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IP SURVEILLANCE AND VIDEO CONFERENCE ON WIMAX LINK

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ABSTRACT

WIMAX (Worldwide Interoperability Microwave Access) has helped to push the wireless communication scenario into hyper drive. For many years cables ruled the world. Optical fibers played a dominate role for its higher bit rates and faster transmission. But the installation of cables caused a greater difficulty and thus led to wireless access. The foremost of this is Bluetooth which can cover 9-10mts. Wi-Fi followed it having coverage area of 91mts. No doubt, introduction of Wi-Fi wireless networks has proved a revolutionary solution to last mile problem. But the human's continuous quest for even better technology despite the substantial advantages of present technologies led to the introduction of new, more up-to-date standards for data exchange rate i.e., WIMAX.

WIMAX provides broadband communication in the area of over 30km in range with the bandwidth comparable to that for cable bands- up to 54 Mbit/s and higher. The WIMAX technology allows operating in any conditions, including in the dense urban coverage, and providing a high quality of communications and data transmission rate. Ultimately, WIMAX may be used to provide connectivity to entire cities, and may be incorporated into laptops to give users an added measure of mobility. WIMAX requires a tower, similar to cell phone tower, which is connected to the Internet using a standard wired high-speed connection, such as a T3 line. But as opposed to a traditional Internet Service Provider (ISP), which divides that bandwidth among customers via wire, it uses a microwave link to establish a connection. WIMAX (Worldwide Interoperability Microwave Access) is the recently approved IEEE 802.16 wireless metropolitan area network (MAN) standard for wireless access. The new ratified 802.16a extension uses a lower frequency range of 2GHz to 11GHz.

The project criteria is to establish voice, data, video communication between two different buildings with IPPBX, IP surveillance cameras and Video conference equipments at a distances of 5km a part on road as a proof of concept of wireless communication on WIMAX link by using WIMAX base station Breeze NET B300 from Alvarion make supports 60km distance coverage and 250Mbps bandwidth for point to point communication.

INTRODUCTION

Worldwide Interoperability for Microwave Access, or WIMAX for short, is a next generation open standard that seeks to serve users' increasing demands for high data throughput (broadband) services such as streaming media on the internet, live video conferencing, and mobile TV on computers as well as handsets and PDAs. WIMAX is expected to be integrated into the next generation mass market consumer devices and to offer something that does not exist today speeds similar to cable and metropolitan area coverage while on the move, all for a much lower cost than we are used to today. WIMAX already offers broadband services in many emerging and rural markets which are not supported by wire line-based technologies and started its first deployment in developed countries replacing both commonly used Wi-Fi on one hand and traditional cellular standards such as 3G.

IEEE 802.16 is the standard to state the radio frequency of fixed Broadband Wireless Access. WIMAX is the trade name of IEEE 802.16 Standard. IEEE 802.16 was first planned to offer the last mile for Wireless Metropolitan Area Network (WMAN) with the line of sight (LOS) of 30 – 50 km.

Basically the goal of WIMAX is to provide high speed internet access to home and business subscribers without wires. It supports legacy voice systems, voice over IP, TCP/IP, and application with different

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QOS requirements. 802.16 consist of the access point, base station and subscriber station. During a communication, all the information coming from a subscriber station go to the base station and retransmitted back to subscriber station. Base station can handle multiple of subscriber station.

