless Medium

Myths and Facts of Wireless Communications

MYTH #1: Wireless communications are vulnerable to intrusion and attacks.

FACT: With the advances in wireless communications today there are multiple solutions for transmitting data securely. The most widely used in the wireless space is AES -128 or Advanced Encryption Standard, ratified by the National Institute of Standards and Technology. It is a secure, 128-bit key standard, which simply means that it would take 2^{128} operations or 340,282,366,920,938,463,463,374,607,431,768,211,456 turns to decipher the message for an unauthorized user, which is widely considered to be out of reach, even for contemporary computing techniques.

MYTH #2: Wireless devices require line of sight to operate.

FACT: MIMO (Multiple In and Multiple Out) technology enables devices to communicate in conditions when line of sight is unavailable. MIMO uses multiple receiving and transmitting antennas and lever-

ages the reflected signals of multipath as opposed to eliminating them. Another benefit of using MIMO is high throughput.

MYTH #3: Wireless backhaul is incompatible with existing backhaul.

FACT: Wireless backhaul technology allows seamless integration of wired backhaul networks with the newly deployed advanced wireless backhaul points, resulting in a complete hybrid model.

MYTH #4: High Capital Expenditure and low ROI are associated with wireless solutions.

FACT: Wireless offers the most cost-effective solution with LOW Capital Expenditure available today. A wireless solution eliminates the high cost of trenching and laying cable between Points of Presence (PoPs), resulting in a rapid and high return on investment.

Wireless Versus Wired Backhaul

Exponential growth in cell phone subscribers, in combination with the availability of mobile data devices such as 3G handsets, laptop cards and PDAs, have driven the demand for data, voice, video and multimedia services. To address to this demand, existing backhaul networks need to continuously upgrade. However the process of upgrading traditional wired backhaul systems presents two major barriers to service providers:

High Capital Expenditure and Operational Expenditure

- Installation of fiber, most cost-effective solution whether on pole or underground, includes expensive trenching costs.
- Optical transmitters and receivers, as well as fiber splicing, are required every six kilometers, resulting in heavy capital cost
- Fiber cables also have high, recurring maintenance and lease costs

Scalability

Fiber must be handled with great care while installing in rough rural terrains as well as highly urbanized areas.

To sum up one of the biggest disadvantages of fiber optic systems is that the RoI is quite low due to recurring maintenance cost and inflexibility

How to Choose a Wireless Solution?

Selecting Your Backhaul Solution

Selecting the right backhaul solution is a balance of speed, distance, and price. For wireless technologies, a rule of thumb is the faster and longer the coverage, the more expensive it is going to be. Also keep in mind future demand when selecting a solution.

Here are a few frequently asked questions that should be considered when looking into a backhaul communication solution:

What frequency ranges and power levels are acceptable in my country?

Different countries and geographies have different policies on the frequency ranges and the power labels. It is imperative that the purchaser be aware of the regional variations in radio communications standards and regulations.

Is the radio easily programmable for both frequency and power?

Many radios on the market today do not meet local country regulations due either to transmitting too much power or to frequencies not approved for unlicensed use. Therefore, it is important to determine whether or not the radio can be programmed to meet these regulations.

Factors	Wireless Backhaul	Wired Backhaul
Cost	Low cost of installation and maintenance	High cost of installation and maintenance
Installation	Easy and quick installation process	Time-consuming process of trenching and laying fiber
Scalability	Completely scalable, can be installed easily in any terrain	Scalability a major limitation in rural/remote areas, as well as in densely populated metro environments
Service Time	The turnaround time to either service or repair the network would only involve replacing the faulty devices	In case of any downtime the complete fiber line has to be checked for any cuts
Manageability	Devices performance can be viewed from a centralized point	No centralized management available

Should I use a licensed or un-licensed band?

Unlicensed links can be up and running in a comparatively short time and without a lot of added expense to the end user. The shortcoming is potential interference. With unlicensed radios, the end user has no control over who is able to use the frequency and, thus, can encounter unexpected interference. However, if precautions are taken, one can use an unlicensed link successfully for a number of years.

