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Fixed Wireless Broadband: Merging the Power of Wireline with the Ease of Wireless

OVERVIEW

Fixed Wireless Broadband is emerging as a viable—and frequently superior—alternative to the more familiar T1, DSL and cable broadband networks. With freedom from copper and coax wirelines as its leading benefit, high-speed fixed wireless can reach far more destinations, usually at a much lower cost.

Yet, a degree of confusion still surrounds Fixed Wireless Broadband. Some people tend to associate it with satellite access and one-way dishes such as DirectPC. Others lump it together with its wireless minion, Wireless Fidelity (WiFi), and the assortment of wireless devices such as cell phones and PDAs offering mobile Internet access.

While fixed wireless fundamentally resembles these technologies, its appeal is in offering the high bandwidth of powerful wireline broadband technologies along with the structural simplicity of low-end mobile wireless access.

In fact, basic fixed-wireless technology is fairly straightforward, despite an array of acronyms.

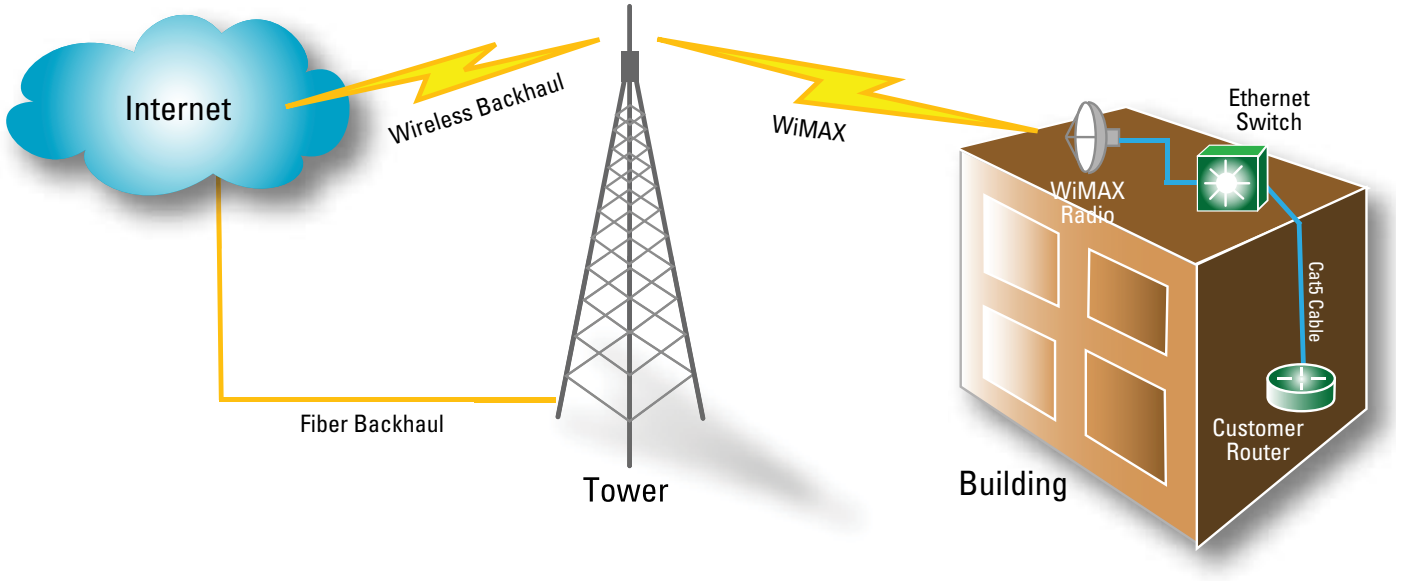
- On one end you have a small microwave antenna and weatherproof radio mounted on the customer's rooftop for transmitting and receiving radio-frequency (RF) signals. This is the Customer Premise Equipment (CPE).
- The customer's antenna points to the Internet Service Provider's RF transceiver—called the Access Point (AP)—located on a radio tower or tall building, as examples.
- Together the CPE and the AC form a Wireless Local Loop (WLL) for RF carrier-grade transmissions between the two fixed locations, sending data packets between towers and antennas with the ease of AM/FM radio.

