

Standard Mobile Based Wireless Broadband Networks

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Abstract— Now-a-days there is high demand for broadband mobile services. Traditional high-speed broadband solutions depend on wired technologies namely digital subscriber line (DSL). Wi-Fi and Wimax are helpful in providing any variety of property like the mounted or transportable or nomadic connectivity without the requirement of LoS (Line of Sight) of the base station. Mobile Broadband Wireless Network (MBWN) may be a versatile and economical answer for remote areas. The IEEE Wi-Fi and Wi-Max/802.16 are the most promising technologies for broadband wireless metropolitan area networks (WMANs) and these are capable of providing high throughput even on long distances with varied QoS. These technologies ensure a wireless network that enables high speed Internet access to residential, little and medium business customers, further as net access for wireless local area network hot spots and cellular base stations. These offer support to both point-to-multipoint (P2MP) and multipoint-to-multipoint (mesh) nodes and offers high speed data (voice, video) service to the customers. In this paper, we study the issues related to, benefits and deployment of these technologies.

Keywords—WIMAX, SSO's, Industry benefits, Wireless Network, Broadband.

I. INTRODUCTION

Prior to any significant WiMAX adoption, broadband wireless access (BWA) in 2005 generated worldwide service revenues totaling \$1.8 billion and equipment revenues of \$750 million (Fellah and Sputa 2006, p. 138).⁵ Most of the equipment sold in 2005 was non-conformant or proprietary technology. However, WiMAX is gaining traction in the marketplace as adoption of the industry-wide standards enables both service providers and technology vendors to make commercial commitments to the technology, forming the foundation of a WiMAX ecosystem. During 2006 service provider trials moved into launch phase in many areas. WiMAX service revenues in 2006 are estimated by analysts in the hundreds of millions of dollars and equipment revenues range from \$143 million (Fellah and Syputa 2006) to \$549 million.⁶ For 2007, world-wide sales of WiMAX equipment totalled nearly \$800 million, representing 46% growth.⁷ WiMAX chipsets will be embedded into laptops by 2008, handheld devices by 2009, and consumer electronics in of 2010. These developments will spur mass market adoption. Full adoption of such services by significant numbers of consu requires an ecosystem of devices that can connect to the service. WiMAX is now promoting new mobile devices with advanced functionality and that support high-speed handoffs, roaming and multiple antenna technologies. Initial mobile WiMAX equipment will include notebook-based subscriber units (mini PCMCIA cards, PCI Express, PCI Express mini, USB modules, etc.) and desktop

units. Various mobile devices now are available with embedded WiMAX devices, such as notebooks, Ultra Mobile PCs (UMPC), PDAs, smart phones and other wireless devices. In addition to VoIP, other real-time applications like mobile video and audio streaming, videoconferencing, and gaming will greatly benefit from the quality of service and low latency offered by WiMAX. New applications and functionality not yet considered may also result.

II. BENEFITS TO ACTORS & STAKEHOLDERS IN WIMAX CAN BE AGGREGATE FOLLOWS OPERATORS:

Operators include the subscription service providers for telephony, communication, data, and other network services to end users. Some of these are major phone and internet service providers whose networks cover huge areas, while others can be small and specialized, both in regional area and in customer base.

A. Legacy Incumbents:

These are existing fixed voice and data service providers using technologies, primarily DSL and cable, and to a lesser extent fibre optics.

B. Vendors/Manufacturers:

These include makers and marketers of chipsets, devices, base stations and servers, peripherals, and test and certification systems as well as consulting services to owners and operators of communications systems.

C. SDO's/SSO's:

Standards development organizations and standards setting organizations develop families of standards. IEEE is the dominant SDO stakeholder in this group. Governments a key metric for inter- and intra-national comparisons is the depth of broadband consecutiveness within countries. Governments therefore have a public policy interest in broadband projects.