Licensed links, on the other hand, tend to have higher throughputs and be more reliable. Because the frequency is licensed, users are certain they're the only ones allowed to use that frequency. They also have confidence that an occasional access point within a residential or business area will not cause downtime or slow their network. Licensed links are generally more expensive because of licensing fees and the additional time needed to install the system.

What type of antenna do I need?

Various types of antennas are available, built with specific purposes. For point to point antennas, there are generally two categories:

Semi-Directional: Using the analogy of a study table lamp that concentrates on a certain area, semi-directional antennas focus on a pie-shaped area.

Highly Directional: Directional antennas are more narrowly focused like a laser pen used for presentations and are used only for point-to-point communications.

The types of antennas are as follows:

Parabolic Antennas: Consist of a parabolic shaped dish and an antenna located in front of the dish. Due to the parabolic shape, the antenna concentrates radiation into a narrow pattern, producing a high-gain beam.

Grid Antennas: Are similar to a grill slightly curved inwards and are highly directional antennas. The grill lets the wind pass through and leaves the antenna direction undisturbed.

Panel Antennas: Fall under the semi-directional antenna category, consisting of a rectangular pane enclosure, is extremely rugged and easy to install.

Patch Antennas: Can be mounted on a flat surface or a wall. They consist of a patch of metal placed on a sheet of metal usually contained inside a plastic enclosure. They are also known as rectangular micro strip antennas.

Yagi Antennas: Are essentially used for small- to medium-distance coverage, however, high-gain Yagi antennas are available to provide higher distance coverage.

A few best practices to consider before implementing a point-to-point backhaul solution:

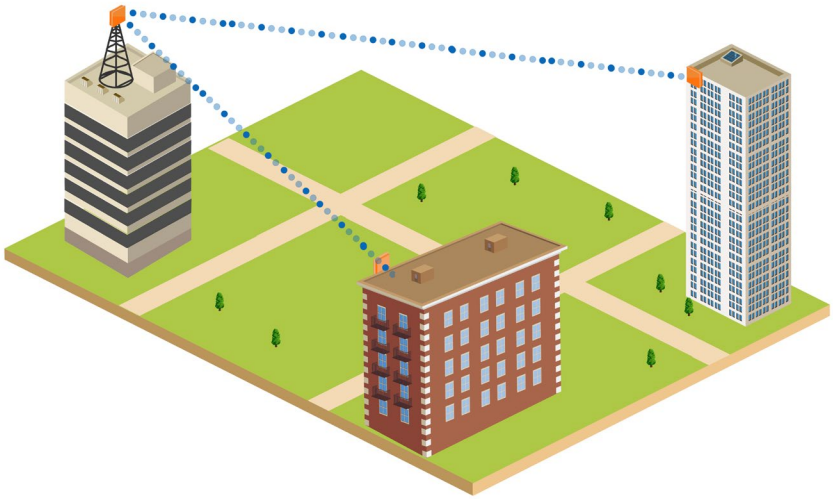
- Hire a good outdoor wireless integrator
- Understand the solution before choosing the system
- Know the wireless equipment you are buying
- Choose proven and field-tested wireless backhaul systems
- Have a professional wireless installer to do It right

Applications

There are many wireless backhaul solutions to meet the needs of all kinds of organizations. A few scenarios for optimized wireless backhaul in real-time applications are illustrated below.