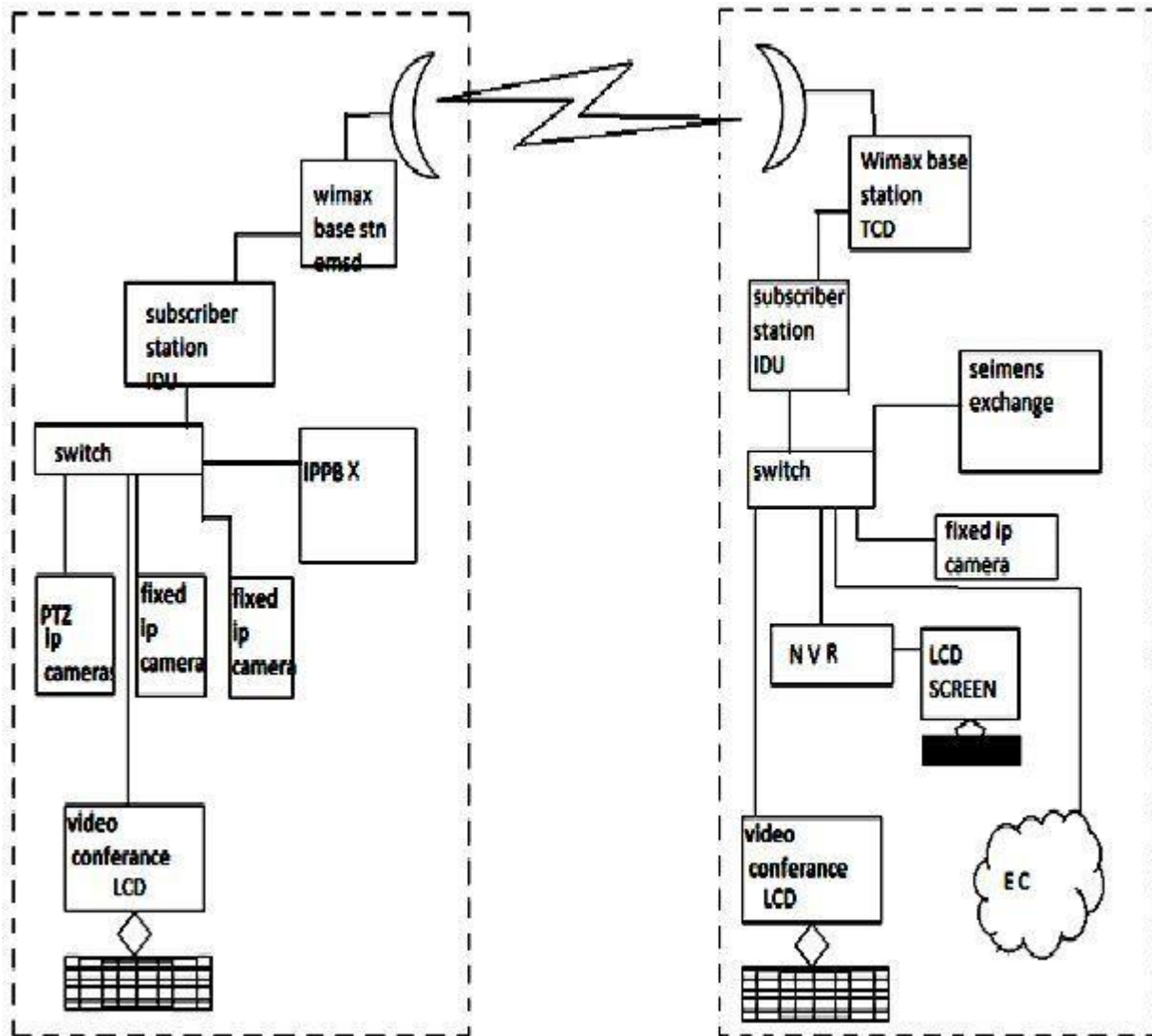


Figure 1: Block Diagram of IP Surveillance and Video Conferencing on WIMAX Link

Background

Historically, the main usage of wireless data-transfer was voice communication. As wireless communication standards evolved to become digital (Wi-Fi or GSM), voice has become one among several more bandwidth consuming (broadband) applications such as high definition video or games. Many wireless IP (internet protocol) network standards try to satisfy the increasing demand for more bandwidth in more locations while on the move.

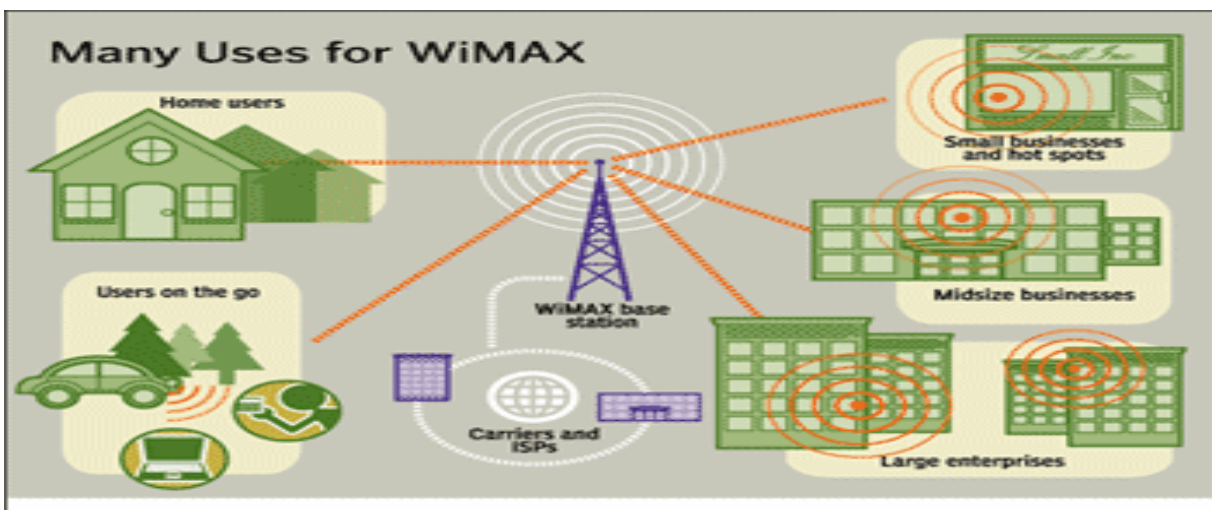
Wi-Fi is the most popular and successful broadband wireless IP network standard to date. Popular Wi-Fi standards like 802.11b and 802.11g – are used in many homes and businesses and enable internet access with high data throughput for computer notebooks, PCs, and more recently, for Smartphone users.