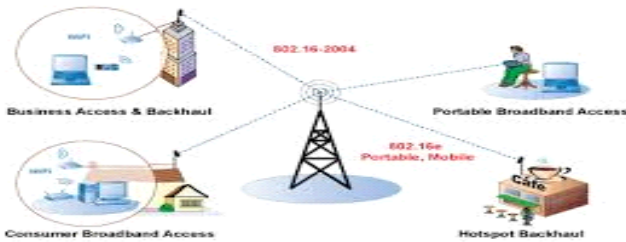
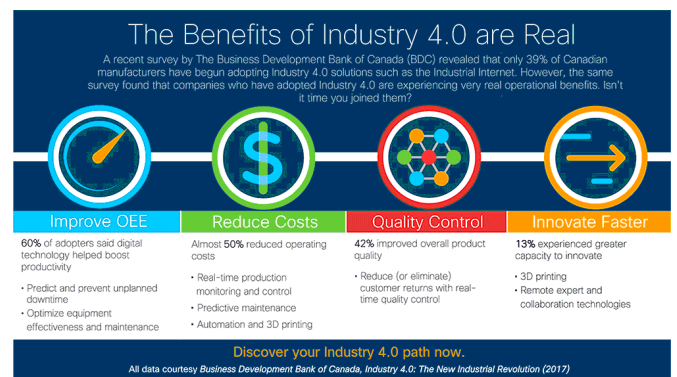


Fig (1): Benefits of actors and stakeholders

III. INDUSTRY BENEFITS

WiMAX has been gaining traction in the marketplace as the establishment of industry-wide standards enables both service providers and technology vendors to make commercial commitments to the technology, thereby forming the foundation of a WiMAX ecosystem. This technology looks to be a major component of the broadband wireless industry. The standard has created opportunities to expand the size of the market well beyond what it has been to date. Although three years have passed since the adoption of 802.16(2004), significant market impact is only in the beginning phases. The initial results in terms of market success achieved by industry actors is not readily available and as a result the ability to conduct a quantitative analysis on revenues (or cost savings) attributable to the standard is limited. It is expected that WiMAX will increase revenues for the companies participating in the new ecosystem. Projected revenue estimates were not provided by our survey respondents except for one firm, and the answer it gave was very general. However, six of the respondents stated that the 802.16 standards effort has hastened adoption of WiMAX technology, & therefore have accelerated revenues or cost savings for the company. Four stated an acceleration of 1 to 2 years, while two suggested an acceleration of 3 or more years, pointing out that there might have been very little adoption at all without a consensus standard. Another key benefit of the standard is increased efficiencies. These can manifest themselves in a number of ways. Within the WiMAX industry some of these include reduction of entry barriers to new entrants, evident from the large number of firms which participated in the IEEE 802.16 process as well as the very large membership of the WiMAX Forum, including

many small companies. Also, fewer base stations required greatly reduces network capital and maintenance costs. Another key benefit of the standard is increased efficiencies. These can manifest themselves in a number of ways. Within the WiMAX industry some of these include reduction of entry barriers to new entrants, evident from the large number of firms which participated in the IEEE 802.16 process as well as the very large membership of the WiMAX Forum, including many small companies. Also, fewer base stations required greatly reduces network capital and maintenance costs. The WiMAX standard has allowed for interoperability between products from different vendors which has an impact on cost.



Fig(2):Benefits of industry

IV. FIXED BROAD BAND WIRELESS NETWORK

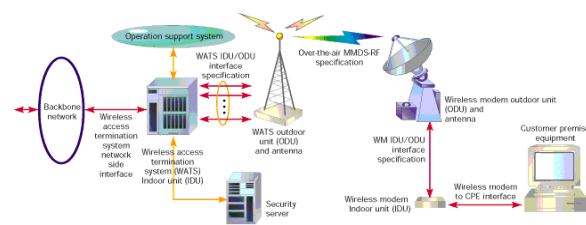


FIGURE 1: Diagram of a typical broadband wireless network. In this network, the WATS acts as a central hub/ base station while the modem helps bring connectivity to the home.

Fig (3): Fixed broadband wireless network

Fixed broadband wireless technologies can be defined as high-speed wireless networks that connect to stationary locations and are intended to serve nomadic users [5]. Wireless Fidelity (Wi-Fi) and Worldwide Interoperability for Microwave Access (WiMAX) technologies which are discussed in this paper are governed by IEEE 802.11 and 802.16 specifications respectively. There specifications are as shown in Table 1. t y N e t w o r k Technology Wi-Fi is the first high-speed fixed wireless technology to enjoy broad