Backhaul to a Central POP

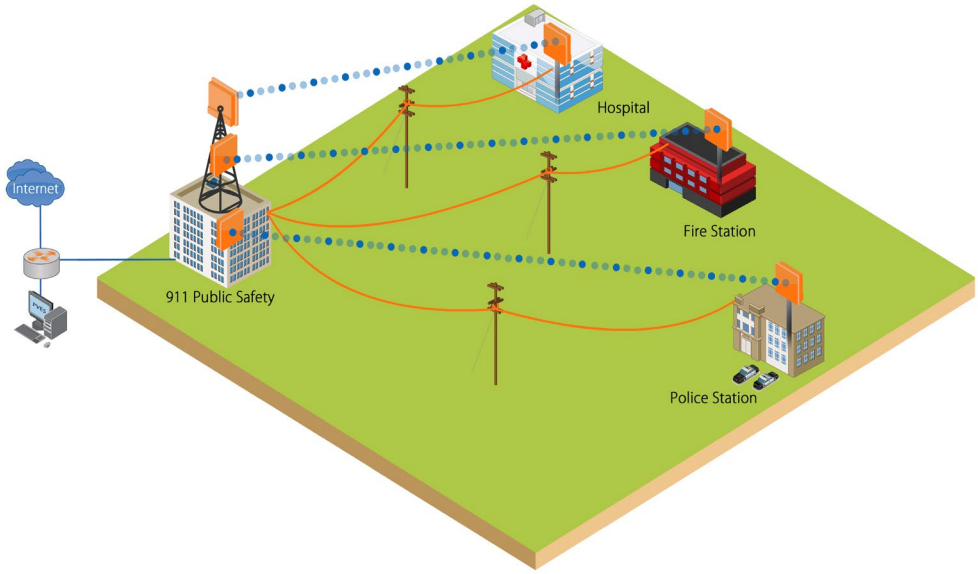
For POPs located in remote areas, backhauling to central POP via Fiber can be expensive and time consuming. Below are shown two remote POPs connected wirelessly to a central POP that avoid the huge cost of laying fiber, enabling rapid scaling in remote locations.



Leased-line Redundancy / Inter-POP Redundancy

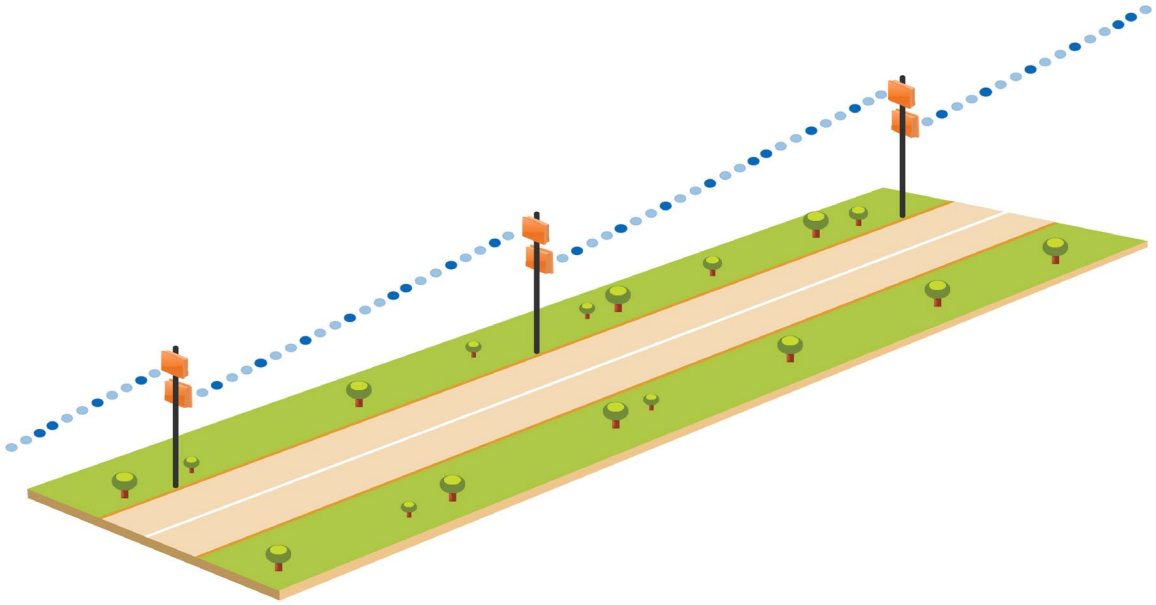
Avoid downtime caused by a wire line backhaul failure by adding a QuickBridge link as an inter-POP redundancy

Fibers or cables run a constant risk of being cut or clipped due to weather, construction, and other causes that can lead to a significant outage. This risk can be avoided by adding a wireless solution to the wire line, strengthening the connection against conditions like construction and weather and reducing downtime, ultimately leading to higher productivity.



