

Emerging Wireless Technologies – WiMax

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Abstract:

The universe of remote broadcast communications is quickly developing. Advances under research and development guarantee to convey more administrations to more clients in less time. This paper exhibits the rising innovations helping wireless systems develop from where we are today into our dreams of the future. WiMAX (Worldwide Interoperability for Microwave Access) is a standard for wireless transmission covering a reach like mobile phone towers. With superior in both range and throughput, WiMAX innovation could be a help to current Internet suppliers trying to wind up the pioneer of cutting edge remote Internet access. This paper likewise investigates how these developing advances vary from each other.

Keywords — LOS, WiMax, MAN, LAN, ASN.

I. INTRODUCTION

WiMax (Worldwide Interoperability for Microwave Access) is a wireless broadband technology, which bolsters point to multi-point (PMP) broadband remote access. WiMax is essentially another short term for IEEE Standard 802.16, which was intended to bolster the European measures. 802.16's antecedents (like 802.11a) were not exceptionally accommodative of the European benchmarks, in essence. The IEEE wireless standard has a range of up to 30 miles, and can convey broadband at around 75 megabits per second. This is hypothetically, 20 times faster than an industrially accessible wireless broadband. The 802.16, WiMax standard was distributed in March 2002 and gave redesigned data on the Metropolitan Area Network (MAN) innovation. The expansion given in the March production, augmented the LOS wireless MAN standard, concentrated exclusively on a range from 10 GHz to 60+ GHz.

This augmentation accommodates non-LOS in low frequency bands like 2 - 11 GHz. These bands are once in a while unlicensed. This additionally increases the range from 31 to 50 miles and

backings PMP (point to multipoint) and mesh technologies.

WiMax can be utilized for wireless systems like the famous WiFi. WiMax, a second-generation protocol, permits higher information rates over longer separations, productive utilization of transmission capacity, and maintains a strategic distance from obstruction just about to a base. WiMax can be named a successor to the Wi-Fi convention, which is measured in feet, and works, over shorter separations.

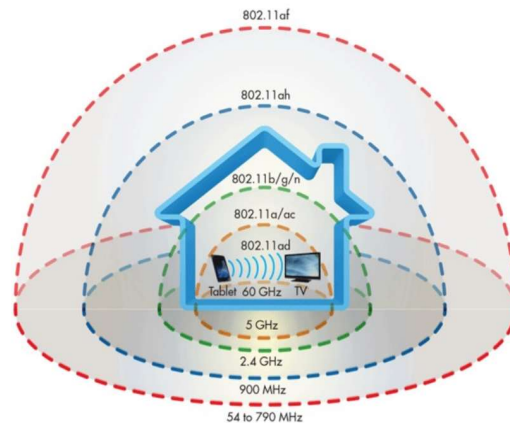


Fig. 1 operating frequency of various transmission media

II. COMPARISION

WiMAX is unique in relation to Wi-Fi in numerous regards. Indeed, Wi-Fi can work at separations as incredible as WiMAX however there are two reasons why it doesn't. One reason is that radios working in the unlicensed frequencies are not permitted to be as effective as those worked with licenses; and from tradition, less power implies less separation. These controls depend on the dated suspicion that devices can't direct themselves — however the presumption might be right over sufficient separations. The second reason regarding why Wi-Fi hotspots don't serve as wide a range as WiMAX does is the basic designing conviction that the issue of everyone yelling on the double, regardless of the possibility that it's surmountable in a classroom, would be calamitous in a bigger field. The Wi-Fi MAC layer utilizes conflict access. This makes clients to vie for data. Wi-Fi even has issues with interference, and throughput and that is the reason triple play (voice, information, and video) advancements can't be facilitated on conventional Wi-Fi. Interestingly, 802.16 utilize a scheduling algorithm. This algorithm permits the user to just contend once for the access point. This gives WiMAX advantages in throughput, latency, spectral efficiency, and antenna support. From the specialized perspective, it can be seen that both of these two wireless advancements are not essentially tended to at the same market but rather are extremely integral. Wi-Fi is essentially an execution of wireless LAN inside a short range like a little building, a school or an institutional grounds. WiMAX then again is a metropolitan innovation whose goal is to interconnect houses, structures or hotspots to permit correspondence amongst them and with different systems.

In spite of the fact that not being focused on the same use, WiMAX has a few points of interest when compared with Wi-Fi. For example, a superior reflection tolerance; a superior penetration of hindrances; and number of interconnections (a couple of several hardware instead of a few many gear for Wi-Fi). Clearly the WiMAX standard objective is not to supplant Wi-Fi in its applications yet rather to supplement it with a specific end goal to shape a remote system web. In spite of the comparability in hardware cost, WiMAX

innovation requires an excessive base as opposed to Wi-Fi which can without much of a stretch be introduced utilizing minimal effort access focuses. These two remote advancements have basic parts in their operations with a noteworthy contrast in the correspondence range. The accompanying table 1 gives the definite similar examination of the two broadband remote access systems (Wi-Fi and WiMAX).