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802.11n, the upcoming Wi-Fi standard, (currently in draft state) can double the data throughput of Wi-Fi for heavy demanding applications. A number of cities around the world are in the process of building city-wide Wi-Fi networks to allow citizens to enjoy wireless data transfer across the city (also known as a metropolitan area network). While Wi-Fi operates over a free unlicensed spectrum and is simple to install and operate, it has some major disadvantages. One of the main drawbacks is poor signal coverage; only 30 meters indoors and 200 meters outdoors. Wi-Fi as a fixed broadband standard cannot support broadband services while on the move and does not support continuous connectivity between Wi-Fi hotspots which could enable, for instance, a person going from his office to a cafe while having a continuous wireless conversation, Wi-Fi is exposed to other interferers on the same band since it runs over an unlicensed spectrum, is considered relatively insecure since it does not use enhanced encryption, is very power inefficient, and does not guarantee quality of service.

WIMAX

WIMAX combines the familiarity of Wi-Fi with the mobility of cellular that will deliver personal mobile broadband that moves with you. It will let you get connected to the Internet, miles from the nearest Wi-Fi hotspot. Soon, Mobile WIMAX will blanket large areas metropolitan, suburban, or rural delivering mobile broadband Internet access at speeds similar to existing broadband. WIMAX is built for the future with advanced, efficient wireless technology that provides higher speeds than today's wide area wireless technologies. It will be able to completely transform our mobile Internet lifestyle, enabling us to connect in ways that we have dreamed about.



Specifications of WIMAX

Table 1: WIMAX Specifications

PARAMETER	VALUE
Range: Line of sight(LOS)	50 Km
Range: Non Line of sight (NLOS)	10 Km
Maximum Data Speed	70 Mbps
Licensed Frequency Band	2-11 GHz
Un-Licensed Frequency Band	10-66 GHz
Switching	Packet
Multiplexing	SOFDMA
Modulation	BPSK,QPSK,16AM,64QAM

WiMAX Applications

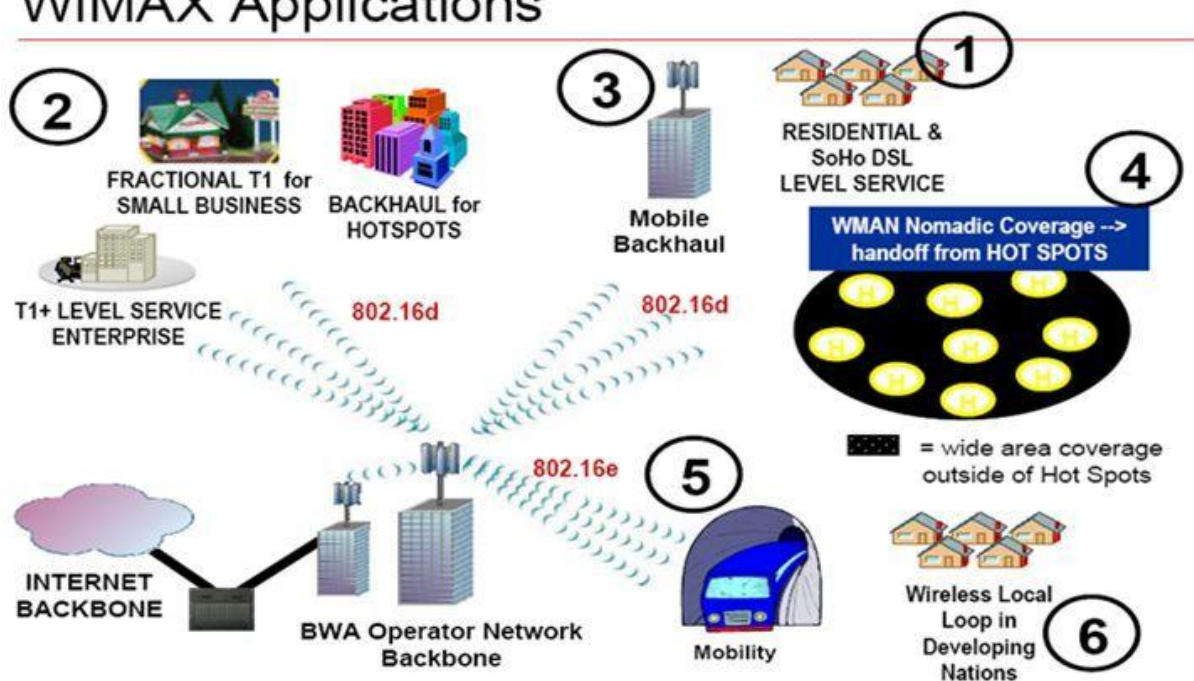


Figure 2: Uses of WIMAX

Benefits of WIMAX

- Speed: Faster than broadband service.
- Wireless: Not having to lay cables reduces cost. Easier to extend to suburban and rural areas.
- Broad Coverage: Much wider coverage than Wi-Fi hotspot