Repeater

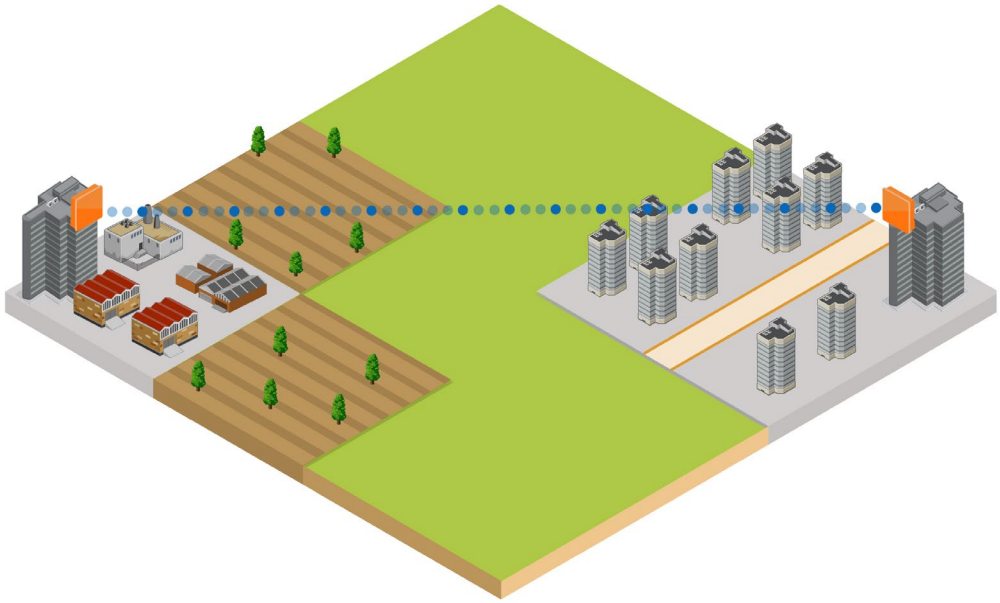
Any communication signal over any medium, whether wireless or wired, gradually looses intensity (i.e., attenuates) as it travels over long distances. This can be overcome by installing repeaters that receive the diminished signal and retransmit it at a higher level / higher power to cover longer distances. Below is a typical scenario of wireless PtP devices functioning as repeaters.



Building-to-Building Connectivity

Organizations ranging from hospitals with several departments to enterprises spread over multiple locations must be able to communicate with each other constantly and with critical applications, such as ERP or Managmement Information Systems. This requires secure, scalable, and high-performance communication solutions. Relying on wired connectivity only adds to complexity and high CapEx.

Connecting buildings and campuses via wireless backhaul is much easier to deploy and far more cost-effective. Surveillance monitoring can also be implemented between the main office and branch locations for security services. Mobility, along with the flexibility for easy structural expansion of connected services and low capital costs is driving the wireless demand for building-to-building applications.



Wireless Backhaul in Action

The Aqaba Water Company

Challenge:

- AWC needed to connect every well throughout their entire system
- Given the number of components that needed to be connected, wired solutions were cost prohibitive and would take far longer to deploy
- As it connected the wells to the central SCADA network, this was a mission-critical network that required high performance and reliability

Solutions:

- Widespread Proxim PtMP and PtP deployment throughout the entire Aqaba region
- The first phase of the wireless SCADA deployment utilized Proxim's Tsunami® MP.11 PtMP and Tsunami QuickBridge® PtP solutions
- The entire system is managed centrally by the ProximVision ES Wireless Network Management System

Results:

- Proxim's PtMP and PtP wireless equipment successfully connects AWC's water wells to a centralized supervisory control and data acquisition (SCADA) network
- Initial savings of over 300,000 JD (more than $422,000 USD) in up-front capital cost over wired solutions
- Annual savings of 15,000 JD (over $21,000 USD) by avoiding leased-line costs

Campus Wide Connectivity-UNACH

Challenge:

- Universidad Autónoma de Chiapas required high bandwidth, high-availability broadband connectivity to support Virtual University, distance education
- 6 of 9 campuses lacked any form of broadband connectivity and were unable to access digital education tools or the Internet
- Cost–effective solutions needed to provide support for voice, data and video