With this basic Point-to-Point (PtP) configuration, customers with clear Line of Sight (LOS) to the AP—sometimes 20 miles away—can receive reliable and secure high-speed Internet service.

For example, EasyStreet's fixed-wireless partners—Freewire Broadband and MetroFi—have established networks of access points throughout the Portland metropolitan area and beyond. If your rooftop offers an uninterrupted line of sight to one of these many base stations, an antenna and radio are installed on your roof and then connected via Ethernet to your LAN infrastructure. Your resulting connection is equivalent to any other Ethernet-based high-speed access, except the "last mile" is without wires.

Coupled with the fact that RF data transmission has been around for decades—note the proliferation of rooftop dishes and antennas atop telephone companies, utilities, cable television providers and governmental agencies—you can easily see how Fixed Wireless Broadband is a natural extension of previously successful technology.

This is especially true in locations where costs and other factors have discouraged carriers from burying cable. Today only half of all buildings in the U.S. are close enough to a central office —within 12,000 feet—to get DSL service, and less than 10 percent have fiber running to them. In fact, in rural areas devoid of wireline, fixed wireless may be the only available wire-free, non-satellite method of obtaining broadband access. This makes it a boon to developing nations and a vital technology for reducing the world's so-called digital divide separating the digital "haves" from the developing nations.



BRINGING ENHANCED PERFORMANCE TO FIXED WIRELESS

While fixed wireless can accommodate anything from voice communications to television programming, its most recent and striking development is in data communications for Internet access.

Here fixed wireless matches wireline in all key parameters, such as delay, a bit-error rate of 1 in 100 million or better, and throughput of 1 Mbps to 155 Mbps. Any applications that run through wireline should run over the fixed-wireless network with no performance degradation. (The one exception is geosynchronous satellites, due to their quarter-second-plus delays).

Frequencies generally range from 1 GHz to 40 GHz and are steadily becoming higher. This opens the way for smaller, more sophisticated antennas, lower costs and systems even easier to deploy. Ease of deployment also is enhanced because Fixed Wireless Broadband is designed to emulate a coaxial cable connection and employ the same interfaces and protocols—T1, frame relay, Ethernet and ATM—for optimum connectivity.

Generally speaking, when you examine wireless and wireline options, the advantages of wireless include lower costs, greater flexibility, and faster deployment. Reliability is on a par with wireline networks except in developing nations, where reliability of fixed wireless often greatly exceeds that of wireline.

This is not say that the wireline technologies have plateaued. DSL and cable modems offering transmission speeds in the megabits per second are coming into their own, while many companies are upgrading their T1 connections to T3 fiber. But at the same time, broadband industry leaders such as Intel and Fujitsu are using innovative RF engineering to upgrade new radio and antenna architecture for the next generation of wireless high-speed broadband.

As explained earlier, point-to-point (PtP) wireless networking connects two locations by using two radios and two antennas dedicated to only each other. A more recent and powerful fixed wireless development—Point-to-Multipoint (PtMP) networking—refers to communication between one access point and multiple end-user radios.

While PtMP equipment has been around for several years, it has been seriously hampered by incompatibility between systems and equipment from different manufacturers, injecting an element of risk most service providers have been unwilling to confront. That too is changing, due to a set of standards called WiMAX.

A SNAPSHOT OF FIXED WIRELESS BENEFITS OVER WIRELINE

- Faster deployment
- Less expensive
- Greater flexibility
- Higher bandwidth

WIMAX: A STANDARD FOR SUPERIOR WIRELESS NETWORKS

More and more people are becoming familiar with wireless technologies through Wireless Fidelity (WiFi), either because of a home network or the proliferation of people with laptops at the local coffee shop. WiFi was the first high-speed wireless technology that enabled access, or "hotspots," in homes, offices, cafes, hotels and airports. While WiFi has gained popularity with telecommuters, road warriors and laptop-bearing coffee drinkers, it has its drawbacks.