TABLE I
COMPARISION OF VARIOUS WIRELESS STANDARD

Feature	WiMAX (802.16a)	Wi-Fi (802.11b)	Wi-Fi (802.11a/g)
Primary Application	Broadband Wireless Access	Wireless LAN	Wireless LAN
Frequency Band	Licensed/Unlicensed 2 G to 11 GHz	2.4 GHz ISM	2.4 GHz ISM (g) 5 GHz U-NII (a)
Channel Bandwidth	Adjustable 1.25 M to 20 MHz	25 MHz	20 MHz
Half/Full Duplex	Full	Half	Half
Radio Technology	OFDM (256-channels)	Direct Sequence Spread Spectrum	OFDM (64-channels)
Bandwidth Efficiency	<=5 bps/Hz	<=0.44 bps/Hz	<=2.7 bps/Hz
Modulation	BPSK, QPSK, 16-, 64-, 256-QAM	QPSK	BPSK, QPSK, 16-, 64-QAM
FEC	Convolutional Code Reed-Solomon	None	Convolutional Code
Encryption	Mandatory- 3DES Optional- AES	Optional- RC4 (AES in 802.11i)	Optional- RC4 (AES in 802.11i)
Mobility	Mobile WiMAX (802.16e)	In development	In development
Mesh	Yes	Vendor Proprietary	Vendor Proprietary
Access Protocol	Request/Grant	CSMA/CA	CSMA/CA

III. ARCHITECTURE

The WiMAX NWG has built a system reference model to serve as an engineering structure for WiMAX arrangements and to guarantee interoperability among different WiMAX hardware and administrators. The system reference model imagines a bounded together system engineering for supporting altered, roaming, and portable organizations and depends on an IP administration model. The following is rearranged delineation of an IP-based WiMAX system design. The general system might be partitioned into three sections -

- Portable Stations (MS) utilized by the end client to get to the system.
- The entrance administration system (ASN), which contains one or more base stations and one or more ASN entryways that frame the radio access system at the edge.

- Availability administration system (CSN), which gives IP availability and all the IP centre system capacities.

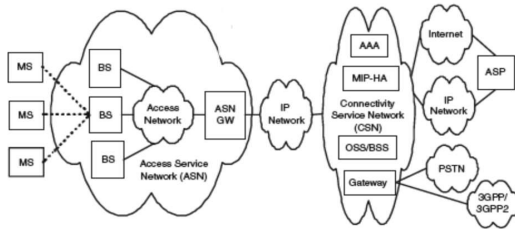


Fig. 2 WiMax architecture

IV. IMPLEMENTATION

Motorola Canopy is an answer for broadband remote access for the arrangement of i or extension of the current system to give broadband administrations to clients. Covering framework permits remote access point that can be specifically associated with the broadband foundation, or back-handed through remote backhaul on the radio or optical system. Shelter items have various focal points over wi-fi and other WLAN conventions. The planning of transmissions is expressly controlled, permitting access focuses to all shafts can be synchronized through GPS, in this way it helps keeping away from the event of impedance. Just the Canopy stage is difficult to lay beside each different access focuses that work in the same recurrence range, which is not the situation, or not prescribed by most different conventions. These items are intended for the requirements of any WISP and are easy to introduce and design, as well as the further administration.

V. PERFORMANCE ANALYSIS

So as to explore the exhibitions of the systems by utilizing diverse “codecs” the OPNET Modeler reenactment device was utilized. The OPNET Modeler bolsters WiMAX innovation. It likewise underpins the examinations on the execution of the “codecs” over a custom system. The examined system topology comprises of more reasonable situation organized like a WMAN. The system

comprises of an inside IP cloud which is associated with an application server running VoIP application. There are 10 endorser stations under every base station (BS). Every BS is associated with a Point-to-Point (PPP) join with a rate of E3 standard interface with the IP cloud and every BS has the limit of taking care of 100 SSs. Every hub is static and the entrance innovation is OFDMA 20 MHz TDD duplexing innovation. The application profile is running in serial mode which implies that every application starts parcel era in a serial way. The bundle era began now and again that are consistently conveyed. The entire procedure of bundle era endures till the end of the reproduction. There are two choices accessible for voice “codecs” in particular without voice recognition and with voice discovery. In this examination we constrain ourselves to “codecs” without voice identification alternative. Voice bundle per edge was 1. The quiet length (determined the time spent by the called party and the calling party peacefully mode in single hush cycle) is 0.65 seconds and “Talk Spurt length” (indicated the time spent by the called party and the calling party in Speech mode in single hush cycle) is 0.65 seconds. The Type of Service (ToS) is intuitive voice. The pressure and the decompression postponements are 0.02 seconds. Discussion environment is calm room. All traffics are discrete. The WiMax Mac layer was designed with two sorts of booking strategy. Most extreme supported movement was arranged with 5 Mbps and greatest held activity was designed with 1.5 Mbps. The most extreme idleness was set to 30 ms.

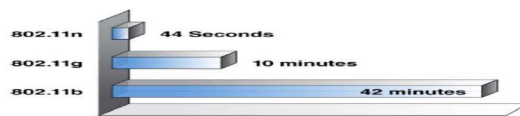


Fig. 3 Time (Best Case) to Transfer 30-Minute Video

VI. CONCLUSION

This paper has presented an overview of emerging wireless technologies. Our vision of the future is that WiMAX will enable mobile broadband at an affordable price. This will be achieved through the adoption of WiMAX by a cellular provider seeking

to make a jump to this disruptive technology. WiMAX is not expected to completely eliminate the Wi-Fi technology in the near future, but will be a complement to Wi-Fi as its primary backhaul service of choice. WiMAX promises to help corporations expand business, drive down costs, increase overall profitability, increase the quality of service, and increase the number of users that connect to the Internet.

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