Solutions:

- Proxim Tsunami® QuickBridge – Quick, easy-to-install point-to-point wireless backhaul that provides a complete hop in a box
- Proxim Tsunami® QB-8100 – High-speed, carrier-grade point-to-point wireless backhaul with NLOS capabilities
- Proxim Tsunami® .GX Series – Carrier-class, long-range wireless Ethernet bridge for voice and data backhaul
- Proxim ORiNOCO® AP-8000/4000

Results:

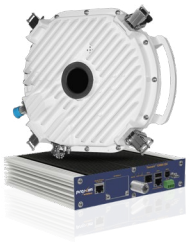
- All 11 campus facilities of UNAC are connected creating "Red UNACH, CERO MAYA," a cutting-edge information and wireless communication network providing access to distance learning, digital education tools and the Internet
- Proxim's wireless solutions cost-effectively delivered voice, data and video connectivity along with management tools to previously isolated campus locations
- UNAC is now able to extend administrative support to all its campuses as well as providing the opportunity for connectivity to other entities such as health, security and educational organizations

Products

Tsunami® QB-8200 Series

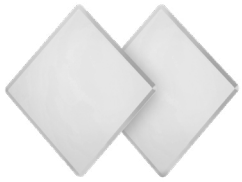
The Tsunami® QB-8200, is a high power, extremely reliable and a cost-effective, non-line-of-sight 4G point-to-point (PtP) wireless backhaul solution. It delivers data rates of 300 Mbps, along with excellent spectrum and 25.8 dBm high power radios for extend coverage.
With its incredible channel capacity & flexibility, excellent spectrum efficiency and a highly evolved prioritization platform tailored to deliver voice, video and data applications, the Tsunami® QB-8200 satisfies carriers, wireless service providers and Government organizations with requirements for fast and reliable wireless backhaul.

Tsunami® GX 800



Tsunami® GX800 is a high-speed, Point-to-Point (PtP) licensed microwave product capable of operating in 6–38* GHz licensed bands with more than 600Mbps aggregate throughput capacity, supporting an array of user configurable channel bandwidths from 7-56 MHz. The product has an extremely small foot print and comes in a split-mount design consisting of a compact indoor unit (IDU) and outdoor unit (ODU) that are a snap to install. The GX800 licensed Point-to-Point products are technically advanced, highly reliable and very cost effective.

Tsunami® QB.11 Series



The Tsunami® QuickBridge.11 family operates in the unlicensed frequency spectrums of 2.4 GHz and 5 GHz (5.15 to 5.95 inclusive (and to 6.08 GHz with LR)) and comes complete with a set of accessories to ease outdoor installations. As the most cost-effective point-to-point solution from Proxim, any deployment will enjoy a quick return on investment.

Tsunami® QB-820 Series

Proxim Wireless is a leader and an early innovator in wireless technology providing high speed, long range broadband wireless solutions. Proxim introduces the Tsunami Quickbridge® 825 series, an incredibly cost-effective, non Line-of-Sight Point-to-Point (PtP) wireless backhaul solution. With this complete “Hop-in-a-Box” solution delivering up to 100 Mbps throughput, deployments of all sizes will enjoy a quick return on investment.

The Tsunami® QB-820 family operates in the frequency of 5.150 – 5.925 GHz and comes complete with a set of accessories to ease outdoor installations. As the most cost-effective point-to-point solution from Proxim, any deployment will enjoy a quick return on investment.

About Proxim

Proxim Wireless Corporation (OTC Markets: PRXM) provides Wi-Fi®, Point-to-Point and Point-to-Multipoint 4G wireless network technologies for wireless internet, video surveillance and backhaul applications. Our ORiNOCO® and Tsunami® product lines are sold to service providers, governments and enterprises with over 2 million devices shipped to over 250,000 customers in over 90 countries worldwide. Proxim is ISO 9001-2008 certified. For more information, visit www.proxim.com. For investor relations information, e-mail ir@proxim.com or call +1 413-584-1425.

Proxim_WP_Key_Considerations_and_Benefits_of_Unwiring_Backhaul

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