For example, WiFi connectivity is confined to about 300 feet from the wireless access point. It uses unlicensed radio frequencies so anyone can put up WiFi equipment anywhere. And the potential for signal interference is high, making it one of the most serious WiFi limitations.

WiMAX—a technology standard developed in 2001 that is revolutionizing the wireless broadband industry—dramatically outperforms WiFi in both range and speed. With WiMAX standard IEEE 802.16, wireless service providers now have non-proprietary technology for cost-effectively building secure, scalable, reliable networks. A single WiMAX base station can deliver excellent coverage by providing multiple high-bandwidth links reaching out up to nearly 20 miles.

As a technology, Fixed Wireless Broadband combines proprietary RF signaling and the WiMAX standard. It communicates

between two fixed antennas for transmissions of authenticated and encrypted data. These signals are processed and delivered to the end location by means of a physical Ethernet handoff. This is unlike WiFi, where any laptop or access device within range of the WiFi "cloud" can gain access.

WiMAX can deliver last-mile broadband to a larger area than WiFi—coverage canopies can reach to six miles wide—and give T1-and-up-equivalent service while providing greater mobility for high-speed data applications. With a line-of-sight range of about 20 miles or more, WiMAX promises to surpass the capability of today's wireless broadband technology.

MITIGATING THE EFFECTS OF GEOGRAPHY AND CLIMATE

While wireline broadband is mostly immune to hills and valleys, rain or shine—though not so protected from the likes of backhoes and tornadoes—wireless can be susceptible to both geographical and climatic conditions.

High hills and unforeseen new construction could potentially impair a wireless signal, which is why a clear line of sight should be determined by a reputable wireless service carrier as an early step in the installation discussion.

Fixed-wireless systems operate at frequencies that require a clear line of sight limited to a perhaps two-dozen miles. This is why microwave dishes are situated on towers, hilltops and tall buildings. Unlike cellular and other mobile wireless systems, fixed wireless uses stationary antennas with narrowly focused beams.

Inclement weather provokes more questions than any other fixed-wireless concern. Skeptics claim the signal can be degraded by moisture in the air, while supporters say the signal is unchanged even in the worst rain and snowstorms. In actuality, both answers are correct. Technically a Fixed Wireless Broadband signal could be affected by heavy moisture in the air, such as hard rain or dense fog.

Moisture can be a factor in the higher frequency wave bands of 28 GHz and greater. A three-mile link at 38 GHz encountering a heavy rainstorm of an inch an hour could sustain degradation of up to 1,000 times the received signal strength. However, experienced carriers are aware of this, and they build sufficient margins into their links to guard against such signal problems. For example, EasyStreet and Freewire ensure that the network is engineered to meet the terms of the customer's Service Level Agreement (SLA). These providers adjust the engineering of each link to consistently meet or exceed the stated SLA in even the stormiest weather. And all base stations are grounded to protect against lightning strikes.

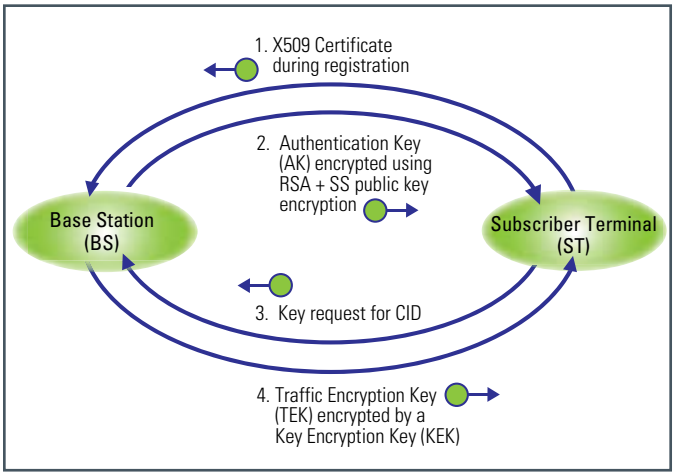
MAKING A NETWORK SECURE IN THE SKY

Despite encryption and other security-enhancing features, the most frequent security concern is whether a Fixed Wireless Broadband network can be "sniffed" by unauthorized sources, especially those with WiFi-enabled computers.