A WIMAX system consists of A WIMAX tower, similar in concept to a cell-phone tower a single WIMAX tower can provide coverage to a very large area as big as 3,000 square miles (~8,000 square km). A WIMAX receiver, the receiver and antenna could be a small box or Personal Computer Memory card, or they could be built into a laptop the way Wi-Fi access is today.



Figure 3: WIMAX transmitter and receiver

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BREEZE NET® B130/B300

Breeze NET B130/B300 answers the growing need for higher bandwidth capacity, by combining up to 250 Mbps throughput with TDM and Ethernet transport which maximizes spectral efficiency for high performance and long distance connectivity. An all-outdoor, high-performance solution with more effective throughput, Breeze NET B130/B300 operates in both LOS (line-of-sight) and NLOS (non-line-of-sight) environments and offers increased link availability for enhanced QoS. The Breeze NET B product family of wireless point-to-point bridging solutions for license-exempt bands provides an efficient and highly secure solution for enterprise wireless connectivity applications and backhaul services between two remote locations and co-location applications.



Figure 4: WIMAX equipment from Alvarion

IP SURVEILLANCE

The growth in surveillance systems is quickly gaining significant ground on conventional analog closed circuit television (CCTV) security camera installations for reasons of both performance and cost-benefits. Surveillance cameras are video cameras used for the purpose of observing an area. They are often connected to a recording device, IP network, and/or watched by a security guard/law enforcement officer. Cameras and recording equipment used to be relatively expensive and required human personnel to monitor camera footage. Now with cheaper production techniques, it is simple and inexpensive enough to be used in home security systems, and for everyday surveillance. Analysis of footage is made easier by automated software that organizes digital video footage into a searchable database, and by automated video analysis software (such as VIRAT and Human ID). The amount of footage is also drastically reduced by motion sensors which only record when motion is detected.

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IP Surveillance systems digitize video streams at camera on the network; this digital stream is then transferred over a standard wired or wireless Internet protocol (IP) network. Unlike traditional analog closed circuit television systems that transport analog.



Figure 5: Types of Surveillance Cameras

VIDEO CONFERENCE

Video conferencing is a communications technology that integrates video and voice to connect remote users with each other as if they were in the same room. Each user needs a computer, webcam, microphone, and broadband internet connection for participation in video conferencing. Users see and hear each other in real time, allowing natural conversations not possible with voice only communications technology.

Communications companies have been dabbling in video conferencing technology since as early as the late 50s, but it took the advent of broadband internet and affordable web cameras (late 90s) for video conferencing to really take off. Good bandwidth is necessary for high-fidelity streaming video and voice. Video conferencing took a serious step into mass use with the release of Microsoft Net meeting 3.0 in 1999. Now there are dozens of software vendors marketing video conferencing software and a number of investors interested in bringing video conferencing to devices. Very appealing to the educational and business sectors, video conferencing allows users to save time and money on travelling and housing costs by bringing people face-to-face virtually. Many prominent universities have adopted video conferencing as an educational tool to be used in conjunction with online courses. Business leaders around the world use video conferencing to keep in touch with important contacts while on the go.

Present-day applications of video conferencing technology are just the beginning. As video and voice capture technology, software, and display technologies continue to improve, the experience of video conferencing will become increasingly natural and intuitive to a wider range of users. Eventually video conferencing and similar technologies will allow the creation of virtual cities, online spaces where people work together without the constraint of geographic proximity. This may decrease urban congestion and save the environment by making it possible for skilled workers living in the suburbs to acquire high-paying jobs without the commute.

RESULTS

The IP surveillance and video conference on WIMAX link using base station; Breeze Net B130/B300 equipment was tested and successfully deployed in ECIL (Electronics Corporation of India Limited).

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CONCLUSION

As WIMAX provides better data rate compared to other wireless networks, so it is deployed in many industries and organizations. Since WIMAX uses OFDM technology the signals are less affected by the noise it provides high security to data that is being transmitted. WIMAX is built from the ground up for the Internet applications, services and security. It is also built on Internet protocol networking.

Applications

Banking networks; Education networks; Public safety; Campus connectivity; offshore communication

Future Scope

The extension of WIMAX is LTE (long term evolution *i.e.* 4G), it has higher data rate compared to WIMAX.

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