deployment, therefore there exist today many wireless products based on Wi-Fi technologies which include the approved IEEE 802.11a, b and g specifications, as well as the yet-to-be ratified 802.11n specification [8]. The different characteristics of the various Wi-Fi standards are given in Table 1. Wi-Fi as a high-speed wireless technology has enjoyed broad deployment, most notably in hotspots around the world including homes and offices, and increasingly in cafes, hotels and airports [4]. Today, Wi-Fi hotspots are very popular and have been applauded for their ability to improve productivity for mobile corporate users. Wi-Fi is limited by its coverage area and high-speed connectivity is only possible as long as a user remains within range of the wireless access point, which is optimally within 100m. The Wi-Fi architecture consists of a base station to which wireless hosts are connected in order to access network resources. The base station is responsible for sending and receiving data to and from the wireless host that is associated with the base station. The connection between the host and the base station is the wireless communication link. This communication link is responsible for data transport between the base station and the hosts [6]. The main strength of Wi-Fi is its simplicity and ease of deployment given that it uses unlicensed radio spectrum. Wi-Fi allows users to be mobile for up to 100m from the base station and still have access to the network. Also, the cost for rolling out this wireless solution is low because no expensive wiring is required. Finally, there is also availability of many other Wi-Fi compatible products, which can interoperate with other network technologies [9].

A. Fixed broadband access technology

Wi-Fi has its weaknesses. The user can only use the technology within the confines of 100m radius thus limiting the level of mobility. Also, the fact that the technology operates in the 2.4 GHz band from other devices such as Bluetooth, cordless phones, etc. In terms of security, the encryption standard used such as Wired Equivalent Privacy (WEP) has been shown to be easily breakable [5]. * Worldwide Interoperability for Microwave Access (WiMAX) Network Technology Worldwide Interoperability for Microwave Access (WiMAX) is a fixed broadband wireless technology that is gaining acceptance and delivers last kilometre broadband connectivity in a larger geographic area than Wi-Fi. It provides canopies of anywhere from one to ten kilometres wide. Such WiMAX coverage range provides fixed and nomadic wireless broadband connectivity without necessarily having a line-of-sight (LOS) with a base station [2]. WiMAX will also enable greater mobility, higher speed data applications, range and throughput [5]. WiMAX uses the IEEE 802.16 standards specifications (802.16d and g). The IEEE 802.16d

specification is primarily tailored to wireless wide area networks (WWANs).

The IEEE 802.16e specification on the other hand is primarily used for mobile wireless metropolitan networks (WMANs). These two specifications render WiMAX architecturally ideal for the last kilometre, the backhaul, Internet Service Providers, cellular base stations that bypass PSTN's, hotspots, and enterprise networks [4]. Abilities such as high bandwidth frequencies between 2 GHz and 11 GHz, makes WiMAX ideal for data transport. WiMAX has a total range of up to 50 km [1]. This ability is enhanced by WiMAX's cell radius of 5 -10 km. Also, WiMAX has the ability to support various data transmitting rates of up to 75 Mbps as shown in tables 1 and 2. There are several advantages that can be derived from the

V. CONCLUSION

Wi MAX is poised to play a very significant role in bringing transformational communications capabilities to people, enterprises, and governments across the globe including hard reaching locations. Development of the standards that enable WiMAX serves as a model of successful public/private cooperation in the standards arena. There has been an unprecedented rapid growth in the demand for mobility globally, seamless communication, data services, and ubiquitous computing. Fixed broadband wireless networks are helping users meet the growing need for broadband wireless access at hotspots and beyond, while broadband mobile technologies are expected to enable broadband wireless network access for highly mobile users. Advances in DSP and antenna technologies along with earning potentials are fuelling the tremendous growth in broadband wireless. Enhancements in High Speed Packet Access (HSPA) are expected to be a major investment area in this decade while the fixed broadband wireless would be more of a niche service for operators during the same period.

The fixed and mobile broadband wirelesses in many ways complement each other & also in some ways compete with each other. There are now many mobile handsets with embedded Wi-Fi technology. 3G which was first deployed in 2002 by Do Como is becoming a commonplace, but its very existence has been challenged by WiMax. In the 3GSM Congress held in February 2007, most of the doyens in the field were evangelizing WiMax as the way forward. Sprint, the third ranked operator in the US chose WiMax in August 2006 for 4G technologies. In 2006, In-Stats reported that the WiMax subscribers will exceed 14 million by the end of 2011.

However, it is the contention of the authors that although WiMax is gaining momentum, it would take more than a decade to catch up with 3G, during which time the technologies should have matured & also tending towards obsolescence.

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