Service carriers go to great lengths to ensure secure data transmissions through the use of high-gain directional antennas as base stations, tightly focusing the signal and directing it precisely at the customer's CPE. And because fixed wireless is not based on WiFi's IEEE 802.11 standard, a WiFi-enabled device cannot identify or process a fixed-wireless signal.

Fixed Wireless Broadband transmits and receives signals from specific, authenticated devices only. It does not broadcast signals in all direction to create a wireless "cloud," such as is the case with WiFi. And even if someone positioned directly between a base station and antenna did receive a signal, it would be unreadable because of data encryption.

For example installations can employ the Advanced Encryption Standard (AES), which is the standard adopted by the U.S. government to protect its data. The AES cryptographic algorithm for protecting electronic data is a symmetric block cipher that can encrypt (encipher) and decrypt (decipher) information. Encryption converts data to an unintelligible form called cipher text,



decrypting the cipher text converts the data back into its original form, called plain text.

In other words, fixed-wireless data transmission using AES are as secure as any transmission in the world.

WIRELESS OR WIRELINE: SOME DECISION GUIDELINES

If you're contemplating a new network and are puzzling between Fixed Wireless Broadband and a wireline system, here are some helpful guidelines to consider. They were compiled by noted wireless consultant Peter Rysavy of Rysavy Research in Hood River, Oregon. He says:

- Remember line of sight. You must be able to see the point with which you wish to connect, whether it is your own site or a wireless carrier. Depending on the technology used, effective range is from about three (5 km) to about 20 miles (30 km). Multiple hops also are an option but add complexity.
- Consider wireless if there are no good wireline options available. Perhaps you are in a suburban area and need high-bandwidth connectivity, but no fiber runs to your building. Even if wireline options exist, the length of time to obtain wireline service may be prohibitive.
- Consider wireless if you need to bridge LANs in two buildings in close proximity. An unlicensed spread-spectrum or licensed microwave connection could be cost-effective, particularly if you have to pay $500 or more for a monthly T1 connection. Wireless equipment providers claim a typical payback of two years.
- Consider wireless if crossing wireline service boundaries. Wireline service might be exceptionally expensive if crossing different LEC areas and a wireless connection could be cost-effective.
- Consider wireless for temporary or backup connectivity. If you need a temporary connection between two nearby sites, or if you need a backup connection, wireless might be your best option.
- Compare offerings between wireless and wireline carriers. If a wireless carrier is offering service to your building, investigate its pricing because it may be undercutting wireline providers to develop its business. Wireless carriers may also have greater flexibility in their offerings, such as the ability to easily increase bandwidth on demand.

Keep in mind that, in most cases, fixed-wireless can be deployed more rapidly than a wireline connection. And it lends itself to easy scalability. Fixed wireless speeds can be upgraded with a phone call to EasyStreet and—because no new equipment is required for speeds from 1.5 to 10 Mbps—you will be at your desired speed within one business day.

For more information about Fixed Wireless Broadband from EasyStreet, call 503-646-8400, send an email to info@easystreet.com or visit www.easystreet.com.

Information for this document is from a variety of sources, including Freewire Broadband, Rysavy Research, Intel and ISP Planet among others.

EasyStreet Online Services, Inc.
9705 SW Sunshine Court
Beaverton, OR 97005
(503) 646-8400
(877) 567-EASY
info@easystreet.com
www.easystreet.com